J-U-B ENGINEERS, Inc.
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April 18, 2007

Kody Van Dyk, P.E.
City of Sandpoint
1123 West Lake Street
Sandpoint, ID 83864-1714

Dear Kody:

RE: 2005 Facility Planning Project

Enclosed for your use is the final draft of your Wastewater Facility Plan. The Facility Plan is comprised of an Executive Summary and 12 Technical Memoranda as follows:

Executive Summary - Summary of Major Findings

Collection System
- TM #1 - Service Area Conditions and Population Trends
- TM #2 - Collection System Infiltration and Inflow Evaluation
- TM #3 - Collection System Model Development and Evaluation
- TM #4 - Future Wastewater Collection Facilities and Improvements
- TM #5 - Collection System Capital Improvement Program

Wastewater Treatment Plant
- TM #6 - Wastewater Treatment Plant Flow and Load Projections
- TM #7 - Existing Wastewater Treatment Plant Capacity Analysis
- TM #8 - Facility Planning Effluent Limits
- TM #9 - Alternative Wastewater Treatment Analysis
- TM #10 - Interim Treatment Plant Actions and Capital Improvement Plan
- TM #11 - Long Term Treatment Plant Actions and Capital Improvement Plan
- TM #12 - Regional Considerations

Development of this Plan has been a pleasure thanks to the strong collaboration between all of the team members. In particular, your contributions and those of your staff, Mayor, the City Council, and Citizens Advisory Council (CAC) gave us the input we needed to make this Plan reflect your needs. We wish especially to thank Larry Hull, Bill Weiden, Mike Hook, and Rod Berget for their superb knowledge of their systems and ideas about potential improvements. Darlene Edwards gave willingly of her time to help research any information requested of her. Special thanks are given to Mayor Ray Miller and the Public Works Committee (Steve Lockwood, Helen Newton, and Michael Boag) for their active involvement throughout development of this work.

Finally, the CAC provided us with exceptional input from the entire region and would like to thank all of the members of the CAC for their time and energy including:

Carrie Logan – City of Ponderay
Cindy Elliott – City of Sandpoint City Council
Diane Williams – Tri State Water Council
Gary Westcott – Southside Water District
Helen Newton – City of Sandpoint
Jeanne Jackson-Heim – Selkirk Assoc. of Realtors
Jim Quinn - Sandpoint Business
John Corn – Area Resident
John Monks – Hydro-Geoscience
John Tindall – Idaho Dept of Environmental Quality
Karl Dye – Bonner County Commissioner
Kody Van Dyk – City of Sandpoint
Maggie Becker – City of Dover
Mark Williams – DCEDC
Nancy Piatt – City of Ponderay
Neal Hewitt – City of Dover
Owen Marcus – Area Resident
Randy Curless – City of Dover Mayor
Ray Miller – City of Sandpoint Mayor
Rosemary Shoong – Area Resident
Ruth Watkins – Tri State Water Council
Ryan Luttman – Bonner County Engineering
Tim Closson – Kootenai Ponderay Sewer District
Tom Trulock - Schweitzer
Verna Brady – Litehouse

Thank you for all of your support in getting this project competed on schedule and in getting active participation by all of your affected stakeholders!

Please do not hesitate to call if you have any questions (208-762-8787).

Sincerely,

J-U-B ENGINEERS, Inc.

Stephen P. James, P.E.
Project Manager

# CITY OF SANDPOINT
# Wastewater Facility Plan

## Executive Summary
## and
## Technical Memorandums

March 2007

PROFESSIONAL ENGINEER
REGISTERED
7768
3/21/07
STATE OF IDAHO
STEPHEN P. JAMES

Prepared by


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# CITY OF SANDPOINT
# Wastewater Facility Plan

## Executive Summary
## and
## Technical Memorandums

March 2007

Prepared by

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# City of Sandpoint
# Wastewater Facility Plan

## March 2007

EXECUTIVE SUMMARY

TECHNICAL MEMORANDUMS

**1 Service Area Conditions and Population Trends**

**2 Collection System Infiltration and Inflow Evaluation**

**3 Collection System Model Development and Evaluation**

**4 Future Wastewater Collection Facilities and Improvements**

**5 Collection System Capital Improvement Program**

**6 Wastewater Treatment Plant Flow and Load Projections**

**7 Existing Wastewater Treatment Plant Capacity Analysis**

**8 Facility Planning Effluent Limits**

**9 Alternative Wastewater Treatment Analysis**

**10 Interim Treatment Plant Actions and Capital Improvement Plan**

**11 Long-term Treatment Plant Actions and Capital Improvement Plan**

**12 Regional Considerations**

# Acronyms

| | |
|---|---|
| ACI | area of city impact |
| ATS | automatic transfer switch |
| BOD | biochemical oxygen demand |
| $BOD_5$ | 5-day biochemical oxygen demand |
| BPR | biological phosphorus removal |
| CBOD | carbonaceous biochemical oxygen demand |
| CCTV | closed-circuit television |
| cfs | cubic feet per second |
| CIPP | cured in-place pipe |
| d/D | depth of flow/diameter (of pipe ratio) |
| DEM | digital elevation model |
| EMDP | emergency distribution panel |
| ERU | cost per equivalent connection |
| FIRM | Flood Insurance Rate Maps |
| FEMA | Federal Emergency Management Agency |
| F:M | food to microorganism (rate) |
| gpcd | gallons per capita per day |
| gpd | gallons per day |
| gpd/acre | gallons per day per acre |
| GPS | global positioning system |
| HRT | hydraulic retention time |
| I/I | infiltration and inflow |
| IDEQ (or DEQ) | Idaho Department of Environmental Quality |
| ISPWC | Idaho Standards for Public Works Construction |
| JWC | JWC Environmental Channel Monster (primary grinding unit at the WWTP) |
| KPSD | Kootenai-Ponderay Sewer District |
| MBR | membrane biological reactor |
| MCRT | mean cell residence time |
| MDP | main (normal) distribution panel |
| mgd | million gallons per day |
| MLSS | mixed liquor suspended solids |
| MLVSS | mixed liquor volatile suspended solids |

| | |
|---|---|
| NPDES | National Pollutant Discharge Elimination System |
| NUFFs | new user facility fees |
| $O_3$ | ozone |
| O&M | operations and maintenance |
| OR | overflow rate |
| ppd | pounds per day |
| PPDU | people per dwelling unit |
| RAS | return activated sludge |
| SCADA | supervisory control and data acquisition |
| SLR | solids loading rate |
| SRT | solids retention time |
| SWSD | Southside Water and Sewer District |
| TKN | total Kjedahl nitrogen |
| TMDL | total maximum daily load |
| TSS | total suspended solids |
| UV | ultraviolet |
| VFDs | variable frequency drives |
| WAS | waste activated sludge |
| *WWTP* | wastewater treatment plant |

# CITY OF SANDPOINT
# Wastewater Facility Plan

## Executive Summary

March 2007

Prepared by

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# 1 Purpose

The City of Sandpoint (City) authorized preparation of this planning document as a proactive approach to managing its wastewater facilities. Wastewater facilities' planning was driven by excessive infiltration and inflow (I/I) in the collection system and by rapid population and commercial growth. This growth is expected to significantly expand the existing service boundary. To accommodate such growth, this study was undertaken to:

1. Evaluate I/I in the existing collection system, including identification of probable magnitudes, potential for removal, and recommendations for additional I/I identification and reduction
2. Determine the capacity of the existing collection system and outline necessary improvements with likely schedules, based on current flows and expected growth
3. Evaluate the current condition and performance of the existing wastewater treatment plant (WWTP) and determine unit process capacities with no major upgrades
4. Review current permit requirements and identify potential changes
5. Identify wastewater treatment alternatives (including upgrades or modifications to the existing WWTP and the potential need to relocate it to meet future discharge requirements at the projected flows and loads), then further screen preferred alternatives to determine short- and long-term recommended actions for the City
6. Evaluate the potential to provide regional wastewater treatment

# 2 Deliverables

This wastewater facility plan (the plan) has been developed in a series of technical memorandums, listed in Table ES-1 and summarized next.

TABLE ES-1
Technical Memorandums for the Facilities Plan
*March 2007*

| Technical Memorandum | Title | Issue Date | |
|---|---|---|---|
| | | Draft | Final |
| 1 | Service Area Conditions and Population Trends | Oct 2005 | Nov 2006 |
| 2 | Collection System Infiltration and Inflow Evaluation | Aug 2005 | Nov 2006 |
| 3 | Collection System Model Development and Evaluation | Oct 2005 | Nov 2006 |
| 4 | Future Wastewater Collection Facilities and Improvements | Oct 2005 | Nov 2006 |
| 5 | Collection System Capital Improvement Program | Mar 2006 | Nov 2006 |
| 6 | Wastewater Treatment Plant Flow and Load Projections | Jan 2006 | Nov 2006 |
| 7 | Existing Wastewater Treatment Plant Capacity Analysis | Jan 2006 | Nov 2006 |
| 8 | Facility Planning Effluent Limits | Dec 2005 | Nov 2006 |
| 9 | Alternative Wastewater Treatment Analysis | Jan 2006 | Nov 2006 |
| 10 | Interim Treatment Plant Actions and Capital Improvement Plan | Mar 2006 | Nov 2006 |
| 11 | Long-term Treatment Plant Actions and Capital Improvement Plan | Apr 2006 | Nov 2006 |
| 12 | Regional Considerations | Apr 2006 | Nov 2006 |

## 2.1 Service Area Conditions and Population Trends

The City is located in northern Idaho, west of Sand Creek, northwest of Lake Pend Oreille, and north of the Pend Oreille River. The City's existing WWTP discharges into the Pend Oreille River.

Hofman Planning Associates (Laclede, Idaho) has performed a draft impact fee study for the City which includes detailed analyses of local population trends and density changes (Technical Memorandum No. 1, Appendix A). The data has been used as the basis for current population totals, future population estimates, and land-use projections for build-out beyond current City limits and Area of City Impact (ACI). Hofman Planning Associates has developed population projections for two scenarios, ultimate build-out to the current City limits and to an expanded boundary (set as the ACI), as summarized in Table ES-2:

TABLE ES-2
Population Projection Summary
*March 2007*

| Geographic Area | Existing Population | Population Growth to Build-Out | Total Build-Out Population |
|---|---|---|---|
| City Limits | 6,829 | 2,377 | 9,206 |
| Area of Impact | 1,399 | 26,565 | 27,965 |
| **Total** | **8,228** | **28,942** | **37,171** |

Data source: Hofman Planning Associates, Laclede, Idaho, 2006.

Population growth rates and trends were evaluated to project and schedule the phasing for required improvements. A final projected growth trend is to be developed, pending input from the City.

## 2.2 Collection System Infiltration and Inflow Evaluation

An I/I analysis was performed on the City's existing collection system to evaluate the effects of extraneous I/I flows to the WWTP. Portable sewer flow monitors were installed in the collection system from March 12, 2005 to April 19, 2005. These flow monitors recorded flows from five zones:

- Zone I: Lincoln Interceptor Basin
- Zone II: Upper Ella Basin (north of Oak Street)
- Zone III: Lower Ella Basin
- Zone IV: Boyer Basin
- Zone V: First Avenue Basin

Flow data from the recorders was analyzed and distinctions were made between base domestic flow, base infiltration, rapid infiltration, and inflow. Based on the flow monitoring data, the collection system is suffering from excess inflow, rapid infiltration, and base infiltration.

Based on observed flows in spring 2005, the potential reduction of peak infiltration and inflow under a moderate I/I removal approach is estimated at 2.45 mgd, or 24 percent. To meet higher I/I reduction, the City will need to embark on an aggressive removal strategy including work with sump pumps and private sewer laterals. I/I reduction under this scenario could reasonably be 50 percent. A summary of the flow monitoring data is presented in Table ES-3.

## 2.3 Collection System Model Development and Evaluation

A hydraulic model of the sewer collection and pumping system was developed to evaluate the capacity of the existing system and establish a tool for planning future expansions. The evaluation under the 10-year design storm revealed that much of the existing system is operating at or above capacity in the Ella, Boyer, and First Avenue Basins. During wet-weather events, areas in the Ella and First Avenue Basins experience surcharging near street level. Several localized areas within the Lincoln Basin have poor and even adverse grade. The capacity of the existing lift stations were evaluated and appear to have

adequate pumping capacity to convey the current flows while maintaining reliability, assuming the largest pump at each station is not operating.

TABLE ES-3
Flow Monitoring Summary[a]
*March 2007*

| Zone | Average Observed Flow (mgd) [% Total] | Peak Observed Flow (mgd) [% Total][a] | Peak Observed Infiltration (mgd) | Peak Infiltration Per Acre of Service Area (gpd/acre) | Estimated Inflow Magnitude (mgd) | Estimated Inflow Impervious Area (acres)[c] |
|---|---|---|---|---|---|---|
| I Lincoln Basin | 0.95 [27%] | 3.30 [35%] | 1.65 | 2,090 | 1.45 | 3.1 to 5.2 |
| II Upper Ella Basin | 0.50 [14%] | 1.83 [19%] | 1.1 | 6,077 | 0.58 | no data[d] |
| III Lower Ella Basin | 0.27 [8%] | 1.90 [20%] | 0.6 | 5,940 | 1.2 | 5.4 |
| IV Boyer Basin | 1.1 [31%] | 1.9 [20%] | 1.0 | 5,380 | 0.5 | no data[d] |
| V First Avenue Basin | 0.69 [20%] | 2.80 [30%] | 1.1 | 3,956 | 0.9 | 2.4 to 2.9 |
| **Total** | **3.51** | **9.5[B]** | **5.45** | **4,688** | **4.63** | **7.8 to 13.5** |

a. Based on monitoring conducted from March 12, 2005, to April 19, 2005
b. Based on peak flow from WWTP Influent chart recorder from March 27, 2005
c. Based on calculations of flow-monitored inflow events in relation to monitored precipitation events; based on Q=CiA, where Q=inflow volume, C=1, i=rainfall total in inches, A=area of impervious surface
d. Flow monitoring manhole surcharged in Zone IV (Site 4) and Zone II (Site 6) during rainfall event of March 27, 2005, causing attenuation of inflow in the collection system; no calculations made to separate infiltration and inflow

## 2.4 Future Wastewater Collection Facilities and Improvements

The existing calibrated hydraulic model was used as the basis for collection system plan, to serve both the current City limits and the ultimate expanded boundary.

Service to the expanded boundary will require an additional 12 new lift stations. In addition to these new lift stations, both the South Boyer and Jail lift stations will require capacity upgrades to pump the projected flows.

A new interceptor will be required to accommodate increased flows resulting from the anticipated population growth. Because much of that growth will occur to the north and west, the new interceptor should be located west of the existing railroad. This future Westside Interceptor will drain a large portion of the expanded boundary by gravity, west of the current City limits, and will accommodate the Northern Service Area, north of the current City limits.

Two preferred alternative routes were identified for the new Westside Interceptor. The first alignment would connect to the existing Lincoln Interceptor at the intersection of Lincoln Road and Poplar Street, and extend north to Selle Road. This route would require increasing the size of the Lincoln Interceptor from the connection point downstream to the WWTP. The second alignment would connect to the existing Ella Interceptor at the intersection of Ella Avenue and Main Street, and extend north to Selle Road. This route would require increasing the size of the Ella Interceptor from the connection point downstream to its connection with the lower end of the Lincoln Interceptor, and subsequently into the WWTP.

Based on discussions with City staff, the final recommended alignment would route the new Westside Interceptor through the lower end of the existing Ella Interceptor Basin (Alternative No. 1).

# 2.5 Collection System Capital Improvement Plan

## 2.5.1 CIP Organization

The Capital Improvement Program for the collection system has been divided into two segments:

**General improvements** to the existing system to remediate areas with excessive deterioration and I/I.

**System Expansion and Capacity Improvements** required to expand the system to serve the expanded future sewer service boundary.

## 2.5.2 General Improvements

Several general improvements are suggested, critical to maintaining the longevity of the system and alleviating system deficiencies. These improvements were identified as key to reducing I/I and rehabilitating weak points of the system. An opinion of probable cost for each of the recommended system upgrades is summarized in Table ES-4.

TABLE ES-4
Opinion of Probable Cost for General Improvements
*March 2007*

| Project | Capital Cost (2006 Dollars) |
|---|---|
| Phase I Project - Lower Ella Basin | $3,166,800 |
| Phase II Project - Upper Ella Basin | $4,247,500 |
| Phase III Project - First Ave. Basin | $4,432,100 |
| Phase IV Project - Lincoln Basin | $832,200 |
| Phase V Project - Boyer Basin | $2,810,400 |
| **Total (all phases)** | **$15,489,000** |

A potential phasing and implementation plan for the General Improvement Projects is included in Table ES-5. This plan groups the various basin projects into 5-year phases. The project costs have been inflated at 3 percent per year until the midpoint of construction for each phase.

## 2.5.3 System Expansion and Capacity Improvements

Several major upgrades to the City's collection system will be required as the system expands west of the current City limits, including the recommended alignment for the proposed Westside Interceptor.

Two separate costs were developed for the interceptor and are shown in Table ES-6. The first assumes the WWTP will remain at the existing site near the Pend Oreille River. The

second assumes the WWTP will be relocated to a new location near the intersection of Baldy Road and Great Northern Road (west of the current City limits).

TABLE ES-5
Collection System Phasing Plan
*March 2007*

| Project | Project Phasing Period | | | | |
|---|---|---|---|---|---|
| | **2006 to 2011** | **2011 to 2016** | **2016 to 2021** | **2021 to 2026** | **2027 to 2032** |
| Phase I Project – Lower Ella Basin | $3,410,000 | | | | |
| Phase II Project – Upper Ella Basin | | $5,300,000 | | | |
| Phase III Project - First Ave. Basin | | | $6,410,000 | | |
| Phase IV Project - Lincoln Basin | | | | $1,400,000 | |
| Phase V Project – Boyer Basin | | | | | $5,465,000 |

Notes:
Costs do not include financing fees, etc.
Costs include 3 percent interest per year to midpoint of project phase.
Costs are ±30 percent and should be verified prior to construction.

TABLE ES-6
Opinion of Probable Cost for Westside Interceptor Alternatives
*March 2007*

| Project | Capital Cost (2006 Dollars) |
|---|---|
| Westside Interceptor (outside current City limits)[a] | $2,795,000 |
| Westside Interceptor (inside current City limits) | |
| Alternate A: Existing WWTP site | |
| Westside Interceptor (Ella Basin reconstruction) flow to existing WWTP site[b] | $8,850,000 |
| Alternate B: New WWTP Site | |
| Westside Interceptor (Ella Basin reconstruction) flow to new WWTP site | $4,270,000 |
| Pressure Lines (to and from new WWTP site) | $7,195,000 |

a. This project is required regardless of WWTP location.
b. Flow from the north end of the Lincoln Interceptor will be directed to the west in a new gravity line to the new WWTP location. The cost reflects this modification and subsequent smaller pipe size required for the lower Ella Basin reconstruction. These costs include new pressure lines to convey flow from the existing plant to the new site and new pressure lines to return flow from the new treatment plant site to the existing outfall. Pumping station costs have not been included here but are discussed in the WWTP evaluation.

## 2.6 Wastewater Treatment Plant Flow and Load Projections

Flows at the WWTP are dominated by I/I throughout most of the year. Domestic flows are estimated at 0.79 mgd (115 gallons per capita per day [gpcd]), based on water meter records. However, base dry weather flows are approximately 2.0 mgd, indicating a base infiltration rate of approximately 1.2 mgd. I/I is most severe during the spring when heavy rain-on-snow events increase flows to observed peaks of 14.7 mgd.

Flows at the WWTP are expected to change in the planning period due to the following factors and are summarized in Tables ES-7 to ES-10.

- Changes in the base domestic flow due to population growth and expansion of the service area into the ACI. The current population of 6,829 is expected to increase to 37,171 at build-out.
- I/I in the existing collection system was examined in three ways: 1) remain unchanged, 2) be reduced approximately 24 percent by moderate I/I reduction projects, or 3) be reduced up to 50 percent with an aggressive I/I reduction plan.
- I/I in new service areas in the ACI can be expected to occur at 300 gallons per day per acre (gpd/acre) on average, with peak events at 500 gpd/acre.

The 5-day biochemical oxygen demand ($BOD_5$) and total suspended solids (TSS) data also were reviewed to identify probable load during the planning period. Average per capita loading and peaking factors were determined for the period from January 2002 to present. The average and peak events were higher than typical design guidance, presumably due to industrial and commercial inputs. Assuming the observed loading trends remain consistent, projected loads for build-out of the existing service boundary and expansion into sewered areas in the ACI are as shown in Table ES-9.

TABLE ES-7
Base Domestic Flow Projections
(Based on Technical Memorandum #1, Service Area Conditions and Population Trends)
*March 2007*

| | Current | Year 2015 | Year 2025 | Build-out |
|---|---|---|---|---|
| Population | 6,829 | 12,179 | 18,029 | **37,171** |
| Base Domestic Flow (mgd)[a] | 0.79 | 1.40 | 2.07 | **4.27** |

a. Based on a per capita flow of 115 gpd

TABLE ES-8
Projected Flow Conditions at Year 2015
*March 2007*

| | No Change in I/I | | | | | Reduced I/I | Moderate/ Aggressive | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Avg Day Dry Weather** | **Yearly Average** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** | **Avg Day Dry Weather** | **Yearly Average** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area[a] | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Expanded Service Area[b] | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area[c] | 0.22 | 0.22 | 0.22 | 0.36 | 0.36 | 0.22 | 0.22 | 0.22 | 0.36 | 0.36 |
| **Total (mgd)** | **2.83** | **3.62** | **4.21** | **6.09** | **14.97** | **2.54/2.2** | **3.14/2.62** | **3.59/2.9** | **5.05/3.9** | **11.80/8.4** |

a. Current population of 6,829 with additional City growth of 594 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 4,756 at 115 gpcd, for a total population of 12,179
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with 17 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area

TABLE ES-9
Projected Flow Conditions at Year 2025
*March 2007*

| | No Change in I/I | | | | | Reduced I/I | Moderate/ Aggressive | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Avg Day Dry Weather** | **Yearly Average** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** | **Avg Day Dry Weather** | **Yearly Average** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area[a] | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Expanded Service Area[b] | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area[c] | 0.46 | 0.46 | 0.46 | 0.76 | 0.76 | 0.46 | 0.46 | 0.46 | 0.76 | 0.76 |
| **Total (mgd)** | **3.74** | **4.53** | **5.12** | **7.16** | **16.04** | **3.45/3.1** | **4.05/3.5** | **4.50/3.8** | **6.12/5.03** | **12.87/9.4** |

a. Current population of 6,829, with additional City growth of 1,189 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 10,012 at 115 gpcd, for a total population of 18,029
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with 36 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area

TABLE ES-10
Projected Flow Conditions at Build-Out
*March 2007*

| | No Change in I/I | | | | | Reduced I/I | Moderate/ Aggressive | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Avg Day Dry Weather** | **Yearly Average** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** | **Avg Day Dry Weather** | **Yearly Avg** | **Peak Month - Seasonal** | **Peak Month - Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area[a] | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| Expanded Service Area[b] | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area[c] | 1.28 | 1.28 | 1.28 | 2.13 | 2.13 | 1.28 | 1.28 | 1.28 | 2.13 | 2.13 |
| **Total (mgd)** | **6.77** | **7.56** | **8.15** | **10.74** | **19.62** | **6.48/6.2** | **7.08/6.6** | **7.53/6.9** | **9.70/8.6** | **16.45/13.01** |

a. Current population of 6,829, with additional City build-out of 2,377 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 27,965 at 115 gpcd, for a total population of 37,171
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with all of the total I/I experienced corresponding to percent of in-fill in the expanded service area.

TABLE ES-11
Projected Loading Conditions
*March 2007*

| Parameter | Average Day[a] | Peak Day using Observed Peaking Factors |
|---|---|---|
| **$BOD_5$** | | |
| lbs/day | 12,000 | 39,600 |
| lbs/day/capita | 0.32 | 1.07 |
| **TSS** | | |
| lbs/day | 11,900 | 57,100 |
| lbs/day/capita | 0.32 | 1.54 |

a. Based on served population of 37,171

Influent nutrient data is based on typical literature values, pending additional sampling at the WWTP. Probable loadings are shown in Table ES-12.

TABLE ES-12
Probable Current and Future Nutrient Loading Conditions
*March 2007*

| Parameter | Value[a] (lbs/day/capita) | | Current Average Day[b] (lbs/day) | 2015 Average Day (lbs/day) | 2025 Average Day (lbs/day) | Buildout Average Day[c] (lbs/day) |
|---|---|---|---|---|---|---|
| | Range | Typical | | | | |
| Total Kjeldahl Nitrogen | 0.020-0.031 | 0.027 | 184 | 329 | 487 | 1,003 |
| Total Phosphorus | 0.007-0.011 | 0.008 | 55 | 97 | 144 | 297 |

a. Metcalf and Eddy, 3rd Edition, Table 5-4
b. Based on a current population of 6,829
c. Based on a projected population of 37,171

## 2.7 Existing Wastewater Treatment Plant Capacity Analysis

The WWTP capacity was evaluated in terms of existing average loads and peak loads. At present, the plant has adequate capacity to handle up to 2.5 mgd of average flow, but the high volume of I/I exceeds the plant's biological capacity during extreme events. The plant is nearing the end of its useful life and is in need of substantial improvements.

The existing plant site is not adequate for future flows or to add unit processes that will be necessary to meet upcoming permit requirements. Thus, the existing plant site can be considered to have nearly reached its full capacity.

## 2.8 Facility Planning Effluent Limits

### 2.8.1 Current and Projected Effluent Limits

The consultant team members, the City, and Idaho Department of Environmental Quality (IDEQ or DEQ) worked together to establish criteria appropriate to the receiving water environment, including its future potential needs.

Table ES-13 contains the current permit limits and the current performance of the wastewater treatment plant toward meeting the limits, based on data analysis from discharge monitoring reports dated January 2002 through March 2005.

Table ES-14 contains effluent quality standards proposed for use in evaluation of alternatives for the existing WWTP, expansion at the existing site, or a new facility located remotely from the existing site. Some of the limits (e.g., nutrients nitrogen and phosphorus) may be seasonal to protect water quality in Pend Oreille Lake and the Pend Oreille River. The assumed seasonal limits are noted, within a proposed period of May 1 to October 31 annually to coincide with the growing season and to avoid the peak flow period.

TABLE ES-13
Current Permit Limits and Current Performance
*March 2007*

| | Current Permit Limit | | | 2002-2004 Performance Range | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **Weekly** | **Daily** | **Monthly** | **Max Week** | **Max Day** |
| BOD | 30 mg/l | 45 mg/l | * | 7-18 mg/l | 12-26 mg/l | ** |
| BOD Rem | 85% | * | * | 75-90% | ** | ** |
| TSS | 30 mg/l | 45 mg/l | * | 4-12 mg/l | 9-34 mg/l | ** |
| TSS Rem | 85% | * | * | 82-97% | ** | *** |
| Total N | * | * | * | *** | *** | *** |
| $NH_3$-N | * | * | * | *** | *** | *** |
| Total P | * | * | * | *** | *** | *** |
| O-$PO_4$-P | * | * | * | *** | *** | *** |
| Temp. | * | * | * | 6-22 ºC | *** | *** |
| pH | Within the Range 6.5 – 9.0 | | | Range = 6.6 – 7.7 | | |
| $Cl_2$ | 0.45 mg/l | * | 1.01 mg/l | 0.34-0.49 mg/l | *** | 0.6-1.0 mg/l |
| E-coli | 126 cfu/100 ml | * | 406 cfu/100 ml | 2-35 cfu/100 ml | 2-434 cfu/100 ml | 2-680 cfu/100 ml |

Notes:
* No limits
** Data not compiled
*** Data not available

TABLE ES-14
Projected Permit Limits for Planning
*March 2007*

| | Projected Permit Limit | | | 2002-2004 Performance Range | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **Weekly** | **Daily** | **Monthly** | **Max Week** | **Max Day** |
| BOD | 30 mg/l | 45 mg/l | * | 15 mg/l | 23 mg/l | * |
| BOD Rem | 85% | * | * | 85% | * | * |
| TSS | 30 mg/l | 45 mg/l | * | 15 mg/l | 23 mg/l | * |
| TSS Rem | 85% | * | * | 85% | no limits | * |
| Total N | * | * | * | 10 mg/l[a] | 15 mg/l* | * |
| $NH_3$-N | 1 mg/l[a] | * | 3 mg/l[a] | 1 mg/l[a] | no limits | 3 mg/l[a] |
| Total P | * | * | * | 1 mg/l[a] | 2 mg/l[a] | * |
| O-$PO_4$-P | * | * | * | * | * | * |
| Temp. | * | * | * | * | * | * |
| pH | Within the Range 6.5 – 9.0 | | | Within the Range 6.5 – 9.0 | | |
| $Cl_2$ | 0.1 mg/l | * | 0.2 mg/l | 0.1 mg/l | * | 0.2 mg/l |
| E-coli | 126 cfu/100 ml | * | 406 cfu/100 ml | 126 cfu/100 ml | * | 406 cfu/100 ml |

Notes:
a. Seasonal Limits (May 1 through October 31)
* = No limits

A total nitrogen removal requirement would be associated with a conclusion by the States of Washington and/or Idaho that excessive dissolved nitrogen in the Pend Oreille River in Washington is promoting macrophyte (bottom growing plants) growth in the river. The Washington Total Maximum Daily Load (TMDL) study on the river is not expected to be completed for about 5 years, after which recommendations will be presented and a water quality improvement implementation plan developed. Imposition of nitrogen removal requirements could be mandated as part of the 2012 or 2017 permit renewals, which could call for implementation prior to the start of the following permit period (e.g., 2017 or 2022).

Based on best information available, planning for wastewater facility improvements needs to include each of these potential future requirements from the implementation dates indicated:

- Chlorine toxicity removal – 2012
- Ammonia removal – 2017
- Phosphorus removal – 2017
- Nitrogen removal – 2022

Design criteria for potential seasonal requirements will be based on flow projections for May through October, not on the annual flow projections (peak flows).

# 2.9 Alternative Wastewater Treatment Analysis

## 2.9.1 Summary of Alternatives

A summary of the alternatives reviewed for a future wastewater treatment plant are presented in Table ES -15.

TABLE ES-15
Pre-screened Alternatives
*March 2007*

| Element | Alternatives |
|---|---|
| **Biological Treatment** | Conventional Activated Sludge |
| | Conventional Activated Sludge Without Primary Treatment |
| | Membrane Bioreactors |
| **Peak Flow Handling** | Storage |
| | Filtration |
| | Stormwater Clarification |
| **Disinfection** | Chlorination |
| | Ozonation |
| | Ultraviolet Light |
| **Tertiary Treatment** | Upflow Sand Filtration |
| | Microfiltration |
| | Chemical Addition |

TABLE ES-15
Pre-screened Alternatives
*March 2007*

| Element | Alternatives |
|---|---|
| **Effluent Discharge** | Land Application (fodder crops) |
| | River Discharge (Pend Oreille River) |
| | Water Reuse (lawn irrigation, wetlands) |
| **Solids Handling** | Gravity Thickening |
| | Mechanical Gravity Belt Thickening |
| | Aerobic Digestion |
| | Anaerobic Digestion |
| | Land Application |
| | Composting |
| | Contract Disposal |

These alternatives were evaluated for preliminary feasibility, capital and operations costs, ability to meet future permit requirements, and flexibility.

### 2.9.2 Recommendations

Based on expected future permit requirements, current capital cost information, and ease of phasing, a conventional activated sludge process without primary treatment and continued river discharge is recommended. Initially, a new WWTP could be constructed without nutrient removal facilities. These could be added in subsequent phases as required by changing permits.

The current facility should be retained for peak flow handling until I/I contributions from the existing service area are reduced. Solids should be aerobically digested and continue to be land applied. Because implementation of the majority of these recommendations will be 5 to 10 years ahead, this selection process should be reviewed for any changes in regulatory requirements or in technology, notably membrane bioreactors, at that time.

## 2.10 Interim Treatment Plant Actions and Capital Improvement Plan

Based on a review of the existing treatment plant site, equipment condition, and required size of future treatment components, the existing site is not adequate. However, to identify a new treatment site, obtain funding, and construct new facilities will require 5-15 years. Therefore, some improvements must be completed in the near term to maintain effluent quality from the existing facility. The recommended interim upgrades to the existing WWTP are summarized next.

### 2.10.1 Improvements

- Headworks improvements including influent screening, new grit washer, and vent/odor control
- Modifications to the aeration system including fine bubble diffusers and automatic control of the blower
- Replacement of the gravity thickener with a gravity belt thickener
- Digester improvements including cleaning, pipe replacement, a new heat exchanger, and gas scrubbing
- Gas dechlorination for the effluent

### 2.10.2 Phasing and Budget

Certain projects must be implemented immediately. The City should consider funding these improvements in fiscal year 2007 and/or fiscal year 2008. Table ES-16 presents a summary of interim costs and a preliminary phasing schedule.

TABLE ES-16
Summary of Interim Costs and Preliminary Phasing Schedule
*March 2007*

| Item No. | Description | Total Est. Cost[b] | FY 2007 | FY 2008 |
|---|---|---|---|---|
| **Treatment Plant[a]** | | | | |
| 1 | Headworks Improvements | $862,700 | | $862,700 |
| 2 | Aeration Basin and Blower | $388,400 | $388,400 | |
| 3 | In-line Chlorine Meter | $23,250 | $23,250 | |
| 4 | Dechlorination System | $191,250 | $191,250 | |
| 5 | Solids Thickening | $1,078,000 | | $1,078,000 |
| 6 | Digester Cleaning and Piping/Valving Upgrades | $377,500 | $377,500 | |
| 7 | Digester Odor Control – new biofilter | $87,400 | $87,400 | |
| 8 | Heat Exchanger/Boiler Building | $174,700 | $174,700 | |
| 9 | Energy Recovery | $132,600 | $132,600 | |
| | **Total** | **$3,316,000** | **$1,375,000** | **$1,941,000** |

**Notes**:
a. Projects based on "high priority" list provided by City
b. Costs in 2006 dollars

## 2.11 Long-term Treatment Plant Actions and Capital Improvement Plan

Since the Ella Avenue plant site is inadequate for future expansion, the treatment facility will need to be relocated. A minimum of 10 years is generally required to acquire property, secure funding, design, and construct a new facility. The final analysis considered four alternatives for the ultimate buildout capacity:

1. **Secondary treatment with river discharge** - This option includes interim treatment plant improvements, secondary treatment process cost, piping to the existing river outfall, and peak flow handling using primary clarification.
2. **Highest quality treatment with river discharge** - In addition to the items associated in the basic secondary treatment, biological nutrient removal and effluent filtration have been added to this option.
3. **Seasonal discharge** - This option has no discharge during the summer months and a discharge to the river in the winter. It would require a land application site of approximately 2,000 acres.
4. **Full water reuse with no river discharge** - This would include the secondary process cost, biological nutrient removal, lagoon storage, and lastly, seasonal land application of year-round flow.

The cost for each of these four options to serve the ultimate buildout population, including the cost per equivalent connection (ERU), is presented in Table ES-17. For this analysis, the number of future connections for the City is estimated at 23,775.

TABLE ES-17
Sandpoint Treatment Options
*March 2007*

| Option | Capital Costs [a] | Cost/ERU |
|---|---|---|
| 1. Basic Secondary Treatment | $73,900,000 | $3,100 |
| 2. Highest Quality River Discharge | $93,300,000 | $3,900 |
| 3. Basic Secondary Treatment with Seasonal Land Application | $118,400,000 | $5,000 |
| 4. Full Water Reuse | $241,500,000 | $10,100 |

a. Costs are in 2006 dollars and do not include interim treatment plant upgrades.

Implementation of the final upgrades is recommended on an incremental basis, beginning with basic secondary treatment to serve the projected 2015 population. Nutrient removal capabilities can be added as required by changes in permit requirements in subsequent years. Based on the City's selection of "highest quality river discharge" as the treatment target, a projected 20-year capital improvement plan is presented in Table ES-18.

TABLE ES-18
20-Year Capital Improvement Plan
*March 2007*

| | 2014 | 2016 | 2020 | 2025 |
|---|---|---|---|---|
| New plant (1.25 mgd capacity) | $15.0 million | | | |
| Full nitrification/P removal (1.25 mgd) | | $5.0 million | | |
| Plant upgrade to 2.5 mgd | | | $20.0 million | |
| Plant upgrade to 5.0 mgd | | | | $21.6 million |
| Outfall + peak flow handling | $6.3 million | | | |
| **TOTALS** | **$21.3 million** | **$5.0 million** | **$20.0 million** | **$21.6 million** |

This table includes peak flow handling (primary clarification) at a new facility, assuming I/I cannot be reduced. If peak flows continue to be treated at the existing plant site, the overall costs can be significantly reduced. If the City is able to reduce I/I by more than 50 percent, the size of the wastewater treatment plant can be reduced.

# 2.12 Regional Considerations

## 2.12.1 Regional Flows and Loads

A regional wastewater treatment plant would receive flows from five participating entities. To estimate the appropriate size for a potential regional facility, wastewater flows and loads from each entity were estimated based on current wastewater facility planning for Sandpoint, Southside Water and Sewer District (SWSD), and Kootenai-Ponderay Sewer District (KPSD). Flows and loads from Dover were estimated by assuming a 3 percent growth rate. Flows and loads from Schweitzer were estimated by using standard engineering assumptions, based on the expected number of dwelling units at build-out (as provided by Mountain Utilities Corporation). The estimated wastewater flows and loads are shown in Table ES-19 and ES-20, respectively.

TABLE ES-19
Approximate Wastewater Flows
*March 2007*

| | Flow (mgd) | | |
|---|---|---|---|
| **Entity** | **Average** | **Peak** | **ERUs** |
| SWSD[a] | 0.11 | 0.2 | 600 |
| Schweitzer[a] | 0.49 | 1.33 | 2,100 |
| KPSD[b] | 1.414 | 3.789 | 8,350 |
| Dover[c] | 0.47 | 1.27 | 2,000 |
| Sandpoint[a] | 7.55 | 19.61 | 23,775 |
| **Total** | **10.0** | **26.2** | **36,825** |

SWSD - Southside Water and Sewer District
KPSD – Kootenai-Ponderay Sewer District
a. Approximate flow at build-out of existing boundary
b. Approximate flow at built-out of expanded boundary
c. Approximate flow in 40 years
d. ERU based on 37,171 residents at 2.29 res/ERU plus additional commercial/industrial load projected at 0.5#/ERU

TABLE ES-20
Approximate Wastewater Loads
*March 2007*

| Entity | Average Load (pounds/day) | |
|---|---|---|
| | $BOD_5$ | TSS |
| SWSD | 202 | 202 |
| Schweitzer | 905 | 905 |
| KPSD | 2766 | 1579 |
| Dover | 862 | 862 |
| Sandpoint | 12000 | 11900 |
| **Total** | **16736** | **15448.7** |

These projected flows and loads were used for preliminary sizing of a regional wastewater treatment facility. The same alternatives were evaluated for regional treatment options. Those costs are presented in Table ES-21. The costs per connection are based on 36,825 equivalent connections.

TABLE ES-21
Regional Treatment Options
*March 2007*

| Option | Cost | Cost/ERU |
|---|---|---|
| 1. Basic Secondary Treatment | $101,500,000 | $2,700 |
| 2. Highest Quality River Discharge | $127,100,000 | $3,450 |
| 3. Basic Secondary Treatment with Seasonal Land Application | $162,500,000 | $4,400 |
| 4. Full Water Reuse | $330,500,000 | $9,000 |

The projected costs per ERU for the City's wastewater treatment facility and a regional facility are compared along with costs for other systems in Table ES-22. Note that regional costs are for 2005 and have been increased by 25 percent to account for general project inflation.

TABLE ES-22
Regional Cost Comparison
*March 2007*

| | ERU | Project Cost | 2005 Cost/ERU |
|---|---|---|---|
| Southside Water and Sewer District | 600 | $4.1 Million | $8,500 |
| Kootenai Ponderay Sewer District (Current Boundary) | 4,100 | $9.8 Million | $3,000 |
| Schweitzer | | N/A | |
| Dover | | N/A | |
| Sandpoint Only – I/I Removal[a] | 23,775 | $96,600,000 | $4,100 |
| Regional – I/I Removal[a] | 36,825 | $127,100,000 | $3,500 |

a. Due to the high cost of treating I/I, both options, including the City of Sandpoint, assume a 50% decrease in I/I.

TECHNICAL MEMORANDUM NO. 1

## City of Sandpoint Wastewater Facility Plan

# Service Area Conditions and Population Trends

March 2007

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Figure 4-1 Current City Limits and ACI
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## Tables

Table 3-1 Sandpoint Climate Summary
Table 4-1 Population Projection Summary
Table 5-1 City of Sandpoint Population Projections

## Appendixes

Appendix A Build-Out Analysis, Draft Impact Fee Analysis for City of Sandpoint, Idaho

# 1 Location

The City of Sandpoint (City) is located in the northern panhandle of Idaho, west of Sand Creek, northwest of Lake Pend Oreille, and north of the Pend Oreille River. The City's existing wastewater treatment plant (WWTP) discharges into the Pend Oreille River. The City and City limits are shown on Figure 1-1.

# 2 Surface and Groundwater Hydrology

Soils in the City are generally dominated by clays and silts that create very shallow groundwater levels ranging from 10 to 30 feet.

# 3 Temperature, Precipitation, and Prevailing Winds

Climatic data for the area is recorded by the University of Idaho Experimental Weather Station in Sandpoint, near the north-central portion of the City limits. A summary of this data is provided in Table 3-1. Prevailing winds are predominantly from the northeast in the fall and winter and southerly in the spring and summer.

TABLE 3-1
Sandpoint Climate Summary
*March 2007*

| | Monthly Average Temperatures (°F) | | | Precipitation[a] (inches) |
|---|---|---|---|---|
| **Month** | **Maximum[b]** | **Mean** | **Minimum[c]** | **Mean** |
| January | 32.3 | 26.3 | 20.3 | 4.06 |
| February | 38.0 | 30.4 | 22.8 | 3.16 |
| March | 46.3 | 37.0 | 27.6 | 2.74 |
| April | 57.2 | 45.5 | 33.9 | 2.08 |
| May | 66.3 | 53.2 | 40.2 | 2.33 |
| June | 73.2 | 59.5 | 45.9 | 2.26 |
| July | 81.9 | 65.2 | 48.5 | 0.99 |
| August | 81.0 | 64.0 | 47.0 | 1.19 |
| September | 70.5 | 55.7 | 41.0 | 1.69 |
| October | 57.0 | 45.5 | 34.0 | 2.63 |
| November | 41.5 | 34.9 | 28.3 | 4.27 |
| December | 34.1 | 28.6 | 23.1 | 4.57 |

a. Western Regional Climate Center, University of Idaho, Experimental Weather Station in Sandpoint, Idaho, Period of record 1910 to 2004
b. Average daily maximum temperature
c. Average daily minimum temperature

# 4 Population Trends

Hofman Planning Associates (Laclede, Idaho) currently is preparing an impact fee analysis for the City which includes more detailed analyses of population trends and density changes. Their draft analysis has been used as the basis for current population evaluation and future population and land-use projections for build-out of the current City limits and Area of City Impact (ACI). An excerpt from Hofman's draft analysis (including the build-out analysis) is provided in Appendix A.

In general, the City is comprised of a residential base and a large commercial area along the U.S. Highway 95 and First Avenue corridor. This commercial area contributes to the sanitary sewer flow but does not have a corresponding population. For the purposes of this plan, no significant changes are anticipated in demographics, including the mix of residential, commercial, industrial, and retail areas as growth occurs. Therefore, flows and loads associated with growth are projected on a per capita basis.

Hofman Planning Associates developed population projections for two growth scenarios, ultimate build-out to the current City limits and ultimate build-out to an expanded boundary set as the ACI. The current City limits and the ACI are shown in Figure 4-1. The extents of the ACI were developed by the City and provided to J-U-B ENGINEERS, Inc. From Hofman Planning Associates' draft impact fee analysis, future development within the City limits is expected to occur at a density of approximately 3.7 dwelling units per acre in areas that are currently vacant.

Growth in the ACI was studied through discussions with the City Public Works Department, City Planning and Zoning Department, and Hofmann Planning Associates. The input led to a generalized map of projected future land use areas and approximate dwelling unit densities for the area outside the current City limits, shown in Figure 4-2. The resulting population projections are summarized in Table 4-1. The population projections (made by Hofman Planning Associates) and the land-use areas shown herein are the basis for evaluation of the City's wastewater collection system and WWTP.

TABLE 4-1
Population Projection Summary
*March 2007*

| Geographic Area | Existing Population | Population Growth to Build-Out | Total Build-Out Population |
|---|---|---|---|
| City Limits | 6,829 | 2,377 | 9,206 |
| Area of Impact | 1,399 | 26,565 | 27,965 |
| **Total** | **8,228** | **28,942** | **37,171** |

Data source: Hofman Planning Associates, Laclede, Idaho, 2006.

# 5 Population Growth Rate Trends

In order to plan for future wastewater collection and treatment needs, reasonable assumptions need to be developed to most accurately anticipate at what rate future development may occur. Population growth trends were developed by reviewing historical population trends within the City and for Bonner County, defining generalized trends for each of these population bases. From this information, reasonable assumptions were made to characterize the projected population growth rate for the City.

Annual growth rates were analyzed for both the City's and Bonner County's data set from 1990 to 2005. The City experienced a peak annual growth rate in 1994 of 4.9 percent, with an average annual growth rate of 2.7 percent. Bonner County experienced a peak annual growth rate in 1994 of 5.4 percent, with an average annual growth rate of 2.9 percent.

To verify the population-based growth rates, City water system connections also were examined. A plot of the historical number of water system connections from May 1998 to May 2005 are shown on Figure 5-1. As this figure indicates, growth over this period ranged from 1.96 percent to 4.13 percent annually.

These historical population and new system connection growth rates provided three population projections to bracket the range of reasonable growth rates to be expected for the Sandpoint area. The first low-rate projection was based on recent growth of the City's water service connections (2002 to 2005) at 2.85 percent. The second, mid-level projection was based on recent (2004 to 2005) population growth in the City, at 3.5 percent. The upper level projected growth rate was based on the peak growth rate of 5.4 percent from Bonner County population data for 1994.

All three growth rates were projected exponentially to 75 percent of the ultimate build-out population. Beyond 75 percent of build-out, the population growth rate generally slows due to less attractive development opportunities. To account for this change in growth rate, the remaining 25 percent of the growth was developed by fitting a splined curve between the 75 percent build-out population and the ultimate population. For the low level (2.85 percent) growth rate, ultimate build-out of the expanded boundary is expected to occur after approximately 85 years, mid-level after 80 years, and within 55 years for the predicted high-rate growth. The three growth projections for the City are shown in Figure 5-2.

Discussions with the City Public Works and Planning Departments have indicated that the mid-level growth projection of 4 percent is reasonable for the Sandpoint area over the next 20 years. As a result, the City has chosen to adopt a geometric growth rate of 4 percent for the 20-year planning period.

The City's 10-year growth projections indicate that the population will increase from 8,228 to 12,179 by 2015. The 20-year projections estimate a population of 18,029 by 2025.

Based on current growth and the expanded boundary, ultimate build-out density will be reached in approximately 80 years (2085), with a projected population of 37,171. Figure 5-3 shows the projected population growth trend that has been adopted by the City for use in this plan. A summary of the projected 10-year, 20-year, 75 percent of build-out, and ultimate build-out (80-year) populations are shown in Table 5-1.

TABLE 5-1
City of Sandpoint Population Projections
*March 2007*

| Year | 2005 | 2015 | 2025 | 75 percent of Build-out (2042) | Build-out (2085) |
|---|---|---|---|---|---|
| Population | 8,228 | 12,179 | 18,029 | 27,840 | 37,171 |

Figure 1-1 - Vicinity Map and City Limits

Figure 4-1 – Current City Limits and ACI

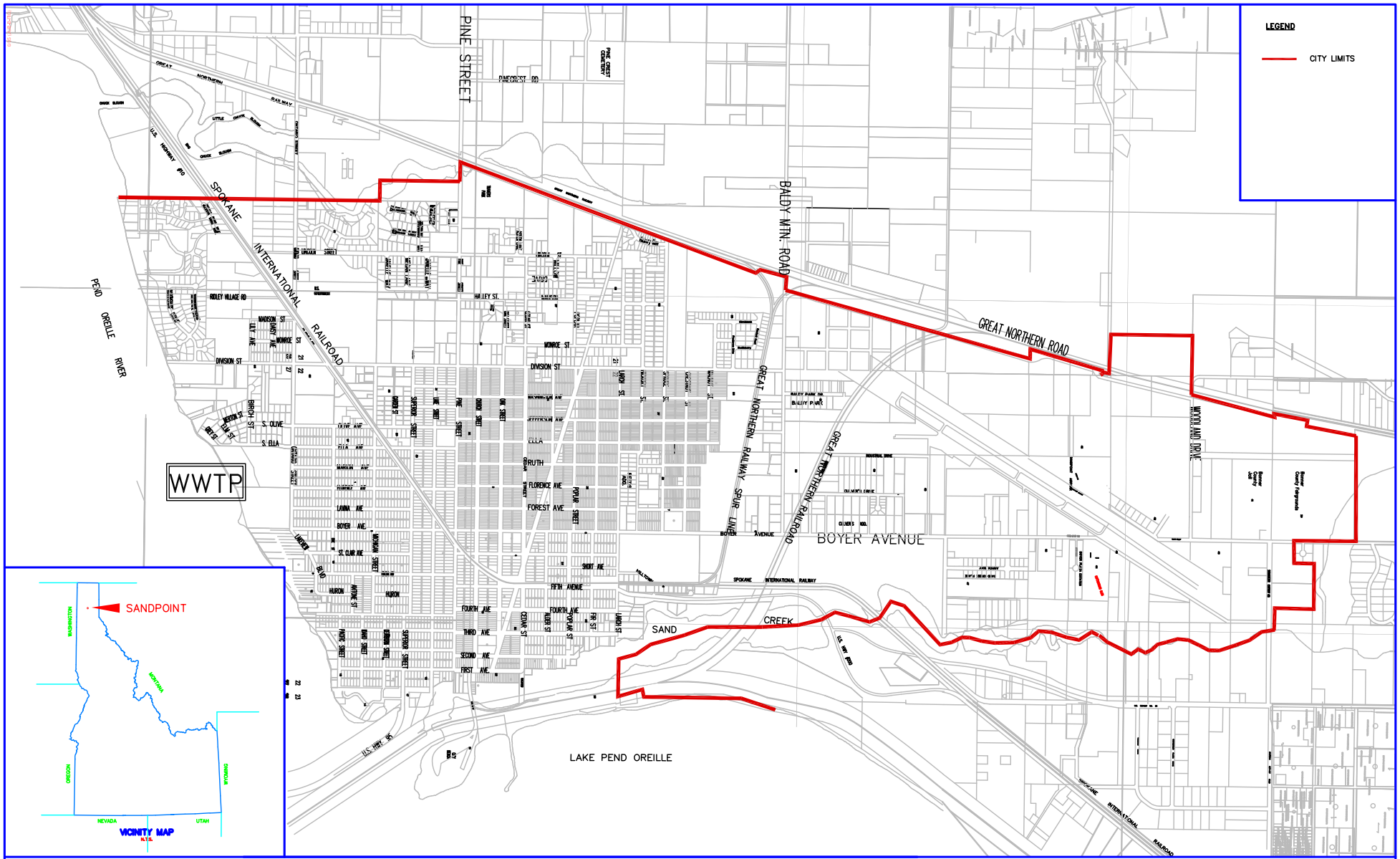
Figure 4-2 – Future Land Use Areas

Figure 5-1 – Historical Population Growth Trends

Figure 5-2 – Growth Projections for City of Sandpoint

Figure 5-3 – Proposed Population Growth Trend

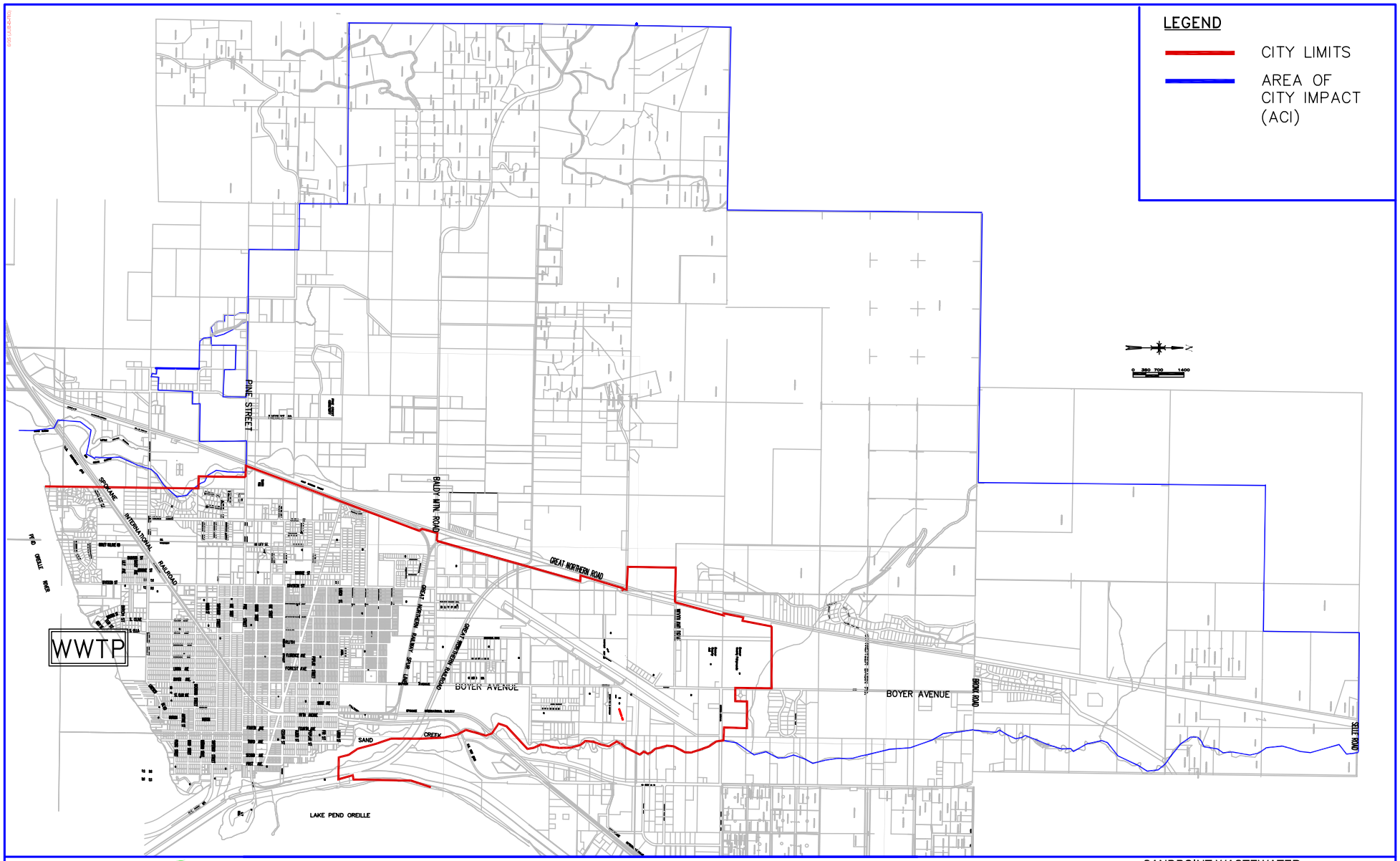
\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#1 FIGURE 1-1




SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 1-1
VICINITY MAP AND CITY LIMITS

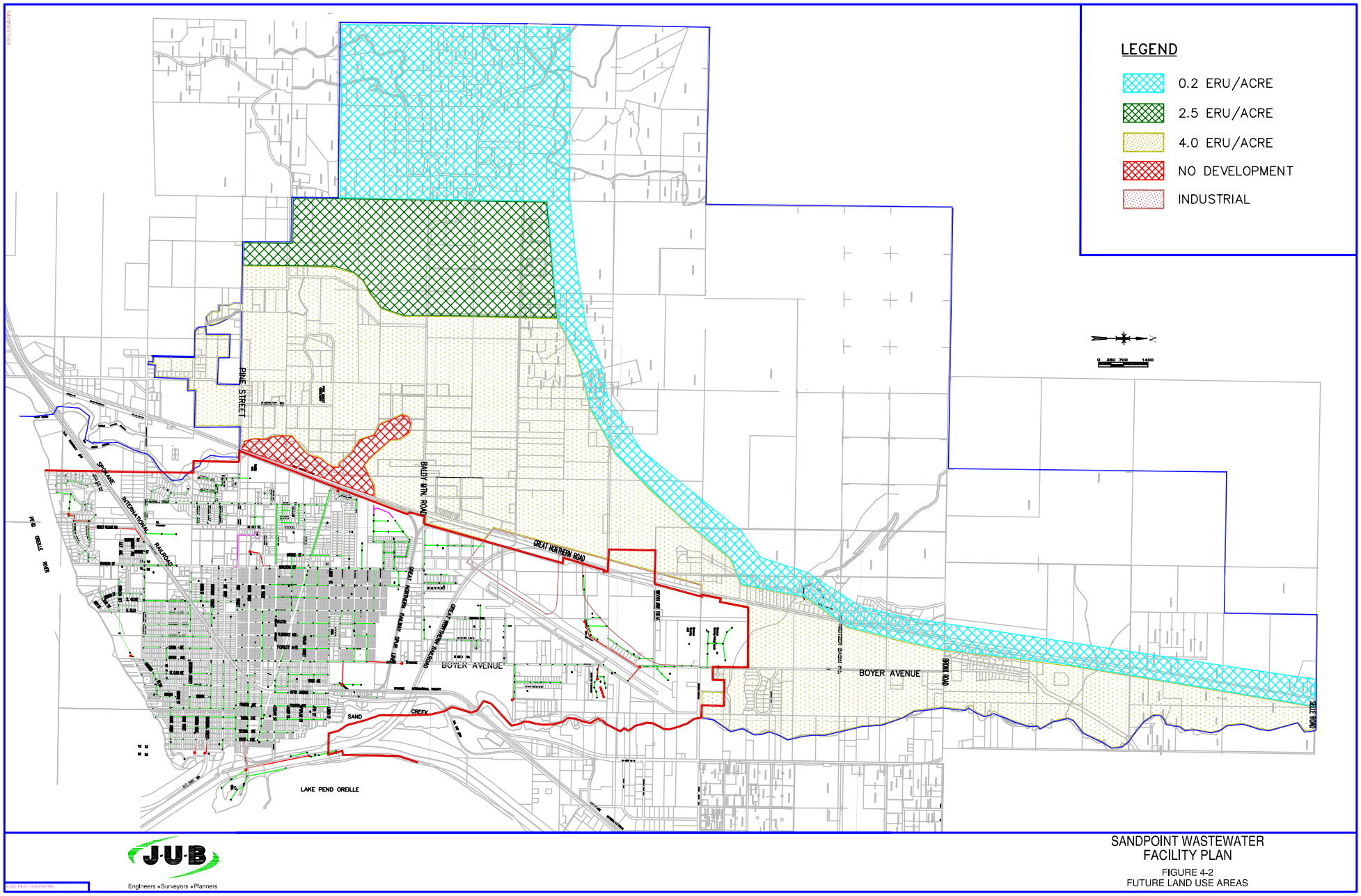
\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#1 FIGURE 4-1




J-U-B
Engineers • Surveyors • Planners

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 4-1
CURRENT CITY LIMITS AND ACI

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SANDPOINT WASTEWATER
FACILITY PLAN

FIGURE 4-2
FUTURE LAND USE AREAS

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#1 FIGURE 4-2

**Figure 5-1**
**City of Sandpoint Historical Water Connection Evaluation**

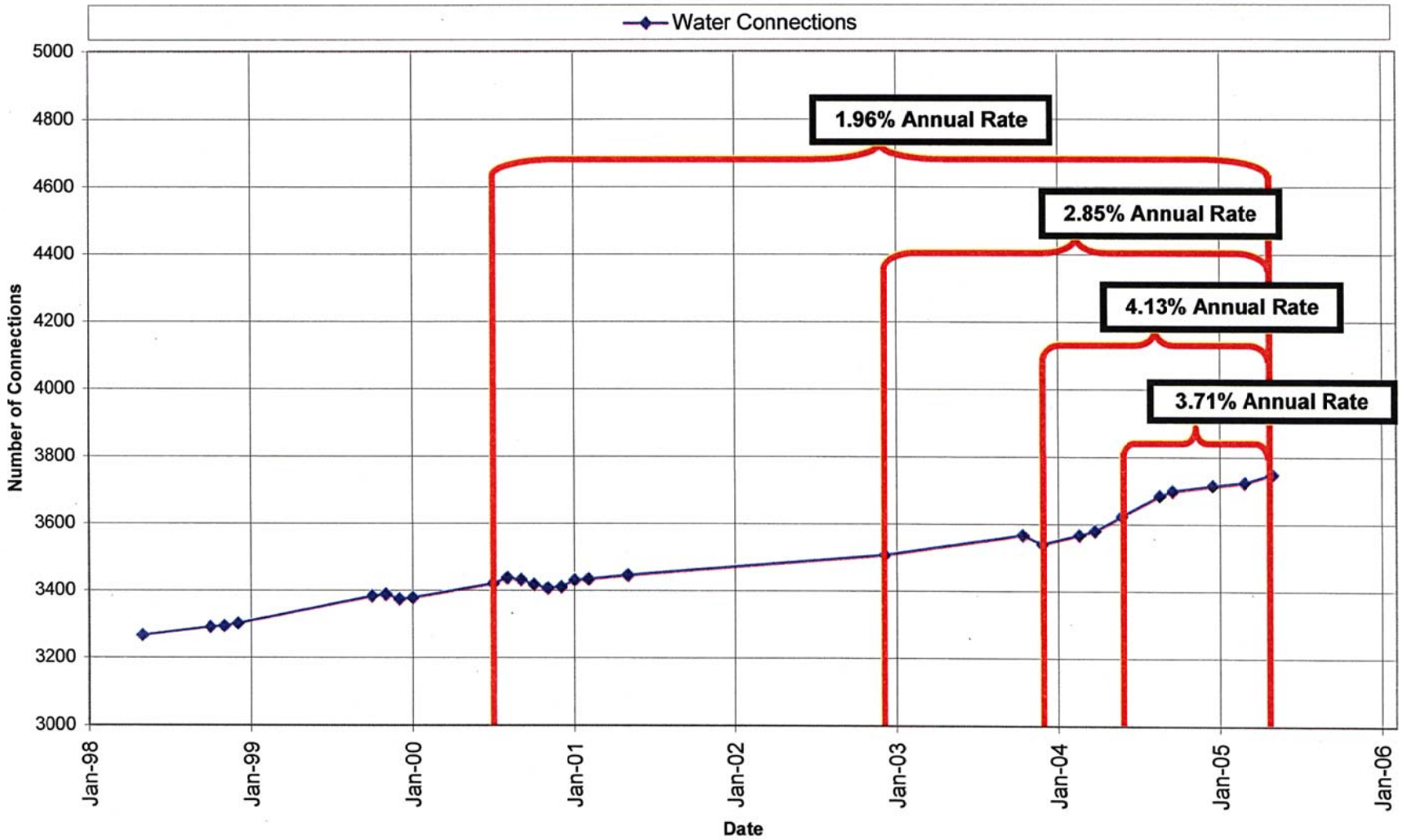

**Figure 5-2**
**Growth Projections for City of Sandpoint**

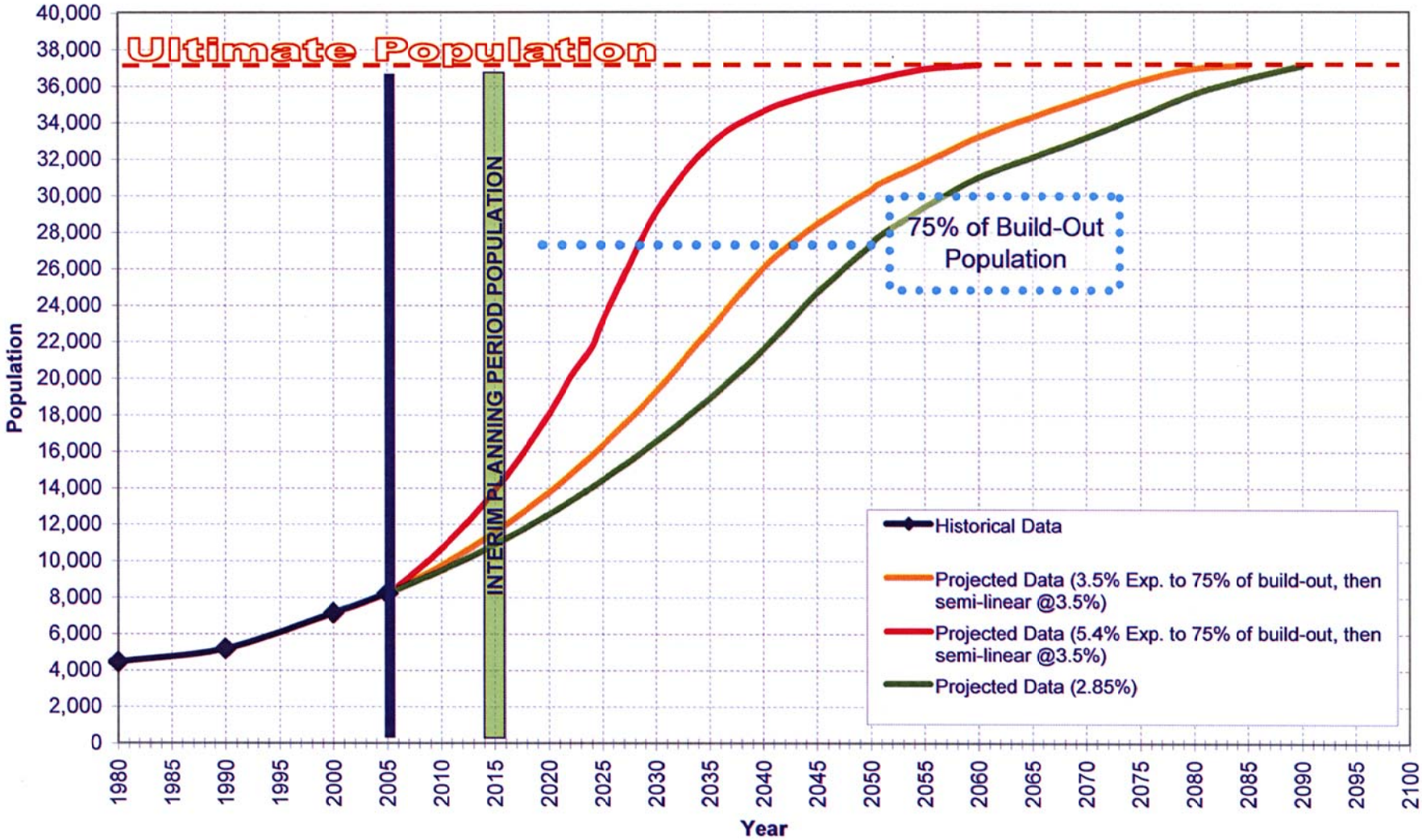


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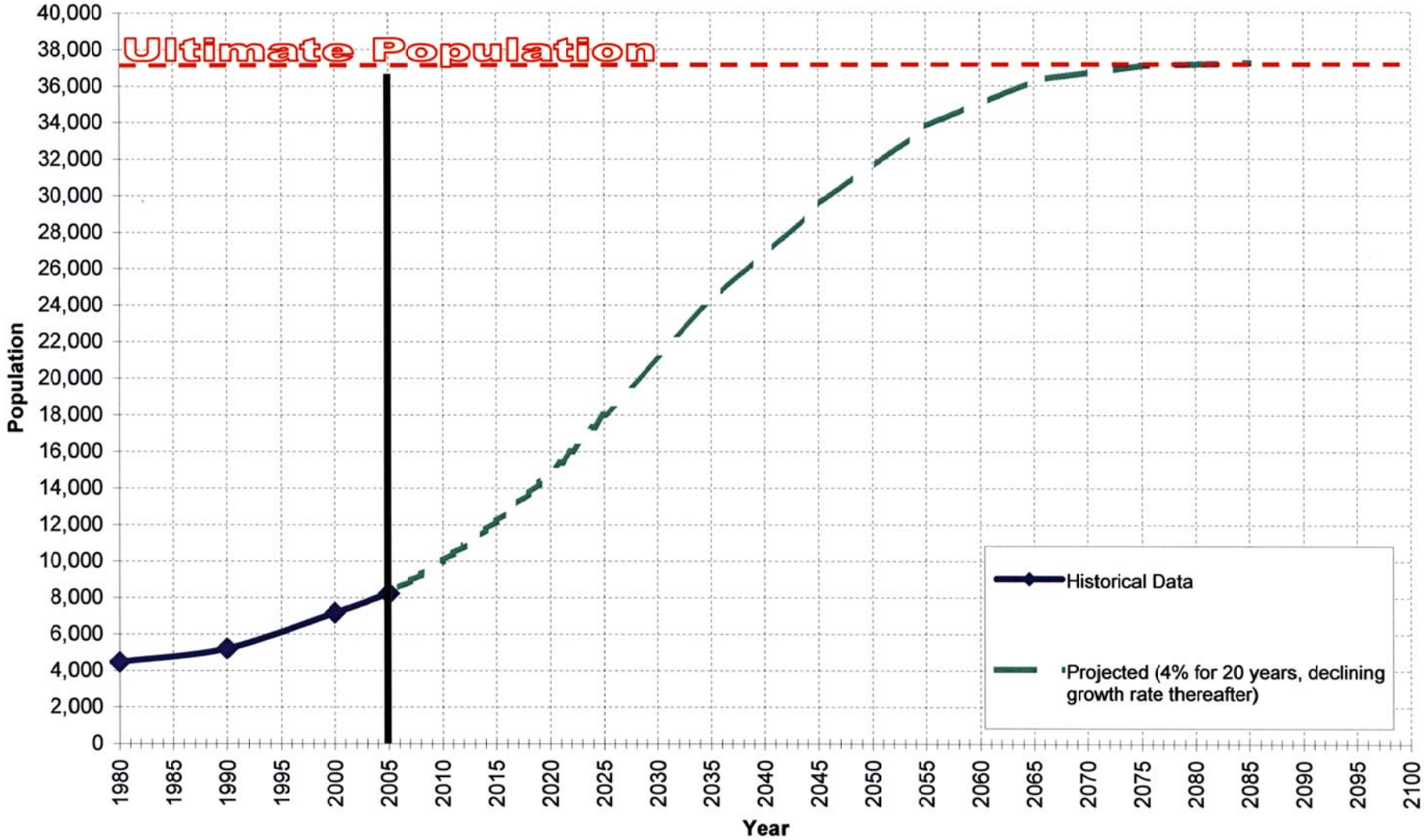
**Figure 5-3**
**Growth Projection for City of Sandpoint**

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# Appendix A

*Build-Out Analysis, Draft Impact Fee Analysis for City of Sandpoint, Idaho*

Hofman Planning Associates, August 24, 2005

# CHAPTER 2 : BUILD OUT ANALYSIS

The City of Sandpoint is experiencing rapid growth and anticipates continued growth in the future. In order to help plan for and facilitate this growth, the City is implementing this development impact fee program. The first step in implementing a Development Impact Fee is to conduct a land use survey and build out analysis. A land use survey was completed in January, 2005. The results of this survey can be found in the Appendices of this document. Using the results of the land use survey, the City's Comprehensive Plan, and guidance from City staff, a build out scenario was determined.

The on-site land use survey was conducted to identify existing land uses within both the city limits of Sandpoint and its area of impact. Using the results of this survey, information obtained from aerial photographs and input from the City's Planning Department staff, development densities and coverage factors were determined. These densities and coverage factors were then applied to future land uses and a build out analysis was prepared.

The build out analysis looks at current development patterns within both the city limits and its area of impact. The build out analysis projects these patterns into the future to provide a picture of the area at build out. The following defines the Study Area and then discusses the methodology, assumptions and resulting build out projections for both residential and nonresidential development within the study area.

## I. STUDY AREA

The Study Area for this build out analysis is composed of two parts - the existing City limits, and City of Sandpoint's Area of Impact. Exhibit 1, on page 2 provides a map depicting the boundary of the City limits and the extension of land known as the "Area of Impact". It is appropriate to include the Area of Impact in this study, as it is likely to be annexed in the future and this area will contribute to future demand on city services.

## II. METHODOLOGY

### A. Land Use Survey

The land use survey began with the collection of materials from City staff. These included assessor parcel maps, aerial photographs, and the City's Comprehensive Plan. Using the maps, a strategy was created to conduct a parcel-by-parcel land use survey for the Study Area. The land use survey involved driving along all existing streets within the Study Area and recording the use of each parcel on the assessor maps. All parcels within the City of Sandpoint and its Area of Impact were physically identified and their current land uses were noted. Land uses included commercial, industrial, single family residential, multi family residential, mobile homes, and vacant properties. Upon completion of the on-site land use survey, the aerial photographs were matched with their corresponding parcel maps to provide additional data necessary to complete the build out analysis.

Exhibit 1: Study Area

(to be inserted)

Parcels were assigned a category based on the City of Sandpoint's Comprehensive Land Use Map. For residential land uses the parcel acreage, number of existing dwelling units and the land use designation were recorded. For non-residential land uses, the acreage, number of existing dwelling units (considered temporary), land use designation, and total estimated square footage of nonresidential space were recorded.

## B. Residential Density Factors

The next part of the build out analysis involved determining a development density factor (dwelling units per acre) for residential land uses. This was done by a sampling method of like land use designations. For example, the density factor for Low Density was calculated by sampling a combination of existing low density single family development areas as well as low density projects in the pipeline. By including future projects, it provides a better idea of what is currently being developed within the City. Average densities were calculated for each land use category based on gross acreage. Within the City Limits, this method of sampling resulted in a Low Density factor of 3.7 dwelling units per acre, and a Medium Density factor of 6.0 dwelling units per acre.

Developing density factors for the Area of Impact required further input from City staff. It was assumed that the Area of Impact would eventually develop at a density higher than the existing Rural density depicted on the Comprehensive Land Use map. Using topographic maps provided by JUB Engineering and input from City Staff, it was assumed that the a majority of the area would develop similar to the Low Density designation within City Limits at 3.7 du/acre. Areas to the north and the west that are constrained by topography were assumed to develop at densities of 2.5 du/acre (Rural 1), and 0.2 du/acre (Rural 2). A small portion of the Area of Impact was assumed to develop at Medium Density of 6.0 du/acre. As a result, the Area of Impact has the existing land use designation of Rural per the Comprehensive Land Use Plan, and the future land use designations of Medium Density, Low Density, Rural 1 and Rural 2. Table 1 below summarizes the residential density factors:

**Table 1: Residential Density Factors**

| Land Use Designation | Average Density (units per acre) |
|---|---|
| Medium Density | 6.0 |
| Low Density | 3.7 |
| Rural 1 | 2.5 |
| Rural 2 | 0.2 |

### C. Non-Residential Coverage Factors

Using aerial photographs and recent development in neighboring cities, average non-residential coverage factors were calculated by comparing the portion of a parcel covered by a building to the size of the entire parcel. To determine existing non-residential square footage, a 40% coverage factor of was assumed, while a coverage factor of 30% was applied for future non-residential development. In determining the average lot coverage, the difference between existing and future lot coverage is that existing is based on lot size after street dedications and future is based on lot size before street dedications.

The downtown area is an exception to the non-residential development. A "Downtown" land use category was included in addition to the Business and Industrial land use category from the Comprehensive Plan. A coverage factor of 65% was used for the downtown area based on the intensity of development.

In discussions with City staff, the Area of Impact was assumed in the future to develop a few commercial projects at major intersections. This is reflected in the future land use designation on the Area of Impact Build Out Analysis Table in the appendices.

The resulting lot coverage factors for non-residential development are summarized in Table 2.

**Table 2 : Non-Residential Lot Coverage Factors**

| Land Use Designation | Average Lot Coverage | |
|---|---|---|
| | Existing | Future[2] |
| Business | 40% | 30% |
| Downtown | 65% | 65% |
| Industrial | 40% | 30% |

## III. RESIDENTIAL BUILD OUT PROJECTIONS

### A. Existing Residential Development

Existing residential development includes all single-family residences, multi family units, and mobile homes within the Study Area identified by the land use survey.

A total of 2,982 dwelling units exist within the City Limits of Sandpoint. Of those, 2,113 are single-family dwelling units, 146 mobile homes and 724 multi-family units. A total of 611 dwelling units exist within the Area of Impact. Of those units, 597 are single-family dwelling units and 14 are mobile homes.

Based on the number of existing dwelling units, the existing population is extrapolated by using the population generation rate of 2.29 people per dwelling unit based on the 2000 Census for the City of Sandpoint. The following table summarizes the existing dwelling units and population figures:

[2] The difference between existing and future lot coverage is that existing is based on lot size after street dedications and future is based on lot size before street dedications.

**Table 3: Existing Dwelling Units and Population**

| Geographic Area | Existing Dwelling Units | Existing Population |
|---|---|---|
| City Limits | 2,982 | 6,829 |
| Area of Impact | 611 | 1,399 |
| **Total** | **3,593** | **8,228** |

## B. Future Residential Development

Two methodologies were used to determine future residential development projections. The first method applies to larger parcels of vacant/underutilized land. Based on the land use survey, the acreage of the vacant/underutilized land was identified. Future residential development projections were determined by applying a density factor to the vacant acreage.

*Example: 140 acres of vacant land x 3.7 du/acre = 518 dwelling units*

The second method utilized to determine residential development projections applied to subdivisions. In subdivisions, where it was apparent there was one vacant lot, it was assumed that one dwelling unit would be developed. Therefore in such areas, the lots were counted instead of adding that acreage to the vacant acreage. As a result, the number of future dwelling units was determined by adding the number of dwelling units generated by the vacant acreage, to the number of vacant lots resulting in dwelling units in subdivisions. The analysis performed resulted in a projection of 12,639 future dwelling units.

Temporary dwelling units were also identified and include single and multi family dwelling units located in non-residential areas. The acreage that these units occupy is included in the Vacant/Underutilized column for non-residential parcels of the Land Use Analysis. It is assumed that these residential uses will ultimately be replaced by nonresidential uses. Therefore, the temporary dwelling units were subtracted from the future dwelling unit counts.

The following table summarizes the future dwelling units and the resulting future population projections:

**Table 4: Future Dwelling Units and Population**

| Geographic Area | Future Dwelling Units | Future Population |
|---|---|---|
| City Limits | 1,038 | 2,377 |
| Area of Impact | 11,601 | 26,565 |
| **Total** | **12,639** | **28,942** |

## C. Build Out Residential Development

Combining the existing dwelling units and population counts with the projected future dwelling units and population projections results in the overall build out projection. The following table summarizes the existing, future and build out residential development for the study area:

**Table 5: Residential Build Out Summary**

| Geographic Area | Existing Dwelling Units | Future Dwelling Units | Build Out Dwelling Units | Build Out Population |
|---|---|---|---|---|
| City Limits | 2,982 | 1,038 | 4,020 | 9,206 |
| Area of Impact | 611 | 11,601 | 12,212 | 27,965 |
| **Total** | **3,593** | **12,639** | **16,232** | **37,171** |

## D. Population Projections

As previously mentioned, population projections were generated from the number of residential dwelling units. Based on the average household size of 2.29 persons per unit (based on the 2000 Census) a build out population of 36,286 persons are projected. Table 6 summarizes these build out projections.

**Table 6: Population Projection Summary**

| Geographic Area | Existing Population | Future Population | Build Out Population |
|---|---|---|---|
| City Limits | 6,829 | 2,377 | 9,206 |
| Area of Impact | 1,399 | 26,565 | 27,965 |
| **Total** | **8,228** | **28,942** | **37,171** |

# IV. NON-RESIDENTIAL BUILD OUT PROJECTIONS

## A. Existing Nonresidential Development

The existing inventory of commercial and industrial development was found within the City limits. As discussed in the methodology section on page 2, an average coverage factor of 40% was applied to non-residential acreage to determine the amount of existing square footage. The one exception is the downtown area in which a 65% coverage factor was applied. A total of 5,798,449 square feet of non-residential development was identified within the Study Area. The existing non-residential square footage is summarized below in Table 7.

**Table 7: Existing Non-Residential Development**

| Geographic Area | Existing Commercial Sq. Ft | Existing Industrial Sq. Ft. | Total Existing Non-Residential Sq. Ft. |
|---|---|---|---|
| City Limits | 3,404,113 | 2,394,336 | 5,798,449 |
| Area of Impact | 0 | 0 | 0 |
| **Total** | **3,404,113** | **2,394,336** | **5,798,449** |

## B. Future Nonresidential Development

The majority of future nonresidential development will occur inside the City limits. As mentioned previously, discussions with City staff resulted in the assumption that some commercial development will occur within the Area of Impact. This amount will be limited and will likely occur at major intersections such as North Boyer Road and Schweitzer. A coverage factor of 30% was used to determine future non-residential square footage on vacant property. The reason for the reduction from 40% for existing development to 30% for future development accounts for reductions of buildable land area for street dedications and other utility or land dedications. The future non-residential square footage by area is summarized in Table 8.

**Table 8: Future Non-Residential Development**

| Geographic Area | Future Commercial Sq. Ft | Future Industrial Sq. Ft. | Total Future Non-Residential Sq. Ft. |
|---|---|---|---|
| City Limits | 539,602 | 2,948,768 | 3,488,371 |
| Area of Impact | 248,292 | 0 | 248,292 |
| **Total** | **787,894** | **2,948,768** | **3,736,663** |

## C. Build Out Nonresidential Projections

The total build out square footage for nonresidential development was determined by adding the existing square footage to the future projected square footage. The resulting build out square footage for nonresidential development is anticipated to reach 9,535,111 square feet within the study area. Table 9 summarizes the build out nonresidential development within the study area.

**Table 9: Non-Residential Development Build Out Summary**

| Geographic Area | Build Out Commercial Sq. Ft | Build Out Industrial Sq. Ft. | Total Build Out Non-Residential Sq. Ft. |
|---|---|---|---|
| City Limits | 3,943,715 | 5,343,104 | 9,286,819 |
| Area of Impact | 248,292 | 0 | 248,292 |
| **Total** | **4,192,007** | **5,343,104** | **9,535,111** |

TECHNICAL MEMORANDUM NO. 2

## City of Sandpoint Wastewater Facility Plan

# Collection System Infiltration and Inflow Evaluation

March 2007

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# 1 Collection System Background

The City's original collection system was constructed in the early 1900s. The system consisted of brick manholes and 8- to 30-inch clay and concrete pipe. The initial construction put sewers in the southeast part of the City. System expansions and upgrades have occurred since then, with major expansions in the mid 1980s and early 1990s and construction of the Lincoln interceptor and subsequent collector extensions in the late 1990s. Figure 1-1 is a schematic of the City's present-day collection system.

Several small, low-lying areas within the City are served by pressure sewer systems, with individual pump stations at each residence or business. Other larger, low-lying areas are served by regional lift stations. The City currently owns and operates 12 sewage lift stations. Three additional lift stations are currently privately owned and operated: Hickory Glen, Condo Del Sol, and Ridley Village.

A summary of each lift station is presented in Table 1-1. Additional detailed information such as recent maintenance activities, upgrades, site photograph, and the year of construction for each lift station, as available, is included in Appendix A.

TABLE 1-1
Sandpoint Wastewater Lift Station Summary
*March 2007*

| Lift Station Name | No. of Pumps | Pump Horsepower (bhp) | Estimated Capacity[a] (cfs) | Pumping Station Type | Pump Manufacturer | Standby Power[b] |
|---|---|---|---|---|---|---|
| Westwood | 2 | 15 | 0.67 | dry-pit, self priming | Hydromatic | MTS |
| L.P. Mill Site | 2 | 3 | 1.11 | dry-pit, self priming | Gorman-Rupp T4A3 | MTS |
| Bristlecone | 2 | 2 | 0.45 | submersible non-clog | Goulds | MTS |
| Fishback | 2 | 5 | 0.62 | submersible non-clog | Hydromatic-S4PX | None |
| Jail | 2 | 2 | 0.50 | submersible non-clog | Hydromatic-S4NX | MTS |
| Sand Creek | 2 | 3 | 0.62 | submersible non-clog | Hydromatic-S4M | MTS |
| North Boyer (Pawn Shop) | 2 | 3 | 0.33 | dry-pit, self-priming | Hydromatic-40MMP | MTS |
| Lake | 2 | 7.5 | 0.80 | submersible non-clog | Peabody-Barnes SEH752 | MTS |
| Bank | 2 | 1.5 | 0.40 | dry-pit, self priming | No Data | MTS |
| Beach | 2 | 3 | 1.11 | dry-pit, self-priming | Gorman-Rupp T4A3 | MTS |
| South Boyer Lift Station | 3 | 1 at 7.5<br>2 at 15 | 1 at 1.67<br>2 at 3.34 | dry-pit, flooded suction | Fairbanks-Morse | Generator |
| Cottonwood | 2 | NA | NA | submersible non-clog | NA | MTS |

TABLE 1-1
Sandpoint Wastewater Lift Station Summary
*March 2007*

| Lift Station Name | No. of Pumps | Pump Horsepower (bhp) | Estimated Capacity[a] (cfs) | Pumping Station Type | Pump Manufacturer | Standby Power[b] |
|---|---|---|---|---|---|---|
| **Privately owned and operated; no data available:** | | | | | | |
| Hickory Glen | | | | | | |
| Condo Del Sol | | | | | | |
| Ridley Village | | | | | | |

a. Capacity based on draw down tests performed by City Staff as available, or based on pump discharge pressure and catalog pump curves
b. MTS – Manual Transfer Switch available for use with portable generator. Generator = dedicated stationary generator
NA = not available

The City currently has one portable generator. This generator is available for use within the City to provide power to the City's lift stations during power outages.

# 2 I/I Source Identification Introduction

Infiltration and inflow (I/I) describes extraneous clean water flows that commonly occur in sanitary sewer systems. Infiltration is clean water that enters the system from high groundwater, typically through offset pipe joints and leaking manholes. Infiltration flow rates usually change slowly, occurring over days, weeks, or months. As a sewer system ages, additional problems (such as settled or cracked pipes, root penetrations in the pipes, environmental attack from soils or sewage carried within the lines, concrete or brick deterioration in and around manholes, seepage through brick manholes, and general degradation of the sewer system infrastructure) increase infiltration into the system.

Inflow is generally rainfall that enters through flooded manhole covers, storm drain connections, and illegal connections from floor or basement drains. Inflow typically has short-term peak flow rates immediately following storm events. Peak and sustained flows due to I/I dramatically affect collection, pumping, and treatment system requirements. These high flows also reduce capacity for future growth and create health hazards if overflows in the collection system occur.

The U.S. Environmental Protection Agency (US EPA) recommends that systems be evaluated for I/I if the flow is greater than 120 gallons per capita per day (gpcd) during periods of high groundwater (US EPA, 1991). This value includes a base flow of 80 gpcd due to domestic sewer flows and assumes 40 gpcd of “normal” infiltration. Additionally, I/I flows that are less than 150 percent of average dry weather wastewater flows generally are considered acceptable, depending on specific collection and treatment conditions.

Water meter records for the spring and fall of 2004 and 2005 were reviewed to identify probable base domestic wastewater flows. The average water use, including residential, commercial, and industrial customers, was 0.79 mgd or 115 gpcd, which is slightly higher than the EPA estimates, presumably due to the inclusion of commercial and industrial flows. The dry weather flows at the wastewater treatment plant (WWTP) in 2004 were

approximately 2.1 mgd or 308 gpcd. This represents a 2.7:1 ratio of dry weather flows to base domestic flow resulting from base infiltration in the collection system. The yearly average flow in 2004 was 2.79 mgd or 408 gpcd, which represents a 3.55:1 ratio of average flow to base domestic flow. With observed peaks of approximately 15 mgd, the ratio of peak flow to domestic flow increases to 19:1.

The difference between the average dry weather WWTP flow and the winter water usage gives the approximate average base infiltration that is entering the collection system. The base infiltration that is experienced by the WWTP year-round is approximately 1.31 mgd.

Based on US EPA guidelines, the City is experiencing significant I/I. Identifying critical areas in the collection system that are experiencing excessive I/I was undertaken in two phases. Phase I consisted of discussions with City personnel to identify historical and potential problem areas, age and general condition of sewer mains, areas of frequent maintenance, and areas with poor soil conditions and high groundwater. Phase II involved installation of flow data loggers in specific manholes throughout the City to specifically isolate drainage basins and quantify flows from areas suspected to be I/I sources.

## 2.1 Phase I – Historical Information

The City has been proactive in identifying and eliminating I/I from the collection system. The work has included service lateral and main-line replacement projects to repair areas that were causing blockages and severe I/I within the system. The City also has undertaken manhole pressure grouting and lining projects in various areas to rehabilitate the existing sewer system. Reports by City staff indicate that these efforts have reduced I/I. However, large sections of the southeastern portion of the collection system are still plagued by recurring root-ball problems and, with high groundwater, I/I is suspected to be a significant problem in this area.

## 2.2 Phase II – Continuous Flow Monitoring

### 2.2.1 General

Based on field investigations and City input, five drainage basins (or zones) were identified for further study. Continuously recording, data logging flow monitors then were installed in the sewer collection system for each basin. Flows were recorded from March 12, 2005 to April 19, 2005. American Sigma 950 flow monitors were used, with ultrasonic transducers for depth measurements and velocity probes to record flow velocity in the pipe.

The installation procedure required operators to measure the horizontal and vertical distances in the pipes, then use pipe-size-specific steel bands for the sewer pipe to be monitored. The steel bands supported the depth transducer and the velocity probe inside the pipeline. The bands were placed in the manhole in the upstream pipe under near-uniform flow conditions at the manhole entrances, and the flow depth was calibrated upon installation. Data sheets used during flow monitoring are provided in Appendix B.

The monitoring units were set to automatically record both the level and flow velocity every 5 minutes. The data recorder then computed the corresponding flow for that 5-minute interval. Prior to removing the monitors from the manholes, the operators measured the flow depth again to provide additional calibration for the recording period. The locations of the flow monitor installations and resulting zones are shown on Figure 2-1.

The zones are described next.

**Zone I**: The Lincoln Interceptor drainage basin on the west side of the City. The flow monitor was installed in the 27-inch line in Manhole LN01427 (Site 1), just east of the intersection of Division and Ontario near the Federal Building parking lot. Zone I has a drainage area of approximately 790 acres.

**Zone II**: The Ella drainage basin north of Oak Street. The flow monitor was installed approximately one-half block south of Oak Street on Ella Avenue, in the 12-inch line in Manhole EL04812 (Site 6). This monitor was installed and maintained by the City collection system crew during the flow monitoring period. This zone discharges into Zone III. Zone II has a drainage area of approximately 181 acres.

**Zone III**: The Ella drainage basin south of Oak Street. The lower end of this drainage basin is served by parallel 12-inch and 15-inch lines (east and west sides, respectively). One monitor was installed in the 15-inch line (Site 3) in Manhole EL02015, at the intersection of Erie Street and Olive Avenue. A second monitor was installed approximately one-half block south on Olive Avenue, in the 12-inch line in Manhole EL01812 (Site 2). These two monitors recorded flow from the entire Ella drainage basin. Flow for this zone was determined by adding flows from these two monitors and then subtracting the flow from the upstream zone (Zone II). Zone III has a drainage area of approximately 101 acres.

**Zone IV**: The Boyer Interceptor drainage basin north of Ontario Street. The flow monitor was installed in the 21-inch line immediately south of the intersection of Ontario Street and Boyer Street (Site 4). This manhole has no specific identification number; however, it is best described as the first manhole downstream of Manhole BO00215. Zone IV has a drainage area of approximately 186 acres.

**Zone V**: The First Avenue drainage basin, generally described as east of Fifth Avenue and south of Larch Street. Flow from this drainage basin is pumped through the South Boyer Lift Station to the WWTP headworks. The flow monitor for this zone was installed four manholes upstream of the South Boyer Lift Station, in Manhole FR10624 (Site 5). Zone V has a drainage area of approximately 278 acres.

### 2.2.2 Results/Summary

A summary of the flow monitoring data is presented on Figure 2-2. A tipping-bucket rain gage was installed on First Avenue and Bridge Street in downtown Sandpoint and recorded precipitation at 5-minute intervals. The total daily precipitation was tallied and has been superimposed over the flow monitoring data. The data show a strong correlation between rainfall and total collection system flows. Total precipitation during the flow monitoring period was 5.18 inches, with a peak 24-hour rainfall event on March 27, 2005, totaling 2.17 inches. This sudden rainfall created a drastic increase of I/I into the system.

Based on the flow monitoring data, the system is suffering from excess inflow, rapid infiltration (also referred to as delayed inflow), and base infiltration. The analysis performed on the flow monitoring data is based on the following terms and is graphically presented on Figure 2-3:

**Basic Domestic Sanitary Flow** refers to flows in the sewer system contributed by private residence, industrial, commercial, retail, and other approved sanitary discharges.

**Base Infiltration** is experienced by the system seasonally. Fluctuations generally occur on the order of weeks to months.

**Rapid Infiltration** is usually related to specific precipitation or snow-melt events in the system. System responses generally occur within a couple of days and typically return to base infiltration levels within several days to weeks, following a precipitation event. Rapid infiltration may appear to be inflow but is often caused by cracks in manholes, mainlines, service laterals near the ground surface, foundation drains, and sump pumps. These sources are generally difficult to identify. In particular, City staff has indicated that sump pumps and foundation drains are a widespread problem.

**Inflow** is an immediate response to a precipitation event, with responses occurring within minutes to hours following an event. Inflow causes sharp peaks in sewer flows, with limited duration. Inflow usually is followed by, and sometimes combined with, rapid infiltration. Inflow sources are typically directly connected catch basins, roof drains, and manholes in ditches.

For the purpose of quantifying potential removable I/I, no division was made between base infiltration and rapid infiltration. Both types of infiltration are caused by similar types of problems in the collection system, and future remediation techniques are likely to address both problems equally. When identifiable, inflow components were separated and the magnitudes of the impervious surfaces contributing inflow to the drainage basins were estimated.

The data were reduced and analyzed for each zone, and the flow monitoring results are summarized in Table 2-1. A detailed discussion of the flow monitoring results from each zone follows.

TABLE 2-1
Flow Monitoring Summary[a]
*March 2007*

| Zone | Average Observed Flow (mgd) [% Total] | Peak Observed Flow (mgd) [% Total][a] | Peak Observed Infiltration (mgd) | Peak Infiltration per acre of Service Area (gpd/acre) | Estimated Inflow Magnitude (mgd) | Estimated Inflow Impervious Area (acres)[c] |
|---|---|---|---|---|---|---|
| I Lincoln Basin | 0.95 [27%] | 3.30 [35%] | 1.65 | 2,090 | 1.45 | 3.1 To 5.2 |
| Ii Upper Ella Basin | 0.50 [14%] | 1.83 [19%] | 1.1 | 6,077 | 0.58 | no data[d] |
| Iii Lower Ella Basin | 0.27 [8%] | 1.90 [20%] | 0.6 | 5,940 | 1.2 | 5.4 |
| Iv Boyer Basin | 1.1 [31%] | 1.9 [20%] | 1.0 | 5,380 | 0.5 | no data[d] |
| V First Avenue Basin | 0.69 [20%] | 2.80 [30%] | 1.1 | 3,956 | 0.9 | 2.4 To 2.9 |
| **Total** | **3.51** | **9.5[b]** | **5.45** | **4,688** | **4.63** | **7.8 To 13.5** |

a. Based on monitoring conducted from March 12, 2005, to April 19, 2005
b. Based on peak flow from WWTP Influent chart recorder from March 27, 2005
c. Based on calculations of flow-monitored inflow events in relation to monitored precipitation events; based on Q=CiA, where Q=inflow volume, C=1, i=rainfall total in inches, A=area of impervious surface
d. Flow monitoring manhole surcharged in Zone IV (Site 4) and Zone II (Site 6) during rainfall event of March 27, 2005, causing attenuation of inflow in the collection system; no calculations made to separate infiltration and inflow

### 2.2.3 Results - Zone I

A plot of the flow monitoring data for Zone I is shown on Figure 2-4. The average flow from Zone I ranged between 0.7 and 2.3 mgd. Peak flow during the period was approximately 3.3 mgd and likely was caused by I/I entering the system from the March 27 rainfall event. The flows exhibited a strong diurnal variation during dry weather, with low flows occurring between 12:00 a.m. and 3:00 a.m. During wet weather flows, diurnal fluctuations became less pronounced.

Early morning low flow conditions prior to March 26 were approximately 250,000 gpd. Following the rainfall on March 27, the early morning base flow increased to approximately 1.9 mgd, indicating a rapid infiltration component of approximately 1.7 mgd.

An analysis of the inflow event observed on March 27 (peak = 2.4 mgd, total volume = 28,300 gallons) and a second, smaller inflow event (3.25 mgd, 35,300 gallons) on April 1 indicates that approximately 3.1 to 5.2 acres of impervious area are contributing inflow in the First Avenue basin.

### 2.2.4 Results - Zone II

A plot of the flow monitoring data for Zone II is shown on Figure 2-5. The average flow from Zone II ranged from 0.02 to 1.75 mgd. Peak flow during the period was approximately 1.83 mgd and likely was caused by I/I into the system from the March 27 rainfall event. The flow monitoring manhole surcharged in Zone II (Site 6) during that event, which attenuated the peak flow. No calculations were made to separate I/I. Dry weather flows exhibited a strong diurnal variation, with low flows occurring between 12:00 a.m. and 3:00 a.m. Wet weather flows had no discernable diurnal variation, indicating the zone was dominated by I/I.

Early morning flows prior to March 27 were approximately 0.15 mgd. Following the rainfall on March 27, the early morning base flow increased to approximately 1.20 mgd. Therefore, infiltration is estimated as approximately 1.10 mgd, based on the rise in early morning base flows.

No discernable inflow events were observed in this zone. However, based on quick response of flows to rainfall (1 to 3 hours), the difference in peak infiltration likely is due to inflow, which caused surcharging in the system.

### 2.2.5 Results - Zone III

A plot of the flow monitoring data for Zone III is shown on Figure 2-6. Flow from Zone III was determined by combining the flow from Sites 2 and 3, then subtracting the recorded flow from Zone II (Site 6). Data from all three sites were available only between March 18, 2005 and April 16, 2005, but the peak rainfall event of March 27 was captured. The flow from Zone III generally ranged from 0.10 to 0.75 mgd. Peak flow during the period was approximately 1.90 mgd and was due to a pronounced inflow event. The calculated flows for Zone III did not have a strong diurnal fluctuation; however, the original source data for Sites 2 and 3 exhibited a strong diurnal variation with low flows occurring between 12:00 a.m. and 3:00 a.m. Early morning flows for Zone III generally ranged from 0.10 up to 0.80 mgd, suggesting that the area is experiencing a peak infiltration of 0.70 mgd.

An analysis of the inflow event (peak = 2.6 mgd, total volume = 98,000 gallons) observed on March 27 indicates that approximately 5.4 acres of impervious area are contributing inflow in Zone III.

### 2.2.6 Results - Zone IV

During the rainfall event observed on March 27, the flow monitoring manhole surcharged due to a root-ball in the downstream line. This caused flows to back up into the monitored manhole and several other manholes upstream. The result was attenuation in the flows, making it difficult to delineate and quantify the impact due to inflow. The surcharging of the manhole likely resulted in erroneous flow monitoring data.

Total flow monitoring data indicated total flows nearly 40 percent higher than those measured by the influent Parshall flume. As discussed, the Boyer Basin surcharged during the March 27 precipitation event due to a root-ball in the line downstream of the flow monitoring site. This caused water depths of nearly 60 inches in the flow monitoring manhole and full-pipe flow. Currents in the manhole likely caused the flow meter calibration to become increasingly erroneous as the system surcharged, thus monitored flows were much higher than actual flows coming from this basin. To correct for this error, calibration for Sites 1, 2, 3, 5, and 6 were assumed reasonable, and I/I parameters for Site 4 were adjusted to match the WWTP influent Parshall flume. This adjusted data was subsequently used for the I/I evaluation of the Boyer Basin.

A plot of the adjusted flow monitoring data for Zone IV is shown on Figure 2-7. The average flow from Zone IV ranged between 0.5 and 2.0 mgd. Peak flow during the period was approximately 1.9 mgd and likely was caused by a combination of I/I into the system during the March 27 rainfall event. The flows exhibited a strong diurnal variation during dry weather, with low flows occurring between 12:00 a.m. and 3:00 a.m.

Early morning flows from March 22 to March 25 were approximately 0.50 mgd. Following the rainfall on March 27, the early morning base flow increased to approximately 1.5 mgd. Therefore, infiltration is estimated as approximately 1.0 mgd, based on the early morning base flows of March 27.

### 2.2.7 Results - Zone V

A plot of the flow monitoring data for Zone V is shown on Figure 2-8. The average flow from Zone V ranged between 0.5 and 1.75 mgd. Peak flow during the period was approximately 2.8 mgd and likely was caused by inflow into the system from the March 27 rainfall event. The flows exhibited a strong diurnal variation during dry weather, with low flows occurring between 12:00 a.m. and 3:00 a.m.

Early morning flows prior to March 16 were at or below 0.10 mgd. Following the rainfall on March 27, the early morning base flow increased to approximately 1.2 mgd, indicating an infiltration component of approximately 1.1 mgd.

Two inflow events were identified in Zone V. The first occurred on March 27, with a peak of 2.75 mgd and a volume of 28,300 gallons. A second, smaller inflow event occurred on April 1, with a peak of 1.6 mgd and a volume of 9,520 gallons. These events indicate that approximately 2.4 to 2.9 acres of impervious area are contributing inflow in the First Avenue basin.

## 3 Potential I/I Reduction

Probable reductions in I/I are based on the flow monitoring conducted during spring 2005, when the average WWTP flow was 3.51 mgd, the peak day flow was approximately 8.26 mgd, and the peak-hour flow was approximately 9.5 mgd. Daily flows were compared to flow records from 1998 through 2005. During that period, the peak observed flow was 11.0 mgd. The flow monitoring period, therefore, captured flows that were 86 percent of

previously observed peaks. These flows are still below the design flow of 14.7 mgd, used in the 1982 upgrade. Such wet periods do result in higher levels of I/I, but the percentage of I/I from each zone is assumed to remain constant. I/I reduction strategies noted in this section are not prioritized.

## 3.1 Zone I Potential I/I Reduction

The flow monitoring results from spring 2005 indicate a peak infiltration component of approximately 1.7 mgd in the Lincoln Interceptor basin. Discussions with City staff indicate this I/I likely is coming from the main Lincoln Interceptor, probably due to adverse soil conditions and differential settlement at manholes combined with weak pipe. The manholes have been observed to move vertically (fractions of an inch to inches) as the surrounding soils saturate and dry throughout the year. This movement has caused the pipe to crack near the manholes, to relieve the stress. The pipe used for the main Lincoln trunk line is a spiral-reinforced PVC pipe. As this pipe cracks due to the internal stresses, the crack propagates away from the manhole along the spiral seam, in some cases 10 to 15 feet from the manhole, creating potential infiltration sites. The City has replaced several of these broken sections of pipe along the trunk line; however, numerous compromised areas still exist. Additional replacements appear justified, based on structural concerns of the pipe and the potential for infiltration. No data set is available to specifically quantify the infiltration reduction possible with such replacement.

This zone also appears to be experiencing some minor inflow during rainfall events. A detailed inflow study should be performed on this zone, using the following steps:

- Perform additional flow monitoring within the basin by subdividing the drainage basin studied in 2005 into several sub-drainage basins (This step is intended to focus efforts on the worst sub-basins to identify potential inflow sources in the next steps.)
- Perform smoke testing in those sub-drainage basins evidencing inflow events and document specific inflow sources (e.g., the number and location of catch basins and roof drains).
- Evaluate the potential contribution of sump pumps and foundation drains through spring video inspection.
- Perform dye testing and develop implementation plans for disconnecting sources.
- Prioritize sources to be removed, based on costs and potential inflow magnitude.

Rehabilitation of the cracked pipe sections, and identification and removal of inflow sources may result in reducing peak flows by approximately 0.50 mgd in Zone I.

## 3.2 Zone II Potential I/I Reduction

The flow monitoring results from spring 2005 indicate a peak infiltration component of approximately 1.1 mgd in the Upper Ella drainage basin. Discussions with City staff and past smoke testing results (Ruen-Yeager, 1995) do not indicate any obvious inflow sources. Furthermore, the flow monitoring data did not show any pronounced inflow events.

This zone likely is experiencing rapid infiltration with minor inflow due to widespread physical deterioration of the system. With a peak infiltration of 6,077 gpd/acre, the zone is the longest infiltration contributor based on service area; however, at 14 percent of the total system flow, magnitude of infiltration in relation to other drainage basins is relatively small and I/I reduction projects may be more successful in other zones. Regular

closed-circuit television (CCTV) inspections should continue in this zone to identify deteriorating pipe conditions and potential sump pump connections/foundation drains that could be allowing infiltration to enter the collection system.

Flows in this basin should continue to be monitored periodically as the system continues to age, to determine if infiltration is increasing.

### 3.3 Zone III Potential I/I Reduction

The flow monitoring results from spring 2005 indicate a peak infiltration component of approximately 0.70 mgd in the lower Ella drainage basin, with a pronounced inflow event on March 27. Discussions with City staff, flow monitoring, and past smoke testing results (Ruen-Yeager, 1995) indicate that inflow sources are present within this zone.

Additional flow monitoring to focus on sub-drainage basins with inflow appears unwarranted because the drainage basin is relatively small. However, the following steps are recommended to identify inflow sources and removal strategies:

- Perform smoke testing in this zone to document specific inflow sources
- Perform dye testing and develop implementation plans for disconnecting sources
- Prioritize sources to be removed based on costs and potential inflow magnitude
- Evaluate the potential contribution of sump pumps and foundation drains through spring video inspection

Infiltration in this zone appears to be the result of general deterioration in the system and is minor relative to the total collection system flows. A significant infiltration reduction in this zone does not appear likely. Regular CCTV inspections should continue in this zone to identify deteriorating pipe conditions that could be allowing infiltration to enter the collection system. Identification and removal of inflow sources may result in reducing peak flows by approximately 0.70 mgd.

### 3.4 Zone IV Potential I/I Reduction

The flow monitoring results from spring 2005 indicate a peak infiltration component of approximately 1.5 mgd in the Boyer Interceptor basin, with no discernable inflow events. Therefore, this basin appears to be experiencing widespread infiltration, accounting for 31 percent of the total collection system flow. As mentioned previously, this will need to be verified with additional wet weather flow monitoring, following removal of the root-ball that is plugging the line.

As this zone is experiencing some minor inflow during rainfall events, the City should verify that the previously identified inflow sources (Ruen-Yeager, 1995) have been disconnected and document sources that still exist.

The primary problem in this zone appears to be infiltration on a flow per acre basis.

Following a precipitation event, the flow takes several days to return to its previous level. This suggests that the flow is entering the system deeper in the ground, due to saturated soil conditions that are impacting mainlines and deep laterals.

Mainline rehabilitation is much less expensive than service lateral reconstruction, which requires entering homeowners' property and reconstruction of sidewalks and landscaping. This zone should be targeted for mainline rehabilitation projects. This rehabilitation effort should proceed with the following steps:

- Perform flow monitoring within the basin, subdividing the drainage basin into several minor drainage basins (This analysis will isolate the sub-basin and general location of potential inflow sources.)
- Utilize flow monitoring data to identify areas that are experiencing higher infiltration relative to length and diameter of mainlines serving the sub-basin
- Review City maintenance records to identify severe problem areas
- Perform additional CCTV inspection of trunk lines (greater than 10 inches") and collector lines (less than 10 inches) to further identify severe problem areas
- Evaluate options for rehabilitation of mainline and manholes (i.e., slip lining, open-trench reconstruction, cured-in-place pipe lining, etc.)

Complete rehabilitation of mainlines, manholes, and service lateral connections to mainlines (no lateral rehabilitation) and identification and removal of inflow sources may result in reducing peak infiltration by approximately 25 percent in this zone, or 0.25 mgd.

### 3.5 Zone V Potential I/I Reduction

The flow monitoring results from spring 2005 indicate a peak infiltration component of approximately 1.1 mgd in the First Avenue Interceptor basin, with identifiable inflow events and peaking factors in excess of 6:1. A detailed I/I study should be performed on this zone, using the following steps:

- Verify that the remaining inflow sources (previously identified in this basin during the 1995 smoke testing) have been disconnected, and document which sources still exist
- Perform flow monitoring within the basin, subdividing the drainage basin into several minor drainage basins (This analysis will isolate the sub-basin and general location of potential inflow sources, and probable infiltration for each of the sub-basins.)
- Evaluate which sub-basins are contributing excessive infiltration
- Perform additional smoke testing in sub-basins with potential inflow sources, to locate and document specific inflow sources
- Evaluate the potential contribution of sump pumps/foundation drains through spring video inspection
- Perform dye testing and develop implementation plans for disconnecting sources
- Prioritize sources to be removed, based on costs and potential inflow magnitude

Several areas along the main trunk in the southeast portion of Sandpoint have been noted by City staff as having major obstructions (recurring root-balls) with broken and offset pipe joints. These known problems should be targeted for replacement, to reduce infiltration into the system. A more detailed infiltration identification project in this zone appears warranted, given the amount of infiltration compared to the entire collection system. Regular CCTV inspections should continue in this zone, to identify deteriorating pipe conditions that could be allowing infiltration to enter the collection system.

The primary recommendation for Zone V is identification and removal of inflow sources, which may result in reducing peak flows by as much as 1.0 mgd.

## 3.6 Summary of Reasonable I/I Removal

The preceding discussions are summarized in Table 3-1. Based on observed flows in spring 2005, the potential reduction of peak infiltration and inflow in the system is estimated at 2.45 mgd, or 24 percent.

TABLE 3-1
Reasonable I/I Removal Summary
*March 2007*

| Zone | Current Contribution to Peak Infiltration (mgd) [% of total] | | Current Contribution to Peak Inflow (mgd) [% of total) | | Potential I/I Removal (mgd) | | Remaining Peak I/I (mgd) |
|---|---|---|---|---|---|---|---|
| I | 1.65 | [31] | 1.45 | [31] | 0.50 | Infiltration | 2.6 |
| II | 1.1 | [20] | 0.58 | [13] | --- | | 1.68 |
| III | 0.6 | [11] | 1.2 | [26] | 0.70 | Inflow | 1.1 |
| IV | 1.0 | [18] | 0.5 | [11] | 0.25 | Infiltration | 1.25 |
| V | 1.1 | [20] | 0.9 | [19] | 1.0 | Inflow and infiltration | 1.0 |
| **Total** | **5.45** | | **4.63** | | **2.45** | | **7.63** |

The City should consider having a target point that establishes when the search for I/I ceases because of the extensive amount of work that is required to identify and document inflow sources. One reasonable criterion is the US EPA standard that states I/I during a storm event should not create flows to the WWTP that exceed 275 gpcd (US EPA, 1991). Flows greater than this are considered excessive and, based on USEPA's comments, such systems should have additional studies to identify I/I sources. Assuming the City currently has 6,829 residents, the peak WWTP flow should be less than 1.9 mgd during storm events. Current dry weather flows exceed this value; therefore, this standard may not be applicable for the City.

# 4 Likely Future Infiltration

During dry weather conditions, infiltration currently contributes over half of the total flow to the WWTP. Extensions of the existing collection system are expected to contribute much less infiltration, due to improved construction methods and materials. The new sewer can be expected to deteriorate over time, as gaskets age, new connections are made, and repairs are made in the main line or service lines. To assess the potential impact of such deficiencies over time, existing collection system zones were reviewed to identify age versus peak observed infiltration per acre, using the 2005 flow monitoring data. Table 4-1 includes the approximate service area for each zone, infiltration contribution per acre of service area, and estimated age, based on discussions with City staff.

Based on this data, a plot of infiltration per acre versus collections system age was developed for each zone and is shown on Figure 4-1. The shaded region in the figure shows the band of probable infiltration experienced by the existing collection system. Based on this band, the range of probable infiltration at the 20-year design point ranges between 2,150 gpd/acre and 3,500 gpd/acre. Using the US EPA guidance of 275 gpcd and assuming nine persons per acre (R4 zoning), the maximum allowable I/I is 2,475 gpd/acre.

By comparison, the Kootenai-Ponderay Sewer District has infiltration ranging from 300 to 700 gpd/acre. The majority of that system is less than 35 years old and has similar soil conditions, but the sewers are generally shallower than in the City.

Based on this data, affected seasonal infiltration is expected to generate 200 to 250 gpd/acre in areas of new construction. Considering the challenging soils in this area, a value to 300 gpd/acre for average day with a peak day infiltration of 500 gpd/acre is recommended for planning purposes in collection system extensions in the City and the ACI.

TABLE 4-1
Collection System Infiltration versus System Age
*March 2007*

| Zone | Peak Observed Infiltration (mgd) | Zone Service Area (acres) | Peak Infiltration per acre of service area (gpd/acre) | Estimated Age of Collection System Zone (years) |
|---|---|---|---|---|
| I – Lincoln Basin | 1.65 | 790 | 2,090 | 10 to 20 |
| II – Upper Ella Basin | 1.1 | 181 | 6,077 | 35 to 55 |
| III – Lower Ella Basin | 0.6 | 101 | 5,940 | 40 to 60 |
| IV – Boyer Basin | 1.0 | 186 | 5,380 | 70 to 95 |
| V – First Ave. Basin | 1.1 | 278 | 3,956 | 70 to 95 |
| WWTP Flow[a] | 5.45 | | Average = 4,688 | |

a. Based on WWTP influent chart recorder.

# 5 References

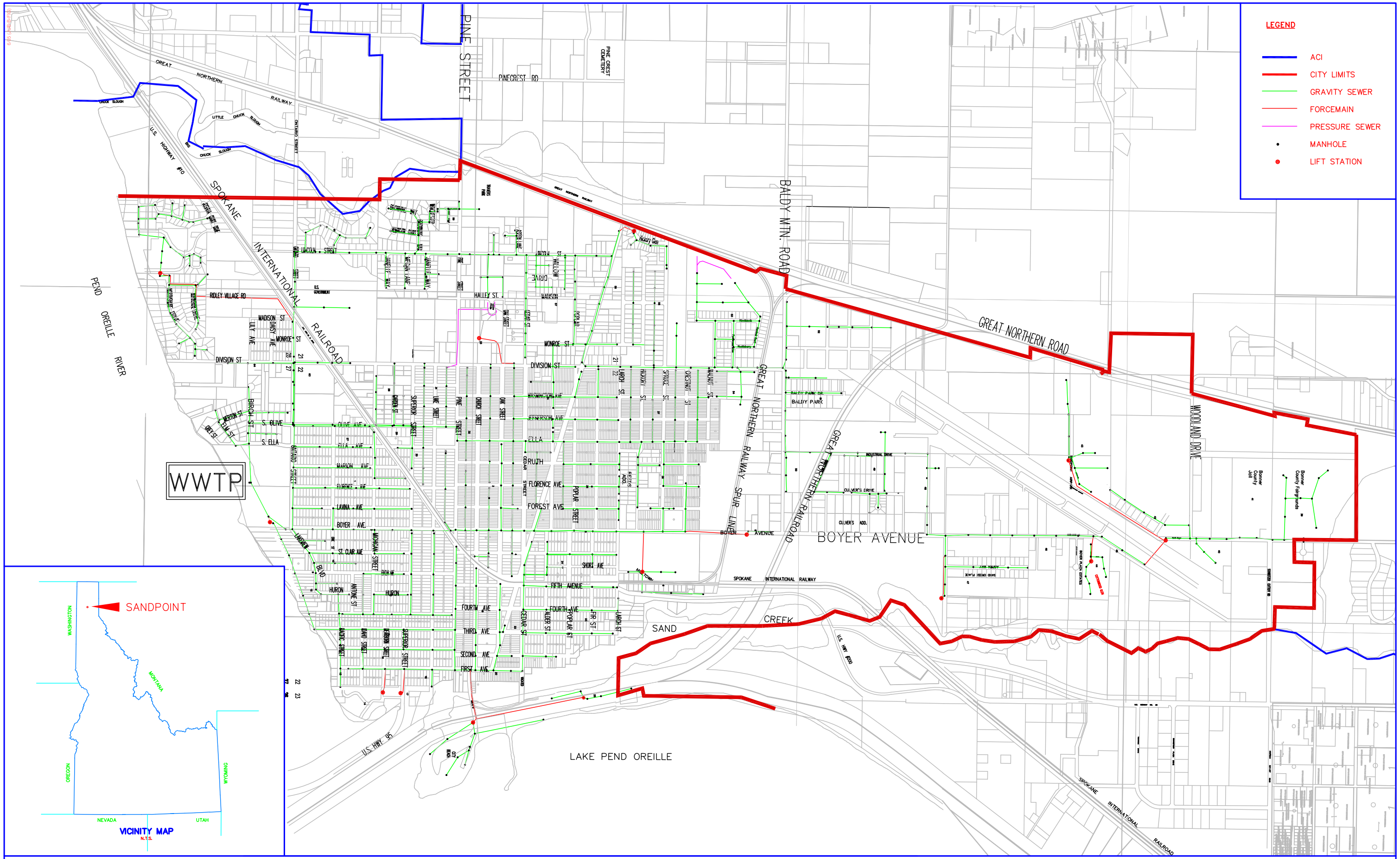
City of Sandpoint Collections System Staff, Rod Berget and Rick Larsen, Personal Communication, 2005.

Ruen-Yeager and Associates, Inflow Analysis, December 1995.

U.S. Environmental Protection Agency (US EPA), *Sewer System Infrastructure Analysis and Rehabilitation*, EPA/625/6-91/030, 1991.

Figure 1-1 Existing Collection System Schematic
Figure 2-1 Flow Monitoring Sites and Drainage Basins
Figure 2-2 Flow Monitoring Summary
Figure 2-3 I/I Definition Sketch
Figure 2-4 Zone I Flow Monitoring Results
Figure 2-5 Zone II Flow Monitoring Results
Figure 2-6 Zone III Flow Monitoring Results
Figure 2-7 Zone IV Flow Monitoring Results
Figure 2-8 Zone V Flow Monitoring Results
Figure 4-1 Peak Infiltration per Acre versus System Age

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#2 FIGURE 1-1, 3/20/2007 4:19:50 PM, wholder, J-U-B

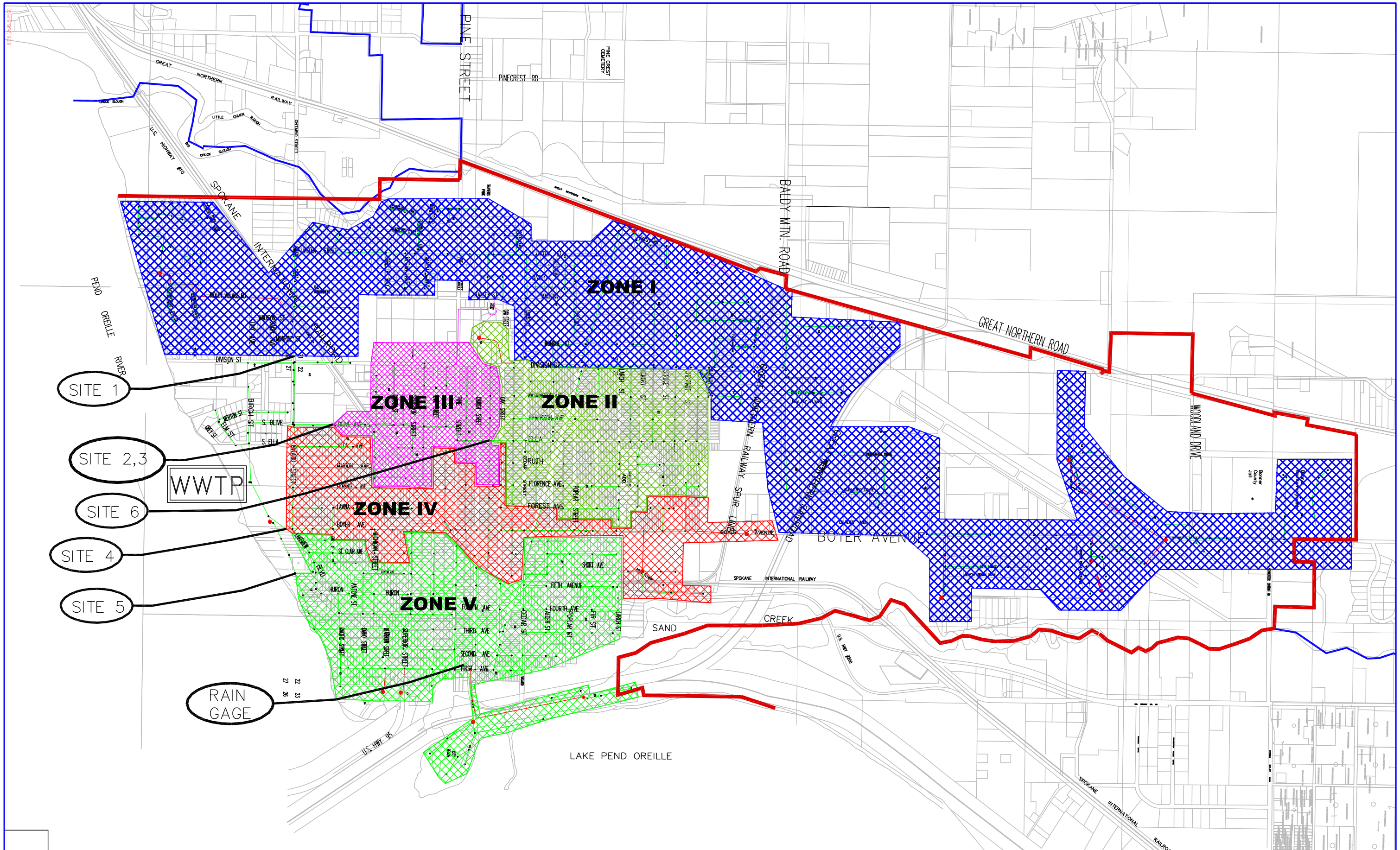



J-U-B
Engineers • Surveyors • Planners

CAD FILE: 20-05-035b

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 1-1
EXISTING COLLECTION SYSTEM SCHEMATIC




J-U-B
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CAD FILE: 20-05-035b

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-1
FLOW MONITORING SITES AND DRAINAGE BASINS

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#2 FIGURE 2-1, 3/20/2007 4:25:05 PM, wholder, J-U-B

**Figure 2-2**
**Flow Monitoring Results Summary**

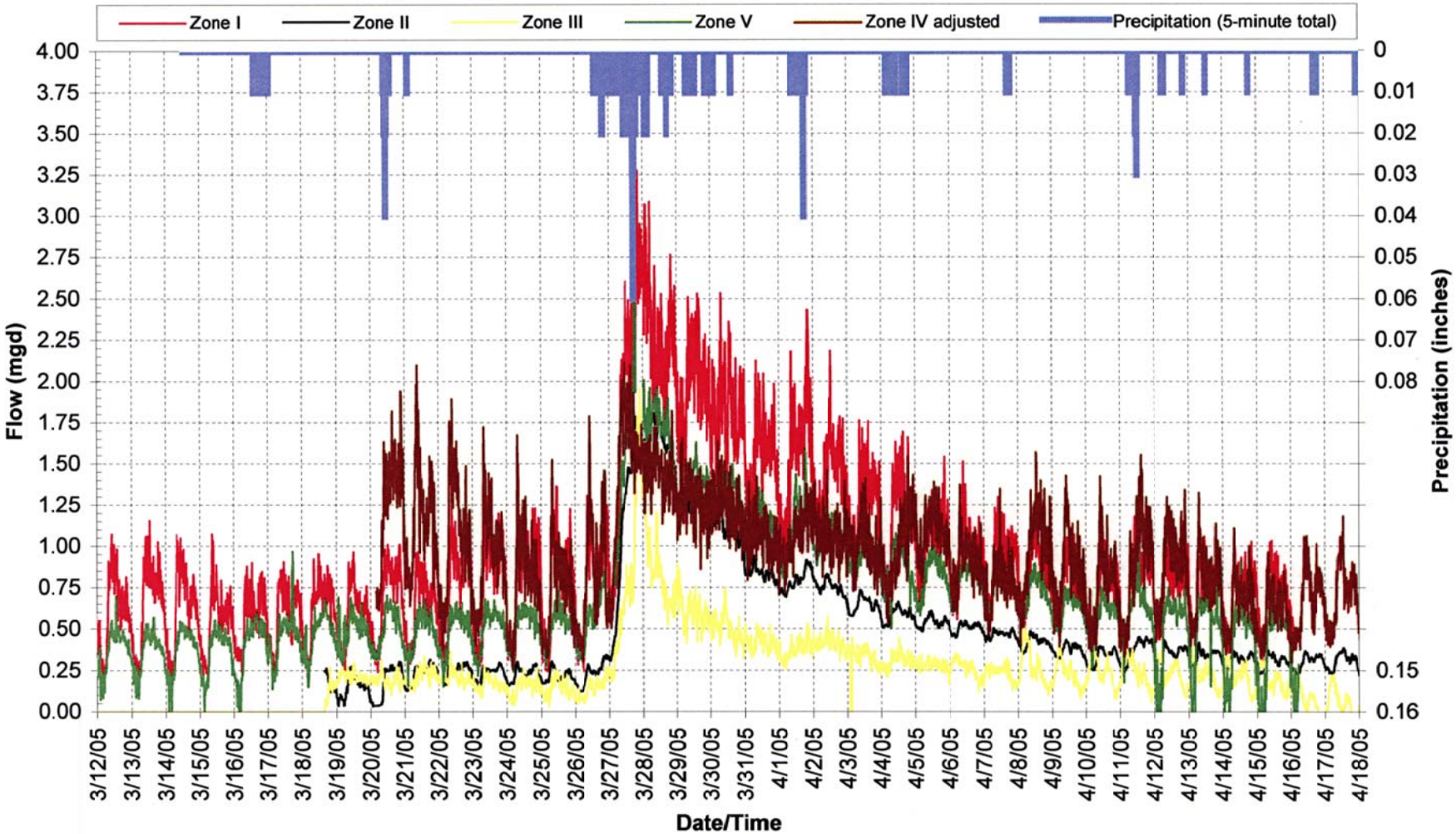


**Figure 2- 3**
**I/I Definition Sketch**

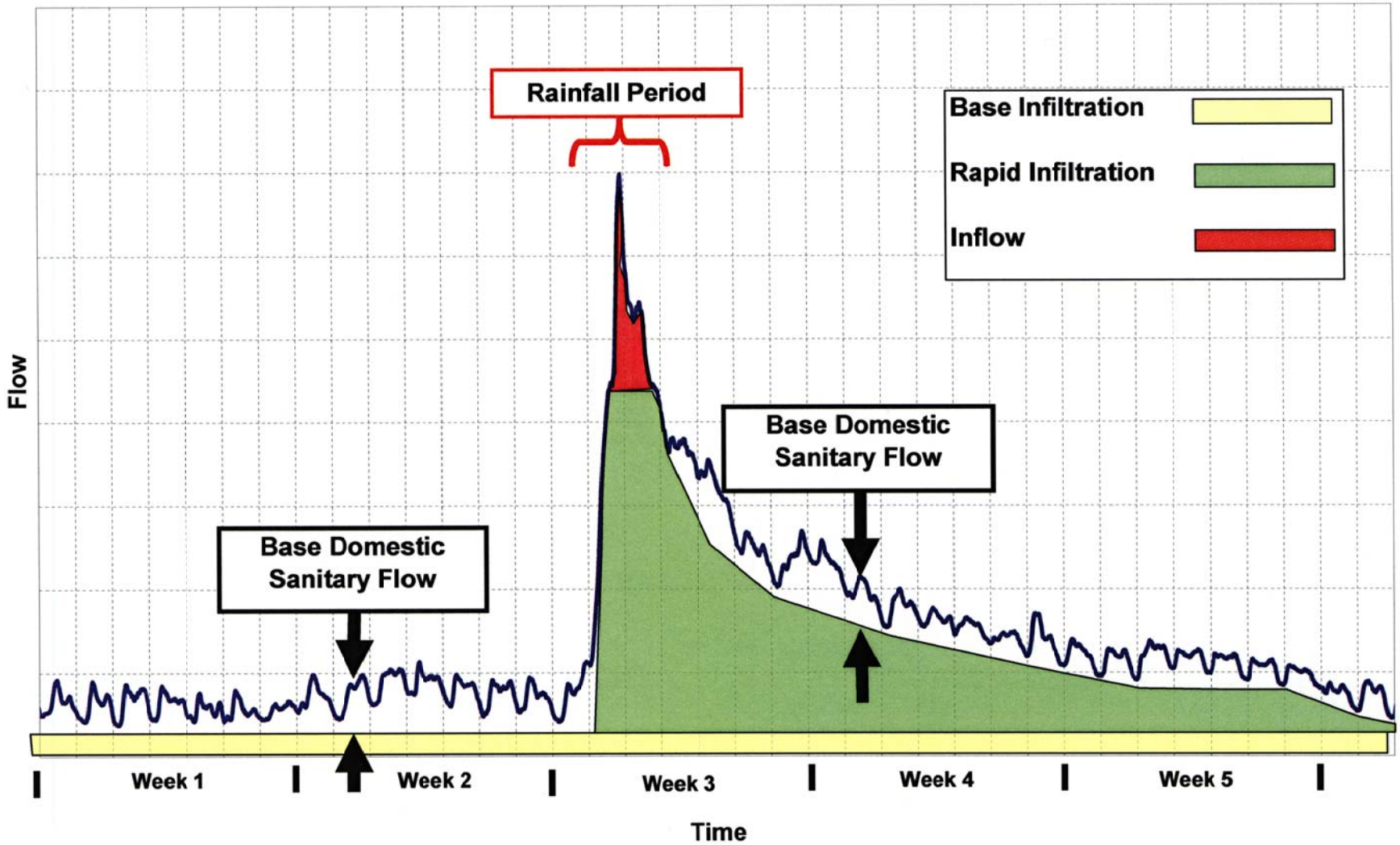


**Figure 2-4**
**Zone I Flow Monitoring Results**

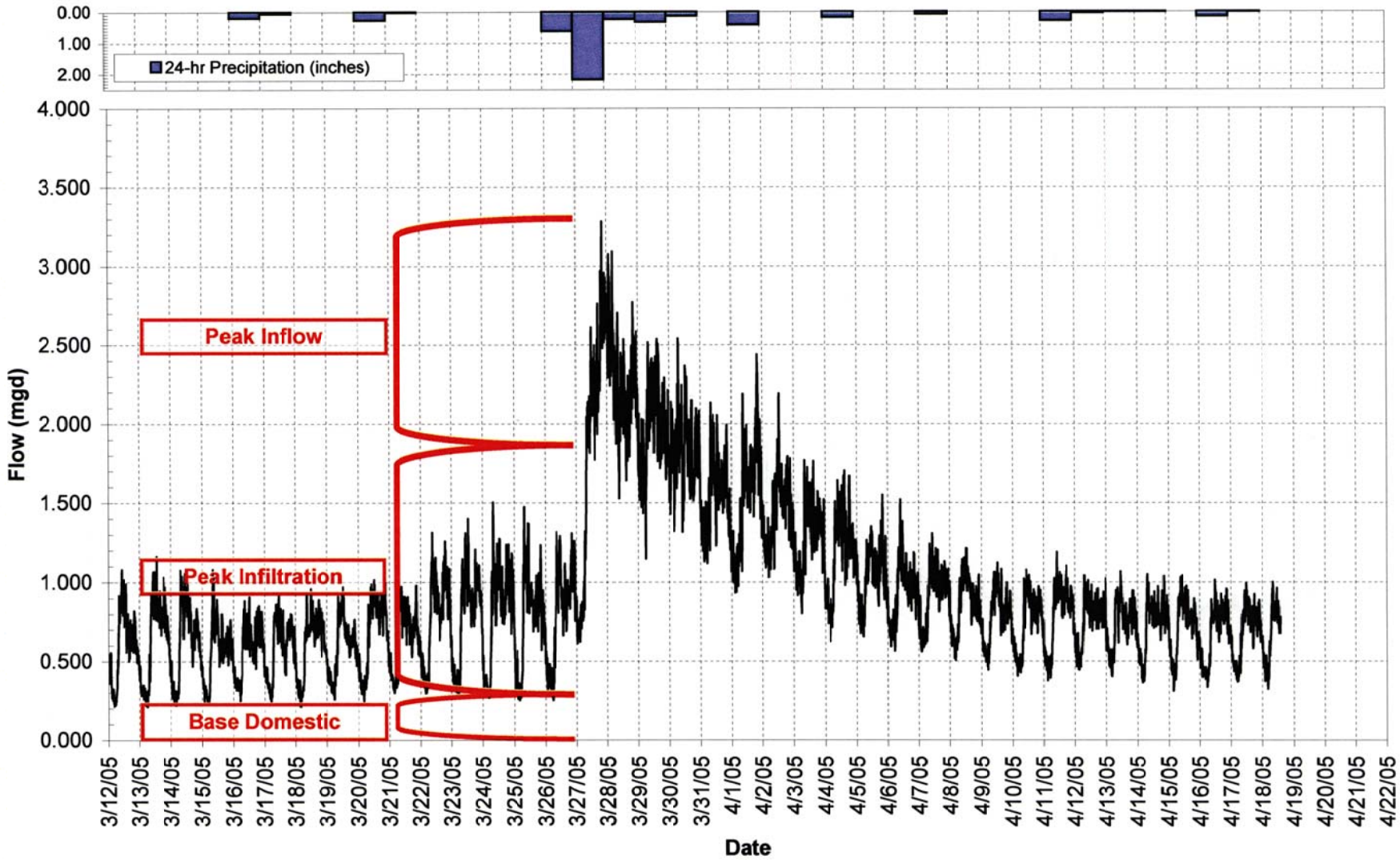


**Figure 2-5**
**Zone II Flow Monitoring Results**

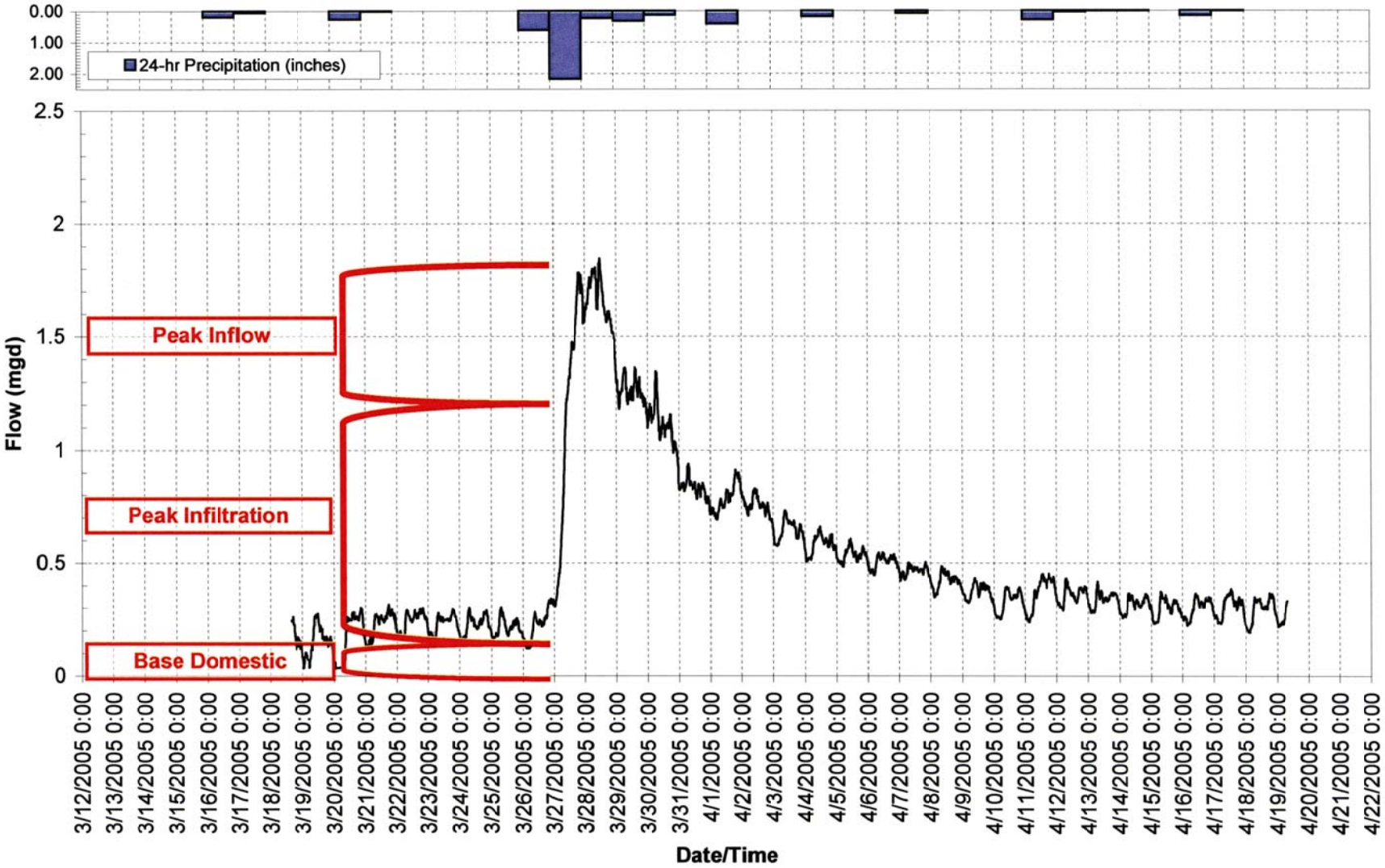


**Figure 2-6**
**Zone III Flow Monitoring Results**

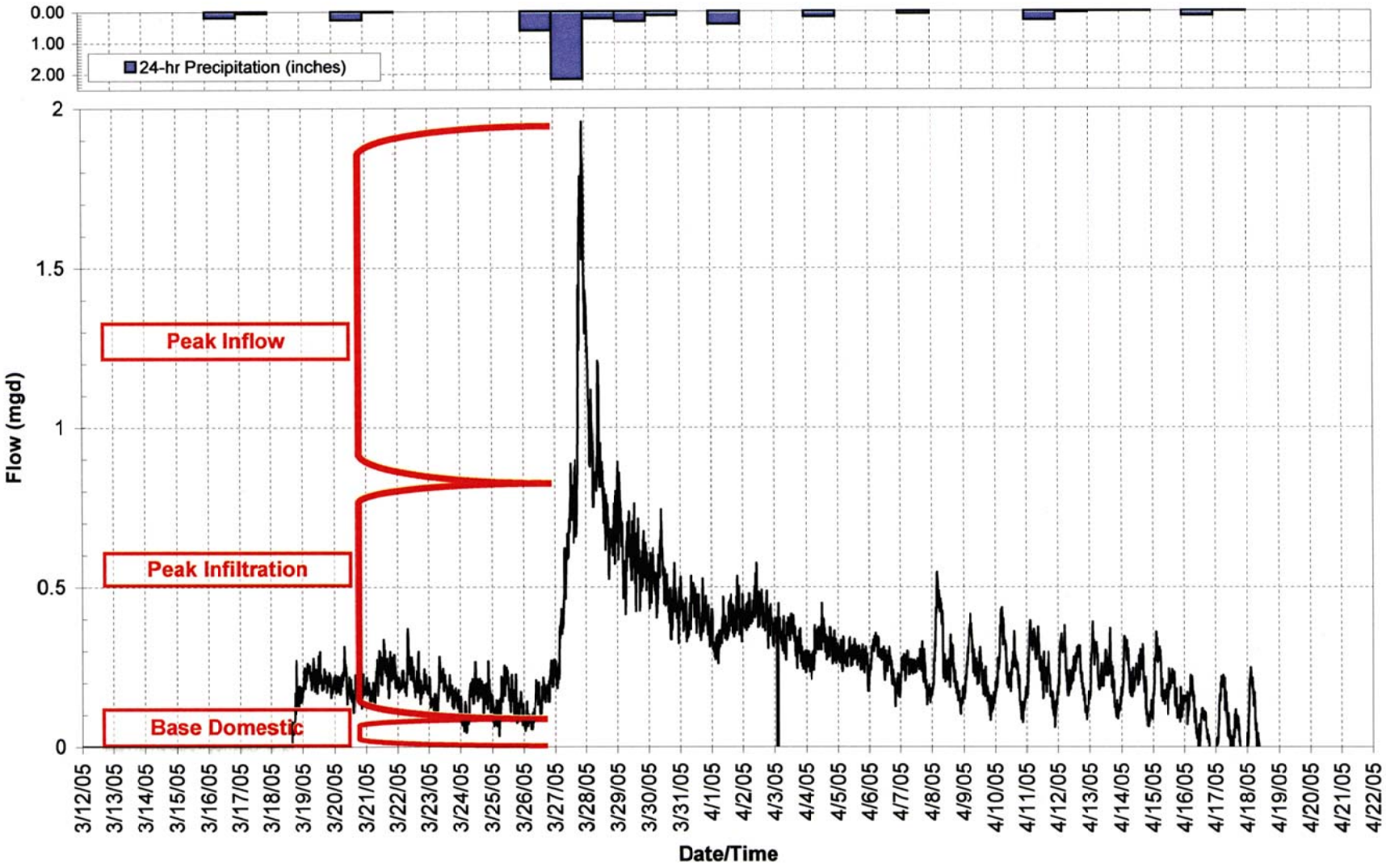


**Figure 2-7**
**Zone IV Flow Monitoring Results**

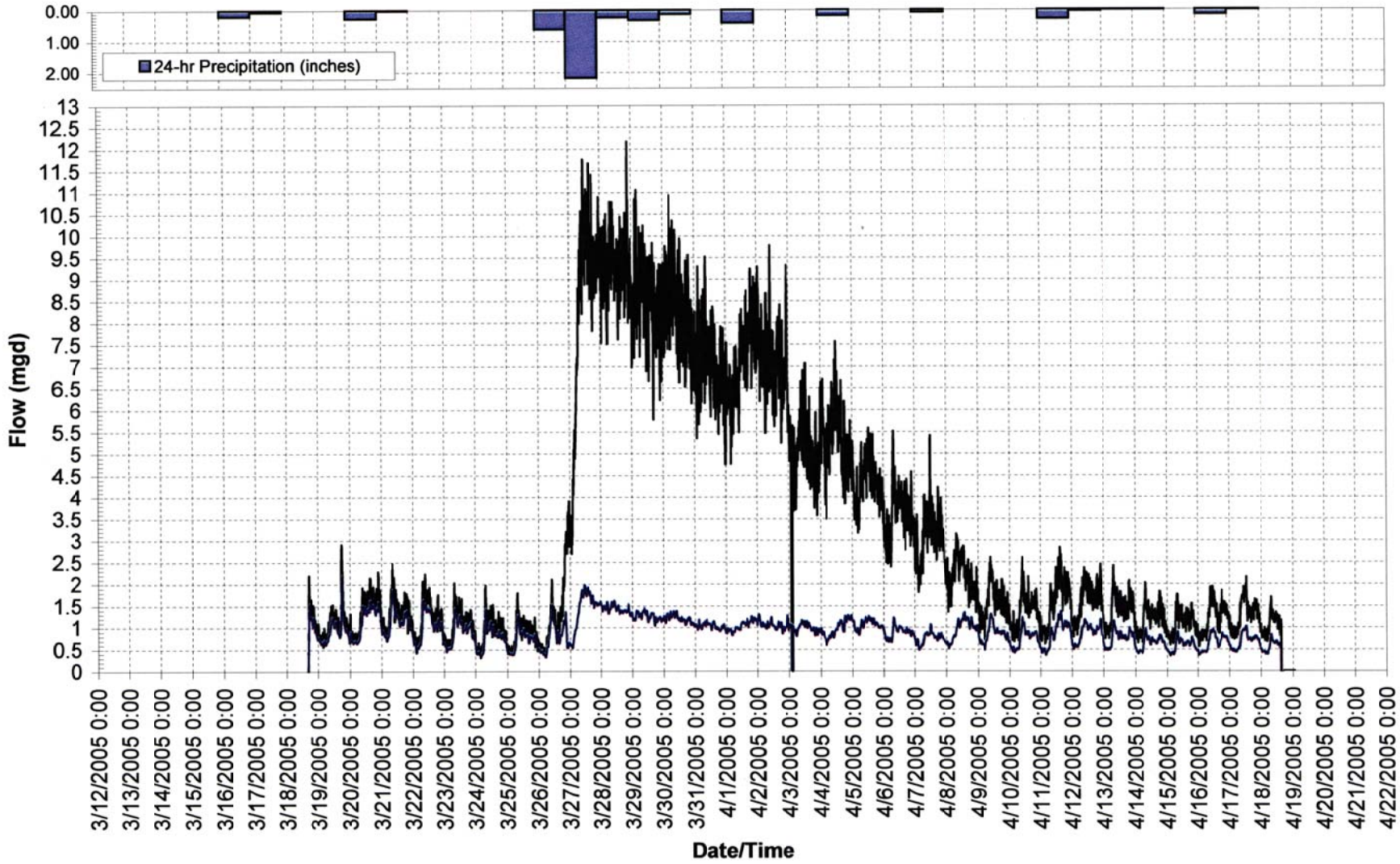


**Figure 2-8**
**Zone V Flow Monitoring Results**

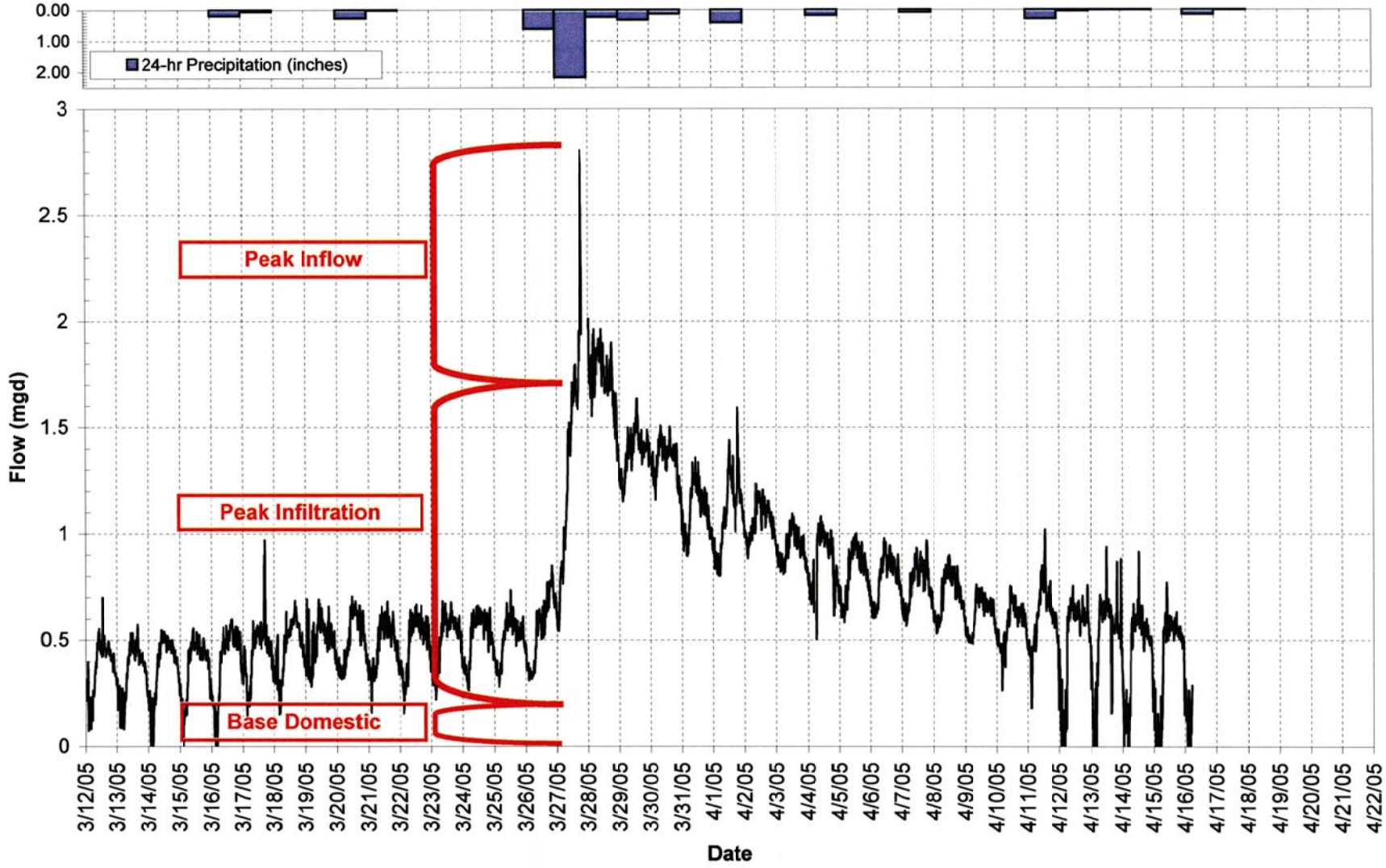
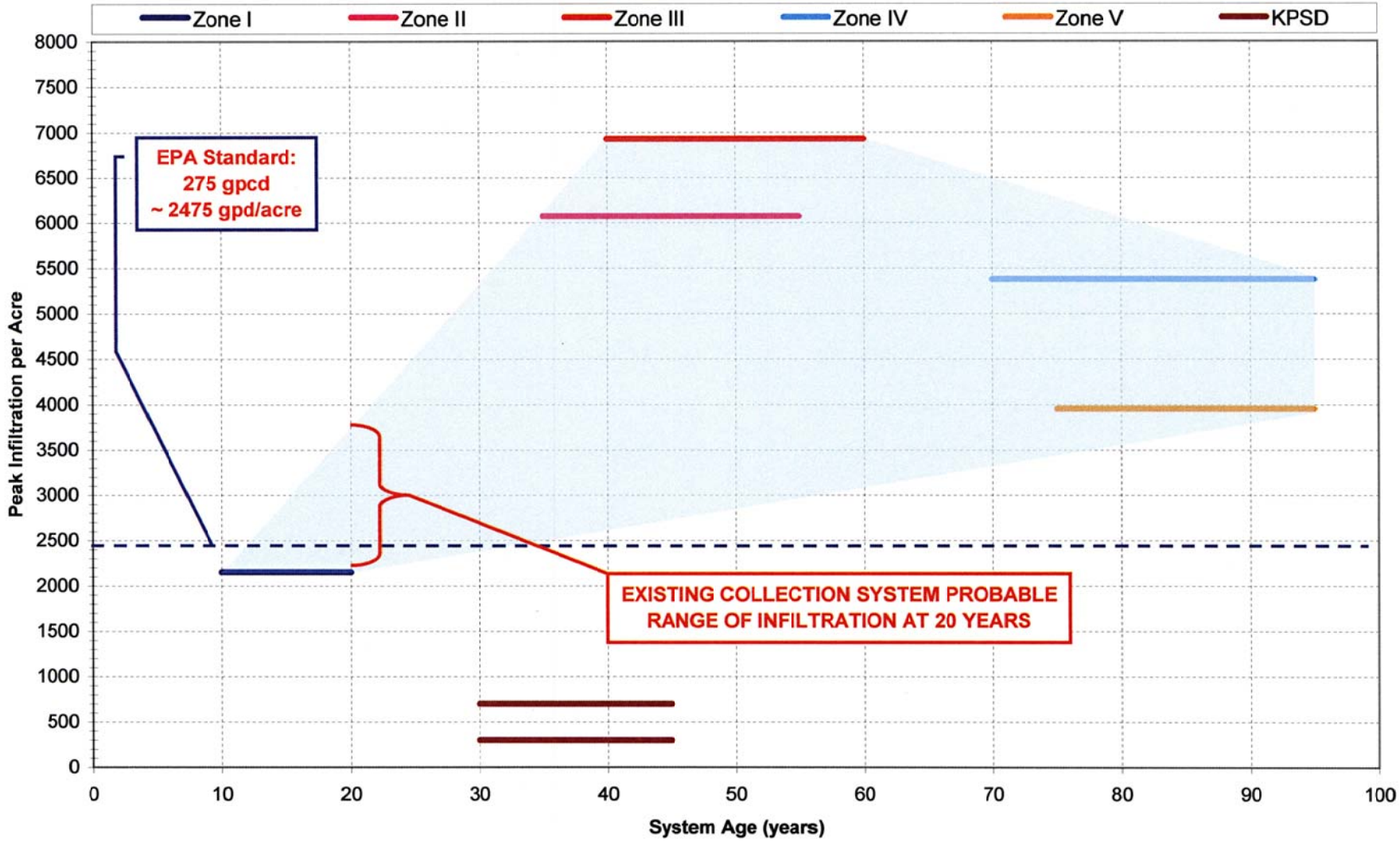


**Figure 4-1**
**Peak Infiltration per Acre versus System Age**

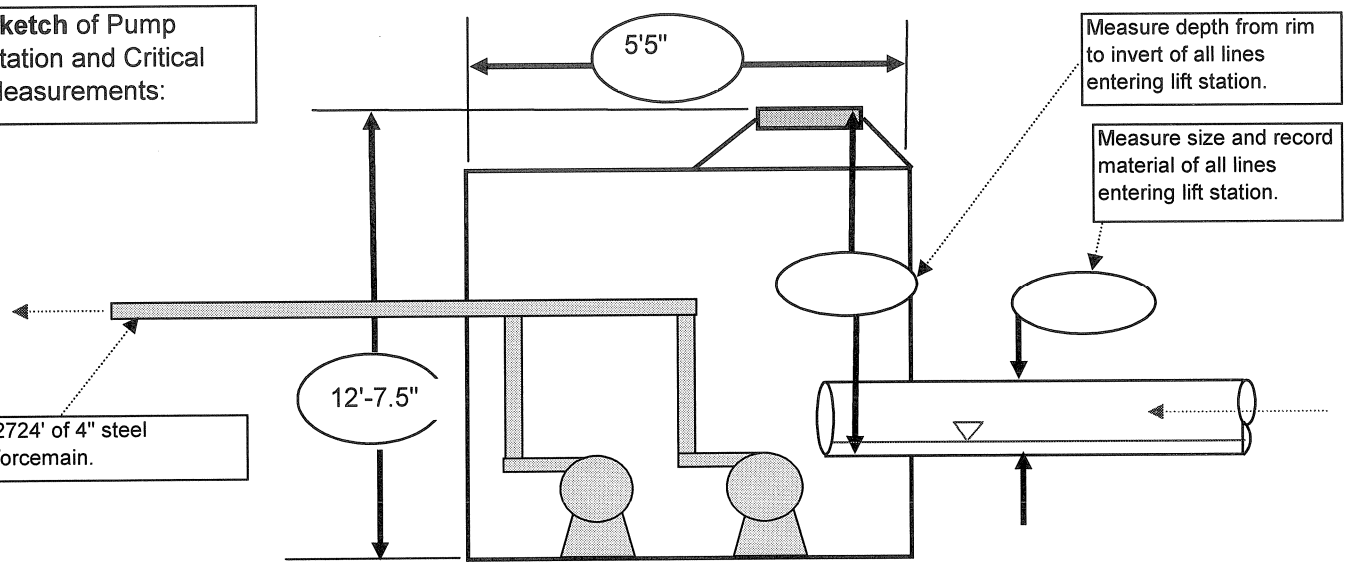


# Appendix A

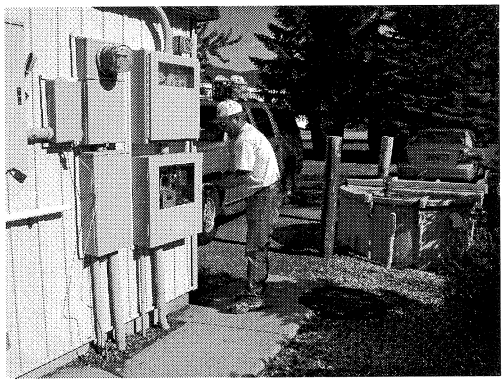
# Lift Station Data

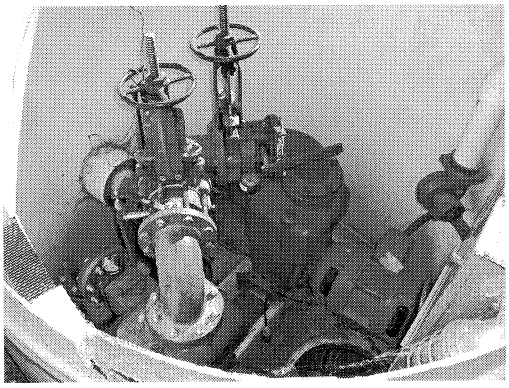
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Westwood |
| Location Description: | Backside of Westwood subdivision between it and North Shore. |
| Number of Pumps: | 2 |
| Pump Horsepower: | 15 hp each |
| Type: | Hydromatic Self-Priming |
| Model / Model #: | 40 MMPCC1500-43 |
| Serial #: | 6548-or 7 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | yes |
| Comments: | Wet well 1 piece unit sit down in fiberglass. Pumping distance 2' between on and off floats. Pump on at 3' off at 1' |

**Sketch** of Pump Station and Critical Measurements:



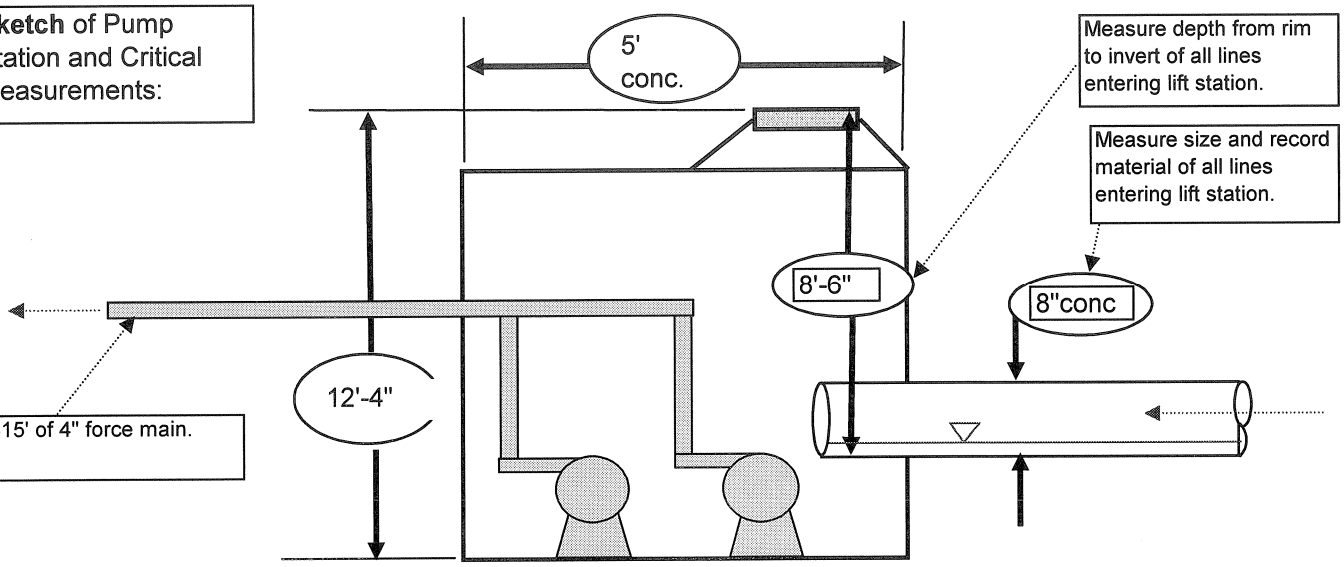
# "WESTWOOD" LIFT STATION



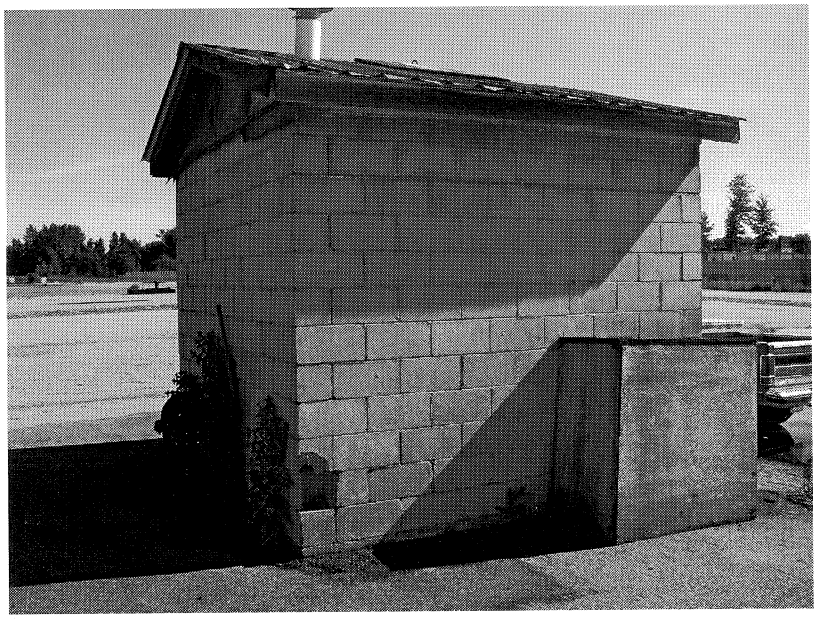


| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | L.P. Lift Station |
| Location Description: | In abandoned Louisiana Pacific Mill yard |
| Number of Pumps: | 2 |
| Pump Horsepower: | 3 hp each |
| Type: | Gorman-Rupp |
| Model / Model #: | T4A3-B 1F |
| Serial #: | 1174771 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | June 28, 1961 construction, Replaced pumps 6/99 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | Impeller 9.75 inches, RPM 1765. Pumping Time 1 minute for 1' drawdown from upper float of 4' to lower float of 3'. |

**Sketch** of Pump Station and Critical Measurements:

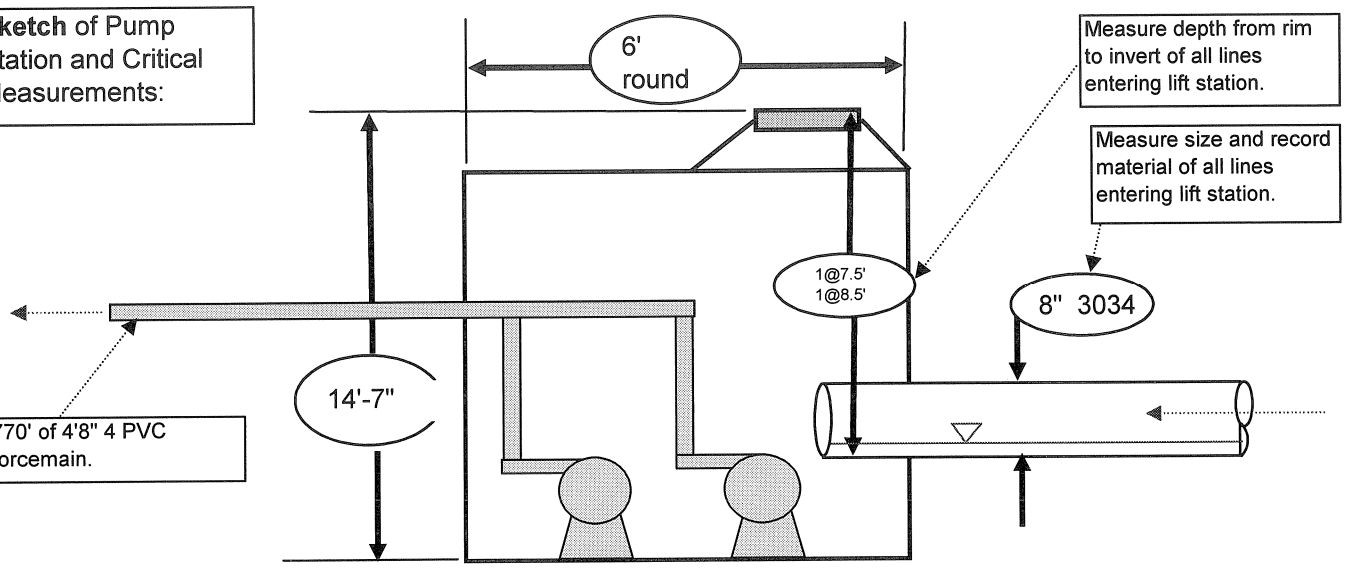


# "L.P." LIFT STATION

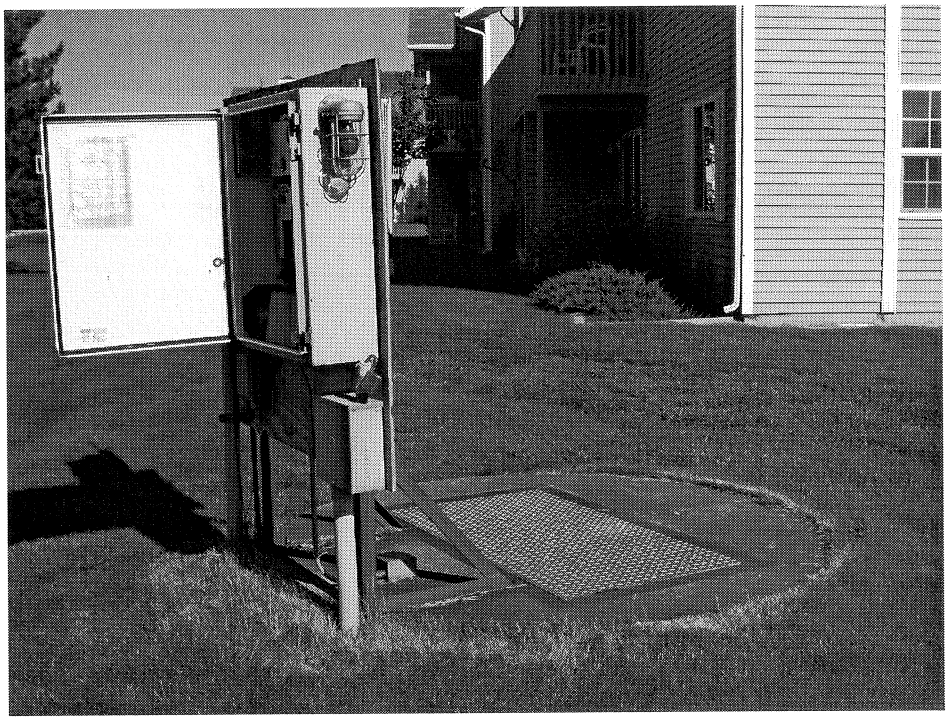


| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Bristle Cone |
| Location Description: | Apartment Complex |
| Number of Pumps: | 2 |
| Pump Horsepower: | 2 |
| Type: | Goulds |
| Model / Model #: | W52012PX |
| Serial #: | 2037749 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | East pump is a Peabody/Barness 2HSE-201 Model. Have Replacement. Multi Ranger, Auto Dialer. Single Phase 230 volt. 5' on. 2.5' off. |

**Sketch** of Pump Station and Critical Measurements:

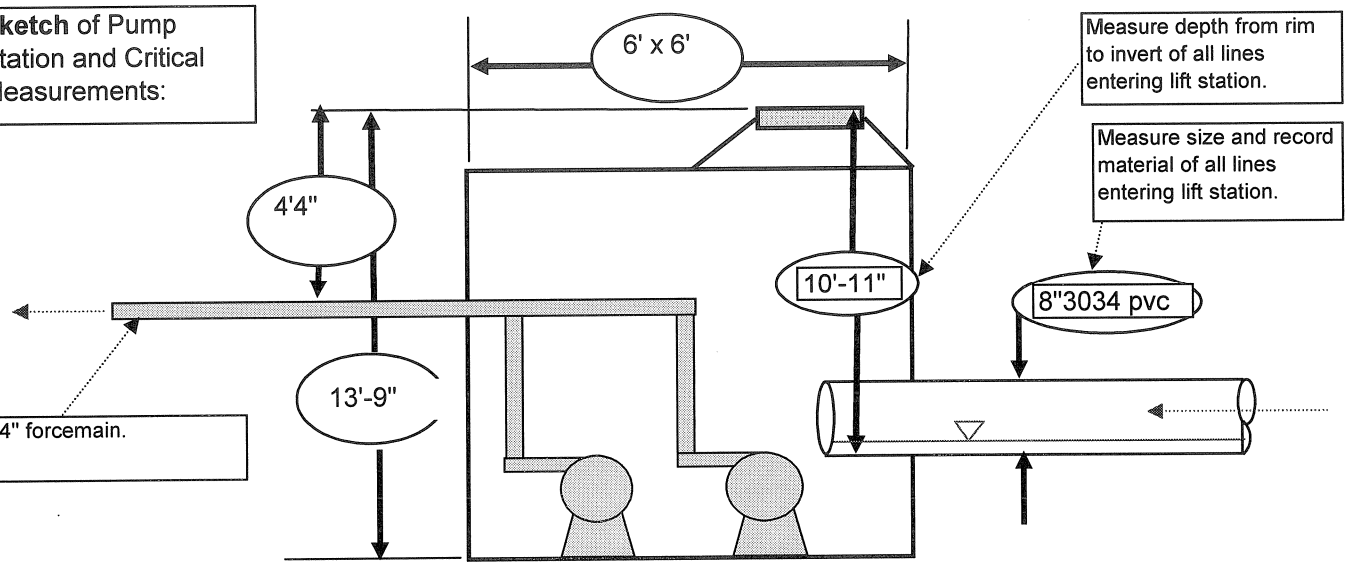


# "BRISTLECONE" LIFT STATION



| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Fishback Airport |
| Location Description: | off 6.N. in by Hangers |
| Number of Pumps: | 2 |
| Pump Horsepower: | 5 |
| Type: | Hydromatic S4PX Sub. Non clog |
| Model / Model #: | |
| Serial #: | |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 4/20/2002 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | Approx. 2050' to Jail ha/F Stations. 4" 160 PVC. 2.8 on, 1.5 off |

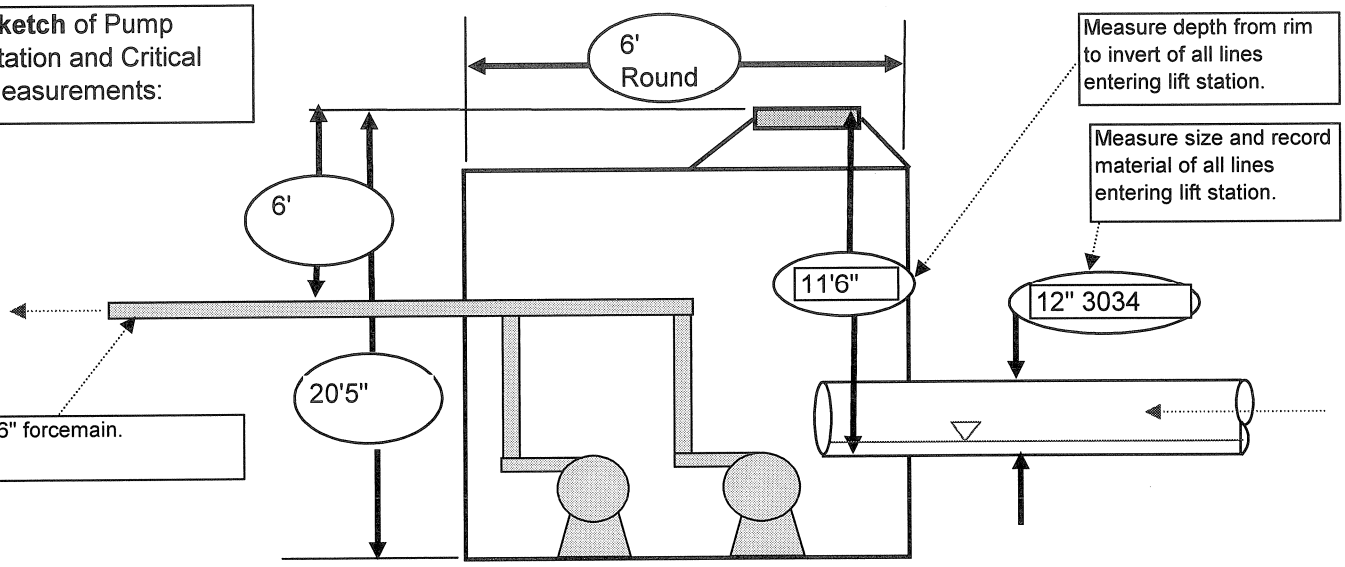
**Sketch** of Pump Station and Critical Measurements:



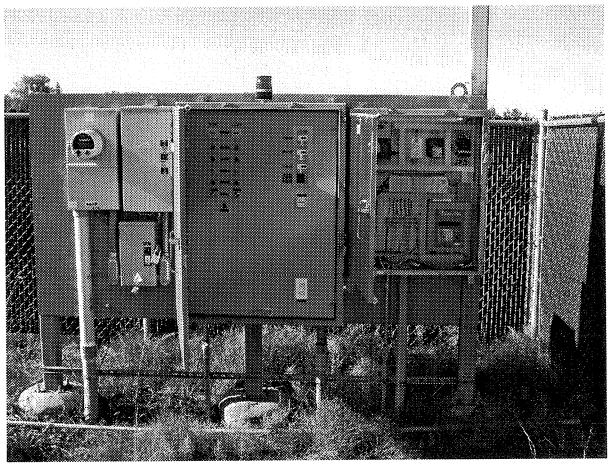
# “FISHBACK” LIFT STATION

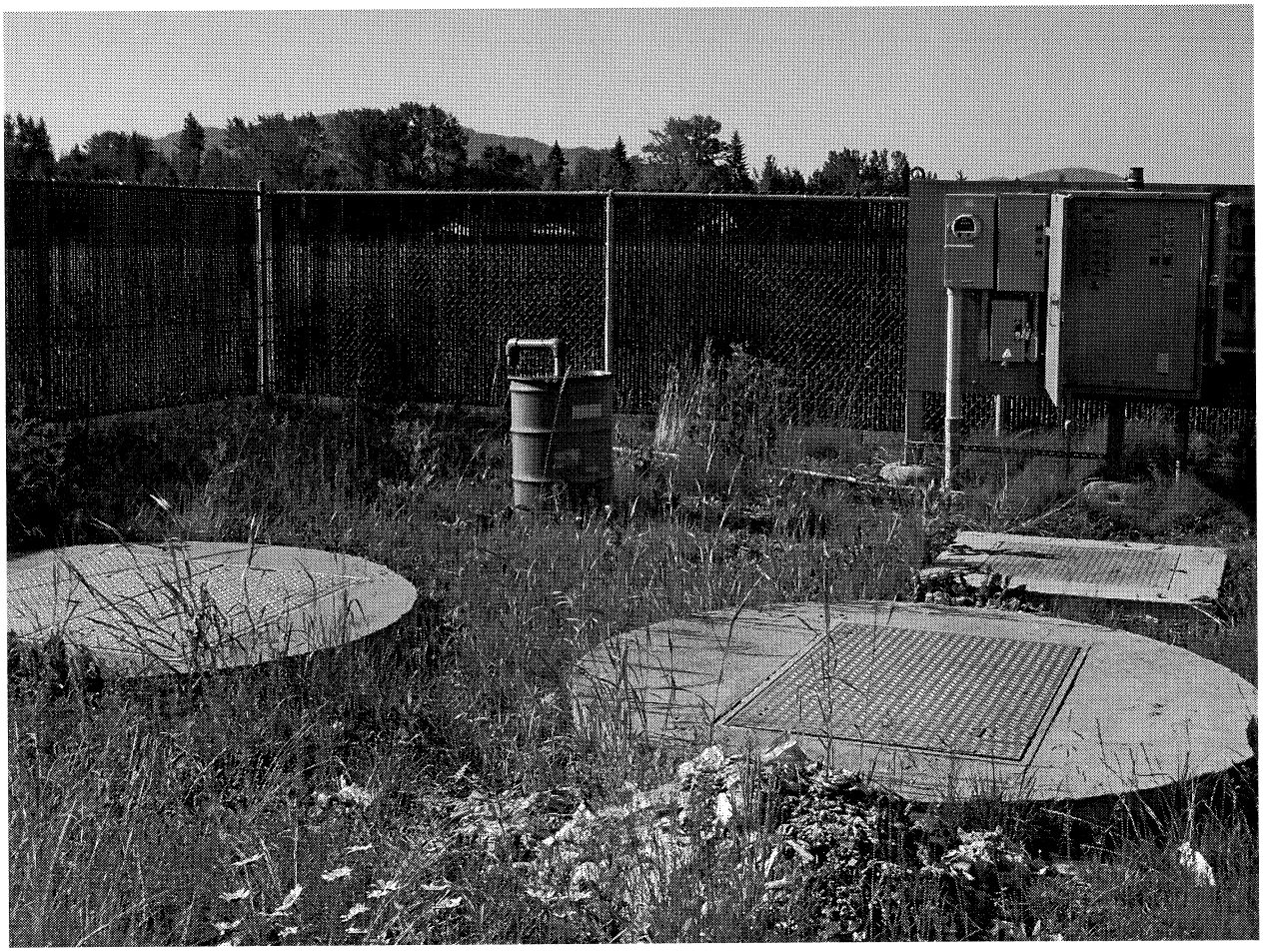
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Jail (N. of Boyer) |
| Location Description: | N. Boyer/Woodland |
| Number of Pumps: | 2 |
| Pump Horsepower: | 2 |
| Type: | Hydromatic Sub |
| Model / Model #: | 54NX200JB |
| Serial #: | 537493 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 6/10/1996 |
| Copy of O&M Manual: | Yes |
| Generator or Manual Transfer Switch: | Yes |
| Comments: | Imp. Diameter = 7.20, 3 Phase 460 Volts RPM1150. pumps on 5'5" off 3'0". 500'0" across Runway. |

**Sketch** of Pump Station and Critical Measurements:



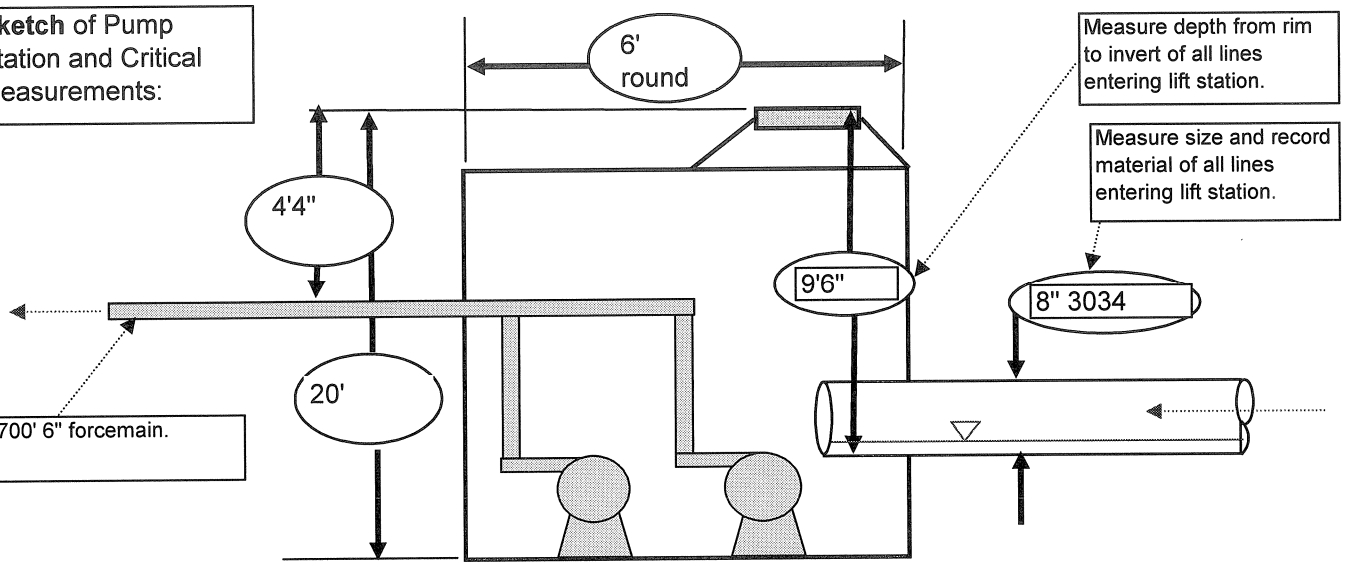
## "JAIL" LIFT STATION



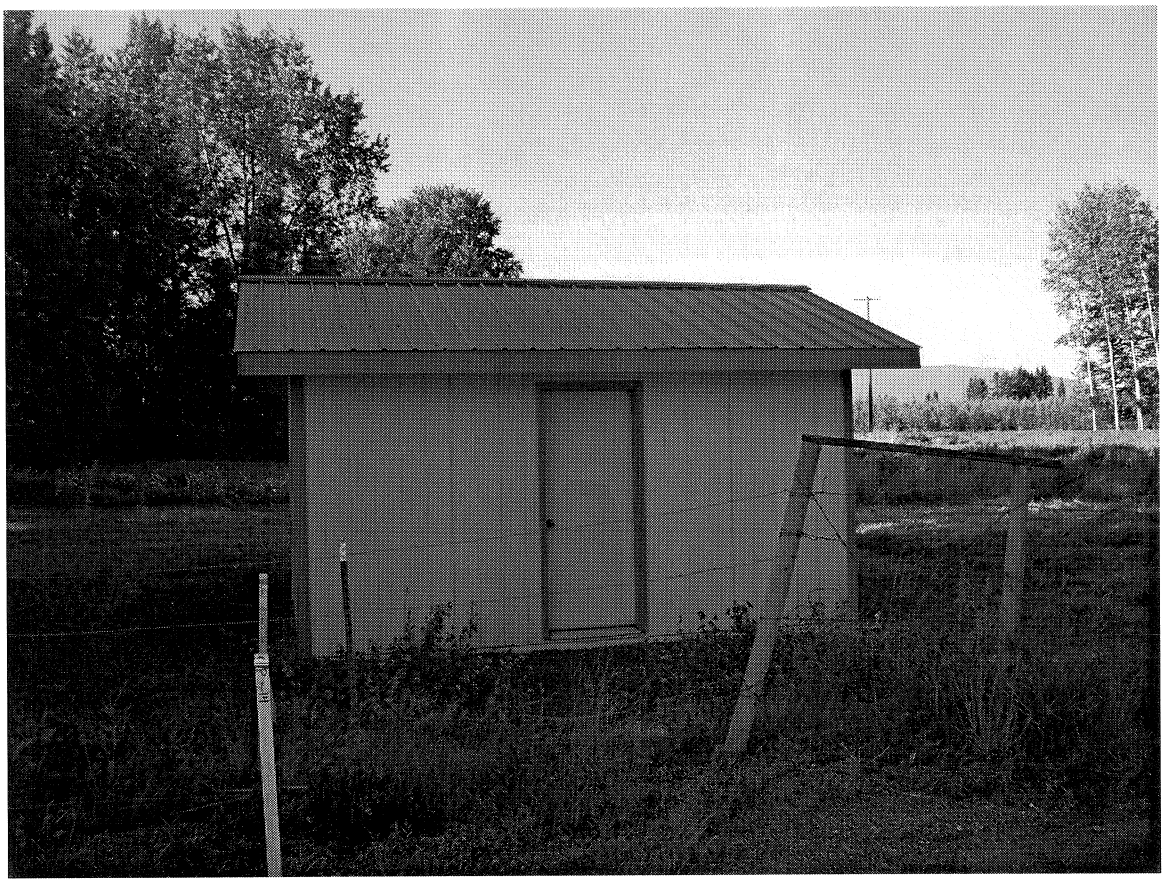


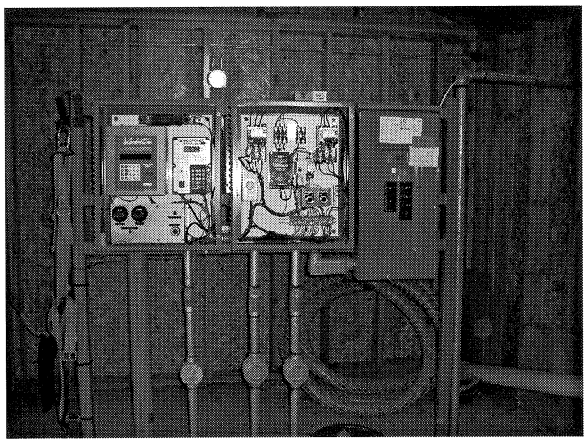
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Sand Creek |
| Location Description: | Mountain View |
| Number of Pumps: | 2 |
| Pump Horsepower: | 3 |
| Type: | Hydromatic S4M Sub non clog. |
| Model / Model #: | |
| Serial #: | |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 1/26/1994 |
| Copy of O&M Manual: | Yes |
| Generator or Manual Transfer Switch: | Yes |
| Comments: | Pump on @ 7' off 4'. 2 min. Muil Ranger Plus. Verbatim Series V.S.S |

**Sketch** of Pump Station and Critical Measurements:



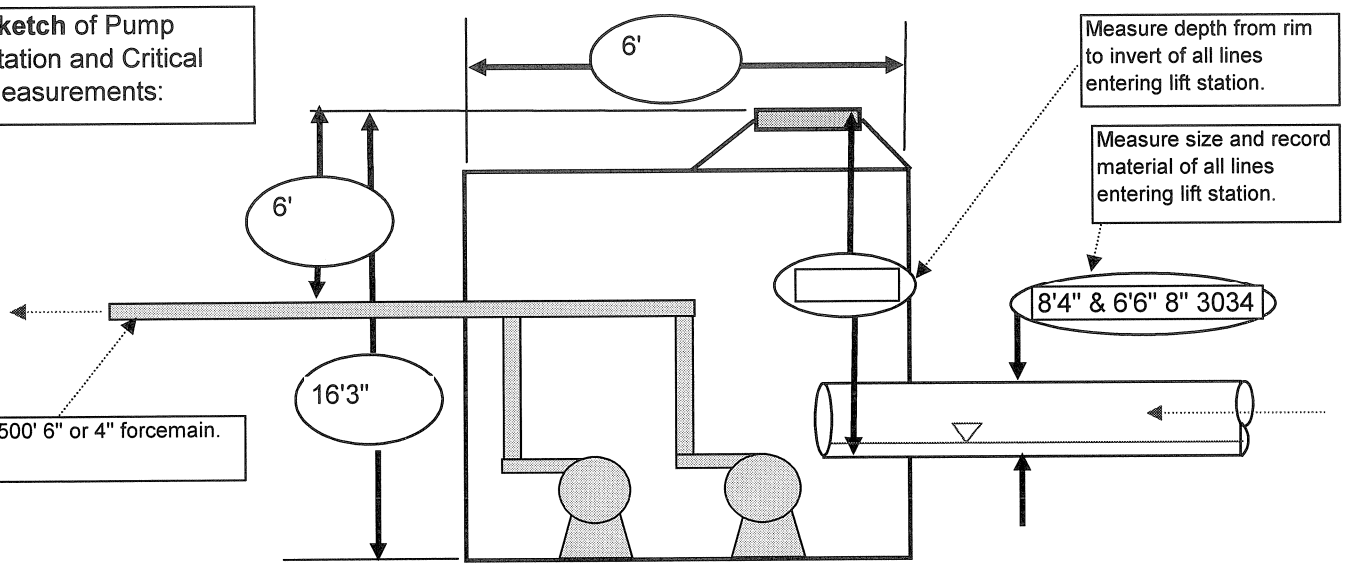
# "SAND CREEK" LIFT STATION



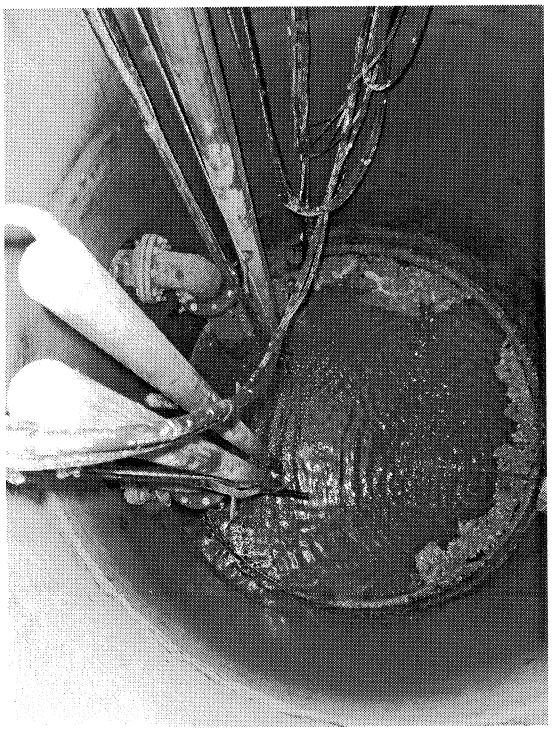


| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Cottonwood (Currently Private LS, will be taken over by city later) |
| Location Description: | Alexander Way |
| Number of Pumps: | 2 |
| Pump Horsepower: | |
| Type: | |
| Model / Model #: | |
| Serial #: | |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 9/22/2003 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | Pumps on @ 5.5 off 4.5 |

**Sketch** of Pump Station and Critical Measurements:

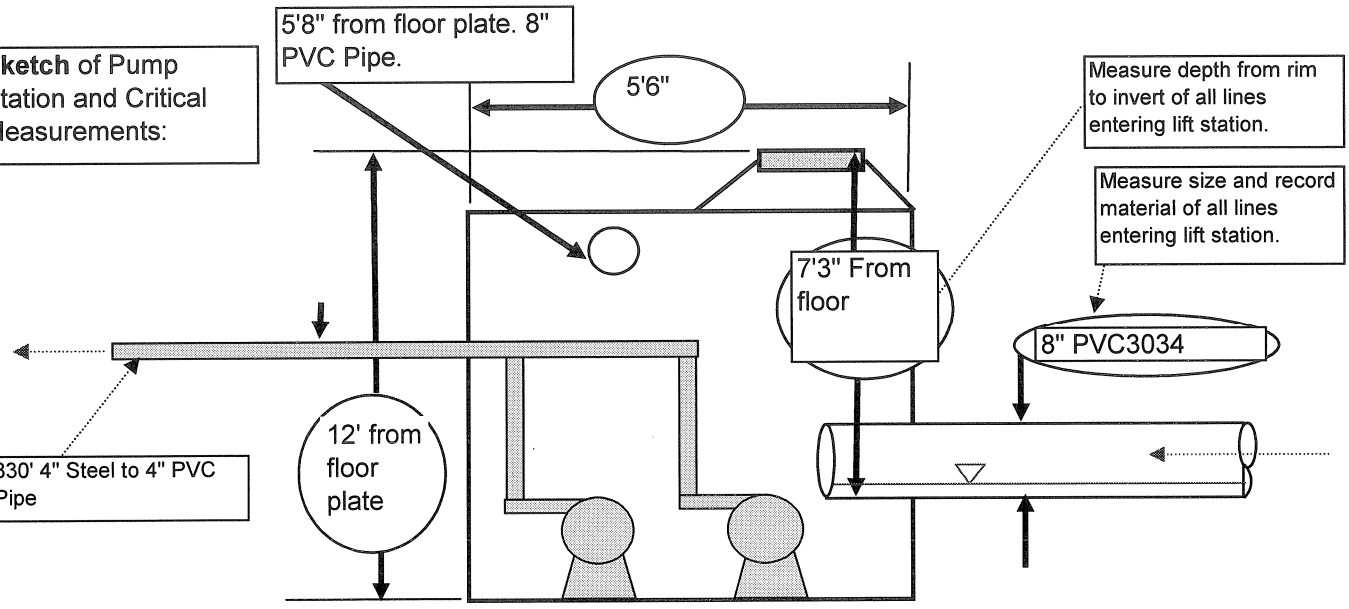


# "COTTONWOOD GLEN" LIFT STATION



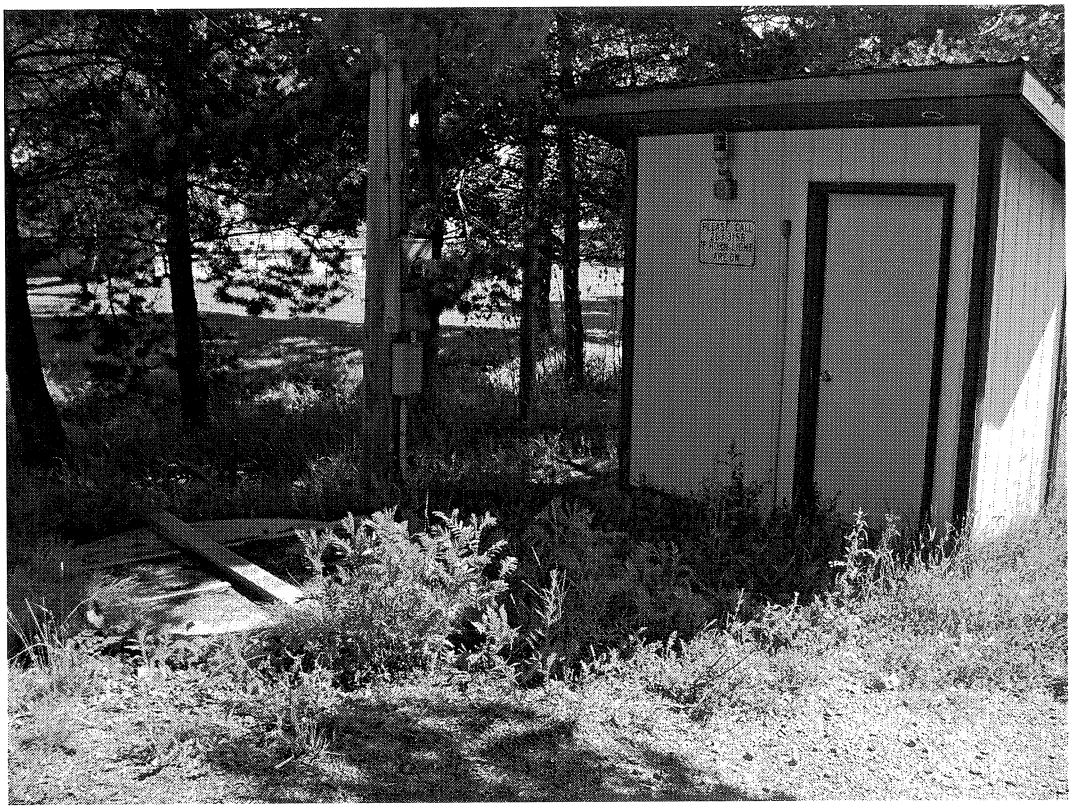
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Noth Boyer Lift Station (Pawn-Shop) |
| Location Description: | boyer btw. Tracks |
| Number of Pumps: | 2 |
| Pump Horsepower: | 3 |
| Type: | 2 Hydromatic Self priming sewers |
| Model / Model #: | 40 MMPC 500-41 |
| Serial #: | 8428 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 5/16/1975 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | Yes |
| Comments: | Wet well 1 piece unit, Fiberglass Inpeller 7", RPM 1155, Amps 10.4/5.2 Pumping time/Pump = 5 min. 45 sec. 2.5' pumping Distance. .05' - 3.0' |

**Sketch** of Pump Station and Critical Measurements:



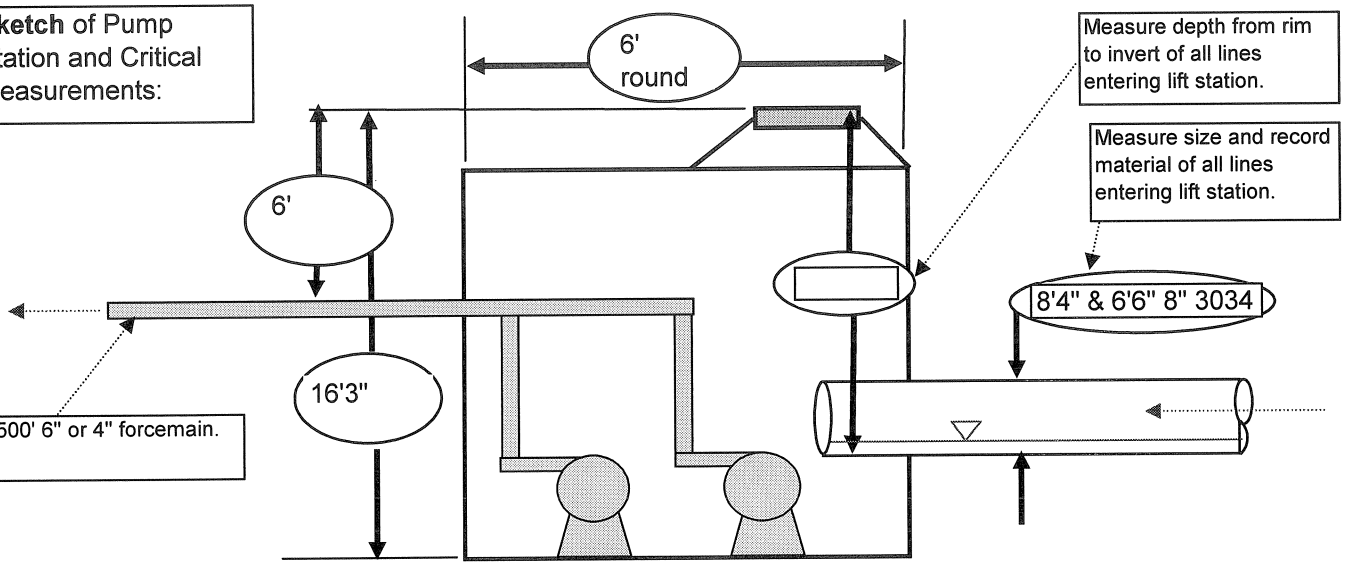

5' from floor plate to ground level.

# "PAWN-SHOP" LIFT STATION



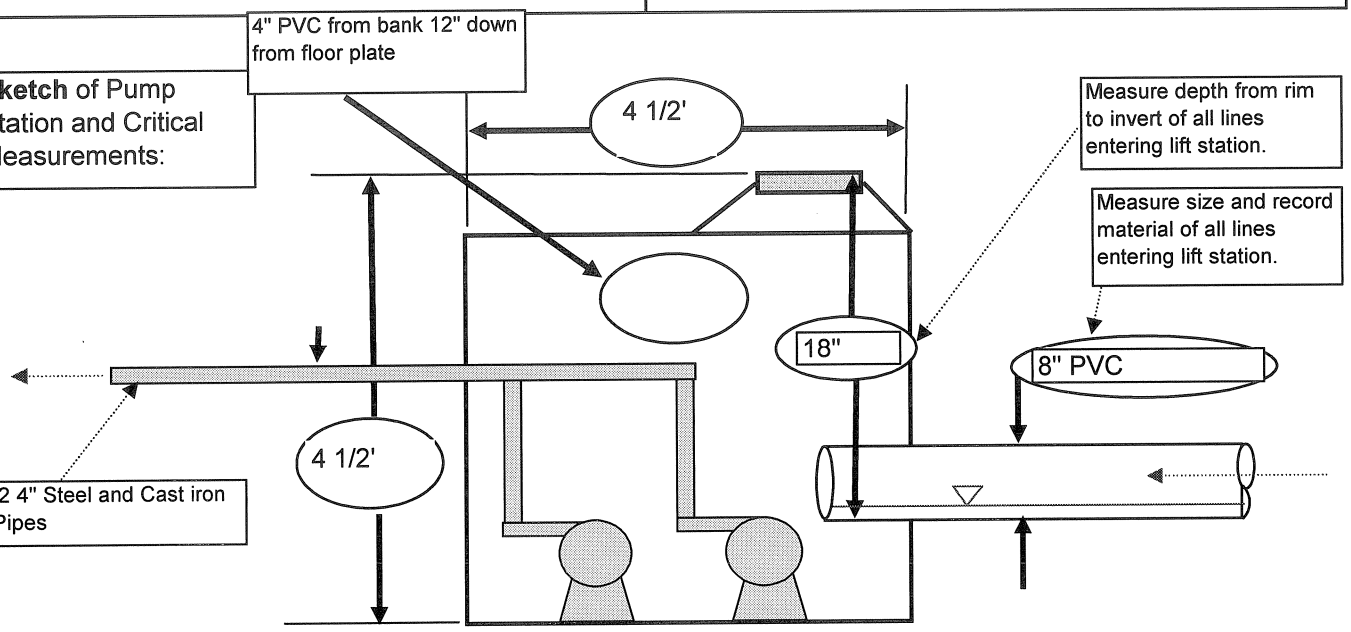
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Lake |
| Location Description: | By Water Treatment |
| Number of Pumps: | 2 |
| Pump Horsepower: | 7 1/2 |
| Type: | Peabody Barnes |
| Model / Model #: | 5EH-752 |
| Serial #: | 51200-679-13 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | 1978 - Building New One Now |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | RPM 1750 Everything going to change. Seasons building new one. |

**Sketch** of Pump Station and Critical Measurements:

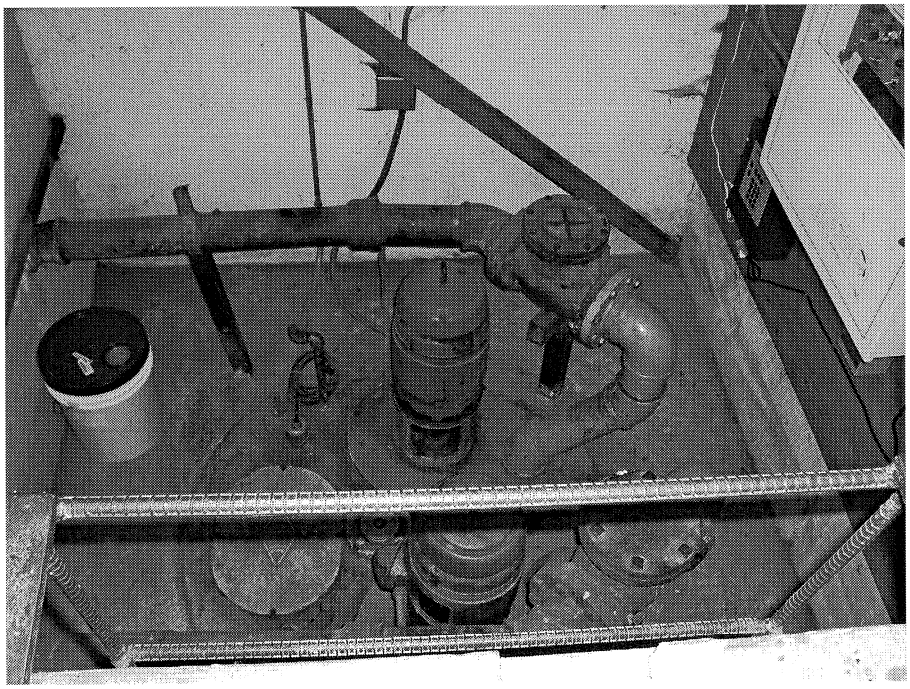


| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Bank Lift Station |
| Location Description: | West of EXXON Station |
| Number of Pumps: | 2 |
| Pump Horsepower: | 1 1/2 |
| Type: | pacific Plumbing Co. |
| Model / Model #: | 4AN-NCD 12315-A |
| Serial #: | 10DY |
| Pump Capacity, gpm (each pump) | 325 |
| Last Upgrade / Construction Date: | Oct. 13 1962 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | Yes |
| Comments: | Uniclosed Electric Motor 1 1/2 H.P.. 900 RPM. 220 Volt/60 cycle. 3 Phase. 4 1/2' from floor plate to bottom 1.5 on 0.75 off, 30 second. |

**Sketch** of Pump Station and Critical Measurements:

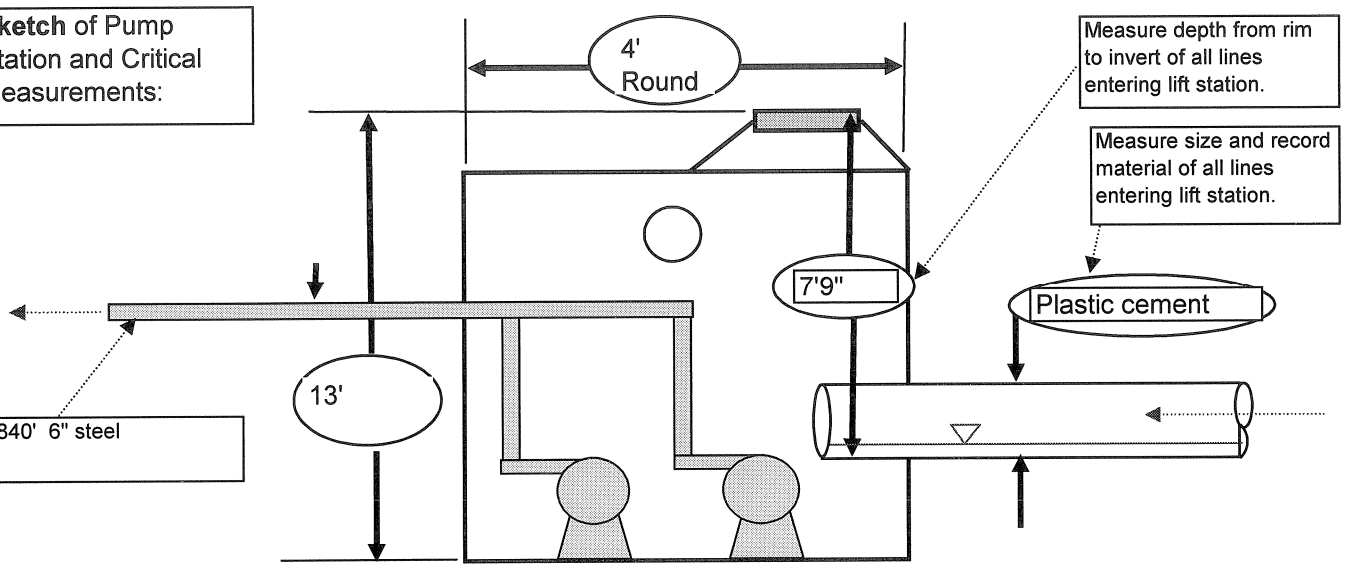


# "BANK" LIFT STATION

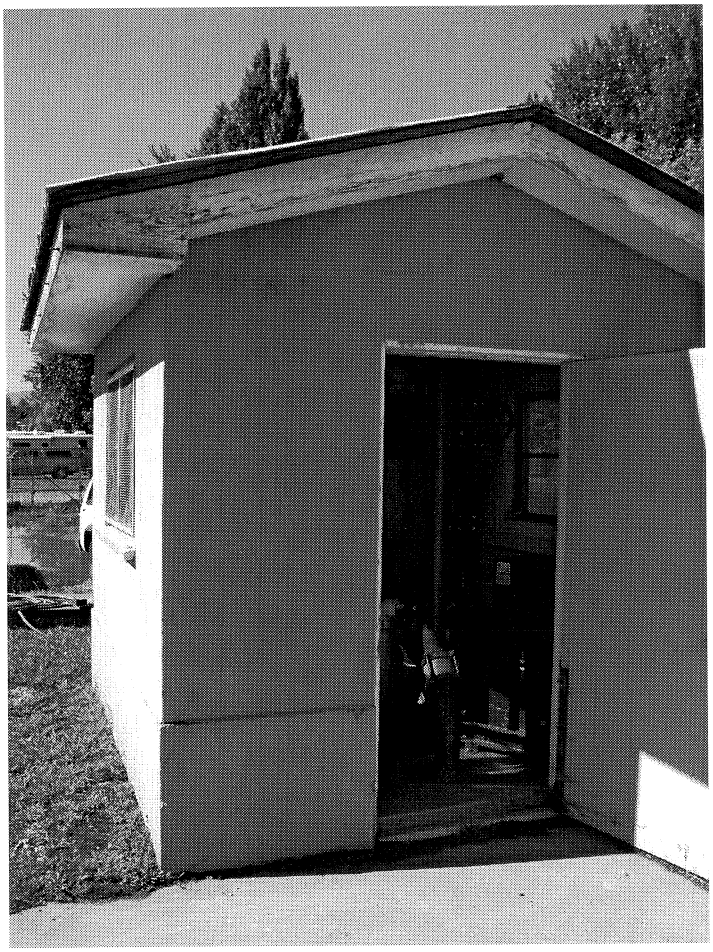


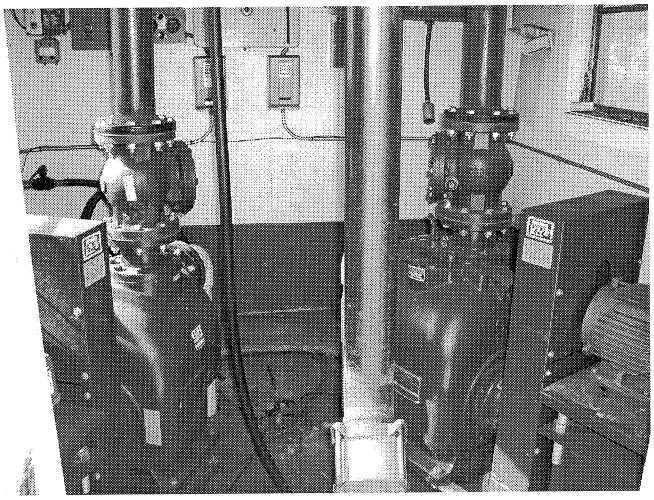
| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Beach Lift Station |
| Location Description: | Beach by Edgewater |
| Number of Pumps: | 2 |
| Pump Horsepower: | 3 |
| Type: | Gorman Rupp |
| Model / Model #: | T4A3-B/F |
| Serial #: | 1225934 |
| Pump Capacity, gpm (each pump) | |
| Last Upgrade / Construction Date: | Nov 9 1949 - Pumps Replaced 7/11/2001 |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | 5' on, 3' off. Lake lift station dumps into same line for now. Pumping time for pumps = 2 minutes 45 seconds. 2' Pumping distance. 8" red tile @ 6' 7" from floor plate. |

**Sketch** of Pump Station and Critical Measurements:



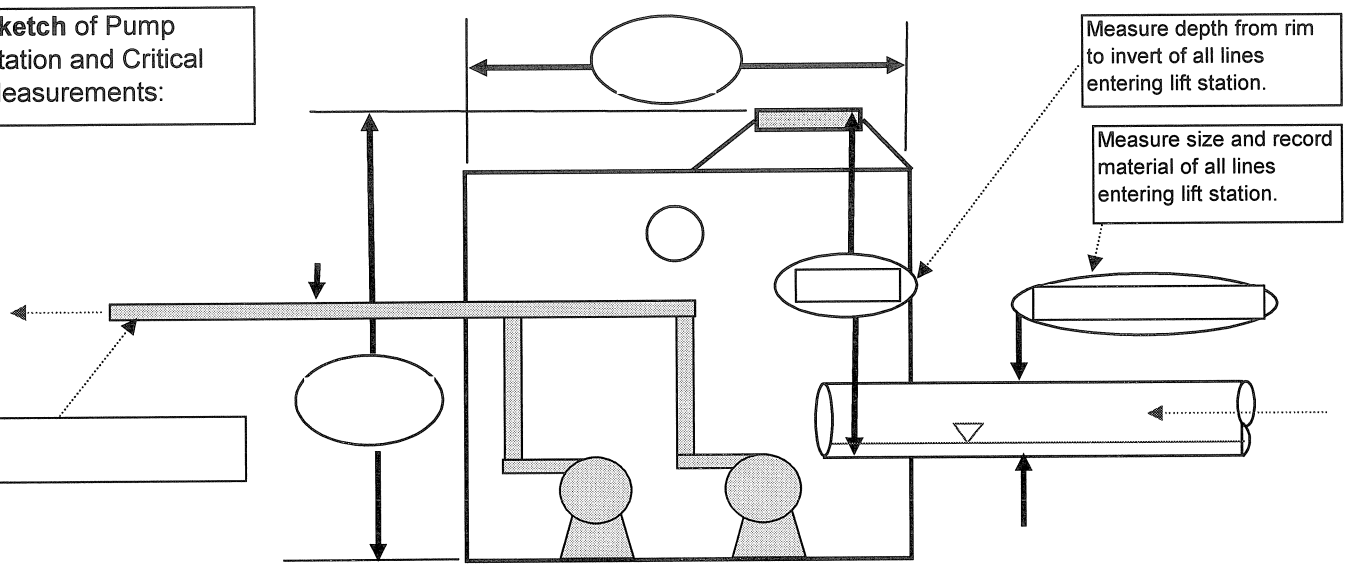
# "BEACH" LIFT STATION





| Lift Station Inventory | |
|---|---|
| | |
| Lift Station Number or Name: | Boyer Lift Station |
| Location Description: | South End of Boyer Ave. Near Memorial Field |
| Number of Pumps: | 3 |
| Pump Horsepower: | 1 @ 7.5 hp, 2 @ 15 hp |
| Type: | Faibanks Morse |
| Model / Model #: | See Attached info |
| Serial #: | See Attached info |
| Pump Capacity, gpm (each pump) | See Attached info |
| Last Upgrade / Construction Date: | See Attached info |
| Copy of O&M Manual: | |
| Generator or Manual Transfer Switch: | |
| Comments: | Has "self-cleaning wet-well" with square channel and dry-pit pumps. Wet well still has to be cleaned daily due to solids drop-out. Concrete is in reasonable condition, metal items are corroding and in need of replacement. |

**Sketch** of Pump Station and Critical Measurements:



# Appendix B

# Flow Monitoring Data Sheets

0

J·U·B
Engineers Surveyors Planners

Site-01
MH 1427

J-U-B ENGINEERS, Inc.
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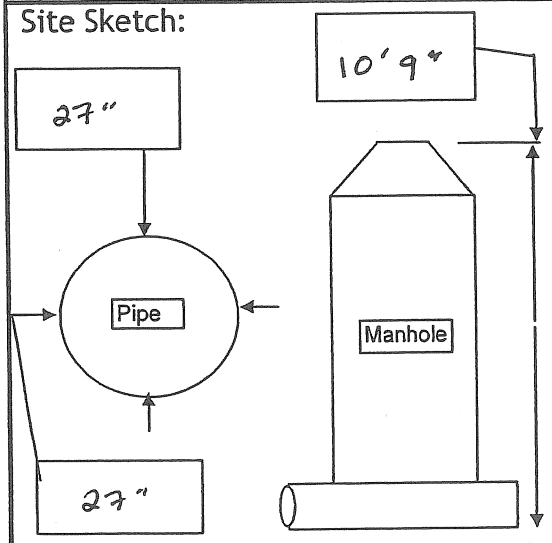
7825 Meadowlark Way, Suite A
Coeur d'Alene , ID 83815
208- 762-8787
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3/11/05 |
| Project Description: | Sandpoint Flow Mon 2005 | Weather: | Sunny 60's |
| | | Temperature: | 60's |
| Transducer Installer: | JRB | Programmer: | JRB / DRBJ |
| Site Location: | Ontario ~~West~~ East of Hwy 2 | Arrival Time: | 10:45 AM |
| Site ID#: | order set 01 ~ 1427 | | |

Site Sketch:




Sampling: YES [ ] NO [X]
Temperature Logging: YES [ ] NO [X]

## Flow Monitor Record

| | | |
|---|---|---|
| Logger / Monitor ID: | ~~KAP~~ ~~ZED~~ CZG | |
| Battery Strength: | 12.5 Volts | % |
| Signal Strength: | NA | % |
| Spectrum Strength: | NA | % |

## Programming

| | | |
|---|---|---|
| Transducer offset: | 0 | in. |
| Pipe Size: | 27" | in. |
| Pipe Type: | Concrete | |
| Depth of Silt: | None | in. |
| [X] Upstream | [ ] Downstream | |

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | 3.482 | 3.5 | | | ALL-IN-ONE PROBE |
| 2 | 3.45 | 3.5 | | | |
| 3 | 3.455 | 3.5 | | | |
| 4 | 3.48 | 3.49 | | | |
| 5 | 3.42 | 3.46 | | | |
| 6 | 3.5 | 3.66 | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [X]

Departure Time: 11:18

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| Site Visit Log: (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-14-05 | 12:20 | 3.89 in | | 3.9 | 12.3 | cell 9 & 10 | Data Download | JRB | ✓ |
| 3-18-05 | 2:53 | | 3.889 | 3.47 | 12.2 | cell 9 & 10 | Data Download | JRB | ✓ |
| 3-21-05 | 10:58 | | 4.749 | 2.89 | 12.0 | cell 9 & 10 | Data download | JRB | ✓ |
| 3-25-05 | 9:07 | | 3.7 | 5.01 | 11.9 | cell 9 & 10 | Data download | JRB | ✓ |
| 4-1-05 | 10:45 | | 4.5 | 5.2 | 11.6 | cell 9 & 10 | Data Download | JRB | ✓ |
| 4-8-05 | 10:00 | | 4.74 | 3.02 | 11.4 | cell 9/10 | data download | JRB | ✓ |
| 4-18 05 | | 3.54<br>3.55<br>~~3.875~~ | 4.401<br>3.414<br>3.419<br>~~3.455~~ | 2.53 | 11.4 | cell 1 & 2 | data download & pull monitor | JRB | ✓ |
| | | ~~3.875~~<br>3.875 | ~~3.9~~<br>3.89 | | | | - visible infiltration @ MH JOINTS ~ to 7' high from invert. | | |

J-U-B Engineers Surveyors Planners

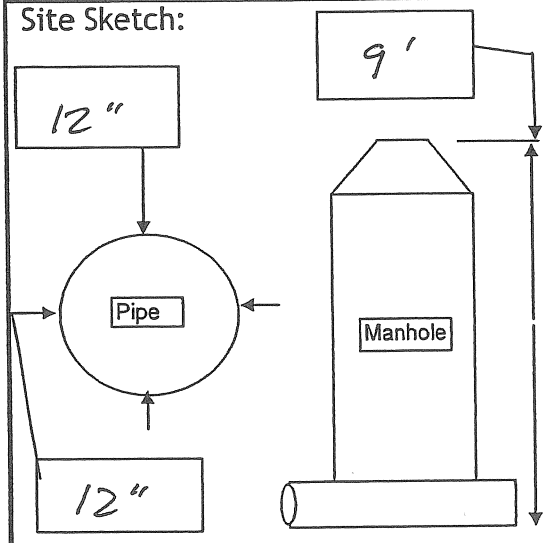
Site-02
M.H. 1812

J-U-B ENGINEERS, Inc.
Engineers • Surveyors • Planners
7825 Meadowlark Way, Suite A
Coeur d'Alene , ID 83815
208- 762-8787
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3-11-05 |
| Project Description: | Sandpoint Flow mon. 2005 | Weather: | Sunny 60's |
| | | Temperature: | 60's |
| Transducer Installer: | JRB | Programmer: | JRB/DRB |
| Site Location: | Olive N. of ontario | Arrival Time: | 11:30 |
| Site ID#: | Engtdll# 2 1812 | | ~~12.5 volts~~ |

Site Sketch:




Sampling: YES [ ] NO [X]
Temperature Logging: YES [ ] NO [X]

## Flow Monitor Record

Logger / Monitor ID: COA
Battery Strength: 12.5 V %
Signal Strength: %
Spectrum Strength: %

## Programming

Transducer offset: in.
Pipe Size: 12" in.
Pipe Type: clay
Depth of Silt: 0 in.
[X] Upstream [ ] Downstream

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | 4 | 4.063 | | | All in one Probe |
| 2 | 4.1 | 4.168 | | | |
| 3 | 4.10 | 4.162 | | | |
| 4 | 4.10 | 4.13 | | | |
| 5 | 4.1 | 4.13 | | | |
| 6 | | | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [X]

Departure Time: 11:55

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| **Site Visit Log:** (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-14-05 | 12:08 | | 3.576 | 2.28 fps | 12.34 | 7 & 8 | DATA Download | JRB | ✓ |
| 3-18-05 | 2:45 | | 3.49 | 2.13 | 12.2 * | 7 & 8 | Data download | JRB | ✓ |
| 3-21-05 | 10:45 | | 3.77 | 1.79 | 12.1 * | 7 & 8 | Data download | JRB | ✓ |
| 3-25-05 | 8:57 | | 3.74 | 2.25 | 12.0 | 7 & 8 | Data Download | JRB | ✓ |
| 4-1-05 | 10:35 | | 5.0 | 2.49 | 11.6 | 7 & 8 | Data downloaded | JRB | ✓ |
| 4-8-05 | 9:52 | | 3.698 | 2.26 | 11.5 | 7/8 | Data Download | JRB | ✓ |
| 4-18-05 | 2:45 | 3.0 3.0 | 2.4 3.99 2.910 | 2.01 | was dead | 5/11 | Data download all 5 & 11 | JRB | ✓ |
| | | | | | | | | | |

J-U-B
Engineers Surveyors Planners

Site 03
M.H. 2015

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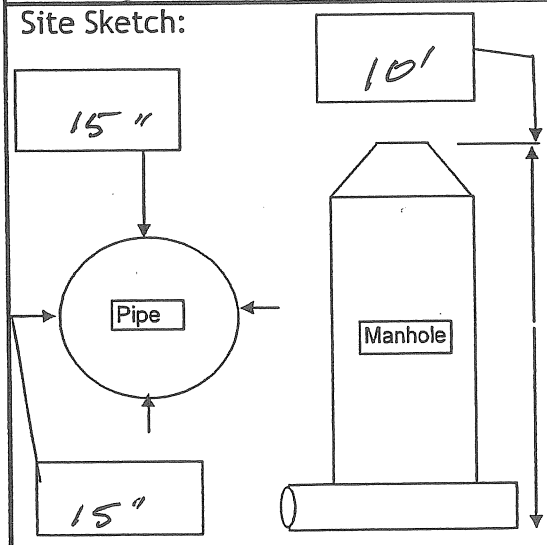
7825 Meadowlark Way, Suite A
Coeur d'Alene , ID 83815
208- 762-8787
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3-11-05 |
| Project Description: | Sandpoint Flow Mon. 2005 | Weather: | Sunny |
| | | Temperature: | 60's |
| Transducer Installer: | RB | Programmer: | JRB/DRBT |
| Site Location: | OLIVE & Erie | Arrival Time: | 12:00 |
| Site ID#: | Install #3 2015 | | |

Site Sketch:




Sampling: YES [ ] NO [X]
Temperature Logging: YES [ ] NO [X]

## Flow Monitor Record

| | | |
|---|---|---|
| Logger / Monitor ID: | CFW | |
| Battery Strength: | 12.6 Volts | % |
| Signal Strength: | NA | % |
| Spectrum Strength: | NA | % |

## Programming

| | | |
|---|---|---|
| Transducer offset: | 0 | in. |
| Pipe Size: | | in. |
| Pipe Type: | Concrete | |
| Depth of Silt: | NA | in. |

[X] Upstream [ ] Downstream

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | 2.88 | 3 | | | All-in-one probe |
| 2 | 2.879 | 3- | | | |
| 3 | 2.89 | 3 | | | |
| 4 | 2.9 | 3- | | | |
| 5 | 2.9 | 3- | | | |
| 6 | 2.88 | 3- | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [X]

Departure Time: 12:33

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| Site Visit Log: (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-14-05 | 11:47 Am | | 2.555 | .61 fps | 12.3 | cell 5 & 6 | Data download | JRB | ✓ |
| 3-18-05 | 2:30 | | 3.313 | .01 | 12.2 | cell 5 & 6 | Data download | JRB | ✓ |
| 3-21-05 | | 4.5 4.5 4.5 4.5 | 4.49 4.5 4.49 | 1.1 fps | 12.0 V | cell 1 & 2 | Data download & cleaning & Reset LEVEL | JRB | ✓ |
| 3-25-05 | 8:45 | | 3.603 | .9 | 11.9 Volts | cell 5 & 11 | data download change BATTERY 13.1 Volts | JRB | ✓ |
| 4-1-05 | 10:25 | | 6.871 | 1.95 | 12.2 | cell 5 & 11 | dadA download | JRB | ✓ |
| 4-8-05 | 9:44 | | 6.16 | 1.78 | 11.8 | cell 5 & 11 | datadownload | JRB | ✓ |
| 4-18-05 | 7:30 | 5.0 5.5 5.5 | 5.457 5.40 5.46 | 1.55 | 11.2 | cell 3 & 4 | ✓ | RMR | ✓ OFF |
| | | | | | | | -manhole has dirt floor, covered pipe with top knocked-in. | | |

Before adjust just below 4"

Site 04
MH 4

Rod w/ city
263-3428

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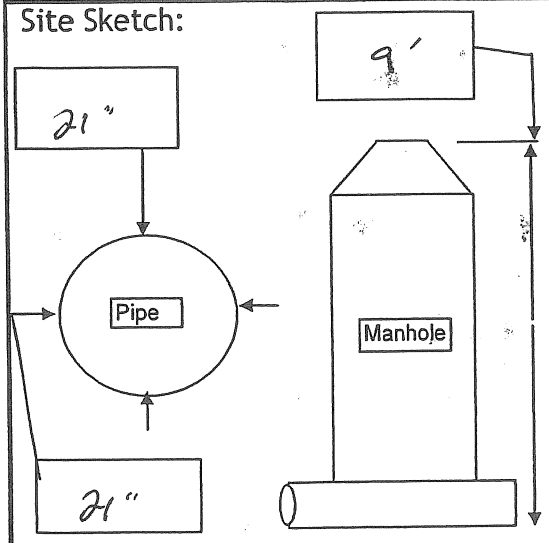
Coeur d'Alene , ID 83815
208- 762-8787
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3/11/05 |
| Project Description: | Sandpoint Flow Mon. 2005 | Weather: | Sunny |
| | | Temperature: | 60's |
| Transducer Installer: | | Programmer: | JRB/DRBJ |
| Site Location: | Boyer East of Memorial Field | Arrival Time: | 1:30 Pm |
| Site ID#: | 4 | | |

Site Sketch:




Sampling: YES [ ] NO [X]
Temperature Logging: YES [ ] NO [X]

## Flow Monitor Record

| | | |
|---|---|---|
| Logger / Monitor ID: | CFS | |
| Battery Strength: | 12.7 v | % |
| Signal Strength: | NA | % |
| Spectrum Strength: | NA | % |

## Programming

| | | |
|---|---|---|
| Transducer offset: | 0 | in. |
| Pipe Size: | 21" | in. |
| Pipe Type: | concrete | |
| Depth of Silt: | 0" | in. |

[X] Upstream [ ] Downstream

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | 7.5 | 7.5 | | | M.H. Has A lot of Roots @ Base |
| 2 | 7.43 | 7.5 | | | & Into pipe, was Able to |
| 3 | 7.439 | 7.5 | | | clear pipe to install. |
| 4 | 7.49 | 7.5 | | | |
| 5 | 7.48 | 7.5 | | | |
| 6 | 7.42 | 7.5 | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [X]

Departure Time: 2:10

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| Site Visit Log: (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-14-05 | 11:35 | | 7.248 | 2.08 | 12.1 V | cell 3 & 4 | DATA Download | JRB | ✓ |
| 3-18-05 | 1:50 | | 8.182 in | .66 fps | 11.5 | cell 3 & 4 | DATA download & Data record interval to 5 min. | JRB | ✓ |
| 3-21-05 | | 10.5 10.5 10.5 10.5 | 10.403 10.49 10.52 10.55 10.5 | 2.51 fps | 11.3 | cell 3 & 4 | DATA download & Level Adjust & Clean change Battery | JRB | ✓ |
| 3-25-05 | 8:35 | ~~[illegible]~~ | 9.254 | 2.16 | 12.2 | cell 3 & 4 | Download Data | JRB | ✓ |
| 4-1-05 | 9:10 | | 28.27" | 4.5 | low Bat | cell 3 & 4 | Download DATA Change Battery → 12.7 V | JRB | ✓ |
| | | | | | | | Had M.H. Flushed B/c it was backed up | | |
| 4-8-05 | 9:28 | | 13.110 | 3.03 | 12.2 | cell 3 & 4 | Data download | JRB | ✓ |
| 4/8-05 | 3:10 | 8.25 8.25 8.25 | 8.274 8.278 8.24 | 1.95 | 11.8 | cell 7 & 8 | Data Downloaded | RME | ✓ |

as reading low.

pring Ahead time change

J-U-B
Engineers Surveyors Planners

Site 05
MH. 0624

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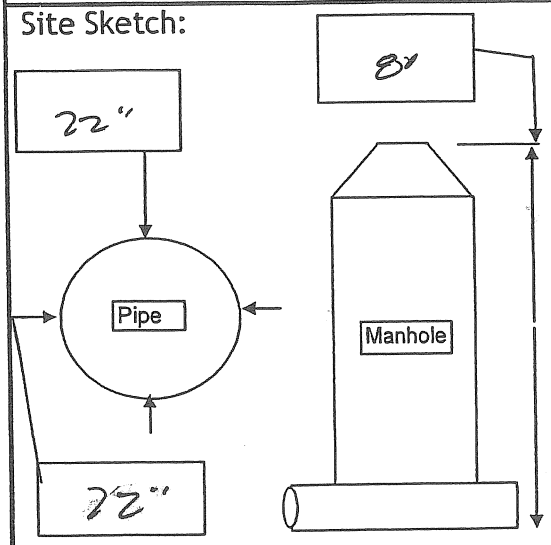
7825 Meadowlark Way, Suite A
Coeur d'Alene , ID 83815
208- 762-8787
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3/11/05 |
| Project Description: | SANDPOINT FLOW MON. 2005 | Weather: | Sunny |
| | | Temperature: | 60's |
| Transducer Installer: | JRB/RMC | Programmer: | JRB/RMC |
| Site Location: | Waterfront & Euclid | Arrival Time: | 2:15 |
| Site ID#: | 0624 | | |

Site Sketch:




Sampling: YES [ ] NO [X]
Temperature Logging: YES [ ] NO [X]

## Flow Monitor Record

| | | |
|---|---|---|
| Logger / Monitor ID: | CFT | |
| Battery Strength: | 12.7 Volts | % |
| Signal Strength: | NA | % |
| Spectrum Strength: | NA | % |

## Programming

| | | |
|---|---|---|
| Transducer offset: | NA | in. |
| Pipe Size: | 22" | in. |
| Pipe Type: | concrete | |
| Depth of Silt: | 0" | in. |

[X] Upstream [ ] Downstream

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | 6.25 | 6.36 | | | |
| 2 | 6.25 | 6.32 | | | |
| 3 | 6.25 | 6.27 | | | |
| 4 | 6.25 | 6.26 | | | |
| 5 | 6.25 | 6.24 | | | |
| 6 | | | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [X]

Departure Time: 2:55 PM

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| Site Visit Log: (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-14 | 11:20 | | 5.822 in | 1.51 fps | 12.3 ✓ | ✓ 1 & 2 | | JRB | ✓ |
| 3-18 | 1:26 | | 5.954 | | 10.4✓ | 1 & 2 | CHANGE Battery 12.7✓ | JRB | ✓ |
| 3-21-05 | 10:36 | | 6.177 | 1.62 | 12.6 ✓ | 5 & 11 | Download data | JRB | ✓ |
| 3-25-05 | 8:25 | | 6.344 | 1.44 | 12.1 ✓ | cell #1 & 2 | Download Data | JRB | ✓ |
| 4-1-05 | 8:40 | | 7.68 | 1.99 | 11.9 ✓ | cell 1 & 2 | Data download | JRB | ✓ |
| 4-8-05 | 9:15 | | 6.91 | 1.61 | 11.8 ✓ | cell 1 & 2 | Data download | JRB | ✓ |
| 4-18-05 | 3:45 | 5 1/4 | 6.111 6.07 6.00 | 1.50 | Dead | cell 9 & 10 | Data downloaded. | RME | ✓ pulled |
| | | | | | | | | | |

J·U·B

Engineers Surveyors Planners

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Coeur d'Alene , ID 83815
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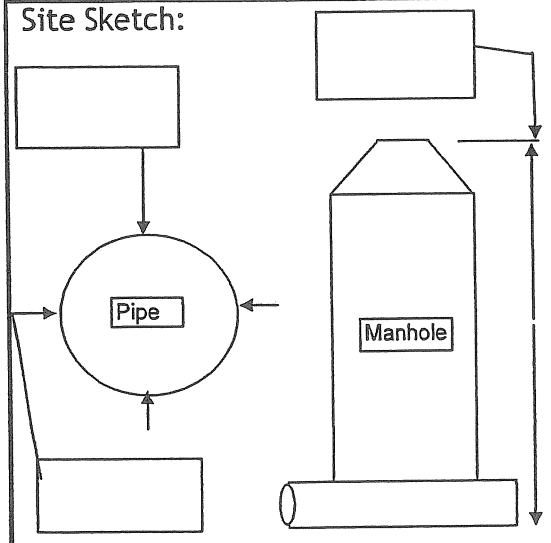
Fax: 208-762-9797

# Flow Monitoring Site Checklist

| | | | |
|---|---|---|---|
| Project # | | Date Installed: | 3-14-05 |
| Project Description: | Sandpoint Flow Mon. 2005 | Weather: | Sunny |
| | | Temperature: | 60's |
| Transducer Installer: | JRB (Raingauge) | Programmer: | JRB |
| Site Location: | J-U-B Sandpoint office | Arrival Time: | 1:25 |
| Site ID#: | Sandpoint Rain-gage | | |

Site Sketch:




Sampling: YES [ ] NO [x]

Temperature Logging: YES [ ] NO [x]

## Flow Monitor Record

Logger / Monitor ID: Isco Rain-gauge

Battery Strength: 11.8 Volts. %

Signal Strength: NA %

Spectrum Strength: Not. %

## Programming

Transducer offset: in.

Pipe Size: in.

Pipe Type:

Depth of Silt: in.

[ ] Upstream [ ] Downstream

## Calibration:

| | Manual Meas. | Manual Level | Monitor Level | Monitor Vel. | Comments |
|---|---|---|---|---|---|
| 1 | | | | | Rain Gauge |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

Monitor Display Reads "Running"? --->>> [ ]

Departure Time: _____

Subsequent Site Visit Log is on back of this sheet ---------->>>>>> OVER--->>>

S:\RMC\Flow Monitor Site Checklist.xls

| **Site Visit Log:** (Check lev. Vel. And flow graphs, band, I-bolt, harness bolts and battery) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Manual Level | Monitor Level | Monitor Vel. | Battery Voltage | Data Downloaded/ Check? | Comments | Initials | Monitor Running? |
| | | | | | | | | | |
| 3-18-05 | 1:10 | | | | | | Download Data | JRB | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

TECHNICAL MEMORANDUM NO. 3

## City of Sandpoint Wastewater Facility Plan

# Collection System Model Development and Evaluation

March 2007

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Appendix A – Land Use Characteristics

# 1 Collection System Model Development and Calibration

## 1.1 Introduction

An important part of the City's master planning effort was to gain an understanding of its collection system. A hydraulic model of the sewer system was developed to evaluate the capacity of the existing sewer collection system and establish a tool for planning future expansions. Hydra 6.3 sewer modeling software (developed by Pizer, Inc.) was used to create the model.

It is important to understand that there are many acceptable ways to develop a sewer model. A computer model of a sewer system is based on assumptions that characterize the area and system under study. The assumptions used in a model are typically based on flow monitoring, learned characteristics of the system, and a general knowledge of sewer flow characteristics gained through past experience with monitoring flows and modeling other sewer systems. Consequently, development of this model was based on discussions with City staff as well as J-U-B ENGINEERS modeling philosophy and past experience.

## 1.2 Base Map

Existing City maps and record drawings were used to develop a reference base map showing streets, property boundaries, and water bodies. This base map was used as the basis of the model for establishing sewer alignments, land use areas, and drainage basin service areas.

## 1.3 Sanitary Sewer Map and Database

The gravity sewer collection and pumping systems were inventoried using maps, construction drawings, field reconnaissance, and discussions with City staff. The data gathered included pipe size and material, length, diameter, invert and rim elevations, and pipe characteristics. A GPS survey was used to gather rim and invert elevation data for approximately 70 manholes. Not all manhole rim and invert elevations were available. In those cases, manhole inverts were estimated using minimum pipe slopes from known elevations.

## 1.4 Model Development

The City's 2005 Hydra model was developed with the following four layers:

- **System Layer**: This layer contains a graphical and informational representation of the sewer system, as well as a database that holds information about the sewer system (i.e., length of line, diameter, infiltration, inverts, etc.).
- **Service Area Layer**: Flow generated through the Land Use Layer is routed into the system through the Service Area Layer. The Service Area Layer designates which point in the system the flow from an area is injected.
- **Land Use Layer**: This layer generates sewer flows by combining flow parameters such as population, contribution per capita, diurnal curves, and commercial flow.
- **Drainage Basin Layer**: This layer is used for hydrologic stormwater modeling or modeling inflow. Although this layer was not used in the Sandpoint model, inflow was still modeled though the defects database of the System Layer.

### 1.4.1 System Layer

The system layer houses physically measurable information about the system, but it also holds information that requires assumptions as listed below:

a. Parameter: Manning's "n"

Description: The roughness factor used in the Manning's formula Q = (1.49/n)AR2/3So1/2. The Manning's formula relates flow in a pipe with the depth of flow, diameter of the pipe, and the slope of the pipe. Typical "n" values range from 0.009 for very smooth glass or plastic to greater than 0.016 for unfinished concrete.

Discussion: A Manning's "n" of 0.013 is the standard roughness value for sewers. A slime layer develops on any sewer material in contact with sewage and provides a consistent roughness, regardless of material.

Model Assumption: Use a Manning's "n" of 0.013 regardless of material and age.

b. Parameter: Design Pipe Sizing Methodology

Description: Hydra software has the capability to size future pipes based on several parameters, including maximum depth of flow/diameter (d/D) of pipe ratio. The d/D is an indicator of how much of the pipe capacity is being used. When the flow in a pipe reaches the point where the d/D ratio is greater than the maximum d/D ratio, the pipe diameter will increase to the next size.

Discussion: In previous models we have used a graduated scale for maximum d/D dependent on the size of the pipe. The scale originated with the ASCE manual on design and construction of sanitary sewers (ASCE, 1982) which recommended master planning sewer systems at a d/D of less than 0.5 for sewers less than 18 inches in diameter and 0.75 for larger sewers. This allows for a larger safety factor for smaller sewers where variations in land use and extensions of the service area can have big impacts on the available capacity of the sewer. The larger sewer lines require a smaller safety factor because variations in land use tend to balance out over the larger area served by the larger sewer.

Model Assumption: Use a graduated scale for the maximum d/D as listed in Table 1-1.

TABLE 1-1
Depth Over Diameter Ratios for Future Design Pipes
*March 2007*

| Size | d/D | Resulting Safety Factor |
|---|---|---|
| 8" | 0.50 | 2.46 |
| 10" | 0.55 | 2.10 |
| 12" | 0.60 | 1.83 |
| 15" | 0.65 | 1.53 |
| 18" | 0.75 | 1.27 |
| >18" | 0.80 | 1.18 |

c. Parameter: Design Pipe Slope Determination

Description: Hydra has the capability to set the slopes of future pipes based on several parameters, including minimum velocity.

Discussion: Most sewer designs in the region use minimum pipe slopes based on The "Ten State Standards" (Great Lakes, 2004) minimum slopes rather than velocity. The use of a minimum velocity may result in master plan slopes that differ from the slopes used in final design and construction of the master plan line.

Model Assumption: Use "Ten State Standards" minimum slopes rather than velocity to set the minimum slopes of design pipes.

d. Parameter: Design Pipe Sewer Match Point

Description: When sewer lines of different sizes meet, Hydra can match inverts, crowns, or anywhere in-between.

Discussion: Convention and some sewer standards require the design to match the crowns or the design depths of the sewers to prevent surcharging the smaller line.

Model Assumption: Match crown for simplicity during design and construction and to reduce the potential of surcharging laterals.

e. Parameter: Allowable Decreases

Description: Hydra allows the user to select the number of pipe size decreases that will be allowed in a model simulation. This allows for smaller pipes to be constructed downstream of larger pipes where additional capacity is gained in the smaller lines due to increased pipe slope.

Discussion: Decreases are not recommended in smaller lines (less than 24 inches) due to the tendency of obstructions to lodge at locations where trunk lines decrease in size. Decreases may be necessary when tying a master planned line into an existing trunk line, but the Allowable Decreases command does not affect those situations.

Model Assumption: Allowable Decreases = 0.

f. Parameter: Design Pipe Distance between Manholes

Description: Distance between manholes is determined by the modeler for each individual case.

Discussion: The distances between manholes may vary but, according to the "Ten State Standards," should be limited to 400 feet for lines less than 18 inches in diameter and 500 feet for lines 18 inches and larger.

Model Assumption: Typically, use 350 feet to allow for manholes at intersections and on curves.

g. Parameter: Design Pipe Depths

Description: Hydra allows minimum depths to be set, but maximum depths must be checked by the modeler.

Discussion: While the minimum depth may be set within Hydra, care must be taken to check that a trunk line has sufficient depth to serve to the boundary of its service area. This can be accomplished by using "check lines" that are added to the model. "Check lines" are 8-inch model lines extended to locations within a service area that may be difficult to reach. "Check lines" force the trunk line down, if necessary, to serve a service area.

Model Assumption: Set the minimum depth at 6 feet and use check lines on service areas that may require additional depth. Check results for excessive depth (greater than 25 to 30 feet).

h. Parameter: MH Drop

Description: Invert drop through manholes of master planned lines.

Discussion: The invert drop through manholes allows for head loss in manholes. Large-diameter lines are not as likely to have significant head loss through the manholes, thus the manhole drop can be reduced for large-diameter lines. Additionally, to account for variability in alignment and topography, additional drop is added to the manholes. For design pipes, the manhole drop has been added and includes 0.10 feet of standard drop plus minimum slope times 20 percent of the length of the upstream line. In some areas, adding an allowance for variability in topography to the design pipes in order to serve a specific area by gravity may not be possible.

Model Assumption: Varies from 0.17 to 0.38 feet. Master planned lines are generally added in 350-foot lengths. Based on these 350-foot pipes, the associated manhole design drop includes a 20 percent allowance for variability in alignment, as shown in Table 1-2.

TABLE 1-2
Design Invert Drop through Manholes (to allow for approximately 20 percent increase in length due to meander)
*March 2007*

| **Pipe Size (upstream of manhole)** | **Manhole Design Drop (feet) assuming 20 percent allowance for meander for 350-foot pipes** |
|---|---|
| 8" | 0.38 |
| 10" | 0.30 |
| 12" | 0.25 |
| 15" | 0.20 |
| 18" | 0.18 |
| 21" | 0.17 |
| 24" | 0.17 |
| 30" | 0.17 |
| 36" | 0.17 |

i. Parameter: MH Type

Description: Hydra allows for three types of manholes, depending on the shelf configuration:

1. Flat bottom, no bench

2. Channeling to one-half the depth of incoming and outlet pipes

3. Channeling to the full depth of the incoming and outlet pipes (This is common for municipalities and is recommended for new construction. This type of channeling decreases the head loss through manholes.)

Discussion: The Type 3 manhole with channeling to the full depth of the pipes is the standard configuration for the Idaho Standards for Public Works Construction (ISPWC).

Model Assumption: Type 3.

j. Parameter: Constant Speed Pump Cycle Volume

Description: The cycle volume of a pump station is the volume of the wet well between the pump off and pump on settings.

Discussion: Hydra performs its calculations in discrete time increments from 6 to 60 minutes. A lift station with a cycle time less than the analysis time increment will result in a peak flow that has been reduced.

Model Assumption: Increase lift station cycle volumes in the model to allow full cycles of the lift stations in Hydra during an analysis increment.

k. Parameter: Future Constant Speed Pump Station Capacity

Description: The capacity of each lift station in the model is set individually.

Discussion: Design of lift stations tend to be based on assumptions that are more conservative and yield peak flows higher than the Hydra model. A safety factor for the lift station is desirable to reduce the chance of overloading.

Model Assumption: Set the lift station capacity at least 10 percent higher than the incoming flow.

### 1.4.2 Service Area Layer

a. Parameter: Service Area Size

Description: The area and shape of each service area are determined individually.

Discussion: The service area size should be small enough to provide reasonable incremental increases in flow along a trunk line but should not be so small that it unnecessarily increases the complexity of the model.

Model Assumption: Size at 1 to 44 acres for existing system service areas. Future areas should be added in 40- to 80-acre increments.

b. Parameter: Service Area Connection Point

Description: Each service area has a point where it connects on the system.

Discussion: The service area connection point can affect the sizing of the trunk lines. If the service area is small, the connection point is not as critical.

Model Assumption: In service areas where lateral sewers connect to the tank predominantly at one location, connect the service area at that point. In service areas where lateral sewers connect generally along the length of the trunk sewer, connect at the upper two-thirds of the trunk line.

c. Parameter: Service Area Delay

Description: Delay of flows for travel time from the service area to the system. The delay can be calculated based on a velocity and the distance from the centroid of the service area to the connection point.

Discussion: The service area delay is particularly useful when a service area is not adjacent to the trunk line. A model assumption of 1.5 ft/s velocity is reasonable, even though the actual collection system velocities may be higher, because the travel time is calculated along a straight line and the sewer flows rarely travel straight to the trunk line.

Model Assumption: Use 1.5 ft/s velocity to calculate delays.

### 1.4.3 Land Use Layer

a. Parameter: Population

Description: Population is the estimated number of people in a land use area, both existing and future.

Discussion: The existing population typically is determined by house counts from aerial photographs, recent census data, or GIS information. The future population estimate typically is based on zoning and current development trends.

Model Assumption: Populations are based on house counts from a 2004 aerial photograph. Areas that have undergone significant growth are checked with site visits and updated. Future population estimates are based on guidance from the *Draft Impact Fee Analysis* developed by Hofman Planning Associates (refer to Technical Memorandum No. 1, Appendix A), the Comprehensive Plan for the City of Sandpoint, and current development trends.

b. Parameter: People per Dwelling Unit (PPDU)

Description: Average people per dwelling unit.

Discussion: This item is not used in the model directly but is used to determine the population data based on house counts. Average PPDU in Sandpoint based on 2000 Census data was 2.29 PPDU.

Model Assumption: Use 2.29 PPDU.

c. Parameter: Flow per Person (Model Parameter CPC)

Description: Average sanitary sewer flow per person (GPCD).

Discussion: During calibration, house counts and population estimates were developed for specific areas; flow per person and diurnal curves then were adjusted to achieve model calibration to measure flow monitoring results.

Model Assumption: Set at 115 GPCD in existing and future models for areas within the service boundary.

d. Parameter: Residential Diurnal

Description: A diurnal curve is the shape of a type of sanitary flow contribution to the collection system over a 24-hour period. For instance, a typical residential diurnal curve has low early morning flows (while residents are sleeping), a morning peak (when they get up, take showers, and get ready for the day), a mid day low, an evening peak, and then a return to the early morning low.

Discussion: Model calibration was performed by adjusting a single diurnal curve for residential areas.

Model Assumption: RES_DIU diurnal curve was used for all residential land use areas and areas with motels that were modeled as visitor population. This resulting diurnal curve was named "RES-DIU." Large schools were added as individual land-use areas and were given their own diurnal curve named "School".

e. Parameter: Commercial Diurnal

Description: A typical commercial diurnal curve has low early morning flows while residents are sleeping, a sharp rise around 9 to 10 AM, a level period throughout most of the day and early evening while people are using businesses and restaurants, then a drop through the late evening to the early morning low.

Discussion: Model calibration was performed by adjusting a single diurnal curve for commercial and industrial areas in the City. The resulting diurnal curve was named "COM-DIU."

Model Assumption: COM-DIU diurnal curve is used for commercial, retail, and industrial land use areas in the City.

f. Parameter: Commercial Volume

Description: The average amount of daily commercial flow, in gallons.

Discussion: The commercial flow was based on the zoning and surrounding flows from an area with similar uses.

Model Assumption: This parameter varies by land use. Model calibration is based on the assumption of 900 gallons per acre of developed area per day. The developed area includes buildings and parking lots within a specific land use area. Future volumes are assumed to increase to 100 percent development for most areas.

## 1.5 Model Calibration

During the calibration process, the land use parameters of the model were adjusted globally, fine-tuning the model to simulate the measured flows. The flow per person for the City was set to 115 gpcd. The final land use characteristics used in the existing model are included in Appendix A.

Flow monitoring results were used to perform two separate model calibrations. The first calibration was completed using "base wet weather" flows. The days used were March 24-25, 2005. No significant rainfall during this period meant that rapid I/I were minimal, and plant flows were reasonably low (3.15 mgd). A base infiltration component was added to each of the drainage basins and combined with sanitary flow to simulate conditions observed during the flow monitoring period. The "base wet weather" comparisons of flow-monitored data to the model results for Sites 1 through 6 and the influent Parshall flume at the WWTP are shown on Figures 1-1, 1-2, 1-3, 1-4, 1-5, 1-6, and 1-7. As shown on Figure 1-1, early morning peak flows at Site 1 were not captured. However, general slope and average flows were well simulated. Attempts to alter the model to simulate this early morning peak caused other portions of the model to become increasingly erroneous.

A second calibration was performed to adjust the model parameters to simulate rapid I/I conditions during a precipitation event. A heavy rainfall on March 27-28, 2005, caused treatment plant flows to increase nearly 5:1, thus the observed peak days of March 27-28 were used for wet weather (storm conditions) calibration of the model.

Rapid I/I parameters were adjusted to simulate the flow experienced on March 27-28 at each of the six flow monitoring sites and the WWTP influent Parshall flume. During the calibration process, an anomaly was discovered with the flow monitoring data. As the model was calibrated to the six sites, the total collection system flows predicted by the model were found to be approximately 40 percent higher than those measured by the WWTP influent Parshall flume. This raised concern regarding which data was more reliable.

The specific problem that arose was with the Site 4 (Boyer Basin) wet weather flow monitoring data. As discussed in Technical Memorandum No. 2 (Collection System I/I Evaluation), the Boyer Basin surcharged during the March 27 precipitation event due to a root-ball in the line downstream of the site. This caused water depths of nearly 60 inches in the flow monitored manhole and a full pipe flow. The flow meter calibration likely became increasingly erroneous as the system surcharged, and monitored flows appeared to be much higher than actual flows coming from this basin. Therefore, calibration for Sites, 1, 2, 3, 5, and 6 were assumed reasonable, and rapid I/I parameters for Site 4 were adjusted to provide reasonable calibration to the WWTP influent Parshall flume. This adjustment caused the model to slightly overestimate infiltration in the Boyer Basin and underestimate the sanitary contribution.

The comparison of flow-monitored data to the model results for the wet period is shown on Figures 1-8, 1-9, 1-10, 1-11, 1-12, 1-13, and 1-14. Domestic flow contribution, base infiltration, and diurnal curves established in the base wet weather condition were not changed.

Overall, Sites 1, 2, 3, 5, and 6 had very good calibration and captured the peak flows well. Calibration at the WWTP was reasonable and was representative for both the shape of the system response and the peak observed flows.

The final diurnal curves used to calibrate the City model are shown on Figure 1-15. The COM_DIU diurnal curve was used for all commercial, industrial, and retail land use areas. The RES_DIU diurnal curve was used for all residential land use areas and motels. The SCHOOL diurnal curve was used for elementary, middle school, and high school land use areas. All three diurnal curves were also used in the future model.

# 2 Collection System Evaluation

## 2.1 Flow Parameters for Modeling and Flow Projections

To analyze the existing collections system, and for modeling expansion of the system and subsequent required upgrades, the flow parameters used for evaluation must be established. These parameters are discussed in the following sections.

### 2.1.1 Existing Collection System Evaluation

Recommendations for modeling and evaluation of the **existing** collection system:

- Utilize the calibrated collection system model
- Evaluate the existing system capacity based on a 24-hour duration rainfall event in the Sandpoint area

Various 24-hour precipitation events in the Sandpoint area are shown in Table 2-1.

TABLE 2-1
24-Hour Precipitation Events for Sandpoint, Idaho
*March 2007*

| Return Period (years) | 24-Hour Total Precipitation (inches) |
|---|---|
| 5 | 2.2 |
| 10 | 2.6 |
| 25 | 2.9 |
| 50 | 3.2 |
| 100 | 3.6 |

Source: *NOAA Atlas II,* precipitation frequency maps, 2005

The design return period that the City chooses to use for evaluation of their system will reflect the level of inherent risk the City is willing to take regarding sanitary sewer overflows, flooding, and surcharging the collection system. A 50-year storm has only a 23 percent greater volume than a 10-year storm. Based on reasonable risk, the City has chosen to evaluate the system based on a minimum of a 10-year return period for the existing system flows.

- Base Domestic Sanitary Flow = 115 gpcd
- I/I will be used as established in the calibrated model

### 2.1.2 Expanded (Future) Collection System Evaluation

Recommendations for modeling and evaluating the **expanded** collection system:

- Evaluate the system capacity based on the expanded model, using the 24-hour rainfall event with a 10-year return period

- Base Domestic Sanitary Flow = 115 gpcd, to be used for infill in the existing system and to account for growth in the expanded system
- I/I in the existing (2005) collection system extents to be modeled as follows:

  All inflow sources will be assumed to be removed in all of the existing drainage basins.

  Infiltration will be assumed to be reduced by 24 percent (as discussed in Technical Memorandum No. 2).
- I/I in the expanded collection system to be modeled as follows**:**

  No inflow sources will be modeled as new construction likely will not permit illicit storm and roof drain connections.

  Infiltration will be added to the expanded system based on a rate of 300 gpd/acre for average flows and 500 gpd/acre for peak seasonal infiltration (as recommended in Technical Memorandum No. 2). Although less than existing infiltration, better construction techniques and materials are expected to be used.

## 2.2 Existing Collection System Capacity Evaluation

### 2.2.1 General

The calibrated model was used to evaluate the existing system capacity. Figure 2-1 shows the line sizes for the major trunk lines, system lift stations, and force mains. Following discussions with City staff, the effects of a 10-year return period SCS Type II, 24-hour storm were modeled to evaluate system capacity. The 10-year return period storm has a total precipitation of 2.6 inches, with a hyetograph distribution (Figure 2-2). The collection system flows predicted to be generated by such a storm were used for evaluation of the system capacity. The system was modeled using the base domestic flow plus infiltration.

The flow depth-to-diameter ratio (d/D) is an indicator of remaining pipe capacity. Lower numbers indicate greater capacity. Figure 2-3 shows three flow depth-to-diameter ratio ranges:

| | |
|---|---|
| Green | d/D less than 0.5 |
| Yellow | d/D 0.5 to 0.85 |
| Red | d/D greater than 0.85 |

Pipes shown in green are operating within design parameters and have significant remaining capacity. Pipes highlighted in yellow are at, or approaching, capacity. Pipes in red are at design maximum capacity and will need improvements, to accommodate additional flow and, in some cases, to mitigate surcharging of manholes into streets.

The model indicates that much of the existing system is operating at or above capacity in the Ella, Boyer, and First Avenue Basins during wet weather events. Some areas in the Ella and First Avenue Basins are experiencing surcharging near street level, resulting in potential sanitary sewer overflows.

The Lincoln Basin has several localized areas with poor grade, and even adverse grade along Ontario at the bore under the Spokane International Railing. This grade issue is creating capacity and maintenance problems that are limiting the ability of this line to serve additional areas.

Many of the lines immediately downstream of the discharge of a lift station are experiencing peak flows that temporarily exceed the capacity of the gravity sewer.

Results of the existing model analysis indicate that much of the collection system is under very high stress and will require improvement in the near future to increase capacity and reduce I/I.

The capacity of each of the City's lift stations was evaluated to determine which components are experiencing higher stress and which may require additional capacity. A summary of the existing lift stations is provided in Table 2-2. Based on the evaluation of the existing lift stations and force mains, most appear to have adequate pumping capacity. The discharge force mains from Fishback, Westwood, and the South Boyer Lift Stations are operating at relatively high velocities, greater than 6 to 7 feet per second (fps). Although high, these force main velocities are not excessive (greater than10 fps). If these lift stations are upgraded with increased capacity, replacing the force mains to reduce velocities should be considered. The Sand Creek lift station force main operates at very low velocities—under 2 feet per second. To provide adequate scour, operators should operate both pumps at the same time on a regular basis to improve scour.

Additionally, City staff indicated that both the Beach Lift Station and the Lake Lift Station discharge into a common 6-inch force main, running across the Bridge Street Bridge. This configuration could not be modeled with Hydra; therefore, each lift station was modeled with independent force mains. This common discharge creates problems when both pump stations try to operate at the same time. The Lake Lift Station has much larger pumps than the Beach Lift Station, overpowering the Beach Lift Station and causing the pumps to run against closed check valves. This condition results in increased wear on the motors as well as causes the Beach Lift Station wet well to fill until the Lake Lift Station is finished pumping. If this problem persists, the wet well at the Beach Lift Station could fill and overflow. A second issue related to this common force main is scour velocity. Each time the "Lake" lift station is turned on, the increased flow flushes the line and maintains adequate scour velocities. The Beach lift station alone does not provide adequate scour velocities in the force main.

TABLE 2-2

Existing Lift Station and Force Main Evaluation

*March 2007*

| LS Name | Pump Capacity (cfs) | Pump Capacity (gpm) | Peak Influent Flow[a] | Capacity | Force Main Diameter (inches) | Velocity (fps) |
|---|---|---|---|---|---|---|
| Westwood | 0.67 | 300 | 0.13 | OK | 4 | 7.7 |
| Sandcreek | 0.23 | 100 | 0.11 | OK | 6 | 1.2 |
| Jail | 0.61 | 270 | 0.61 | OK | 6 | 3.1 |
| Pawn Shop | 0.33 | 150 | 0.19 | OK | 4 | 3.8 |
| Cottonwood | 0.4 | 180 | 0.04 | OK | 4 | 4.6 |
| Fishback | 0.62 | 280 | 0.12 | OK | 4 | 7.1 |
| Beach | 0.15 | 70 | 0.12 | OK | 6 | 0.8 |
| Lake | 0.8 | 360 | 0.13 | OK | 6 | 4.1 |
| Bank | 0.4 | 180 | 0.37 | OK | 4 | 4.6 |
| L.P. | 0.4 | 180 | 0.32 | OK | 4 | 4.6 |
| Boyer South: | | | | OK | | |
| (Pump 1 and 2) | 5.01 | 2250 | 5.01 | OK | 12[b] | 6.4 |
| Pump 3 = 3.34cfs (reserve pump) | | | | | | |
| Bristlecone | 0.44 | 200 | 0.16 | OK | 4 | 5.0 |

a. Based on model output under 10-year, 24-hour SCS Type II storm conditions and existing domestic flows
b. Force main diameter based on discussions with City staff; not verified

# 3 References

American Society of Civil Engineers (ASCE). *Gravity Sanitary Sewer Design and Construction.* ASCE Manual and Report on Engineering Practice No. 60 and WPCF Manual of Practice No. FD-5. 1982.

City of Sandpoint. *Comprehensive Plan*.

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. *Recommended Standards for Wastewater Facilities.* "Ten State Standards." 2004 edition.

Figure 1-1 Lincoln Basin Site 1, MH 1427, Base Wet Weather, March 24-25
Figure 1-2 Ella Basin Site 2, MH 2512, Base Wet Weather, March 24-25
Figure 1-3 Ella Basin Site 3, MH 2415, Base Wet Weather, March 24-25
Figure 1-4 Boyer Basin Site 4, Base Wet Weather, March 24-25
Figure 1-5 First Avenue Basin Site 5, Base Wet Weather, March 24-25
Figure 1-6 Ella Basin Site 6, Base Wet Weather, March 24-25
Figure 1-7 Base Wet Weather, Comparison of Model and WWTP Influent Flume
Figure 1-8 Lincoln Basin, MH 1427, Wet Weather, March 27-28
Figure 1-9 Ella Basin Site 2, MH 2512, Wet Weather, March 27-28
Figure 1-10 Ella Basin Site 3, MH 2415, Wet Weather, March 27-28
Figure 1-11 Boyer Basin Site 4, Wet Weather, March 27-28
Figure 1-12 First Avenue Basin Site 5, Wet Weather, March 27-28
Figure 1-13 Ella Basin Site 6, Wet Weather, March 27-28
Figure 1-14 Comparison of Model and WWTP Influent Flume
Figure 1-15 System Diurnal Curves
Figure 2-1 Existing System Pipe Size
Figure 2-2 SCS 10-Year, 24-Hour Hyetograph for Sandpoint, Idaho
Figure 2-3 Existing System d/D

**Figure 1-1**
**Lincoln Basin Site 1, MH 1427, Base Wet Weather**
**March 24th and 25th**

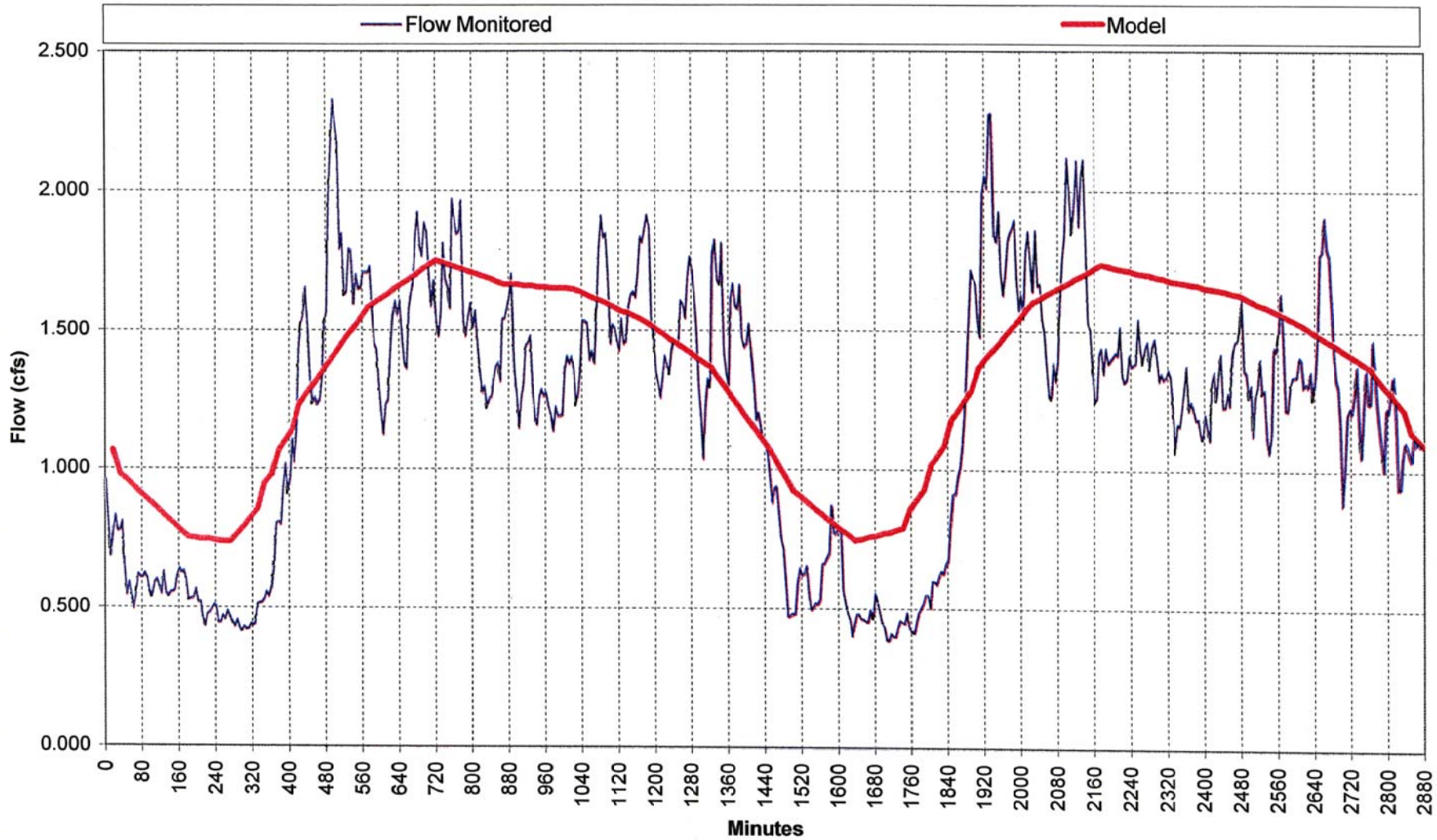


**Figure 1-2**
**Ella Basin Site 2, MH 2512, Base Wet Weather**
**March 24th and 25th**

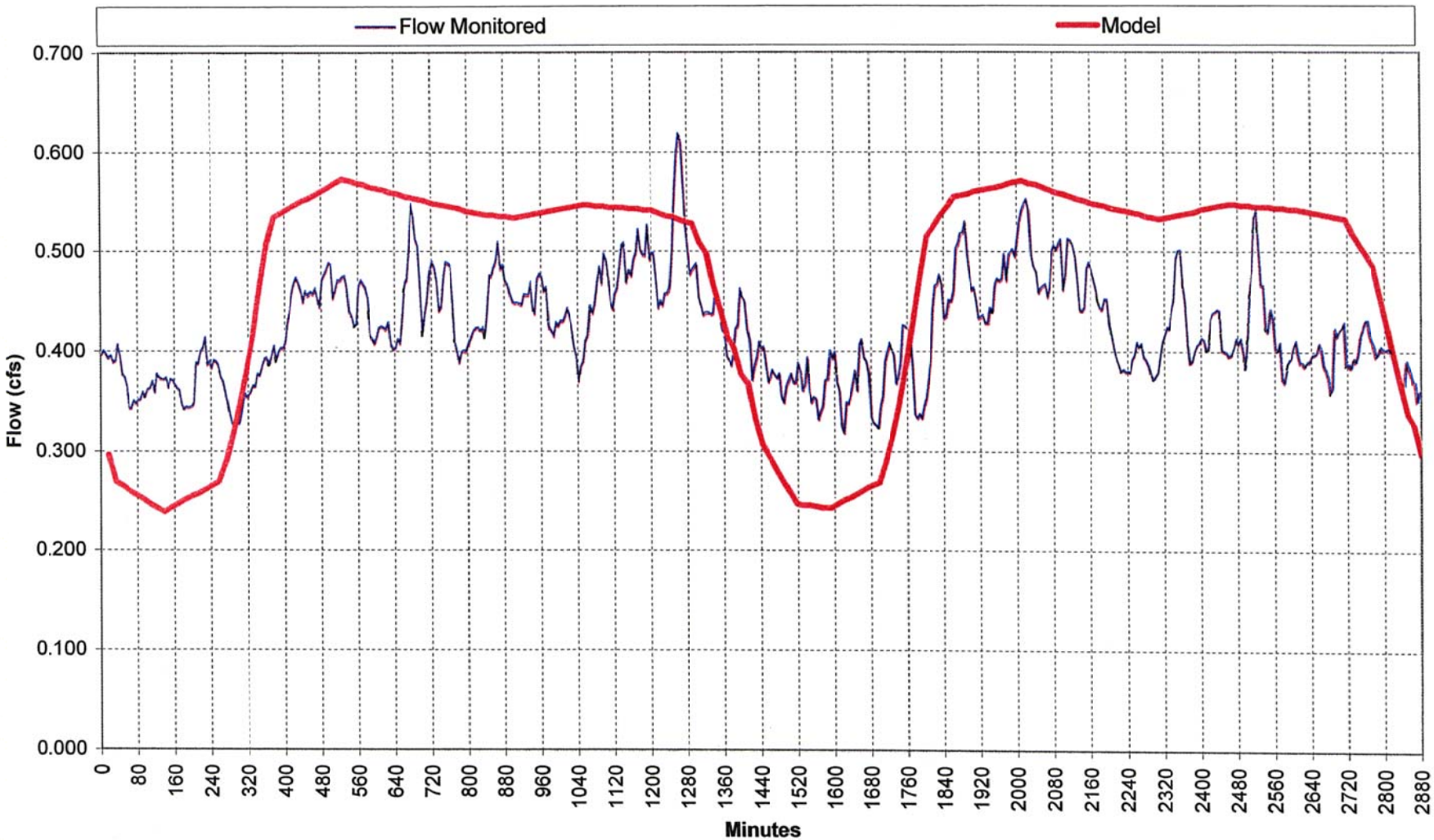


**Figure 1-3**
**Ella Basin Site 3, MH 2415, Base Wet Weather**
**March 24th and 25th**

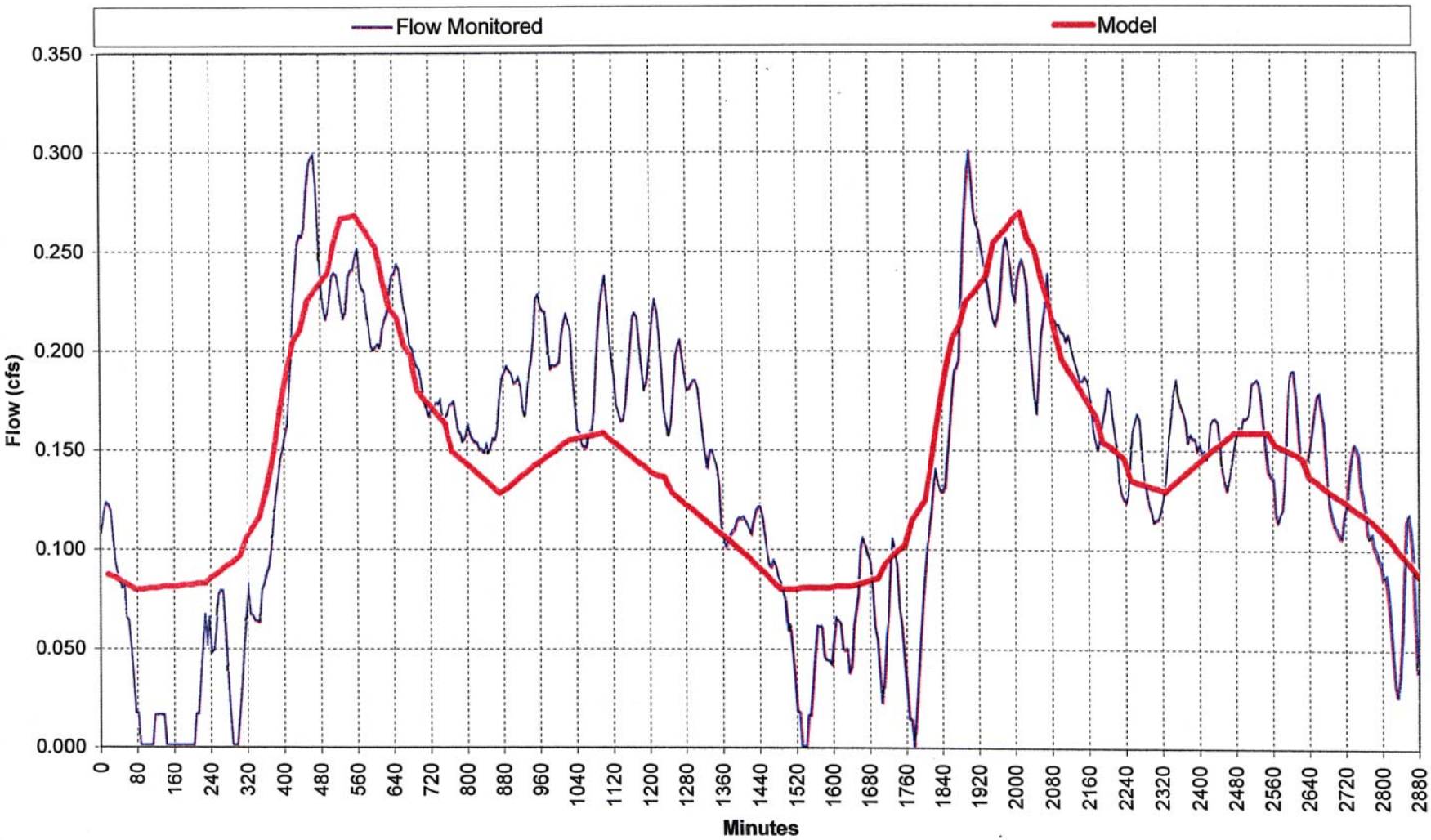


**Figure 1-4**
**Boyer Basin Site 4, Base Wet Weather**
**March 24th and 25th**

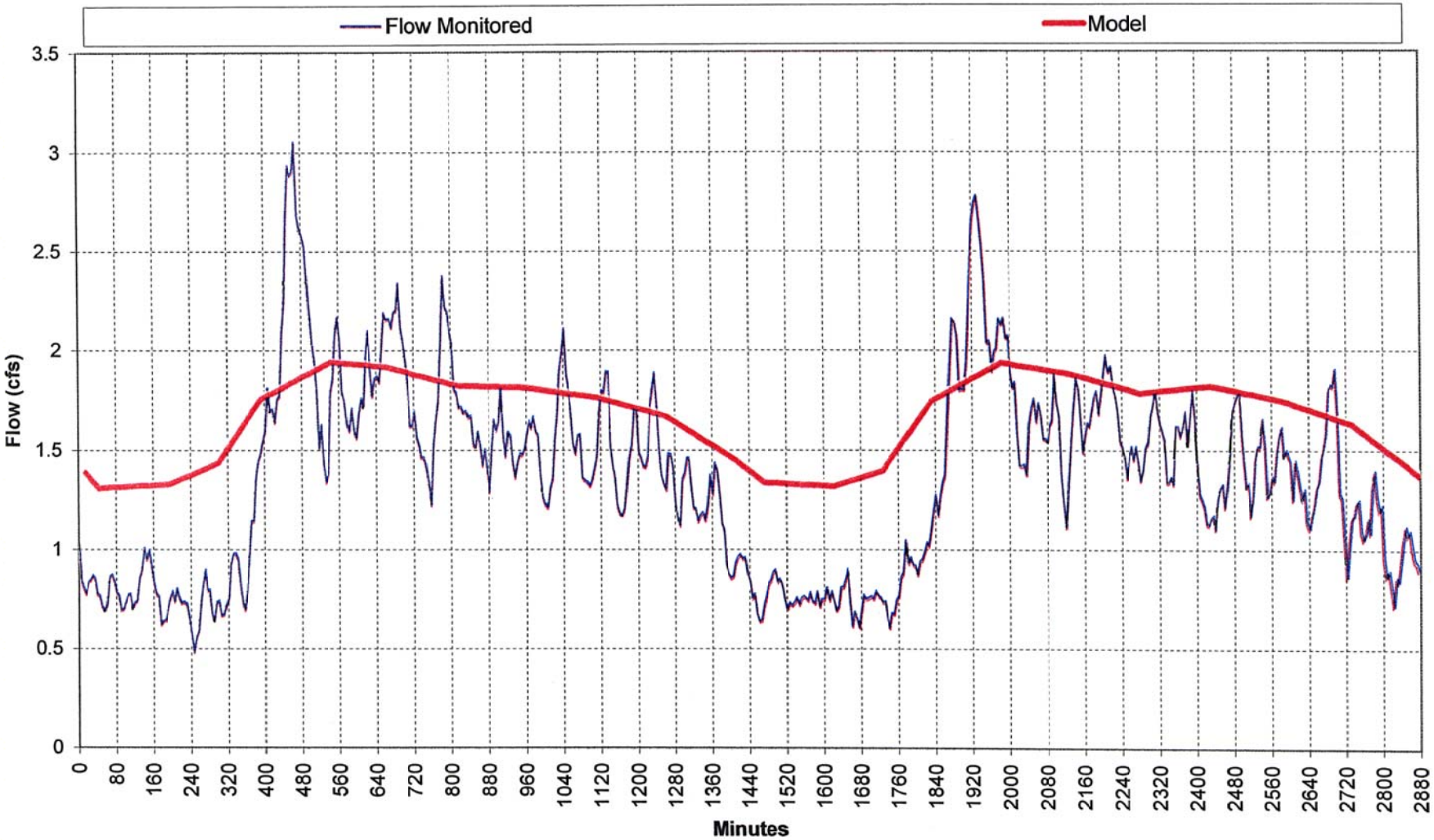


**Figure 1-5**
**First Ave. Basin Site 5, Base Wet Weather**
**March 24th and 25th**

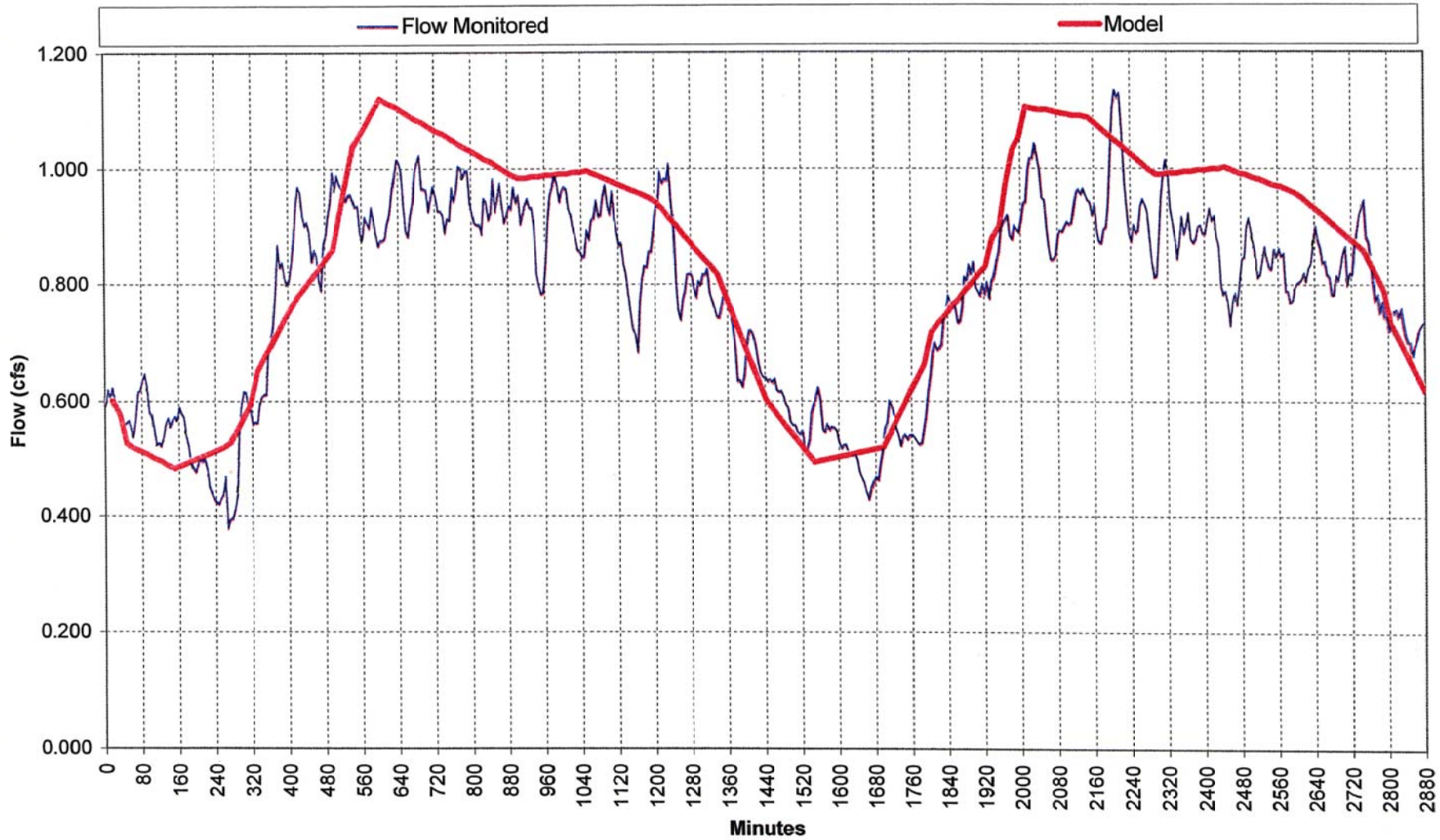


**Figure 1-6**
**Ella Basin Site 6, Base Wet Weather**
**March 24th and 25th**

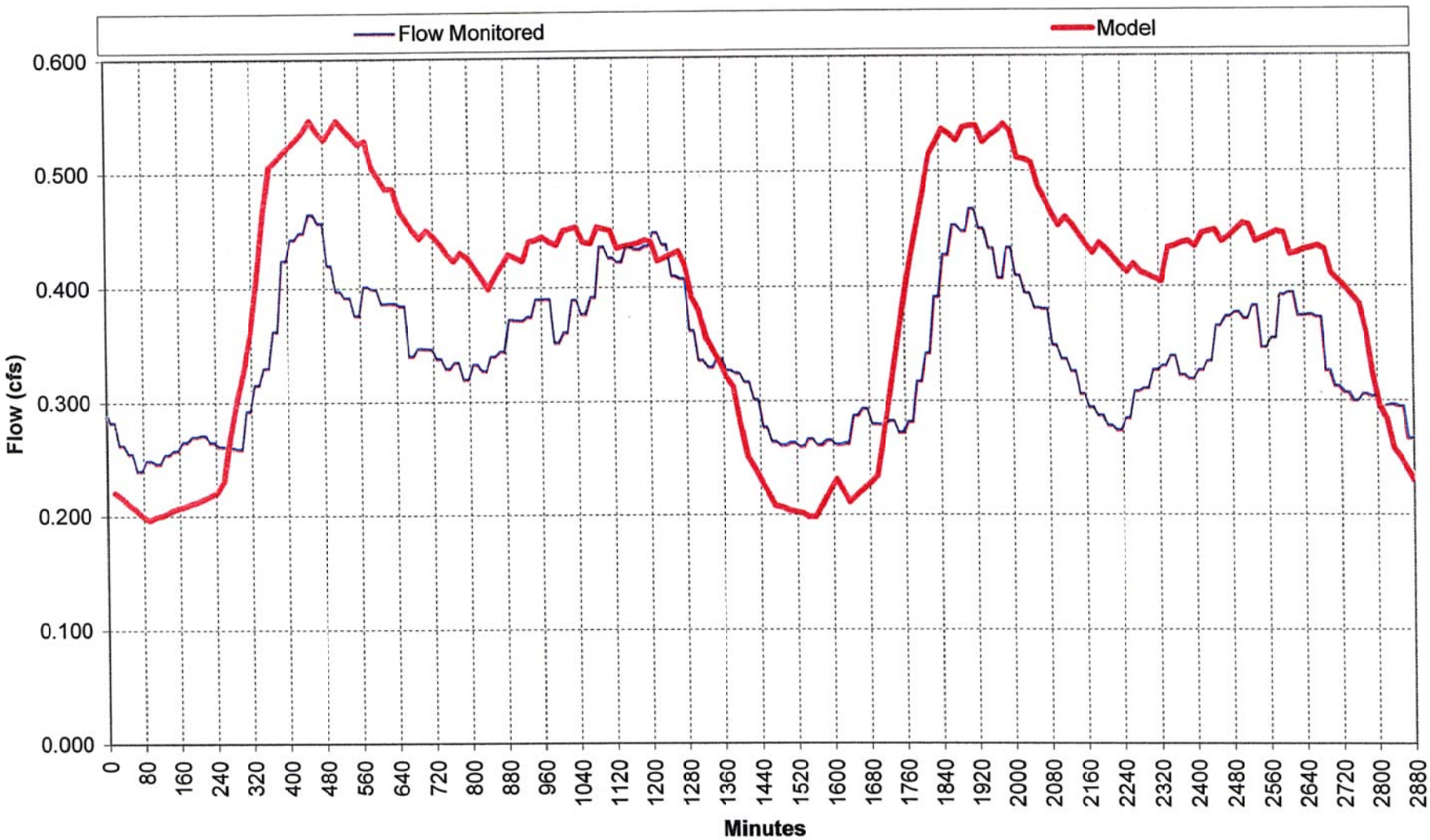


**Figure 1-7**
**Base Wet Weather**
**Comparison of Model and WWTP Influent Flume**

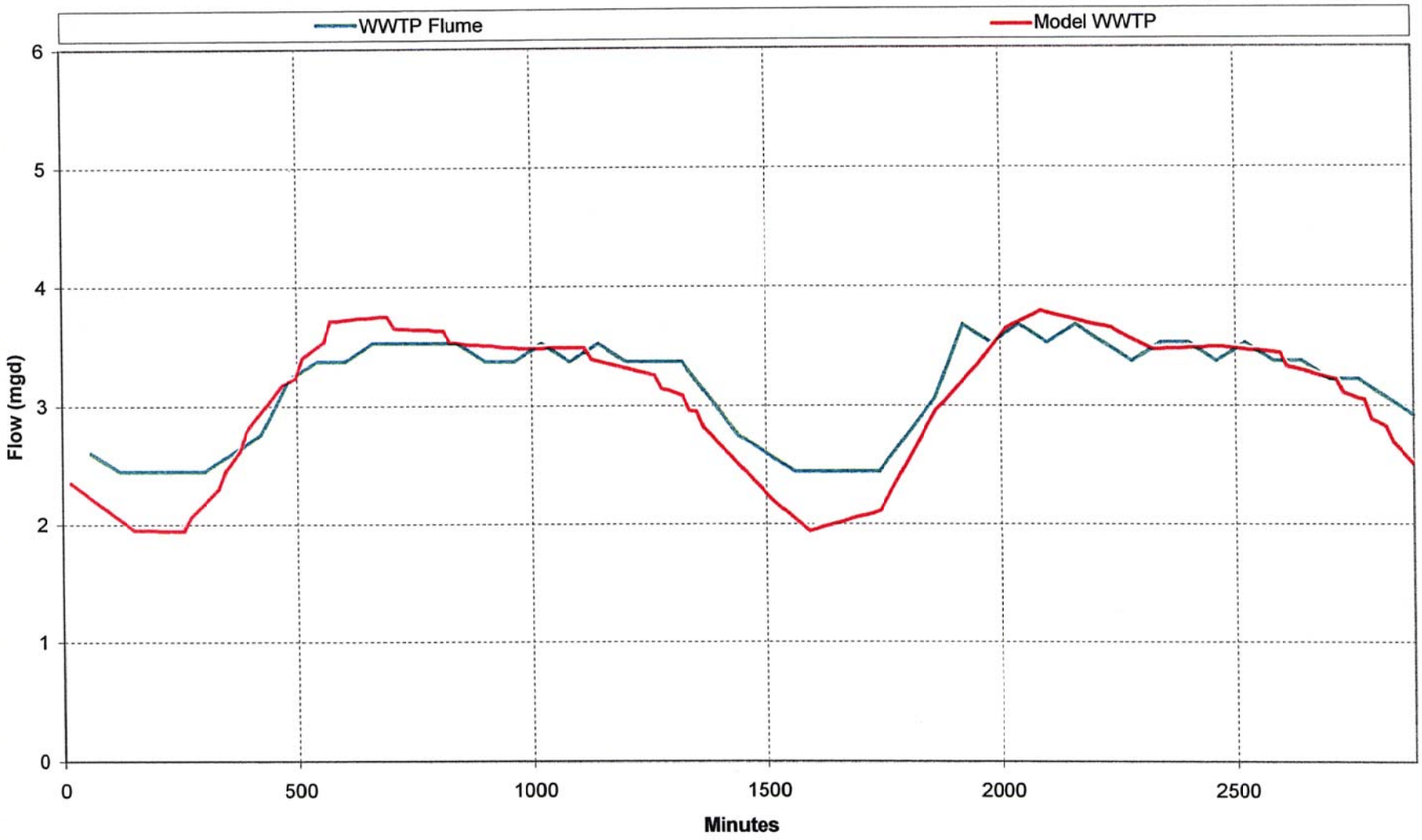


**Figure 1-8**
**Lincoln Basin Site 1, MH 1427 Wet Weather**
**March 27th and 28th**

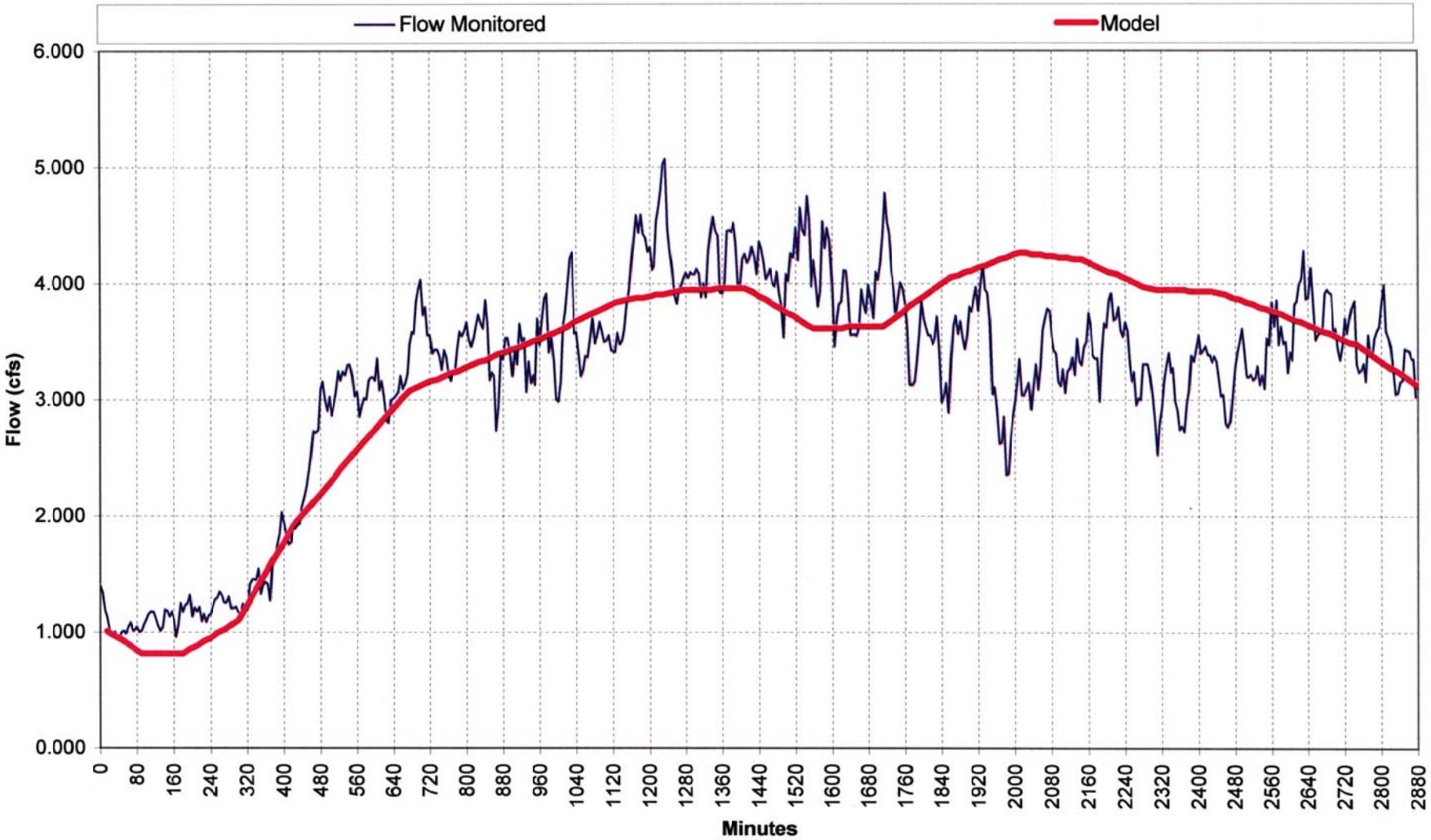


**Figure 1-9**
**Ella Basin Site 2, MH 2512 Wet Weather**
**March 27th and 28th**

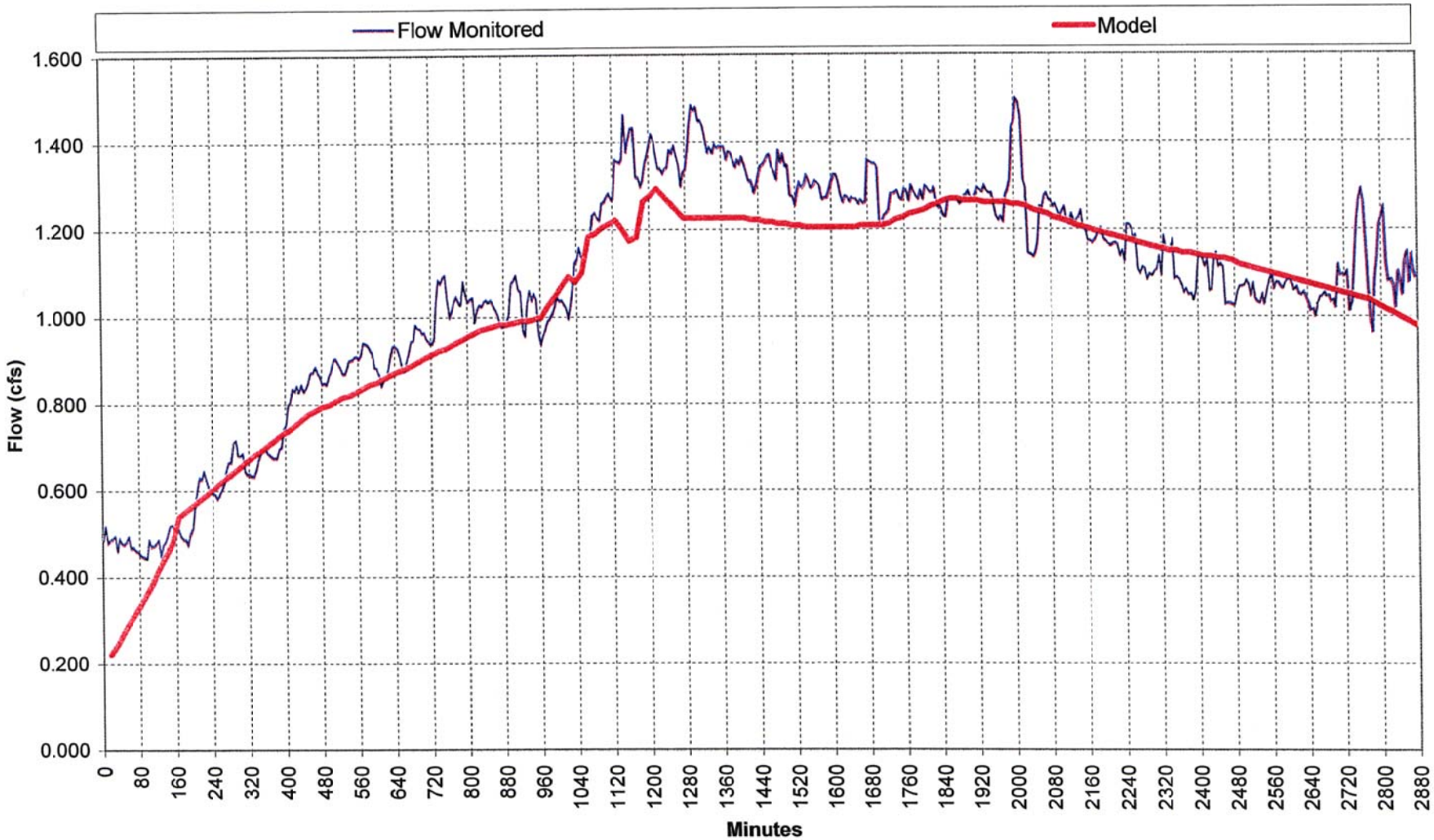


**Figure 1-10**
**Ella Basin Site 3, MH 2415 Wet Weather**
**March 27th and 28th**

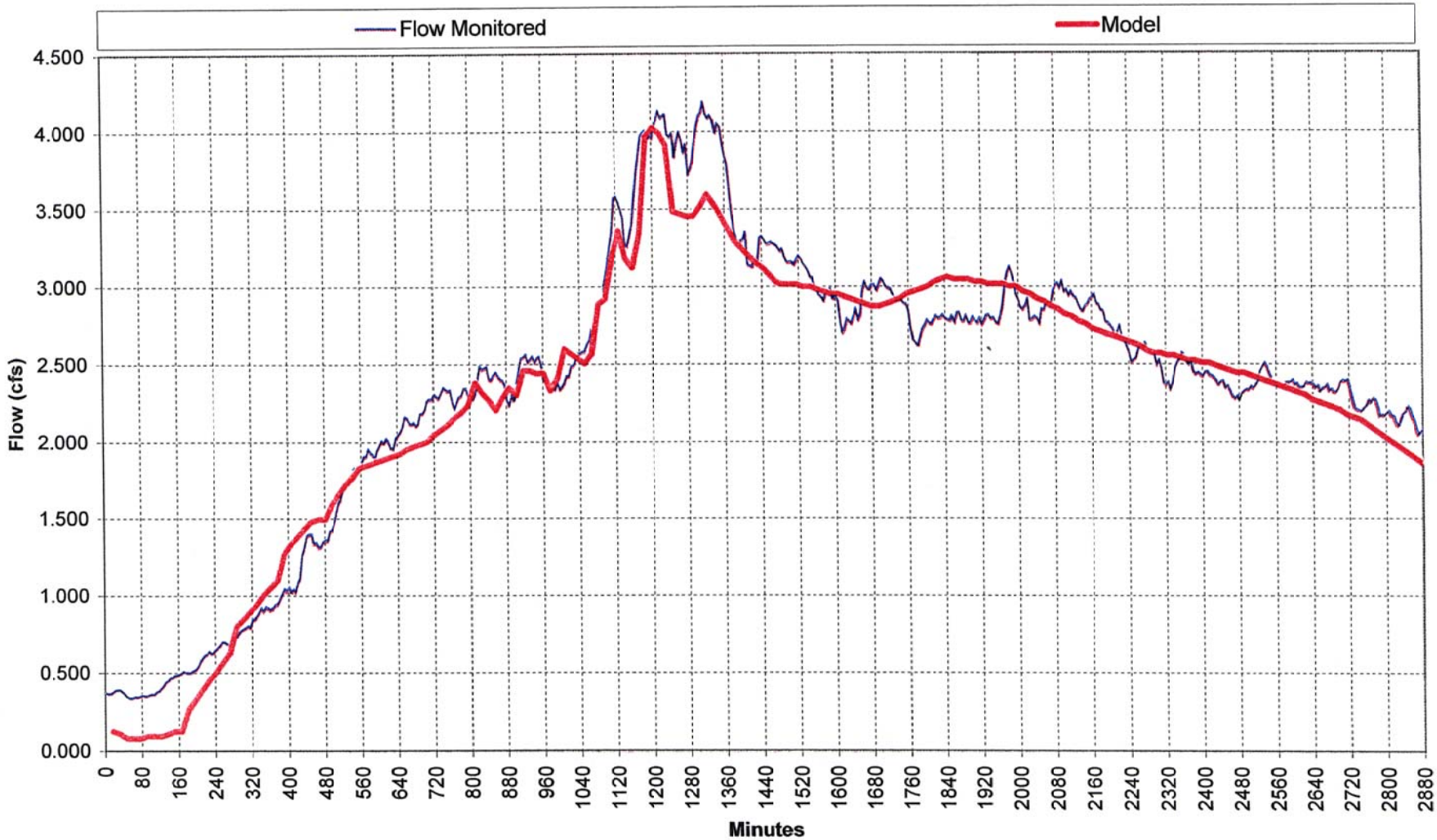


**Figure 1-11**
**Boyer Basin Site 4, Wet Weather**
**March 27th and 28th**

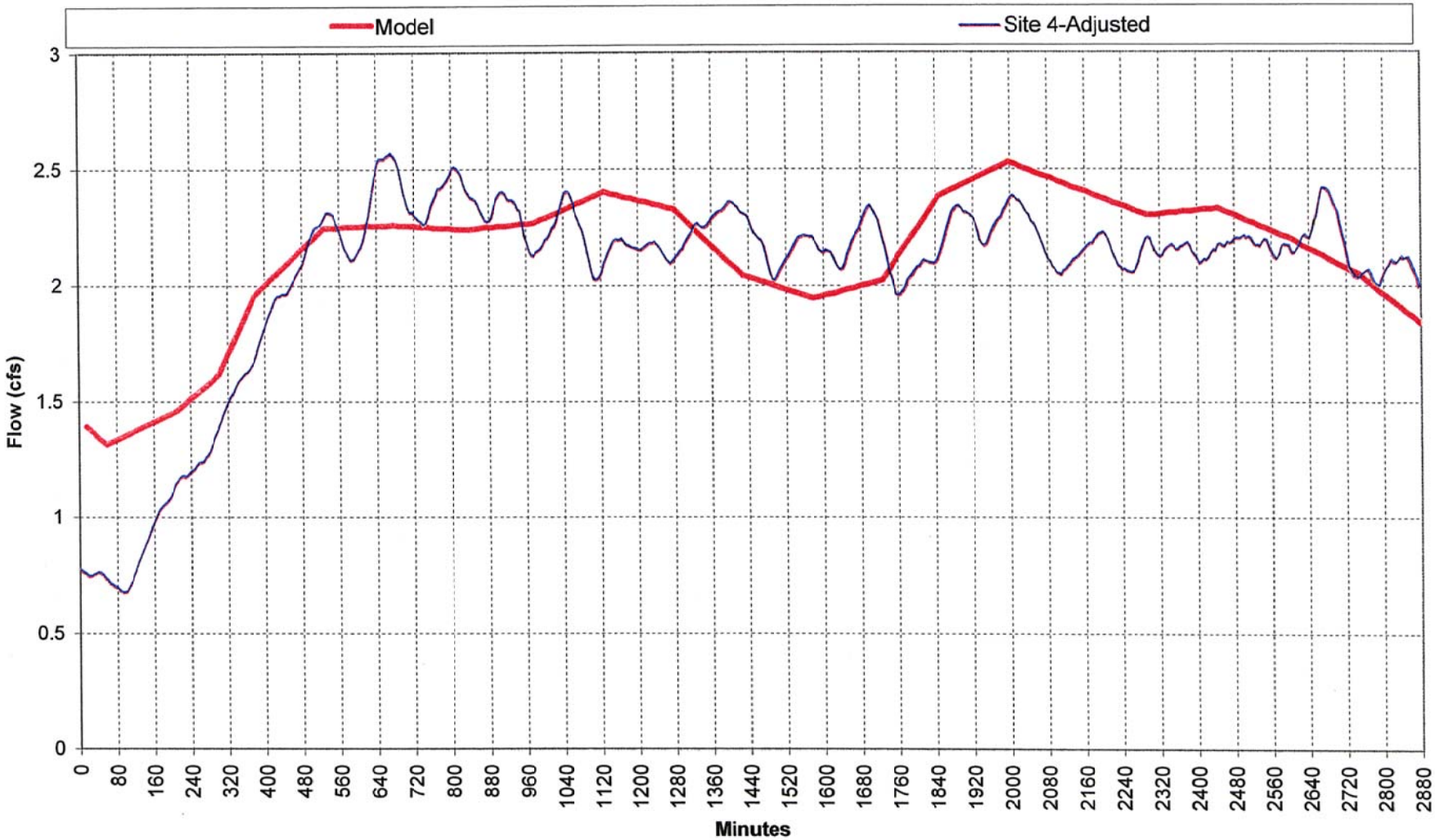


**Figure 1-12**
**First Ave. Basin Site 5, Wet Weather**
**March 27th and 28th**

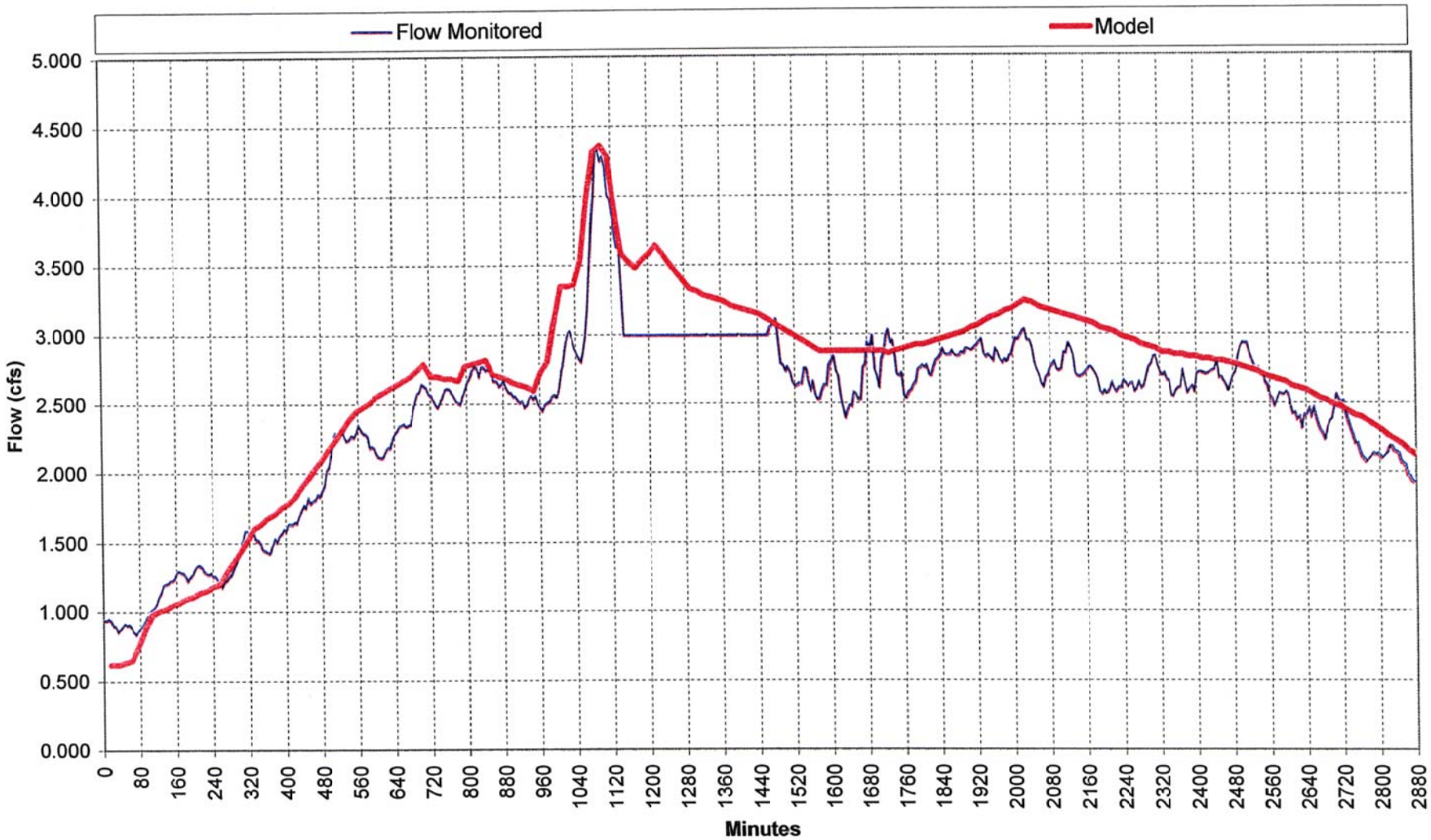


**Figure 1-13**
**Ella Basin Site 6, Wet Weather**
**March 27th and 28th**

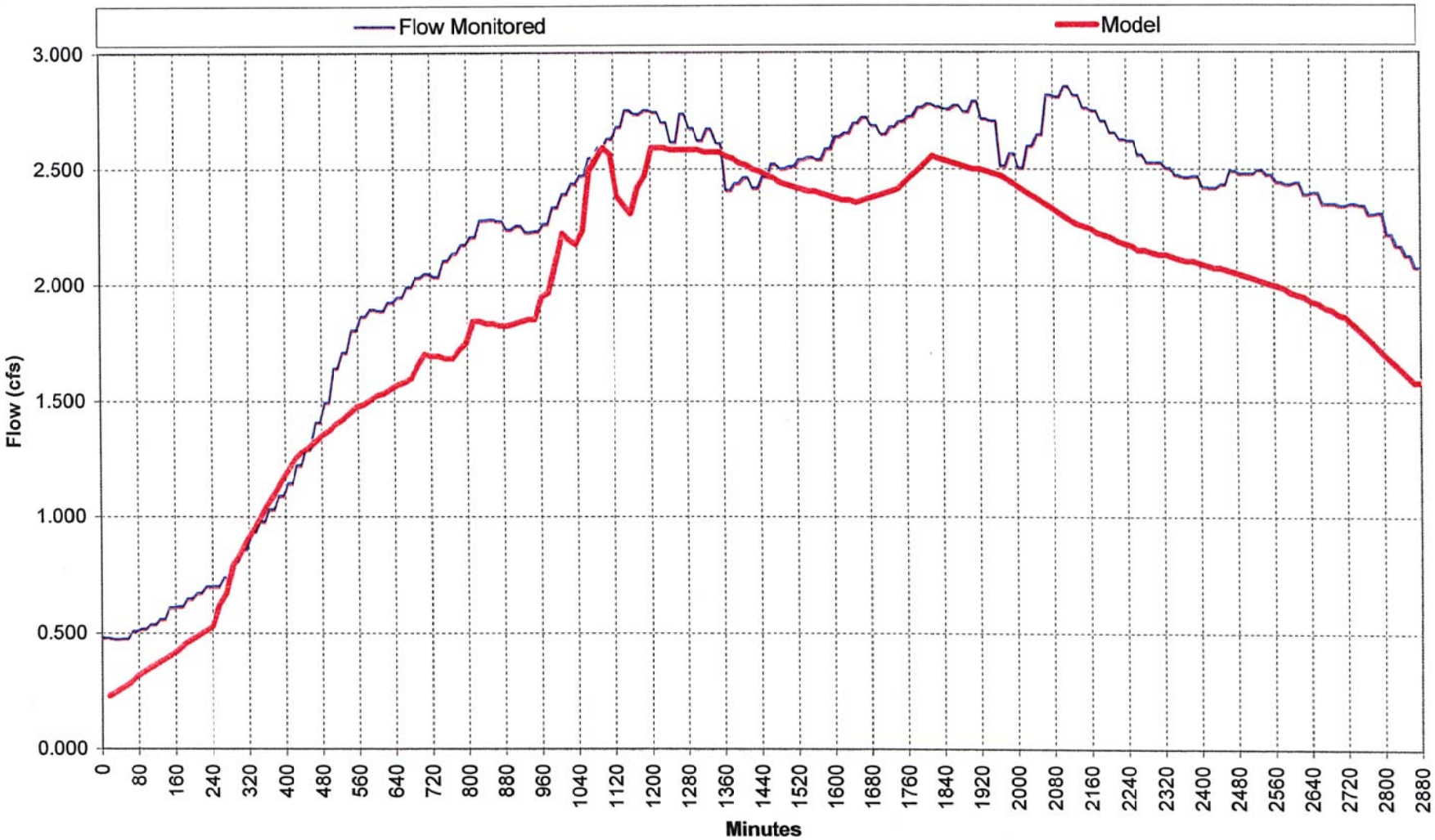


**Figure 1-14**
**Comparison of Model and WWTP Influent Flume**

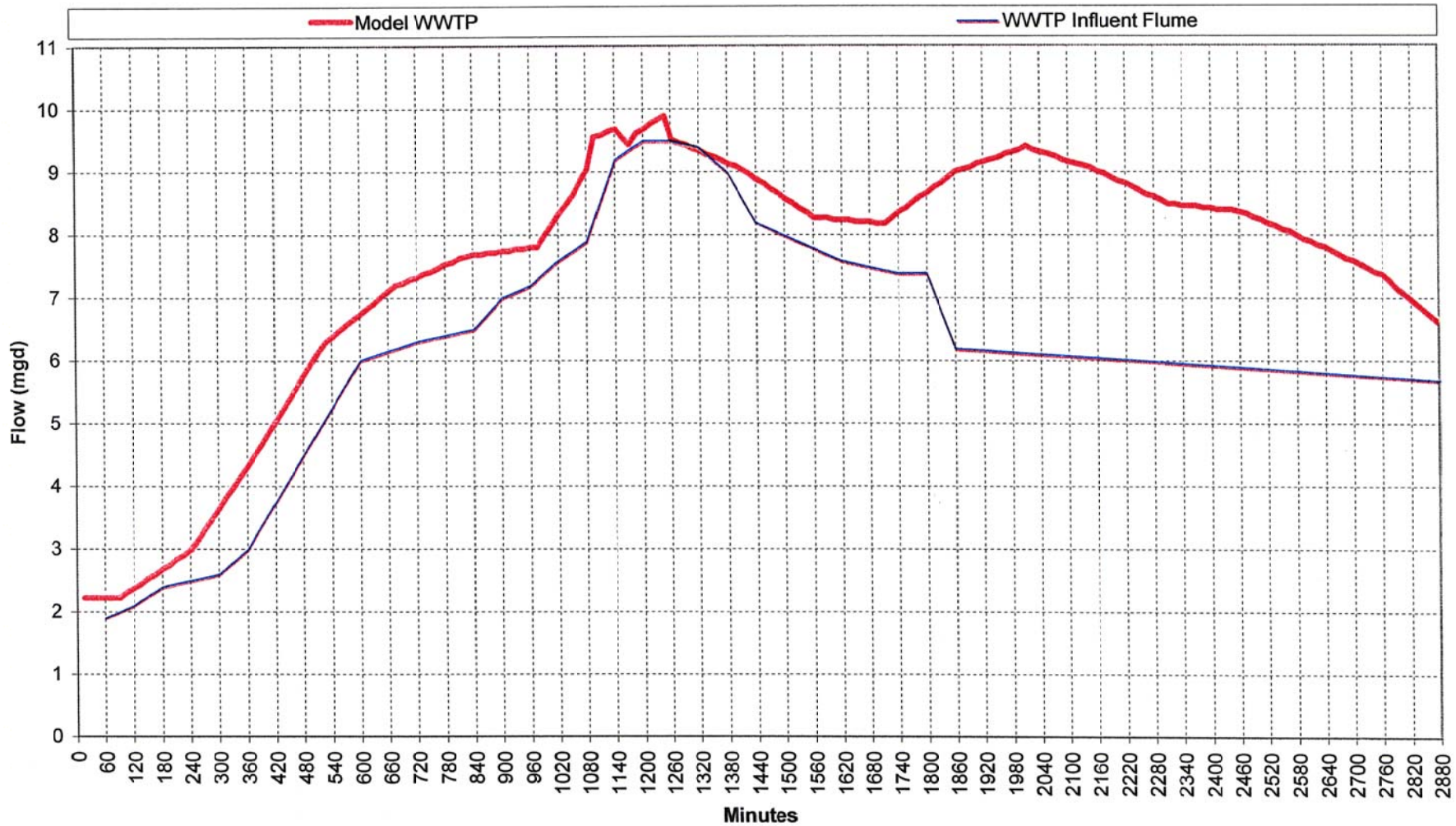
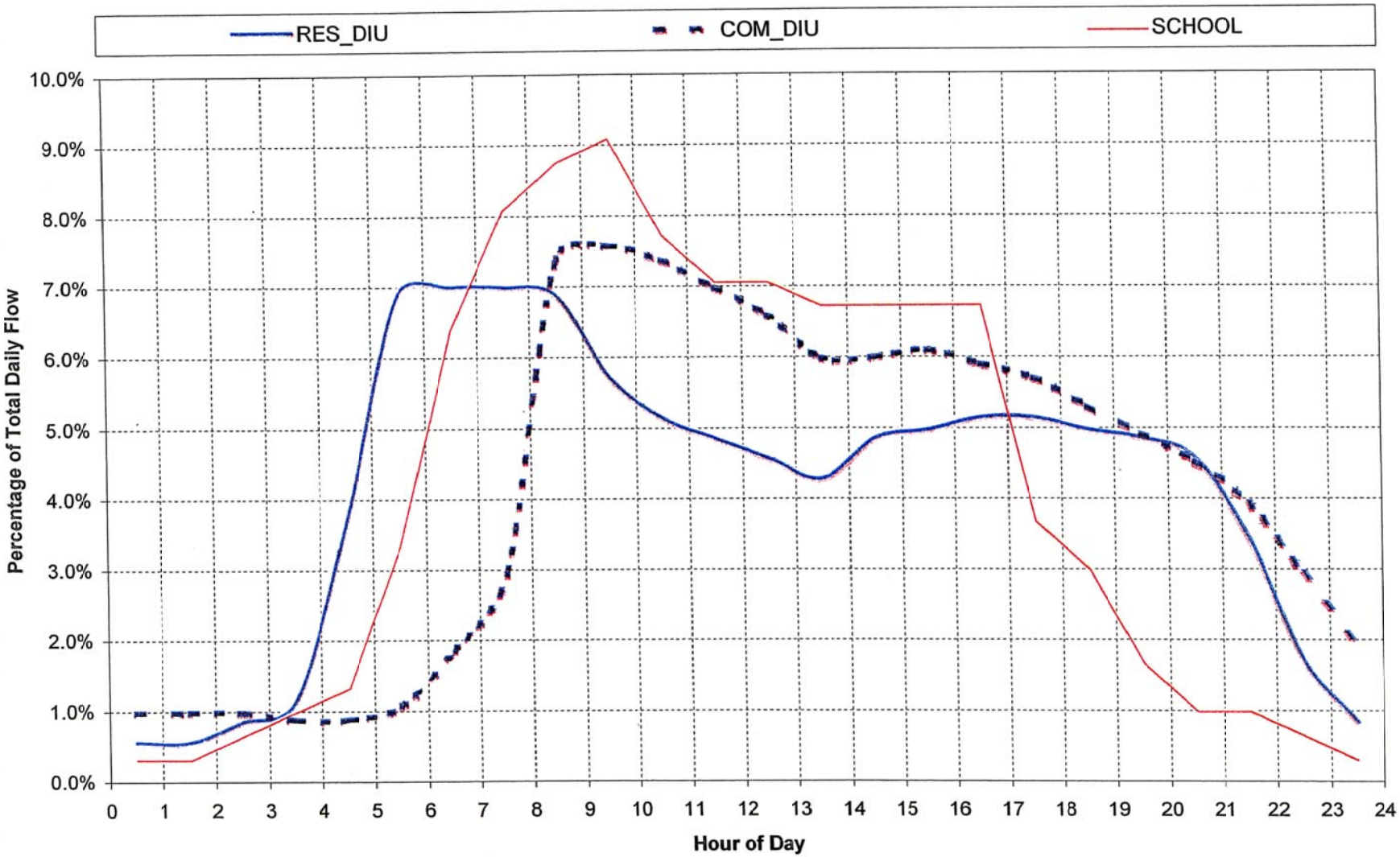
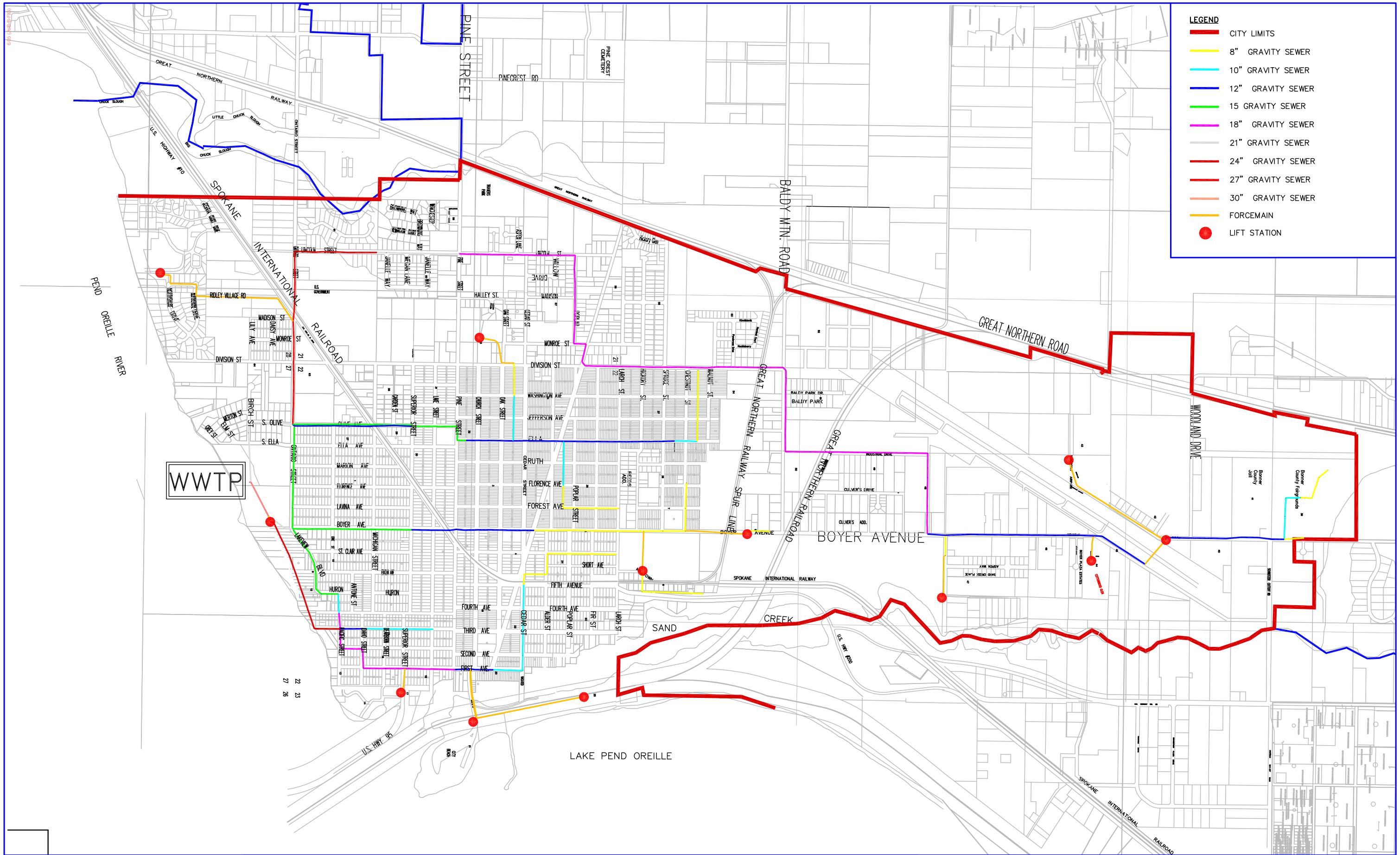


**Figure 1-15**
**System Diurnal Curves**



\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#3 FIG 2-1, 3/20/2007 4:30:59 PM, wholder, J-U-B CDA

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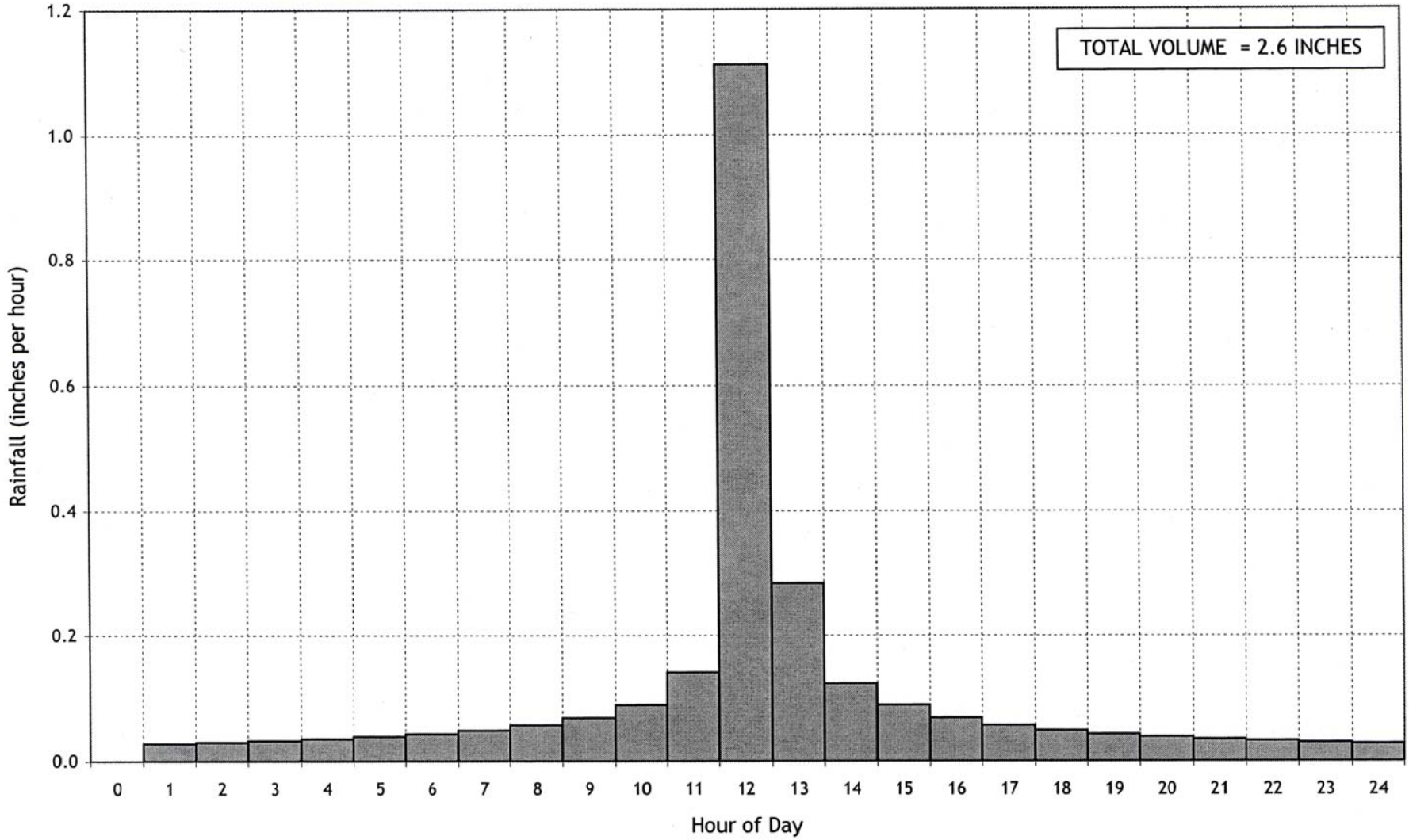
CAD FILE: 20-05-035b

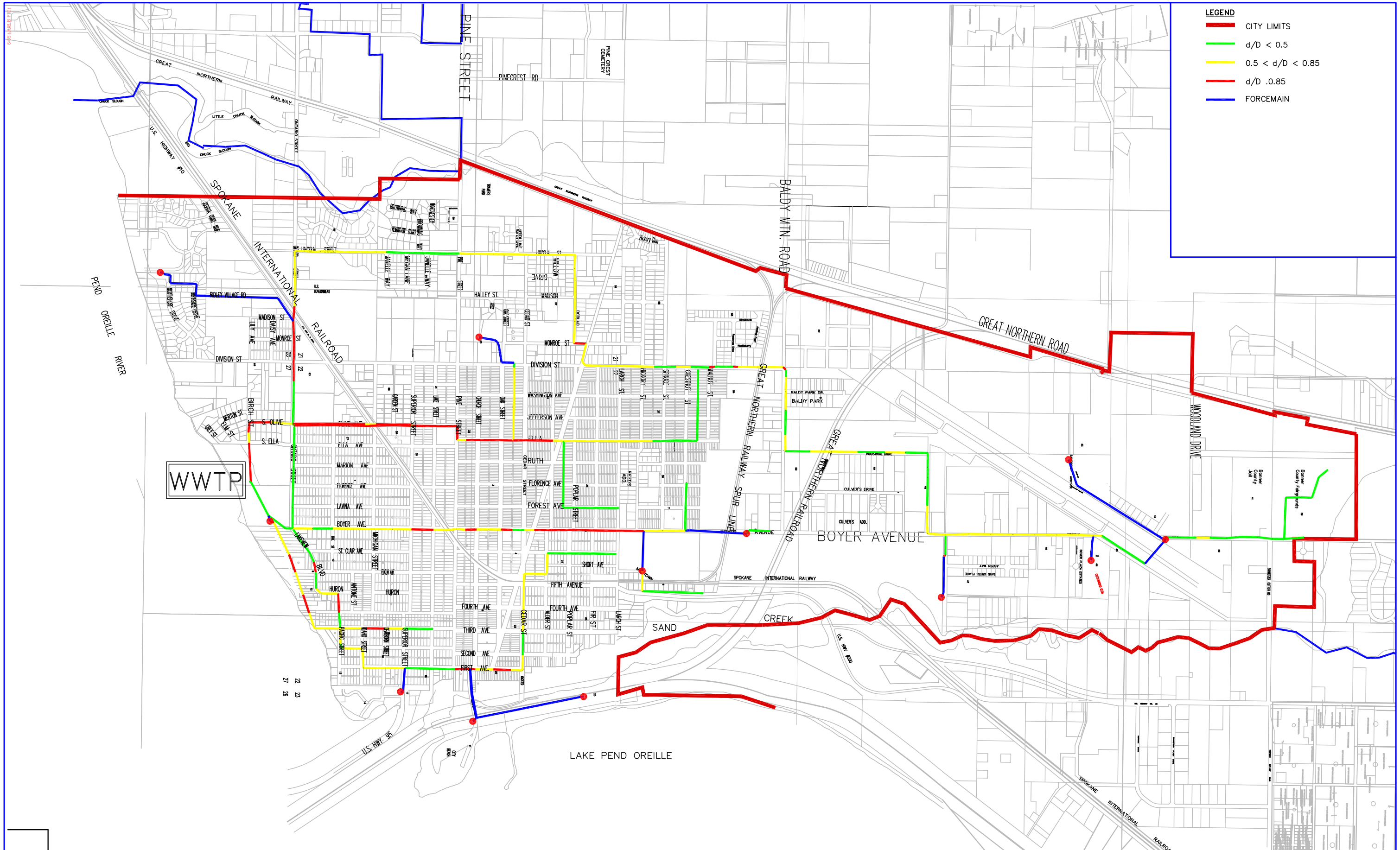
SANDPOINT WASTEWATER
FACILITY PLAN

FIGURE 2-1
EXISTING SYSTEM PIPE SIZE

Figure 2-2
SCS 10-Year, 24-Hour Hyetograph for Sandpoint, Idaho



\\Cdafiles\Public\Projects\20-05-035b.dwg, TM#3 FIG 2-3, 3/20/2007 4:34:10 PM, wholder, J-U-B CDA Design\dwg\20-05-035b.dwg, TM#3 FIG 2-3, 3/20/2007 4:34:10 PM, wholder, J-U-B CDA

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SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-3
EXISTING SYSTEM d/D

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# Appendix A

# Land Use Characteristics

## *APPENDIX A : EXISTING LAND USE DATA*

| G_ID | G_TYPE | G_NUMDOT | G_SIZE | LU_AREA | RES_POP | RES_ACTIVE | RES_CPC | RES_DIU | VIS_POP | VIS_ACTIVE | VIS_CPC | VIS_DIU | COM_VOL | COM_ACTIVE | COM_DIU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 3 | 19 | 2850487 | 65 | 366 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 5 | 3 | 12 | 1126986 | 26 | 220 | 1 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 6 | 3 | 7 | 480743 | 11 | 94 | 50 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 11 | 3 | 11 | 962539 | 22 | 243 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 12 | 3 | 22 | 3528710 | 81 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 150792 | 100 | COM_DIU |
| 13 | 3 | 15 | 13079392 | 300 | 2370 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 14 | 3 | 24 | 6437342 | 148 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 221670 | 100 | COM_DIU |
| 17 | 3 | 13 | 4093100 | 94 | 399 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 84600 | 20 | COM_DIU |
| 19 | 3 | 16 | 4312820 | 99 | 350 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 20 | 3 | 11 | 1862984 | 43 | 365 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 21 | 3 | 10 | 586033 | 13 | 15 | 100 | 115 | RES_DIU | 250 | 100 | 115 | RES_DIU | 33625 | 100 | COM_DIU |
| 22 | 3 | 10 | 2112018 | 48 | 550 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 23 | 3 | 15 | 23364030 | 536 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 482400 | 100 | COM_DIU |
| 24 | 3 | 9 | 1758588 | 40 | 348 | 35 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 25 | 3 | 13 | 3147231 | 72 | 100 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 54126 | 50 | COM_DIU |
| 26 | 3 | 23 | 844264 | 19 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 17442 | 5 | COM_DIU |
| 27 | 3 | 26 | 4472164 | 103 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 92403 | 5 | COM_DIU |
| 28 | 3 | 9 | 2619526 | 60 | 508 | 1 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 29 | 3 | 14 | 3441714 | 79 | 292 | 15 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 30 | 3 | 15 | 2397785 | 55 | 10 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 31 | 3 | 6 | 1676955 | 38 | 326 | 2 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 32 | 3 | 24 | 4042336 | 93 | 787 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 33 | 3 | 12 | 925257 | 21 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 19100 | 5 | COM_DIU |
| 34 | 3 | 9 | 2821518 | 65 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 58293 | 100 | COM_DIU |
| 35 | 3 | 12 | 1396798 | 32 | 271 | 9 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 36 | 3 | 12 | 306883 | 7 | 61 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 37 | 3 | 12 | 1386264 | 32 | 270 | 90 | 115 | RES_DIU | | | | | | | |
| 38 | 3 | 8 | 1931663 | 44 | 1 | 100 | 115 | RES_DIU | 600 | 100 | 115 | SCHOOL | | | |
| 39 | 3 | 16 | 3709280 | 85 | 721 | 100 | 115 | RES_DIU | | | | | | | |
| 40 | 3 | 7 | 197586 | 5 | 1 | 100 | 115 | RES_DIU | 400 | 100 | 115 | SCHOOL | | | |
| 41 | 3 | 7 | 736122 | 17 | 1 | 100 | 115 | RES_DIU | 350 | 100 | 115 | SCHOOL | | | |

TECHNICAL MEMORANDUM NO. 4

## City of Sandpoint Wastewater Facility Plan

# Future Wastewater Collection Facilities and Improvements

March 2007

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Figure 2-2 Westside Interceptor Alternative No. 1 Alignment
Figure 2-3 Westside Interceptor Alternative No. 2 Alignment
Figure 2-4 Recommended Master Plan Layout – Pipe Sizes
Figure 2-5 Recommended Master Plan Layout – Pipe Depth

## Tables

Table 2-1 Expanded City Boundary-Required Lift Station Capacity Upgrades and Additional New Lift Stations
Table 2-2 Expanded City Boundary-Lift Station Forcemain Evaluation

## Appendixes

Appendix A Future Land Use Data
Appendix B Future Service Area Data
Appendix C Future Model System Data

# 1 Introduction and Future Model Assumptions

As discussed in Technical Memorandum No. 3, portions of the existing collection system currently are experiencing flows at or near capacity. The projected growth at the build-out condition (expanded boundary) will exceed the capacity of the existing system. This memorandum describes recommended improvements to the system and presents a conceptual layout for the expansion to the system that will be required to convey the projected flows. The assumptions used for the conceptual layout components included:

- **Expanded System Boundary**. The City's sewer boundary will be expanded north to Selle Road and west to the planning boundary, as established by the City. The eastern boundary will continue to be defined by Sand Creek for areas north of Highway 200. Lake Pend Oreille will continue to be the southern boundary (see Figure 1-1 for future sewer system boundaries). These boundaries were assumed to represent the future ultimate system boundary.
- **Future Sewer Lines**. In the future, sewer lines will be added for areas that are able to be served by gravity using existing system components (lift stations and extensions of gravity lines) and new gravity lines. New lift stations will be added as necessary to serve areas with rolling topography, containing isolated low-lying areas where minimum bury depths for gravity lines served by existing system components will be difficult to maintain.
- **Future Trunk Lines**. Trunk lines will be added along main road alignments and low points in the service area. Deeper trunk lines combined with large regionalized lift stations will be used to minimize the number of small lift stations. Private lift stations or individual pressure sewer systems still will be necessary in areas with very steep terrain, at the system's extremities, and in areas isolated from the existing gravity sewer system.

## 1.1 Land Use and Sanitary Flows

The projected land-use layer data for both model scenarios were identical. Domestic sanitary input was modeled at 115 gallons per person per day and 2.29 people per ERU (cost per equivalent connection), based on existing densities in the current City limits. Future land use in areas outside the City limits was modeled, based on the projections and estimates discussed in Technical Memorandum No. 1.

Unsewered areas inside the existing City limits are projected to fill in at the current development density of 3.7 ERU/acre.

Infiltration and inflow (I/I) observed during continuous flow monitoring in 2005 were assumed to remain unchanged in the existing system. Infiltration for future system components is expected to be lower due to imposed construction methods and will be assigned a rate of 500 gpd/acre. Land use data for the future model is provided in Appendix A.

## 1.2 Collection System

Collection system lines were aligned to take advantage of existing public rights-of-way and low-lying areas within the service boundaries. The routes of planned trunk lines were added and included a 20 percent allowance to account for variability in alignment and topography. This 20 percent allowance assumes an additional 20 percent of line length

will be required to route lines through subdivisions, and also provides additional flexibility in the grades for the master planned alignment.

Because of the limited allowance for variability in topography, the routes of the planned trunk lines are critical. The affects of changing trunk line locations should be thoroughly studied to maintain capacity and service to outlying areas.

Future lines were evaluated assuming "Ten State Standards" (Great Lakes, 2004) minimum slopes, a minimum depth of 7 feet at the manholes, and a minimum cover depth of 3 feet between manholes. The minimum cover depth of 3 feet was used in areas where a gravity sewer line needed to pass through a low-lying area or at creek crossings.

### 1.3 Service Areas

The service areas were delineated by natural and/or political boundaries and divided into approximately 20-80-acre parcels that will drain naturally to the trunk lines. Service area data for the future model are presented in Appendix B.

## 2 Expanded System Boundary Future Model Results

### 2.1 General

Based on discussions with City staff, only those lines in the existing system that will be operating with surcharging near street-level (during peak wet weather events) were recommended for replacement. Future maintenance and line replacement activities likely will reduce I/I and decrease extraneous flows.

In some cases, lines that were immediately downstream of a lift station and were experiencing only temporary surges were not recommended for upgrades.

In order to verify sufficient depth of a trunk line to serve to the boundary of its service area, "check lines" were added to the model. "Check lines" are 8-inch model lines extended to locations within a service area that may be difficult to reach. "Check lines" force the trunk line down, if necessary, to serve a service area. However, these "check lines" are not shown, to enhance clarity of the output figures.

Model output data, including planning level rim and invert elevations, pipe slopes, and alignments, are included in Appendix C. The projected pipe depths and alignments were based on aerial photographs and a digital elevation model (DEM) provided by Avista Utilities. This planning level data has an error allowance of up to 5 feet vertically. Therefore, plan assumptions always should be checked by topographic surveys, prior to system construction.

### 2.2 Northern Service Area (North of Fairgrounds to Selle Road)

The Avista DEM did not contain information for the area north of the Bonner County Fairgrounds. Future lift stations and lines in this area and along Sand Creek were established by setting the lift station invert elevations approximately 15 feet above the 100-year flood elevation for Sand Creek. The 100-year flood elevation was obtained from the Flood Insurance Rate Maps (FIRM) for Sand Creek developed by the Federal Emergency Management Agency (FEMA). Rim elevations were approximated from a digital elevation model, developed from a global positioning system (GPS) survey of major roads in the area. This survey was limited to portions of Boyer Avenue, Selle Road, and Brown Road, and should be checked by a detailed topographic survey prior to system construction.

The layout of future gravity lines and lift stations was determined, based on minimum slopes and fixed invert elevations established by the flood plains of Sand Creek and several of its smaller tributary creeks. These elements generally defined the parameters used to establish the limits of the gravity sewer and required locations for new regional lift stations. Due to the long linear nature of this service area, four lift stations will be necessary, placed in a "cascading" arrangement (one lift station pump will downstream into a gravity line to the next downstream lift station). Areas lying below the invert of the lift stations will have to be served by private lift stations or individual pressure sewer systems. The layout of the collections system in the Northern Service Area is shown on Figure 2-1.

As an alternative, the City could provide the Northern Service Area with a pressure sewer system that would have individual grinder pump stations at each residence or business. These would pump into a single forcemain, varying in size from 4 inches to 10 inches or larger, that would run from the northern end of the service area near Selle Road and discharge at the southern end into the new West Side Interceptor (see Section 2.4).

This option would have advantages for the City because operations and maintenance of the lift stations would be the responsibility of the landowners instead of City-owned regional lift stations. Also, a deep gravity sewer would not be necessary, and the City would only have to construct a pressure forcemain that could be buried 5 to 6 feet below grade. Despite these advantages, pressure sewers generally tend to be problematic, i.e., be poorly maintained by homeowners, have increased I/I, and generate quantities of hydrogen sulfide sufficient to cause damage and excessive corrosion in downstream manholes and gravity lines. In addition, discussions with IDEQ indicate they are "in favor of the City operating and maintaining the collection system as much as possible. This provides a higher degree of public health and water quality protection when compared to individual homeowners being responsible for portions of the collection system, such as grinder pumps." Thus, for planning purposes, using a combination of gravity sewer and regional lift stations is recommended.

## 2.3 Lift Stations

The existing lift stations were evaluated based on their capacity to meet projected flows. Both the Jail Lift Station and the South Boyer Lift Station will require capacity upgrades to meet the projections. Additionally, several new lift stations will be required to serve the expanded boundary and some low-lying areas within the current City limits. The recommended upgrades and required capacity of the new lift stations are presented in Table 2-1.

In addition to evaluating the pumping capacity, each of the forcemains for the lift stations was evaluated. The recommended upgrades for existing forcemains and the required forcemain size for each of the new lift stations are presented in Table 2-2.

The Beach Lift Station and the Lake Lift Station currently discharge into a common forcemain. A new independent forcemain should be laid from the Beach Lift Station to the gravity sewer, across the Bridge Street Bridge over Sand Creek.

TABLE 2-1
Expanded City Boundary-Required Lift Station Capacity Upgrades and Additional New Lift Stations
*March 2007*

| | Pump Capacity | | Future Required Firm Capacity | | |
|---|---|---|---|---|---|
| **Lift Station Name** | **(cfs)** | **(gpm)** | **(cfs)** | **(gpm)** | **Capacity Check** |
| **Existing Lift Stations** | | | | | |
| Westwood | 0.67 | 300 | 0.17 | 80 | OK |
| Sandcreek | 0.23 | 100 | 0.19 | 85 | OK |
| Jail | 0.61 | 270 | 1.10 | 500 | Inadequate (reserve pump is operating) |
| Pawn Shop | 0.33 | 150 | 0.21 | 100 | OK |
| Cottonwood | 0.4 | 180 | 0.17 | 80 | OK |
| Fishback | 0.62 | 280 | 0.15 | 70 | OK |
| Beach | 0.15 | 70 | 0.13 | 60 | OK |
| Lake | 0.8 | 360 | 0.36 | 165 | OK |
| Bank | 0.4 | 180 | 0.37 | 170 | OK |
| L.P. | 0.4 | 180 | 0.34 | 155 | OK |
| Boyer South: | | | | | OK |
| (Pump 1 and 2)<br>Pump 3 = 3.34 cfs<br>(reserve pump) | 5.01 | 2,250 | 8.22 | 3700 | Inadequate (reserve pump is operating) |
| Bristlecone | 0.44 | 200 | 0.17 | 80 | OK |
| **New Lift Stations** | | | | | |
| Baldy | - | - | 0.36 | 165 | - |
| West Side | - | - | 0.21 | 100 | - |
| Pine St. #1 | - | - | 1.79 | 800 | - |
| Pine St. #2 | - | - | 0.28 | 125 | - |
| Schweitzer | - | - | 2.83 | 1270 | - |
| Bronx | - | - | 1.65 | 750 | - |
| Bronx-Selle | - | - | 0.95 | 425 | - |
| Selle | - | - | 0.27 | 120 | - |
| Mountain View | - | - | 0.43 | 190 | - |
| Lake #4 | - | - | 0.24 | 110 | - |
| Lake #3 | - | - | 0.20 | 100 | - |
| Gooby | - | - | 0.23 | 110 | - |

TABLE 2-2
Expanded City Boundary-Lift Station Forcemain Evaluation
*March 2007*

| Lift Station Name | Future L.S. Capacity (cfs) | Existing FM Diameter (inches) | Existing Velocity Diameter (w/existing FM) (fps) | Future Recommended Diameter (inches) | Velocity in New Forcemain (fps) |
|---|---|---|---|---|---|
| **Existing Lift Stations** | | | | | |
| Westwood | 0.67 | 4 | 7.7 | No Change | No Change |
| Sandcreek | 0.23 | 6 | 1.2 | No Change | No Change |
| Jail | 1.10 | 6 | 5.6 | No Change | No Change |
| Pawn Shop | 0.33 | 4 | 3.8 | No Change | No Change |
| Cottonwood | 0.40 | 4 | 4.6 | No Change | No Change |
| Fishback | 0.62 | 4 | 7.1 | No Change | No Change |
| Beach | 0.15 | 6 | 0.8 | No Change | No Change |
| Lake | 0.80 | 6 | 4.1 | No Change | No Change |
| Bank | 0.40 | 4 | 4.6 | No Change | No Change |
| L.P. | 0.40 | 4 | 4.6 | No Change | No Change |
| Boyer South: | | | | | |
| (Pump 1 and 2) Pump 3 – 3.34 cfs (reserve pump) | 8.22 | 12[a] | 10.5 | 16[a] | 6.7 |
| Bristlecone | 0.44 | 4 | 5.0 | No Change | No Change |
| **New Lift Stations** | | | | | |
| Baldy | --- | --- | --- | 4 | |
| West Side | --- | --- | --- | 4 | |
| Pine St. #1 | --- | --- | --- | 10 | 3.3 |
| Pine St. #2 | --- | --- | --- | 4 | |
| Schweitzer | --- | --- | --- | 10 | 5.2 |
| Bronx | --- | --- | --- | 8 | 4.7 |
| Bronx-Selle | --- | --- | --- | 6 | 4.8 |
| Selle | --- | --- | --- | 4 | 3.1 |
| Mountain View | --- | --- | --- | 4 | 4.9 |
| Lake #4 | --- | --- | --- | 4 | |
| Lake #3 | --- | --- | --- | 4 | 2.3 |
| Gooby | --- | --- | --- | 4 | 2.6 |

a. Existing forcemain diameter, based on discussions with City staff and not verified

A minimum level of upgrades also should be made to the City's lift stations, linking them with a telemetry system. This will allow the system operators to control and monitor lift station activity with a central online Supervisory Control and Data Acquisition (SCADA) system. The SCADA system also could be used to coordinate the collection system pumping to minimize cycling and downstream lift station overloading by attenuating peak flow events.

## 2.4 West Side Interceptor

A new interceptor will be required to accommodate new growth. Because much of that growth is expected to be to the north and west, the new interceptor should be located west of the existing railroad. This future West Side Interceptor will drain a large portion of the expanded boundary by gravity west of the current City limits and will accommodate the Northern Service Area.

The criteria for evaluation of the new interceptor route included:

- Minimizing directional bores under the railroad
- Connecting to and replacing existing interceptors that already need size increases to improve capacity
- Routing along railroad right-of-way or City-owned right-of-way
- Maintaining a minimum cover of 3 feet over the interceptor
- Maximizing the area that can be served by gravity

The southwestern portion of the expanded service area will be pumped through either of two future lift stations along Pine Street. The Pine Street #1 Lift Station will be the larger of the two and will serve the majority of this subdivision. Pine Street #2 will serve a localized, low-lying area that cannot be drained into the Pine Street #1 Lift Station. Figure 2-2 shows the relative locations of both lift stations.

### Alternative No. 1 – Extension of Lincoln Interceptor

Two preferred alternative routes were identified for the new West Side Interceptor. The first alignment would connect to the existing Lincoln Interceptor at the intersection of Lincoln Road and Poplar Street, and extend north to Selle Road. This route would require increasing the size of the Lincoln Interceptor from the connection point downstream to the WWTP. The alignment and required pipe sizes for Alternative No. 1 are shown on Figure 2-2.

Advantages of this option:

- Much of the lower portion of the Lincoln Interceptor is already impacted adversely by areas with poor grade and even adverse grade at the bore under the Spokane International Railroad crossing along Ontario Street. This improvement would allow for the line to be replaced at the proper grade.
- The forcemains from both of the future Pine Street Lift Stations # 1 and #2 will discharge into the Lincoln Interceptor at the intersection of Pine Street and Lincoln Street. The additional flow from these two lift stations will cause capacity problems in the existing line from this point downstream to the WWTP. Therefore, this portion of the Lincoln Interceptor would need to be replaced anyway.

Disadvantages of this option:

- The Lincoln Interceptor was constructed in the early 1990s and is relatively new. Most of the interceptor upstream of Pine Street would have adequate capacity to handle projected future flows (without connecting in the new West Side Interceptor) and would not require capacity improvements.
- A large portion of Lincoln Street was recently reconstructed, including new pavement and curb and gutter from Main Street to Pine Street. Construction of the new interceptor would require trenching along this newly improved street.

#### Alternative No. 2 – Extension of Ella Interceptor

The second alternative would be to use the existing Ella Interceptor at the intersection of Ella Avenue and Main Street and extend it north to Selle Road. This route would require increasing the size of the Ella Interceptor from the connection point downstream to its connection with the lower end of the Lincoln Interceptor and subsequently into the WWTP. The alignment and required pipe sizes for Alternative No. 2 are shown on Figure 2-3.

Advantages of this option:

- Much of the lower portion of the Ella Interceptor already is over capacity and surcharges near street level under storm conditions.
- The invert of the Ella Interceptor would allow the interceptor to be deepened slightly at the bore under the Great Northern Railroad. This would give more flexibility in the alignment upstream, and would provide additional cover and protection at the shallow railroad crossing.
- The alignment of the new interceptor along Main Street would allow re-routing of the upper portion of the Lincoln Interceptor into the new West Side Interceptor at the intersection of Main Street and Division Street (and subsequently into the Ella Interceptor). This would result in lower flows in the lower portion of the Lincoln Basin and allow for the additional flow from the future Pine Street Lift Stations #1 and #2 into the Lincoln Interceptor, without an upgrade.
- The Ella Basin historically has had high levels of I/I. Pipe replacement in this area likely would cut these flows.

Disadvantages of this option:

- The increased length of this option in comparison to Alternative No. 1 would result from the required interceptor from the intersection of Main Street and Lincoln Street to the Intersection of Ella Avenue and Main Street.

### 2.4.1 Recommended Alignment

From the foregoing, the recommended alignment for the new West Side Interceptor is along the Ella Avenue and Main Street corridors. This option will allow for the re-routing of flows from the upper portion of the Lincoln Interceptor into the Ella Basin. In so doing, future capacity issues in the Lincoln Basin will be mitigated. In addition, the required capacity improvements will be made in the Ella Basin.

The lower portion of the Lincoln Interceptor with adverse grade will need to be re-constructed to remove the adverse-grade bore and allow for unobstructed flow along Ontario Street, from the Spokane International Railroad crossing to its intersection with the new Ella Interceptor.

The recommended layout for the collection system to serve an expanded boundary, including recommended pipe sizes, is presented on Figure 2-4. Existing system lines that will require upgrades are identified by color. System lines that will not require upgrades are shown in grey. Cross-hatching identifies areas that will require private or individual lift stations. In the figure, 10-inch and larger trunk lines, and 8-inch lines acting as trunks are shown. Smaller 8-inch side sewers are not shown, for the purpose of clarity.

The projected depths of the new interceptors are color-coded on Figure 2-5.

# 3 References

Federal Emergency Management Agency (FEMA). *Flood Insurance Rate Maps* (FIRM) for Sand Creek.

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. *Recommended Standards for Wastewater Facilities.* "Ten State Standards." 2004 edition.

Figure 1-1 – Expanded Sewer System Boundary

Figure 2-1 – Northern Service Area – Future Line Sizes

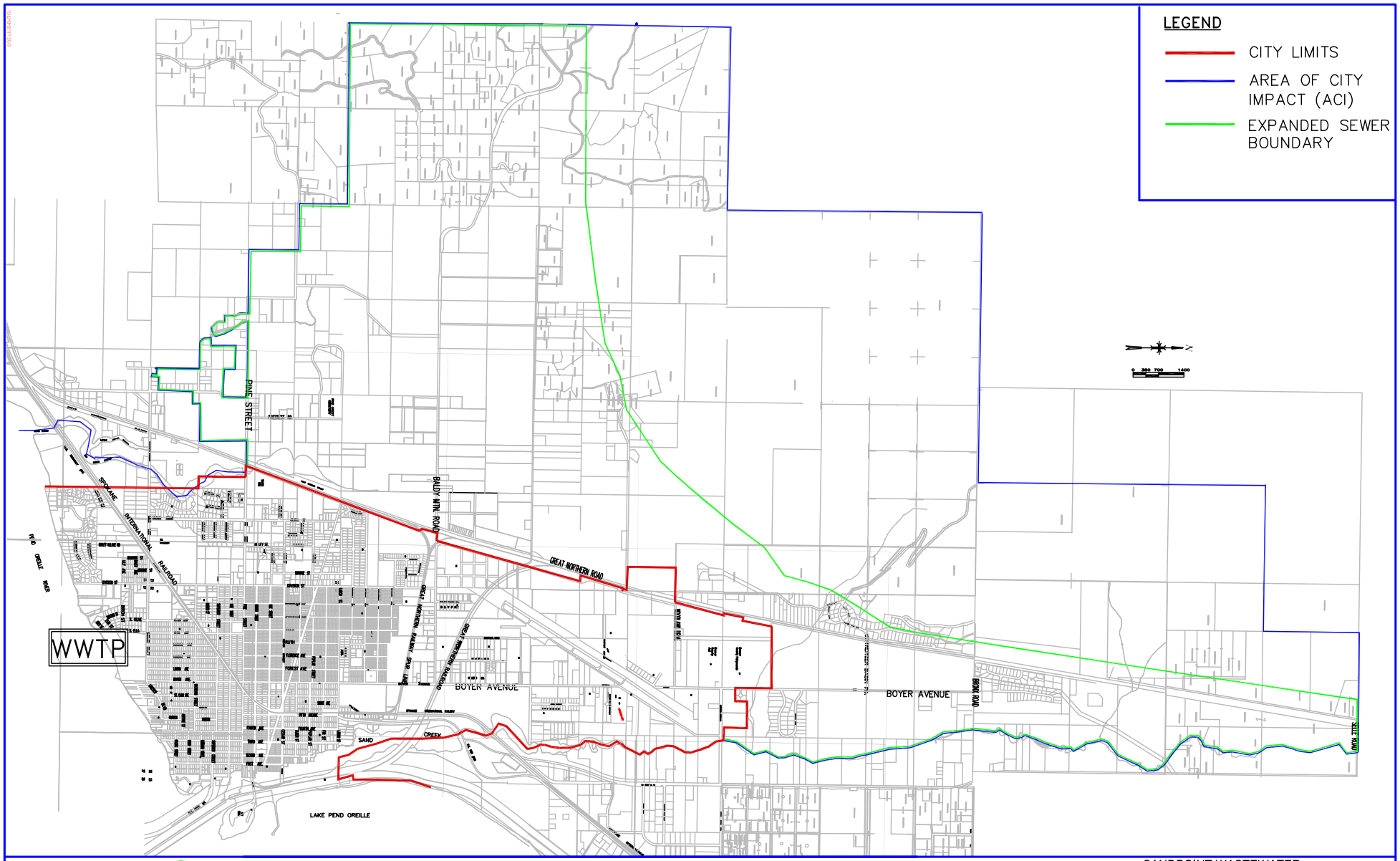
Figure 2-2 – West Side Interceptor Alternative No. 1 Alignment

Figure 2-3 – West Side Interceptor Alternative No. 2 Alignment

Figure 2-4 – Recommended Master Plan Layout – Pipe Sizes

Figure 2-5 – Recommended Master Plan Layout – Pipe Depth

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIGURE 1-1

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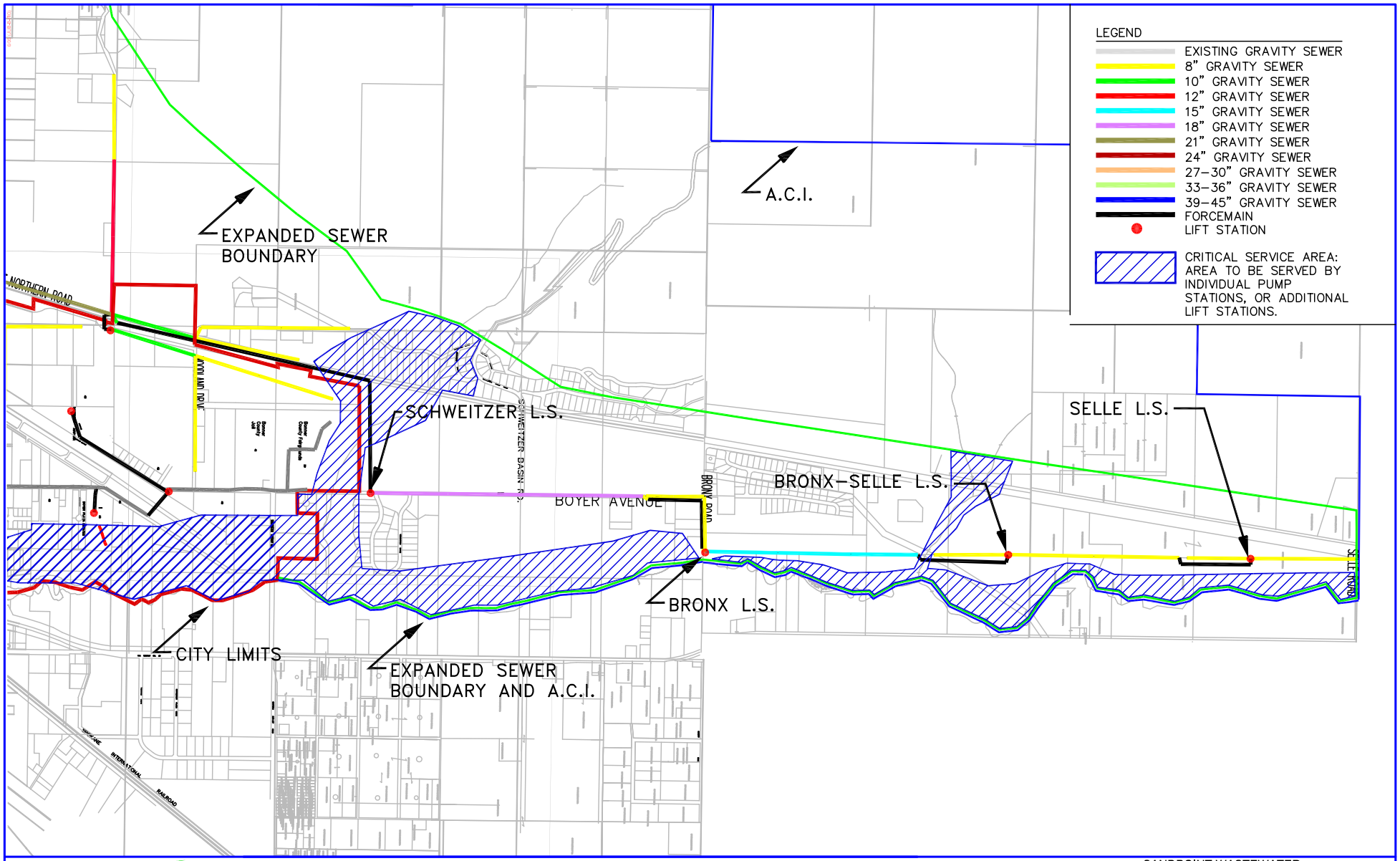
SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 1-1
EXPANDED SEWER SYSTEM BOUNDARY

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIG 2-1, 3/

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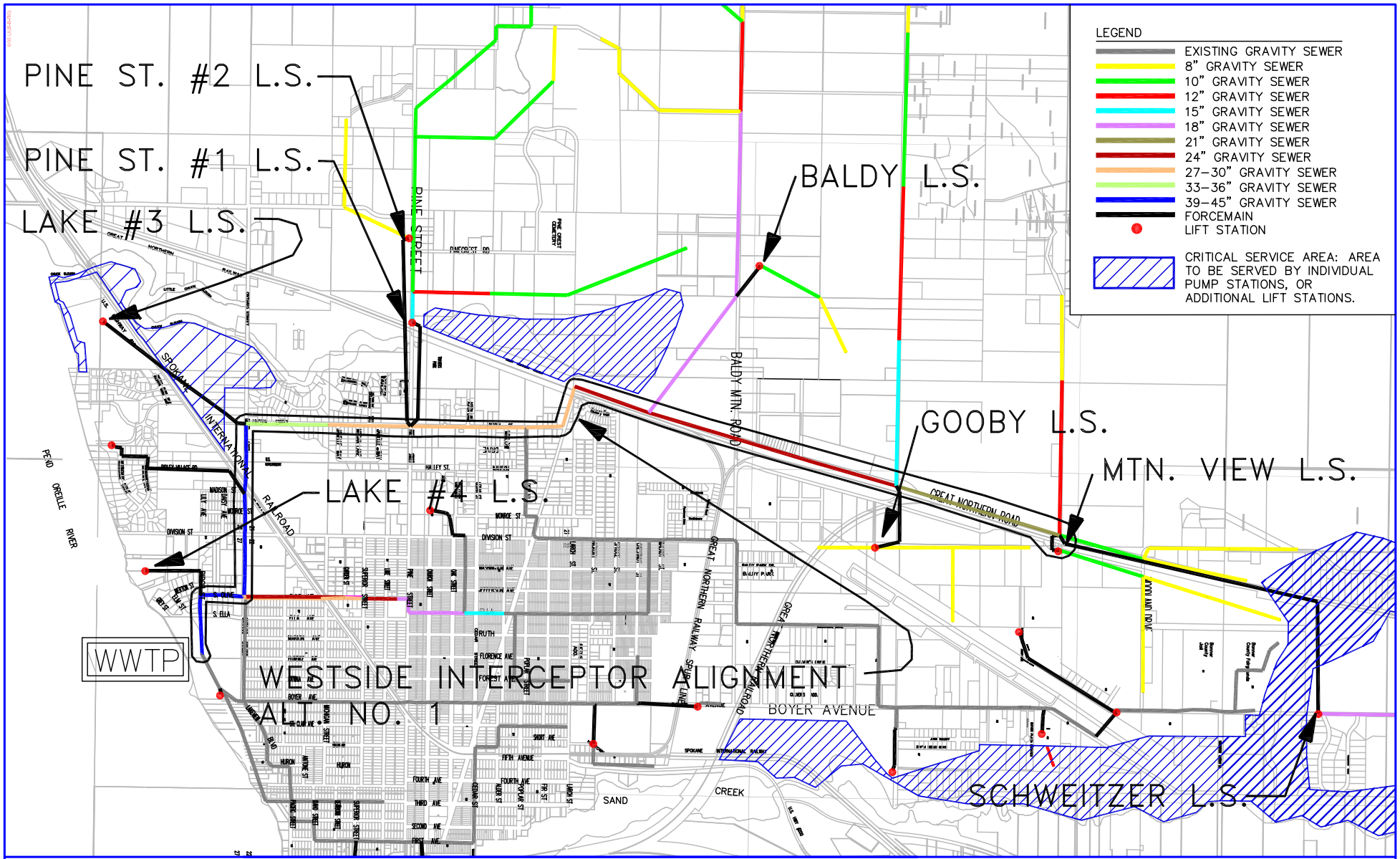
SANDPOINT WASTEWATER
FACILITY PLAN

FIGURE 2-1
NORTHERN SERVICE AREA - FUTURE LINE SIZE

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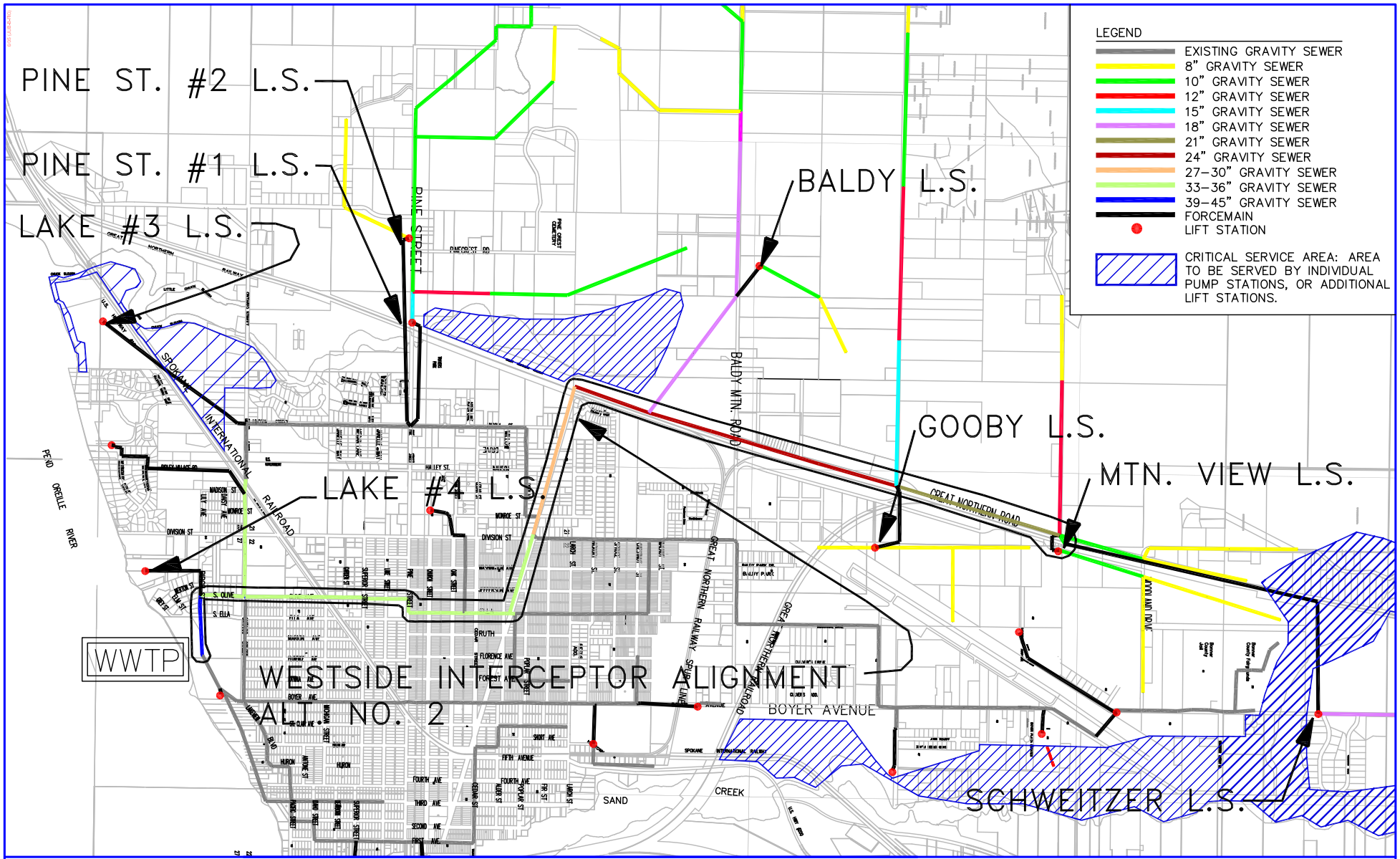
SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-2
WESTSIDE INTERCEPTOR: ALTERNATIVE NO. 1 ALIGNMENT

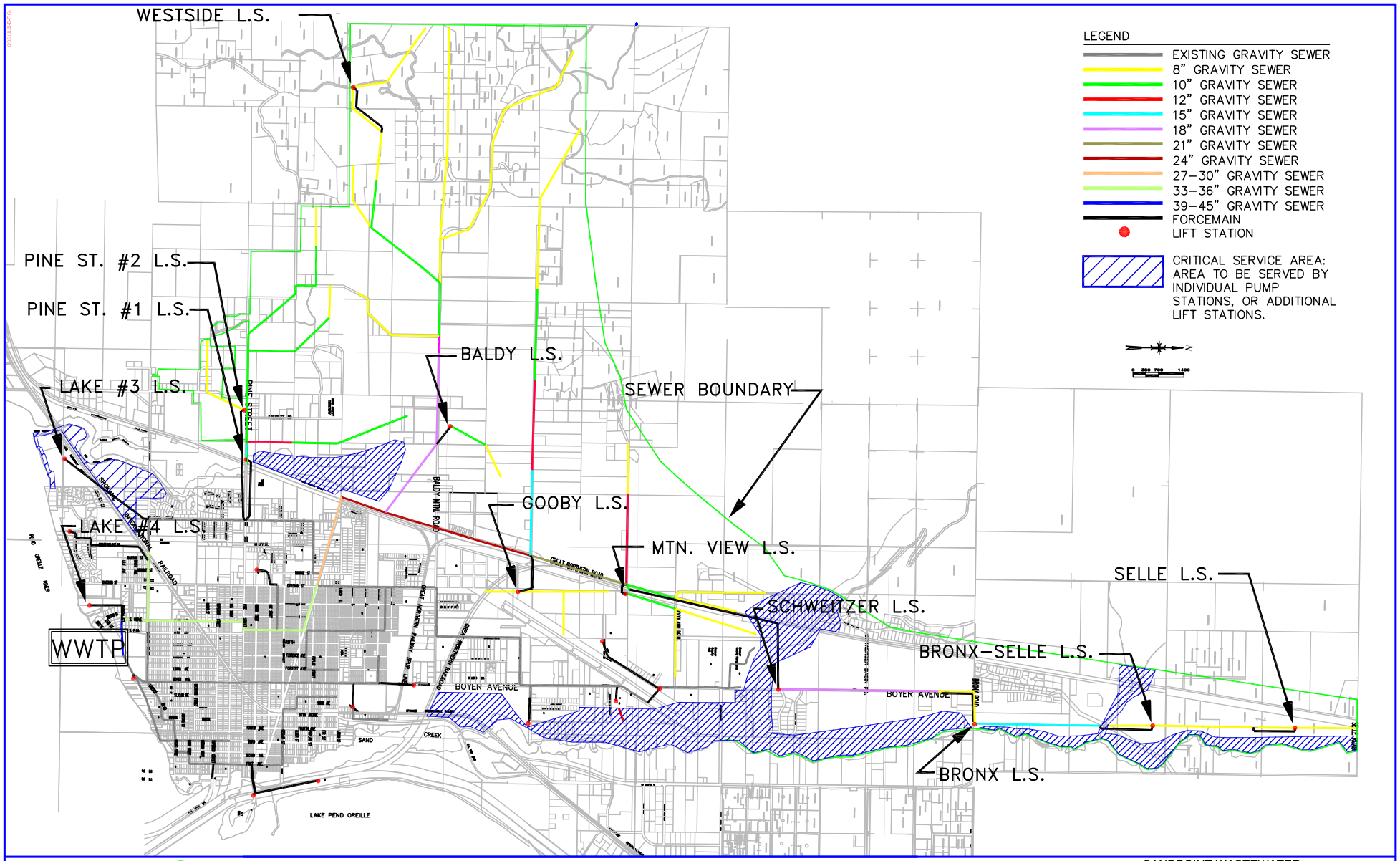
\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIG 2-2, 3/




SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-3
WESTSIDE INTERCEPTOR: ALTERNATIVE NO. 2 ALIGNMENT

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIG 2-3, 3/

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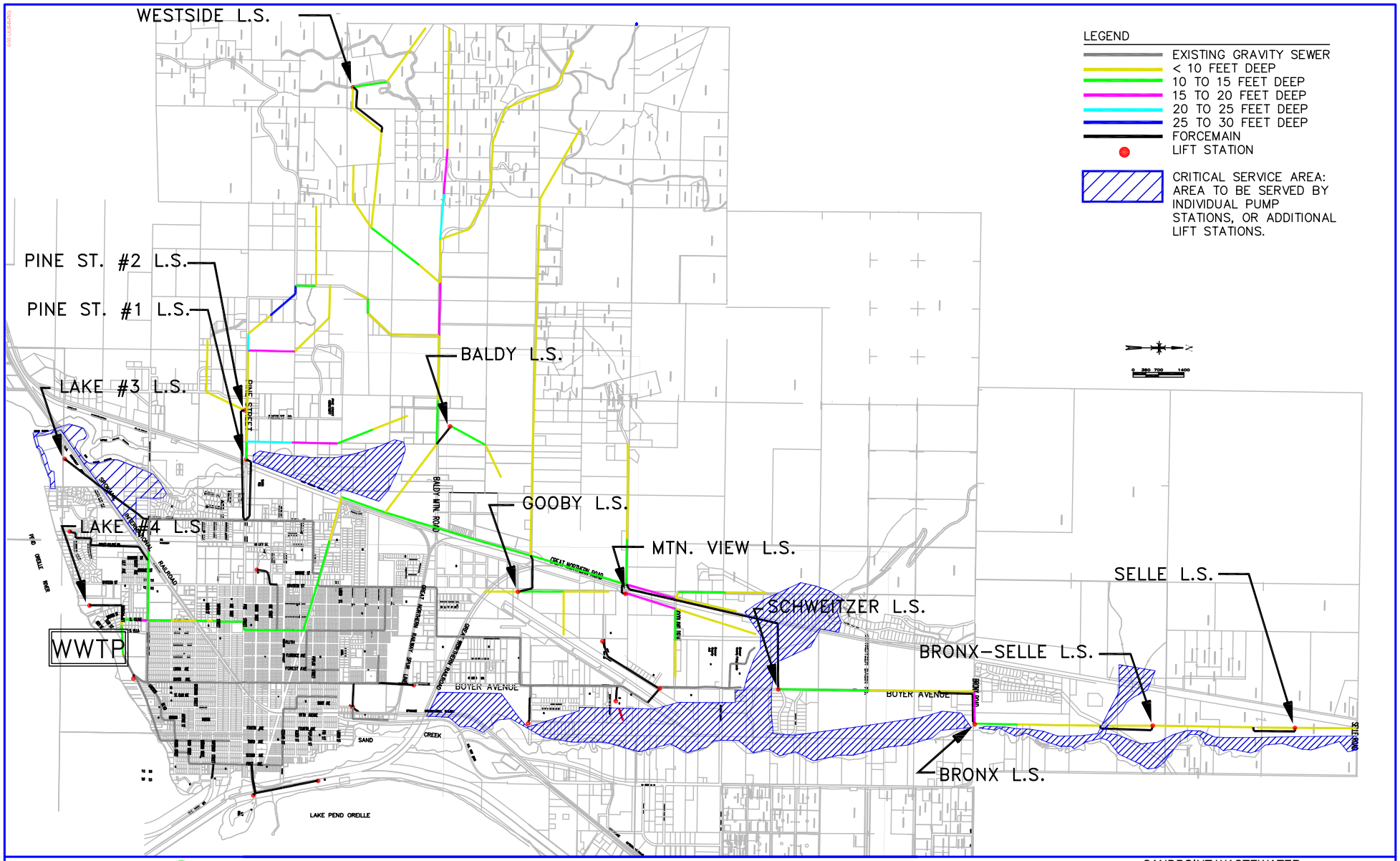
SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-4
RECOMMENDED MASTER PLAN LAYOUT: PIPE SIZES

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIGURE 2-4

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#4 FIGURE 2-5




SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-5
RECOMMENDED MASTER PLAN LAYOUT: PIPE DEPTH

# Appendix A

# Future Land Use Data

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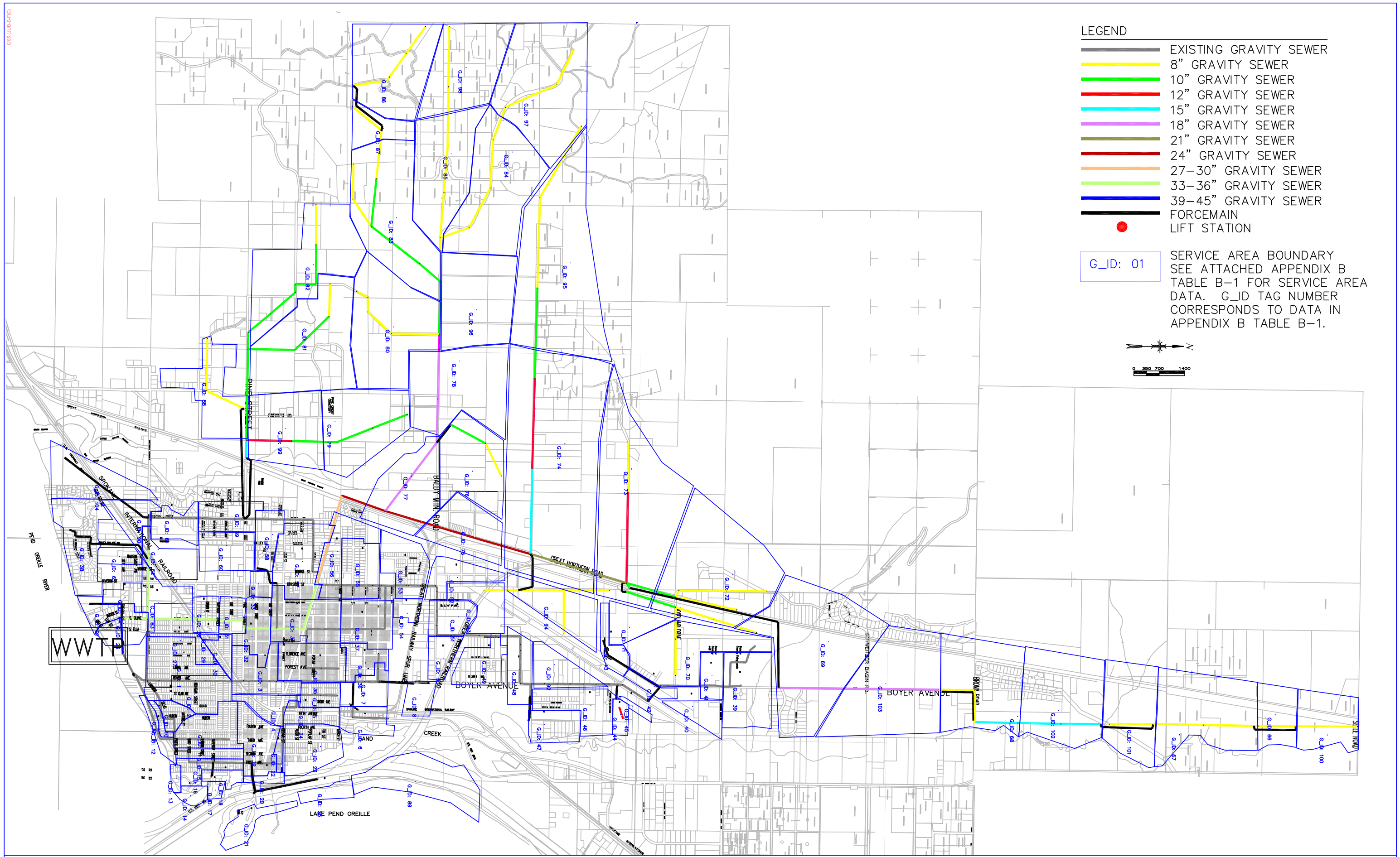


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CAD FILE: 20-05-035b

SANDPOINT WASTEWATER
FACILITY PLAN

APPENDIX B
FUTURE SERVICE AREAS

# APPENDIX A : FUTURE LAND USE DATA

| G_ID | LU_AREA | RES_POP | RES_ACTIVE | RES_CPC | RES_DIU | VIS_POP | VIS_ACTIVE | VIS_CPC | VIS_DIU | COM_VOL | COM_ACTIVE | COM_DIU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 65.4 | 366 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 5 | 25.9 | 220 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 6 | 11.0 | 94 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 11 | 22.1 | 243 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 12 | 81.0 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 150792 | 100 | COM_DIU |
| 13 | 300.3 | 2370 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 14 | 147.8 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 221670 | 100 | COM_DIU |
| 17 | 94.0 | 399 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 84600 | 20 | COM_DIU |
| 19 | 99.0 | 350 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 20 | 42.8 | 365 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 21 | 13.5 | 15 | 100 | 115 | RES_DIU | 250 | 100 | 115 | RES_DIU | 33625 | 100 | COM_DIU |
| 22 | 48.5 | 550 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 23 | 536.4 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 482400 | 100 | COM_DIU |
| 24 | 40.4 | 348 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 25 | 72.3 | 100 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 54126 | 50 | COM_DIU |
| 26 | 19.4 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 17442 | 5 | COM_DIU |
| 27 | 102.7 | 940 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 92403 | 5 | COM_DIU |
| 28 | 60.1 | 508 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 29 | 79.0 | 292 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 30 | 55.0 | 10 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 31 | 38.5 | 326 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 32 | 92.8 | 787 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 33 | 21.2 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 19100 | 5 | COM_DIU |
| 34 | 64.8 | 1 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 58293 | 100 | COM_DIU |
| 35 | 32.1 | 271 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 36 | 7.0 | 61 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 37 | 31.8 | 270 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 38 | 44.3 | 1 | 100 | 115 | RES_DIU | 600 | 100 | 115 | SCHOOL | 0 | 0 | |
| 39 | 85.2 | 721 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 40 | 4.5 | 1 | 100 | 115 | RES_DIU | 400 | 100 | 115 | SCHOOL | 0 | 0 | |
| 41 | 16.9 | 1 | 100 | 115 | RES_DIU | 350 | 100 | 115 | SCHOOL | 0 | 0 | |
| 42 | 1197.8 | 549 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 43 | 512.5 | 2934 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 44 | 2455.7 | 22493 | 100 | 115 | RES_DIU | 0 | 0 | 0 | | 0 | 0 | |
| 45 | 61.7 | 523 | 100 | 115 | RES_DIU | | | | | | | |

# Appendix B

# Future Service Area Data

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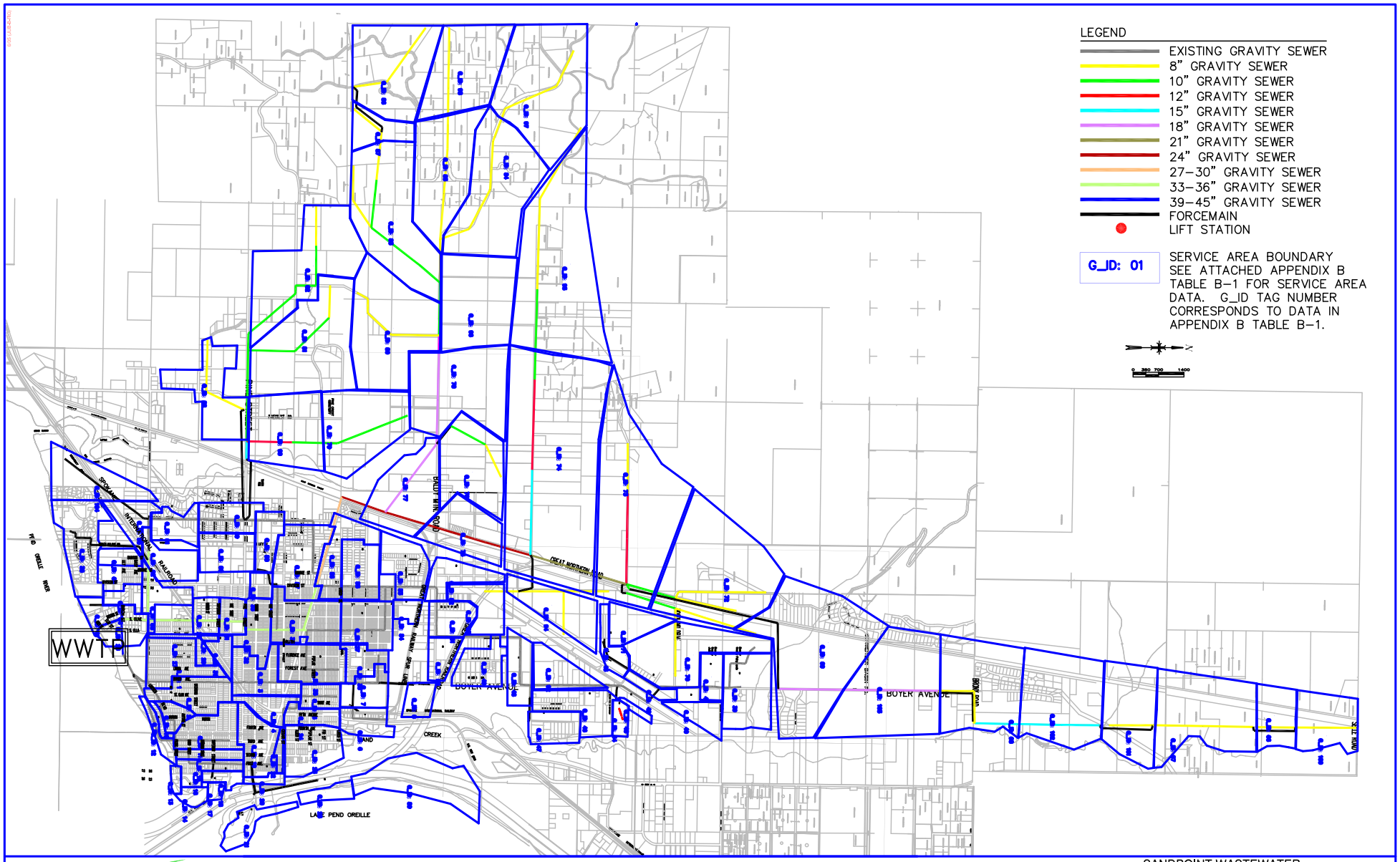


SANDPOINT WASTEWATER FACILITY PLAN

APPENDIX B
FUTURE SERVICE AREAS

# APPENDIX B: FUTURE SERVICE AREA DATA

| G_ID | G_SIZE | SY_DELAY | SE_AREA |
|---|---|---|---|
| 1 | 1897553.25 | 10.75 | 43.56 |
| 2 | 1699998.38 | 1.47 | 39.03 |
| 3 | 1689981.63 | 9.67 | 38.80 |
| 4 | 810967.19 | 5.00 | 18.62 |
| 5 | 713834.75 | 4.22 | 16.39 |
| 6 | 1018205.88 | 2.53 | 23.37 |
| 7 | 1138757.50 | 4.54 | 26.14 |
| 8 | 727775.31 | 3.35 | 16.71 |
| 9 | 180547.66 | 1.01 | 4.14 |
| 10 | 520436.63 | 4.18 | 11.95 |
| 11 | 1711711.50 | 7.63 | 39.30 |
| 12 | 485284.94 | 1.27 | 11.14 |
| 13 | 198686.73 | 5.51 | 4.56 |
| 14 | 365430.56 | 7.57 | 8.39 |
| 15 | 526254.31 | 1.55 | 12.08 |
| 16 | 790053.44 | 3.18 | 18.14 |
| 17 | 200521.94 | 1.28 | 4.60 |
| 18 | 398850.00 | 2.03 | 9.16 |
| 19 | 1649015.75 | 13.08 | 37.86 |
| 20 | 261200.23 | 1.21 | 6.00 |
| 21 | 961046.44 | 5.15 | 22.06 |
| 22 | 211547.92 | 2.15 | 4.86 |
| 23 | 1930999.75 | 14.05 | 44.33 |
| 24 | 744257.13 | 1.62 | 17.09 |
| 25 | 578896.63 | 2.47 | 13.29 |
| 26 | 1069979.75 | 3.74 | 24.56 |
| 27 | 418283.13 | 2.77 | 9.60 |
| 28 | 715784.56 | 7.92 | 16.43 |
| 29 | 71314.80 | 3.38 | 1.64 |
| 30 | 497362.88 | 5.85 | 11.42 |
| 31 | 696886.13 | 17.71 | 16.00 |
| 32 | 1230754.38 | 2.51 | 28.25 |
| 33 | 429383.44 | 0.71 | 9.86 |
| 34 | 2331049.25 | 7.53 | 53.51 |
| 35 | 1944356.38 | 5.22 | 44.64 |
| 36 | 871020.38 | 6.75 | 20.00 |
| 37 | 1784539.88 | 9.50 | 40.97 |
| 38 | 2689558.25 | 6.18 | 61.74 |
| 39 | 2733007.50 | 3.62 | 62.74 |
| 40 | 899229.13 | 2.47 | 20.64 |
| 41 | 787303.31 | 7.53 | 18.07 |
| 42 | 441190.75 | 6.98 | 10.13 |
| 43 | 757986.69 | 6.45 | 17.40 |
| 44 | 401107.13 | 1.23 | 9.21 |
| 45 | 168187.98 | 1.56 | 3.86 |
| 46 | 1908577.63 | 2.65 | 43.81 |
| 47 | 1239150.50 | 6.64 | 28.45 |
| 48 | 1311587.75 | 1.28 | 30.11 |
| 49 | 1415516.75 | 3.24 | 32.50 |
| 50 | 831726.50 | 3.55 | 19.09 |
| 51 | 1155972.00 | 7.40 | 26.54 |
| 52 | 1262372.38 | 11.06 | 28.98 |

# APPENDIX B: FUTURE SERVICE AREA DATA

| G_ID | G_SIZE | SY_DELAY | SE_AREA |
|---|---|---|---|
| 53 | 1810162.50 | 11.48 | 41.56 |
| 54 | 423583.25 | 5.16 | 9.72 |
| 55 | 1638651.13 | 14.05 | 37.62 |
| 56 | 1653610.75 | 13.99 | 37.96 |
| 57 | 2559954.25 | 6.34 | 58.77 |
| 58 | 1048668.75 | 1.01 | 24.07 |
| 59 | 1338934.00 | 7.86 | 30.74 |
| 60 | 1610447.50 | 4.88 | 36.97 |
| 61 | 1092365.63 | 5.10 | 25.08 |
| 62 | 1332894.00 | 4.11 | 30.60 |
| 63 | 1067199.25 | 4.43 | 24.50 |
| 64 | 537378.25 | 8.58 | 12.34 |
| 65 | 526699.75 | 13.22 | 12.09 |
| 66 | 1788506.00 | 18.24 | 41.06 |
| 67 | 5608179.00 | 9.16 | 128.75 |
| 68 | 5499848.50 | 16.65 | 126.26 |
| 69 | 9358001.00 | 22.34 | 214.83 |
| 70 | 4041400.50 | 7.98 | 92.78 |
| 71 | 1238779.75 | 7.49 | 28.44 |
| 72 | 8206114.00 | 11.42 | 188.39 |
| 73 | 10042647.00 | 4.94 | 230.55 |
| 74 | 16000775.00 | 11.34 | 367.33 |
| 75 | 2640312.25 | 16.63 | 60.61 |
| 76 | 3805631.00 | 7.35 | 87.37 |
| 77 | 3657404.25 | 6.11 | 83.96 |
| 78 | 5714144.00 | 16.03 | 131.18 |
| 79 | 4490840.50 | 16.02 | 103.10 |
| 80 | 6399346.00 | 9.42 | 146.91 |
| 81 | 6805998.00 | 7.59 | 156.24 |
| 82 | 6076176.50 | 2.80 | 139.49 |
| 83 | 6809111.50 | 11.61 | 156.32 |
| 84 | 6645234.50 | 11.54 | 152.55 |
| 85 | 4958582.00 | 19.57 | 113.83 |
| 86 | 5241947.00 | 6.32 | 120.34 |
| 87 | 1307753.38 | 14.10 | 30.02 |
| 88 | 3254636.50 | 8.93 | 74.72 |
| 89 | 3267667.50 | 35.53 | 75.02 |
| 90 | 1068702.25 | 8.55 | 24.53 |
| 91 | 679370.19 | 17.10 | 15.60 |
| 92 | 1446378.88 | 12.02 | 33.20 |
| 93 | 1488127.38 | 13.25 | 34.16 |
| 94 | 2433063.25 | 15.18 | 55.86 |
| 95 | 10666448.00 | 32.19 | 244.87 |
| 96 | 4985328.00 | 18.61 | 114.45 |
| 97 | 7689570.50 | 14.66 | 176.53 |
| 98 | 4600945.00 | 5.91 | 105.62 |
| 99 | 4007098.75 | 10.97 | 91.99 |
| 100 | 2523221.50 | 11.72 | 57.93 |
| 101 | 3716010.75 | 3.97 | 85.31 |
| 102 | 5376078.00 | 18.67 | 123.42 |
| 103 | 7220208.50 | 21.14 | 165.75 |
| 104 | 2575299.25 | 27.42 | 59.12 |

# Appendix C

# Future Model System Data

# APPENDIX C: FUTURE SYSTEM DATA

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | EPI | 364.4719 | 2080.242 | 2078.47 | 2068.88 | 2068.44 | 18 | 208.814 | 3.1223 | 2.0978 | 1.6676 | 0.00121 | 0.8 |
| 14 | EPI | 313.4855 | 2072.906 | 2080.2419 | 2069.33 | 2068.88 | 18 | 187.862 | 2.8558 | 2.1715 | 1.5509 | 0.00144 | 0.7067 |
| 16 | EPI | 451.9279 | 2082 | 2072.906 | 2072.23 | 2069.33 | 18 | 187.862 | 2.4207 | 3.5115 | 1.4098 | 0.00642 | 0.4267 |
| 18 | EPI | 368.9254 | 2084.9299 | 2082 | 2074.20 | 2072.23 | 18 | 187.862 | 2.2461 | 3.2033 | 1.3306 | 0.00534 | 0.4267 |
| 20 | EPI | 246.7034 | 2086.1799 | 2084.9299 | 2074.59 | 2074.20 | 12 | 187.862 | 2.1696 | 2.7748 | 1.2785 | 0.00158 | 1 |
| 22 | EPI | 83.7629 | 2086.3799 | 2086.1799 | 2074.66 | 2074.59 | 12 | 84.934 | 1.7295 | 2.213 | 0.9874 | 0.00083 | 1 |
| 24 | EPI | 185.1851 | 2086.5 | 2086.3799 | 2075.38 | 2074.66 | 12 | 47.413 | 1.5085 | 2.6803 | 0.8556 | 0.00389 | 0.68 |
| 26 | EPI | 106.523 | 2087.22 | 2086.5 | 2075.72 | 2075.38 | 12 | 47.413 | 1.4284 | 2.4596 | 0.8092 | 0.00319 | 0.7 |
| 28 | EPI | 282.4231 | 2084.5801 | 2087.22 | 2076.78 | 2075.72 | 10 | 47.413 | 1.3291 | 2.6013 | 0.752 | 0.00375 | 0.912 |
| 30 | EPI | 185.2044 | 2087.8999 | 2084.5801 | 2077.49 | 2076.78 | 10 | 47.413 | 1.2505 | 2.5744 | 0.7061 | 0.00383 | 0.84 |
| 34 | EPI | 358.3481 | 2073.75 | 2072.1499 | 2067.39 | 2066.75 | 18 | 208.814 | 3.5089 | 2.5017 | 1.795 | 0.00179 | 0.76 |
| 46 | EPI | 311.0349 | 2078.47 | 2073.75 | 2068.44 | 2067.39 | 18 | 208.814 | 3.3145 | 3.082 | 1.7311 | 0.00338 | 0.6 |
| 48 | EPI | 75.676 | 2072.1499 | 2072 | 2066.75 | 2066.00 | 18 | 211.828 | 3.7263 | 4.6533 | 1.8672 | 0.00991 | 0.48 |
| 50 | EPI | 249.6989 | 2072 | 2071.79 | 2066.00 | 2065.06 | 18 | 211.828 | 3.9247 | 3.3602 | 1.9312 | 0.00376 | 0.64 |
| 52 | EPI | 417.9665 | 2071.79 | 2072.6001 | 2065.06 | 2064.40 | 24 | 276.444 | 7.0854 | 2.8344 | 2.722 | 0.00158 | 0.75 |
| 54 | EPI | 359.797 | 2073.28 | 2071.79 | 2065.88 | 2065.06 | 12 | 48.891 | 0.9278 | 1.9322 | 0.2613 | 0.00228 | 0.6 |
| 56 | EPI | 360.9876 | 2070.4399 | 2073.28 | 2066.09 | 2065.88 | 10 | 48.891 | 0.7236 | 1.3355 | 0.2168 | 0.00058 | 1 |
| 58 | EPI | 304.0426 | 2070.9199 | 2070.4399 | 2066.93 | 2066.09 | 10 | 48.891 | 0.5189 | 1.7975 | 0.1724 | 0.00276 | 0.552 |
| 60 | EPI | 473.5606 | 2086.1699 | 2070.9199 | 2080.79 | 2066.93 | 10 | 0 | 0.2095 | 3.2522 | 0.0448 | 0.02927 | 0.192 |
| 66 | EPI | 266.389 | 2072.6001 | 2073.1799 | 2064.40 | 2063.38 | 24 | 276.444 | 7.265 | 3.902 | 2.7862 | 0.00383 | 0.58 |
| 68 | EPI | 308.7764 | 2073.1799 | 2072.8701 | 2063.38 | 2063.19 | 24 | 276.444 | 7.4166 | 2.3834 | 2.8475 | 0.00062 | 1 |
| 70 | EPI | 383.937 | 2072.8701 | 2070.2419 | 2063.19 | 2062.40 | 24 | 283.543 | 7.5673 | 3.1768 | 2.9201 | 0.00206 | 0.72 |
| 72 | EPI | 302.4417 | 2070.2419 | 2073.54 | 2062.40 | 2062.73 | 24 | 283.543 | 7.5816 | 2.4431 | 2.9524 | -0.0011 | 1 |
| 74 | EPI | 292.8668 | 2073.54 | 2071.0901 | 2062.73 | 2062.05 | 24 | 283.543 | 7.5288 | 3.3091 | 2.9586 | 0.00232 | 0.69 |
| 76 | EPI | 176.8181 | 2071.0901 | 2085.2371 | 2062.05 | 2061.14 | 24 | 283.543 | 7.4718 | 4.3896 | 2.9645 | 0.00515 | 0.55 |
| 80 | EPI | 129.5909 | 2085.2371 | 2085 | 2061.14 | 2061.00 | 24 | 283.543 | 7.4014 | 2.3791 | 2.9616 | 0.00108 | 1 |
| 97 | EPI | 258.6371 | 2076.5 | 2071.79 | 2069.91 | 2065.06 | 18 | 15.725 | 2.0668 | 4.8689 | 0.4686 | 0.01875 | 0.2933 |
| 98 | EPI | 308.2376 | 2084.6699 | 2076.5 | 2071.43 | 2069.91 | 10 | 15.725 | 1.8691 | 3.446 | 0.4243 | 0.00493 | 1 |
| 103 | EPI | 211.7986 | 2089 | 2085.22 | 2073.64 | 2073.32 | 15 | 0 | 0.4184 | 1.285 | 0.0895 | 0.00151 | 0.32 |
| 105 | EPI | 176.9544 | 2085.22 | 2083.8501 | 2073.32 | 2072.92 | 15 | 0 | 0.6256 | 1.6582 | 0.1342 | 0.00226 | 0.352 |
| 107 | EPI | 167.3882 | 2083.8501 | 2084.8799 | 2072.92 | 2073.23 | 15 | 15.725 | 0.8582 | 0.7031 | 0.2023 | -0.0019 | 1 |
| 109 | EPI | 165.3357 | 2084.8799 | 2084.3701 | 2073.23 | 2072.29 | 15 | 15.725 | 1.0645 | 2.6957 | 0.247 | 0.00569 | 0.368 |
| 111 | EPI | 99.9402 | 2084.3701 | 2083.9199 | 2072.29 | 2071.97 | 15 | 15.725 | 1.2696 | 2.3003 | 0.2916 | 0.0032 | 0.464 |
| 113 | EPI | 175.8584 | 2083.9199 | 2083.96 | 2071.97 | 2071.79 | 15 | 15.725 | 1.4719 | 1.6202 | 0.3359 | 0.00102 | 0.704 |
| 115 | EPI | 340.5327 | 2083.96 | 2084.6699 | 2071.79 | 2071.43 | 15 | 15.725 | 1.67 | 1.7122 | 0.38 | 0.00106 | 0.768 |
| 203 | EPI | 172.7496 | 2100.6201 | 2100.98 | 2090.64 | 2089.66 | 8 | 5.609 | 0.6477 | 2.5357 | 0.3593 | 0.00567 | 0.72 |
| 205 | EPI | 388.9014 | 2100.98 | 2097.6399 | 2089.66 | 2087.52 | 10 | 47.413 | 0.8992 | 2.659 | 0.5079 | 0.0055 | 0.6 |
| 207 | EPI | 374.9399 | 2097.6399 | 2092.8201 | 2087.52 | 2083.99 | 10 | 47.413 | 1.0005 | 3.3186 | 0.5656 | 0.00941 | 0.552 |
| 209 | EPI | 39.4929 | 2092.8201 | 2089.4399 | 2083.99 | 2079.87 | 10 | 47.413 | 1.0866 | 8.0347 | 0.6131 | 0.10432 | 0.312 |
| 211 | EPI | 335.492 | 2089.4399 | 2087.8999 | 2079.87 | 2077.49 | 10 | 47.413 | 1.1672 | 3.1893 | 0.6593 | 0.00709 | 0.672 |
| 248 | EPI | 367.6892 | 2102.5601 | 2100.6201 | 2092.45 | 2090.64 | 8 | 5.609 | 0.5635 | 2.3164 | 0.3121 | 0.00492 | 0.69 |
| 250 | EPI | 123.5298 | 2101.3601 | 2102.5601 | 2093.31 | 2092.45 | 8 | 5.609 | 0.4789 | 2.5049 | 0.2654 | 0.00696 | 0.57 |
| 254 | EPI | 210.9853 | 2102.04 | 2101.3601 | 2094.13 | 2093.31 | 8 | 5.609 | 0.3926 | 1.9256 | 0.2181 | 0.00389 | 0.6 |
| 258 | EPI | 362.7999 | 2104.27 | 2102.04 | 2096.59 | 2094.13 | 8 | 5.609 | 0.3061 | 2.1649 | 0.171 | 0.00678 | 0.45 |
| 260 | EPI | 365.373 | 2105.3701 | 2104.27 | 2098.83 | 2096.59 | 8 | 0 | 0.1744 | 1.8185 | 0.0944 | 0.00613 | 0.36 |
| 262 | EPI | 385.9561 | 2105.28 | 2105.3701 | 2100.47 | 2098.83 | 8 | 0 | 0.0875 | 1.2888 | 0.0472 | 0.00425 | 0.27 |
| 331 | EPI | 328.9789 | 2102.03 | 2099.8301 | 2096.02 | 2094.59 | 8 | 31.713 | 0.2253 | 1.6683 | 0.1593 | 0.00435 | 0.42 |
| 334 | EPI | 647.6832 | 2099.8301 | 2101.25 | 2094.59 | 2093.52 | 8 | 31.713 | 0.275 | 1.2866 | 0.1979 | 0.00165 | 0.63 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 335 | EPI | 518.2336 | 2100.28 | 2102.03 | 2097.28 | 2096.02 | 8 | 0 | 0.0513 | 0.913 | 0.0388 | 0.00243 | 0.24 |
| 342 | EPI | 147.7611 | 2111.02 | 2113.7839 | 2103.00 | 2101.76 | 8 | 0 | 0.0891 | 1.6962 | 0.0609 | 0.00839 | 0.24 |
| 347 | EPI | 89.6433 | 2113.7839 | 2113.77 | 2101.76 | 2101.54 | 8 | 0 | 0.1411 | 1.2027 | 0.0998 | 0.00245 | 0.39 |
| 348 | EPI | 364.7568 | 2113.166 | 2111 | 2109.05 | 2107.43 | 8 | 0 | 0.0371 | 1.0543 | 0.0343 | 0.00444 | 0.18 |
| 351 | EPI | 309.0122 | 2111 | 2108.6299 | 2107.43 | 2105.80 | 8 | 25.23 | 0.1319 | 1.5225 | 0.1039 | 0.00527 | 0.3 |
| 352 | EPI | 440.7541 | 2108.6299 | 2107.9199 | 2105.80 | 2103.22 | 8 | 25.23 | 0.3543 | 2.1531 | 0.2807 | 0.00585 | 0.51 |
| 354 | EPI | 380.7371 | 2107.9199 | 2108.3301 | 2103.22 | 2102.01 | 8 | 25.23 | 0.4013 | 1.7844 | 0.3193 | 0.00318 | 0.63 |
| 355 | EPI | 440.7541 | 2108.3301 | 2106.5 | 2102.01 | 2100.01 | 8 | 56.943 | 0.7779 | 2.4568 | 0.5939 | 0.00454 | 0.9 |
| 357 | EPI | 380.7371 | 2106.5 | 2104.4199 | 2100.01 | 2099.11 | 8 | 72.432 | 0.8471 | 2.4501 | 0.6542 | 0.00236 | 1 |
| 359 | EPI | 301.6389 | 2104.4199 | 2103.3601 | 2099.11 | 2097.80 | 8 | 72.432 | 0.8933 | 2.5758 | 0.6927 | 0.00434 | 1 |
| 361 | EPI | 366.4967 | 2103.3601 | 2103.05 | 2097.80 | 2096.23 | 8 | 72.432 | 0.9394 | 2.708 | 0.7313 | 0.00428 | 1 |
| 363 | EPI | 278.0002 | 2103.05 | 2102.01 | 2096.23 | 2095.12 | 8 | 72.432 | 0.9859 | 2.841 | 0.7699 | 0.00399 | 1 |
| 365 | EPI | 178.5468 | 2102.01 | 2101.6399 | 2095.12 | 2094.57 | 12 | 72.432 | 1.0381 | 2.2467 | 0.8115 | 0.00308 | 0.6 |
| 367 | EPI | 202.0135 | 2101.6399 | 2100.6399 | 2094.57 | 2088.10 | 12 | 72.432 | 1.0934 | 5.0998 | 0.856 | 0.03203 | 0.32 |
| 368 | EPI | 196.099 | 2100.6399 | 2097.49 | 2088.10 | 2087.96 | 12 | 72.432 | 1.1466 | 1.4684 | 0.9004 | 0.00071 | 1 |
| 370 | EPI | 183.633 | 2097.49 | 2095.9299 | 2087.96 | 2087.03 | 12 | 80.52 | 1.2508 | 2.8268 | 0.9776 | 0.00506 | 0.58 |
| 371 | EPI | 196.099 | 2095.9299 | 2095 | 2087.03 | 2085.50 | 12 | 114.366 | 1.3808 | 3.3685 | 1.081 | 0.0078 | 0.54 |
| 373 | EPI | 183.633 | 2095 | 2094.51 | 2085.50 | 2086.01 | 12 | 114.366 | 1.4317 | 1.8333 | 1.1251 | -0.0028 | 1 |
| 375 | EPI | 134.9354 | 2094.51 | 2097.1089 | 2086.01 | 2085.00 | 12 | 114.366 | 1.4856 | 3.3691 | 1.1695 | 0.00749 | 0.56 |
| 377 | EPI | 100.4024 | 2097.1089 | 2097 | 2085.00 | 2084.76 | 12 | 114.366 | 1.539 | 2.2755 | 1.2139 | 0.00239 | 0.82 |
| 379 | EPI | 279.1642 | 2097 | 2091.1499 | 2084.76 | 2084.06 | 12 | 114.366 | 1.589 | 2.3305 | 1.2579 | 0.00251 | 0.82 |
| 381 | EPI | 354.8454 | 2091.1499 | 2096.03 | 2084.06 | 2083.23 | 12 | 114.366 | 1.6363 | 2.3018 | 1.3017 | 0.00234 | 0.88 |
| 383 | EPI | 338.9317 | 2096.03 | 2095 | 2083.23 | 2082.39 | 15 | 114.366 | 1.6861 | 2.3213 | 1.3459 | 0.00248 | 0.592 |
| 385 | EPI | 335.4744 | 2095 | 2094.3601 | 2082.39 | 2081.55 | 15 | 114.366 | 1.7388 | 2.3329 | 1.39 | 0.0025 | 0.592 |
| 386 | EPI | 338.9317 | 2094.3601 | 2093.0601 | 2081.55 | 2080.87 | 15 | 149.222 | 1.9479 | 2.2457 | 1.5414 | 0.00201 | 0.688 |
| 388 | EPI | 335.4744 | 2093.0601 | 2091.8799 | 2080.87 | 2080.13 | 15 | 149.222 | 1.9999 | 2.3307 | 1.5855 | 0.00221 | 0.672 |
| 390 | EPI | 109.1387 | 2091.8799 | 2090.1101 | 2080.13 | 2079.22 | 15 | 149.222 | 2.0517 | 3.7114 | 1.6304 | 0.00834 | 0.464 |
| 392 | EPI | 345.6809 | 2090.1101 | 2089.28 | 2079.22 | 2078.48 | 15 | 149.222 | 2.1039 | 2.3436 | 1.6743 | 0.00214 | 0.704 |
| 393 | EPI | 109.1387 | 2089.28 | 2085.6001 | 2078.48 | 2078.20 | 21 | 189.818 | 2.6033 | 2.521 | 2.0882 | 0.00257 | 0.4457 |
| 395 | EPI | 345.6809 | 2085.6001 | 2085 | 2078.20 | 2074.67 | 21 | 189.818 | 2.601 | 4.1819 | 2.0877 | 0.01021 | 0.32 |
| 397 | EPI | 333.9125 | 2085 | 2072.6899 | 2074.67 | 2068.50 | 30 | 473.361 | 7.5984 | 6.7256 | 4.9835 | 0.01848 | 0.288 |
| 400 | EPI | 329.7258 | 2091 | 2090.3899 | 2082.39 | 2081.54 | 15 | 0 | 0.1452 | 1.2063 | 0.1203 | 0.00258 | 0.176 |
| 403 | EPI | 329.7258 | 2090.3899 | 2089.6899 | 2081.54 | 2080.75 | 15 | 40.596 | 0.3356 | 1.4279 | 0.2573 | 0.0024 | 0.256 |
| 405 | EPI | 474.777 | 2089.6899 | 2090.3101 | 2080.75 | 2079.79 | 15 | 40.596 | 0.4025 | 1.4015 | 0.3173 | 0.00202 | 0.288 |
| 407 | EPI | 520.254 | 2090.3101 | 2089.28 | 2079.79 | 2078.48 | 15 | 40.596 | 0.4692 | 1.6118 | 0.3772 | 0.00252 | 0.304 |
| 619 | EPI | 362.6187 | 2101.5901 | 2101.3 | 2090.42 | 2088.58 | 10 | 59.521 | 0.6815 | 2.3741 | 0.3341 | 0.00507 | 0.528 |
| 621 | EPI | 362.6474 | 2101.5 | 2101.5901 | 2091.54 | 2090.42 | 10 | 59.521 | 0.5716 | 1.9008 | 0.2832 | 0.00309 | 0.552 |
| 623 | EPI | 455.4614 | 2101.5 | 2101.5 | 2093.45 | 2091.54 | 8 | 9.49 | 0.3789 | 1.9439 | 0.163 | 0.00419 | 0.57 |
| 625 | EPI | 75.5333 | 2101.5 | 2101.5 | 2093.86 | 2093.45 | 8 | 9.49 | 0.2671 | 1.9373 | 0.1117 | 0.00543 | 0.45 |
| 645 | EPI | 365.0879 | 2103.1001 | 2103.47 | 2093.37 | 2091.68 | 10 | 41.326 | 0.4305 | 2.0296 | 0.2396 | 0.00463 | 0.432 |
| 647 | EPI | 355.221 | 2103.45 | 2103.1001 | 2095.52 | 2093.37 | 10 | 41.326 | 0.3216 | 2.0175 | 0.1999 | 0.00605 | 0.336 |
| 649 | EPI | 359.1684 | 2103.5 | 2103.45 | 2096.98 | 2095.52 | 8 | 41.326 | 0.2573 | 1.7355 | 0.16 | 0.00406 | 0.48 |
| 691 | EPI | 548.625 | 2103.78 | 2103.5 | 2099.11 | 2096.98 | 8 | 41.326 | 0.2041 | 1.5768 | 0.126 | 0.00388 | 0.42 |
| 693 | EPI | 352.0776 | 2104.46 | 2103.78 | 2100.56 | 2099.11 | 8 | 0 | 0.0588 | 1.1043 | 0.0341 | 0.00412 | 0.21 |
| 715 | EPI | 541.3321 | 2104 | 2103.47 | 2095.76 | 2091.68 | 12 | 57.675 | 1.3442 | 3.3107 | 0.7936 | 0.00754 | 0.54 |
| 717 | EPI | 354.4362 | 2106 | 2104 | 2097.75 | 2095.76 | 12 | 57.675 | 1.2117 | 2.8574 | 0.7209 | 0.00561 | 0.54 |
| 719 | EPI | 177.0302 | 2107.5801 | 2106 | 2098.05 | 2097.75 | 12 | 57.675 | 1.0847 | 1.8162 | 0.6473 | 0.00169 | 0.72 |
| 721 | EPI | 181.0581 | 2106.79 | 2107.5801 | 2098.35 | 2098.05 | 12 | 57.675 | 0.9632 | 1.7499 | 0.5735 | 0.00166 | 0.68 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 739 | EPI | 178.5429 | 2107.53 | 2106.79 | 2098.68 | 2098.35 | 12 | 57.675 | 0.8407 | 1.7398 | 0.4996 | 0.00185 | 0.6 |
| 749 | EPI | 183.5375 | 2108.71 | 2107.53 | 2099.54 | 2098.68 | 12 | 57.675 | 0.7183 | 2.3294 | 0.4257 | 0.00469 | 0.44 |
| 759 | EPI | 175.2971 | 2109.48 | 2108.71 | 2100.85 | 2099.54 | 12 | 38.746 | 0.5637 | 2.5484 | 0.3246 | 0.00747 | 0.34 |
| 767 | EPI | 178.466 | 2110.46 | 2109.48 | 2101.76 | 2100.85 | 10 | 38.746 | 0.4452 | 2.1299 | 0.2631 | 0.0051 | 0.432 |
| 769 | EPI | 184.0475 | 2110.8601 | 2110.46 | 2102.50 | 2101.76 | 10 | 38.746 | 0.3367 | 1.7713 | 0.2148 | 0.00402 | 0.384 |
| 771 | EPI | 354.791 | 2112.3 | 2110.8601 | 2104.90 | 2102.50 | 8 | 38.746 | 0.2631 | 2.0812 | 0.1665 | 0.00676 | 0.42 |
| 773 | EPI | 362.5095 | 2114.8301 | 2112.3 | 2106.10 | 2104.90 | 8 | 0 | 0.1245 | 1.2731 | 0.0713 | 0.00331 | 0.33 |
| 775 | EPI | 431.8422 | 2117.4399 | 2114.8301 | 2109.08 | 2106.10 | 8 | 0 | 0.0622 | 1.4294 | 0.0357 | 0.0069 | 0.21 |
| 804 | EPI | 408.0487 | 2088 | 2089.842 | 2079.56 | 2079.30 | 27 | 881.513 | 3.8099 | 1.6816 | 2.5438 | 0.00063 | 0.56 |
| 806 | EPI | 474.0675 | 2088.8601 | 2088 | 2079.88 | 2079.56 | 27 | 829.509 | 3.5967 | 1.686 | 2.415 | 0.00067 | 0.5333 |
| 824 | EPI | 163.0765 | 2088.4871 | 2088.8601 | 2080.18 | 2079.88 | 24 | 745.103 | 3.2703 | 2.3663 | 2.2005 | 0.00183 | 0.46 |
| 826 | EPI | 170.8587 | 2089.6111 | 2088.4871 | 2080.44 | 2080.18 | 24 | 745.103 | 3.2324 | 2.2255 | 2.1757 | 0.00154 | 0.48 |
| 828 | EPI | 184.9981 | 2090.04 | 2089.6111 | 2080.63 | 2080.44 | 24 | 745.103 | 3.1946 | 1.8989 | 2.1507 | 0.00101 | 0.53 |
| 830 | EPI | 111.439 | 2089.4399 | 2090.04 | 2080.83 | 2080.63 | 24 | 745.103 | 3.1571 | 2.3109 | 2.1259 | 0.00179 | 0.45 |
| 832 | EPI | 239.8338 | 2087.8 | 2089.4399 | 2081.23 | 2080.83 | 24 | 718.074 | 3.0283 | 2.2447 | 2.0427 | 0.00168 | 0.45 |
| 834 | EPI | 432.3273 | 2092.8899 | 2087.8 | 2081.94 | 2081.23 | 24 | 718.074 | 2.9895 | 2.2226 | 2.018 | 0.00165 | 0.45 |
| 836 | EPI | 153.8396 | 2093.875 | 2092.8899 | 2082.25 | 2081.94 | 21 | 718.074 | 2.9558 | 2.419 | 1.994 | 0.00202 | 0.5143 |
| 838 | EPI | 318.7963 | 2088.4099 | 2093.875 | 2083.93 | 2082.25 | 21 | 718.074 | 2.9172 | 3.3958 | 1.9686 | 0.00525 | 0.4 |
| 840 | EPI | 154.701 | 2088.3 | 2088.4099 | 2084.72 | 2083.93 | 21 | 718.074 | 2.8824 | 3.3478 | 1.9436 | 0.00511 | 0.4 |
| 842 | EPI | 176.0465 | 2090.78 | 2088.3 | 2085.64 | 2084.72 | 21 | 718.074 | 2.8495 | 3.3332 | 1.9184 | 0.00523 | 0.3886 |
| 844 | EPI | 352.2553 | 2093.8999 | 2090.78 | 2087.49 | 2085.64 | 21 | 682.512 | 2.7387 | 3.3418 | 1.8299 | 0.00525 | 0.3886 |
| 846 | EPI | 188.9637 | 2095.2 | 2093.8999 | 2088.48 | 2087.49 | 21 | 682.512 | 2.7137 | 3.3376 | 1.805 | 0.00524 | 0.3886 |
| 848 | EPI | 169.8696 | 2097.7 | 2095.2 | 2089.38 | 2088.48 | 18 | 110.564 | 0.7629 | 2.3833 | 0.4719 | 0.0053 | 0.2533 |
| 850 | EPI | 302.9373 | 2099 | 2097.7 | 2090.98 | 2089.38 | 18 | 110.564 | 0.719 | 2.3107 | 0.4463 | 0.00528 | 0.24 |
| 852 | EPI | 81.0955 | 2100 | 2099 | 2091.40 | 2090.98 | 18 | 110.564 | 0.6757 | 2.2878 | 0.4211 | 0.00518 | 0.24 |
| 854 | EPI | 90.5997 | 2100.8 | 2100 | 2091.82 | 2091.40 | 18 | 110.564 | 0.6323 | 2.1651 | 0.3955 | 0.00464 | 0.24 |
| 856 | EPI | 278.6368 | 2102 | 2100.8 | 2093.29 | 2091.82 | 18 | 110.564 | 0.5885 | 2.165 | 0.3698 | 0.00528 | 0.2133 |
| 858 | EPI | 162.3245 | 2103.5 | 2102 | 2094.15 | 2093.29 | 18 | 88.121 | 0.5237 | 2.0925 | 0.3273 | 0.0053 | 0.2 |
| 860 | EPI | 157.3169 | 2104.6001 | 2103.5 | 2094.98 | 2094.15 | 18 | 88.121 | 0.4802 | 2.0884 | 0.3016 | 0.00528 | 0.2 |
| 862 | EPI | 467.1397 | 2111.575 | 2104.6001 | 2097.47 | 2094.98 | 18 | 88.121 | 0.4394 | 2.0208 | 0.2759 | 0.00532 | 0.1867 |
| 864 | EPI | 163.3044 | 2110.2 | 2111.575 | 2098.03 | 2097.47 | 18 | 88.121 | 0.3997 | 1.691 | 0.2509 | 0.00346 | 0.2 |
| 950 | EPI | 259.8308 | 2112.6201 | 2111.353 | 2103.02 | 2102.92 | 18 | 36.128 | 0.0984 | 0.5139 | 0.0605 | 0.00037 | 0.1733 |
| 999 | EPI | 369.8302 | 2113.5 | 2111.3 | 2106.16 | 2105.38 | 18 | 279.407 | 3.0722 | 2.54 | 1.9691 | 0.00211 | 0.6533 |
| 1001 | EPI | 172.7941 | 2111.3 | 2110 | 2105.38 | 2105.01 | 18 | 279.407 | 3.1079 | 2.5588 | 1.993 | 0.00214 | 0.6533 |
| 1003 | EPI | 354.3987 | 2110 | 2109.2 | 2105.01 | 2104.26 | 18 | 279.407 | 3.1436 | 2.5682 | 2.0149 | 0.00212 | 0.6667 |
| 1005 | EPI | 209.531 | 2109.2 | 2107.8999 | 2104.26 | 2103.82 | 18 | 279.407 | 3.1793 | 2.5581 | 2.039 | 0.0021 | 0.6667 |
| 1007 | EPI | 82.194 | 2107.8999 | 2108.2 | 2103.82 | 2103.65 | 18 | 279.407 | 3.2156 | 2.563 | 2.0622 | 0.00207 | 0.68 |
| 1008 | EPI | 92.0396 | 2115.5 | 2113.5 | 2106.92 | 2106.16 | 18 | 228.538 | 2.8734 | 4.0519 | 1.8612 | 0.00826 | 0.44 |
| 1014 | EPI | 270.3806 | 2117 | 2115.5 | 2107.41 | 2106.92 | 18 | 228.538 | 2.8343 | 2.3544 | 1.8357 | 0.00181 | 0.6533 |
| 1016 | EPI | 70.5045 | 2118.3 | 2117 | 2108.03 | 2107.41 | 18 | 228.538 | 2.7965 | 4.1111 | 1.8139 | 0.0088 | 0.4267 |
| 1018 | EPI | 402.6257 | 2118.6499 | 2118.3 | 2108.23 | 2108.03 | 18 | 228.538 | 2.7569 | 1.5603 | 1.7883 | 0.0005 | 1 |
| 1020 | EPI | 127.5478 | 2123.1499 | 2118.6499 | 2108.83 | 2108.23 | 18 | 228.538 | 2.7206 | 3.2529 | 1.7685 | 0.0047 | 0.4933 |
| 1022 | EPI | 399.4347 | 2122.55 | 2123.1499 | 2108.75 | 2108.83 | 18 | 190.191 | 2.577 | 1.459 | 1.6672 | -0.0002 | 1 |
| 1024 | EPI | 383.0193 | 2124.4199 | 2122.55 | 2109.40 | 2108.75 | 18 | 181.274 | 2.5174 | 2.2164 | 1.6346 | 0.00171 | 0.6133 |
| 1038 | EPI | 364.5648 | 2124.4199 | 2124.4199 | 2110.42 | 2109.40 | 18 | 181.274 | 2.4811 | 2.6189 | 1.6132 | 0.00279 | 0.5333 |
| 1060 | EPI | 264.1006 | 2119 | 2124.4199 | 2110.17 | 2110.42 | 18 | 181.274 | 2.4425 | 1.383 | 1.5901 | -0.001 | 1 |
| 1062 | EPI | 91.5115 | 2118.1299 | 2119 | 2110.57 | 2110.17 | 18 | 181.274 | 2.3477 | 3.0446 | 1.5322 | 0.00437 | 0.4667 |
| 1064 | EPI | 283.86 | 2119.4399 | 2118.1299 | 2110.78 | 2110.57 | 18 | 181.274 | 2.3074 | 1.6101 | 1.508 | 0.00074 | 0.76 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1066 | EPI | 271.3129 | 2123.9399 | 2119.4399 | 2111.04 | 2110.78 | 18 | 181.274 | 2.2022 | 1.747 | 1.4387 | 0.00096 | 0.68 |
| 1068 | EPI | 42.2171 | 2119.27 | 2123.9399 | 2111.45 | 2111.04 | 18 | 181.274 | 2.1144 | 3.9296 | 1.3826 | 0.00971 | 0.36 |
| 1070 | EPI | 436.1394 | 2124.72 | 2119.27 | 2111.72 | 2111.45 | 18 | 181.274 | 2.0732 | 1.4704 | 1.3572 | 0.00062 | 0.76 |
| 1089 | EPI | 254.8397 | 2125 | 2124.72 | 2112.38 | 2111.72 | 18 | 181.274 | 2.0323 | 2.4132 | 1.3368 | 0.00259 | 0.4933 |
| 1091 | EPI | 426.6639 | 2125.55 | 2125 | 2113.05 | 2112.38 | 18 | 181.274 | 1.953 | 1.9946 | 1.2862 | 0.00157 | 0.5467 |
| 1101 | EPI | 337.9582 | 2121.1001 | 2125.55 | 2113.57 | 2113.05 | 18 | 181.274 | 1.9111 | 1.9742 | 1.2641 | 0.00154 | 0.5467 |
| 1109 | EPI | 221.7811 | 2121.8 | 2121.1001 | 2114.08 | 2113.57 | 18 | 181.274 | 1.8715 | 2.2415 | 1.2413 | 0.0023 | 0.48 |
| 1131 | EPI | 299.0916 | 2122.8401 | 2121.8 | 2114.48 | 2114.08 | 18 | 181.274 | 1.7726 | 1.8403 | 1.1757 | 0.00134 | 0.5467 |
| 1133 | EPI | 169.1645 | 2122.9099 | 2122.8401 | 2114.90 | 2114.48 | 18 | 181.274 | 1.7302 | 2.2583 | 1.1524 | 0.00248 | 0.4533 |
| 1135 | EPI | 126.6721 | 2126.51 | 2122.9099 | 2115.35 | 2114.90 | 18 | 181.274 | 1.6878 | 2.5673 | 1.1276 | 0.00355 | 0.4133 |
| 1137 | EPI | 53.8775 | 2127.02 | 2126.51 | 2115.62 | 2115.35 | 18 | 181.274 | 1.6466 | 2.8812 | 1.1027 | 0.00501 | 0.3733 |
| 1139 | EPI | 46.6499 | 2126 | 2127.02 | 2116.05 | 2115.62 | 18 | 181.274 | 1.5491 | 3.4994 | 1.0342 | 0.00922 | 0.3067 |
| 1141 | EPI | 299.0916 | 2125 | 2126 | 2116.33 | 2116.05 | 18 | 178.796 | 1.4595 | 1.54 | 0.9691 | 0.00094 | 0.5467 |
| 1143 | EPI | 169.1645 | 2124.5801 | 2125 | 2116.49 | 2116.33 | 18 | 178.796 | 1.4266 | 1.5253 | 0.946 | 0.00095 | 0.5333 |
| 1246 | EPI | 298.8424 | 2122 | 2121.8601 | 2118.38 | 2117.09 | 8 | 26.771 | 0.1836 | 1.6624 | 0.0897 | 0.00432 | 0.42 |
| 1256 | EPI | 298.8424 | 2121.8601 | 2124.5801 | 2117.09 | 2116.49 | 12 | 178.796 | 1.391 | 2.0856 | 0.922 | 0.00201 | 0.82 |
| 1257 | EPI | 288.4416 | 2126.26 | 2121.8601 | 2117.85 | 2117.09 | 12 | 152.025 | 1.1882 | 2.1768 | 0.8074 | 0.00263 | 0.66 |
| 1259 | EPI | 200.8691 | 2126 | 2126.26 | 2118.49 | 2117.85 | 12 | 152.025 | 1.1437 | 2.3227 | 0.7818 | 0.00319 | 0.62 |
| 1261 | EPI | 137.3431 | 2126.5 | 2126 | 2119.08 | 2118.49 | 12 | 152.025 | 1.0993 | 2.5525 | 0.7557 | 0.0043 | 0.56 |
| 1263 | EPI | 438.6024 | 2125.9299 | 2126.5 | 2119.76 | 2119.08 | 12 | 152.025 | 1.0547 | 1.7586 | 0.73 | 0.00155 | 0.74 |
| 1265 | EPI | 403.1269 | 2127.6299 | 2125.9299 | 2120.27 | 2119.76 | 12 | 152.025 | 1.0121 | 1.607 | 0.7059 | 0.00127 | 0.76 |
| 1267 | EPI | 138.8539 | 2127.99 | 2127.6299 | 2120.82 | 2120.27 | 12 | 123.029 | 0.9122 | 2.3478 | 0.6345 | 0.00396 | 0.52 |
| 1269 | EPI | 200.8691 | 2127 | 2127.99 | 2121.22 | 2120.82 | 12 | 123.029 | 0.868 | 1.8061 | 0.6089 | 0.00199 | 0.6 |
| 1271 | EPI | 137.3431 | 2128 | 2127 | 2121.48 | 2121.22 | 12 | 114.475 | 0.7669 | 1.7284 | 0.5539 | 0.00189 | 0.58 |
| 1273 | EPI | 128.9841 | 2129.51 | 2128 | 2122.10 | 2121.48 | 12 | 114.475 | 0.7235 | 2.3594 | 0.5286 | 0.00481 | 0.44 |
| 1275 | EPI | 153.181 | 2128.1201 | 2129.51 | 2122.81 | 2122.10 | 12 | 111.223 | 0.6786 | 2.2575 | 0.5008 | 0.00463 | 0.42 |
| 1297 | EPI | 191.3649 | 2134.3501 | 2134.6399 | 2130.79 | 2130.77 | 8 | 0 | 0.0441 | 0.2784 | 0.0257 | 0.0001 | 0.48 |
| 1300 | EPI | 349.1165 | 2134.6399 | 2134.26 | 2130.77 | 2127.63 | 8 | 0 | 0.0881 | 1.756 | 0.0514 | 0.00899 | 0.24 |
| 1304 | EPI | 371.9387 | 2134.26 | 2136.49 | 2127.53 | 2126.71 | 8 | 0 | 0.1322 | 1.1401 | 0.0769 | 0.0022 | 0.39 |
| 1306 | EPI | 319.0662 | 2136.49 | 2135.7 | 2126.71 | 2126.43 | 10 | 0 | 0.1763 | 0.8558 | 0.1022 | 0.00088 | 0.408 |
| 1312 | EPI | 189.2604 | 2135.7 | 2132.25 | 2126.43 | 2125.21 | 10 | 91.991 | 0.3589 | 2.1637 | 0.2251 | 0.00645 | 0.36 |
| 1314 | EPI | 231.8407 | 2132.25 | 2131.8899 | 2125.21 | 2123.59 | 10 | 91.991 | 0.3975 | 2.2527 | 0.2507 | 0.00699 | 0.36 |
| 1316 | EPI | 290.6431 | 2135.8601 | 2131.8899 | 2124.76 | 2123.59 | 8 | 0 | 0.0441 | 1.0917 | 0.0258 | 0.00403 | 0.21 |
| 1322 | EPI | 317.505 | 2131.8899 | 2131.21 | 2123.59 | 2122.90 | 12 | 91.991 | 0.4746 | 1.546 | 0.3017 | 0.00217 | 0.42 |
| 1324 | EPI | 207.8461 | 2131.21 | 2134.9099 | 2122.90 | 2121.97 | 12 | 91.991 | 0.5168 | 2.0357 | 0.3272 | 0.00447 | 0.36 |
| 1326 | EPI | 429.5716 | 2134.9099 | 2134.5901 | 2121.97 | 2121.38 | 12 | 91.991 | 0.5599 | 1.3811 | 0.3519 | 0.00137 | 0.52 |
| 1328 | EPI | 373.4157 | 2134.5901 | 2130 | 2121.38 | 2120.42 | 12 | 91.991 | 0.6036 | 1.7689 | 0.3766 | 0.00257 | 0.46 |
| 1330 | EPI | 369.8599 | 2130 | 2129.1699 | 2120.42 | 2119.55 | 12 | 110.869 | 0.6818 | 1.7674 | 0.4296 | 0.00235 | 0.5 |
| 1332 | EPI | 267.4426 | 2129.1699 | 2133 | 2119.55 | 2119.21 | 12 | 110.869 | 0.7249 | 1.4675 | 0.4545 | 0.00127 | 0.62 |
| 1369 | EPI | 298.0645 | 2128.5801 | 2126.72 | 2118.86 | 2117.60 | 12 | 111.223 | 0.8298 | 2.3192 | 0.5184 | 0.00423 | 0.48 |
| 1371 | EPI | 299.7371 | 2126.72 | 2129.0601 | 2117.60 | 2117.51 | 12 | 111.223 | 0.8731 | 1.1126 | 0.5426 | 0.0003 | 1 |
| 1445 | EPI | 330.8928 | 2091.55 | 2091 | 2082.40 | 2082.39 | 15 | 0 | 0.0746 | 0.3019 | 0.0601 | 0.00003 | 0.272 |
| 1448 | EPI | 98.7459 | 2133 | 2128.5801 | 2119.21 | 2118.86 | 12 | 110.869 | 0.7683 | 2.1232 | 0.4801 | 0.00354 | 0.48 |
| 1489 | EPI | 224.0655 | 2108.8 | 2110.2 | 2098.78 | 2098.03 | 18 | 88.121 | 0.36 | 1.6029 | 0.2253 | 0.00335 | 0.1867 |
| 1491 | EPI | 197.0012 | 2108.5 | 2108.8 | 2099.45 | 2098.78 | 18 | 88.121 | 0.3199 | 1.6157 | 0.1997 | 0.0034 | 0.1867 |
| 1493 | EPI | 288.6428 | 2107.8999 | 2108.5 | 2100.46 | 2099.45 | 18 | 36.128 | 0.2183 | 1.4368 | 0.1373 | 0.0035 | 0.1467 |
| 1495 | EPI | 366.6353 | 2108.2 | 2107.8999 | 2101.71 | 2100.46 | 18 | 36.128 | 0.1783 | 1.3562 | 0.1117 | 0.00341 | 0.1333 |
| 1497 | EPI | 370.0939 | 2111.353 | 2108.2 | 2102.92 | 2101.71 | 18 | 36.128 | 0.1382 | 1.2568 | 0.0862 | 0.00328 | 0.12 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1550 | EPI | 231.5124 | 2089.28 | 2089 | 2078.48 | 2073.64 | 15 | 0 | 0.2095 | 2.916 | 0.0448 | 0.02091 | 0.128 |
| 481 | DPI | 169.907 | 2082.8201 | 2085.9199 | 2074.3451 | 2074.0752 | 36 | 5026.364 | 20.6359 | 3.7032 | 15.5922 | 0.00159 | 0.74 |
| 483 | DPI | 160.8276 | 2085.9199 | 2088.1599 | 2073.9752 | 2073.7144 | 36 | 5026.364 | 20.6114 | 3.7267 | 15.5928 | 0.00162 | 0.7333 |
| 499 | DPI | 322.8666 | 2091.5801 | 2087.2419 | 2075.3909 | 2074.968 | 36 | 4974.682 | 20.4428 | 3.4478 | 15.4854 | 0.00131 | 0.7867 |
| 502 | DPI | 322.8666 | 2087.2419 | 2082.8201 | 2074.868 | 2074.4451 | 36 | 4999.564 | 20.5074 | 3.4478 | 15.5374 | 0.00131 | 0.7867 |
| 527 | DPI | 175.6002 | 2092.6699 | 2091.26 | 2083.29 | 2081.5901 | 33 | 3995.037 | 16.6605 | 6.6018 | 12.3303 | 0.00968 | 0.4436 |
| 529 | DPI | 527.288 | 2091.26 | 2092 | 2081.5901 | 2081.01 | 36 | 3995.037 | 16.8692 | 3.0694 | 12.4021 | 0.0011 | 0.7333 |
| 531 | DPI | 625.476 | 2092 | 2091.6001 | 2081.01 | 2080.48 | 36 | 4001.262 | 16.8582 | 2.7903 | 12.4267 | 0.00085 | 0.8 |
| 543 | DPI | 288.654 | 2094.8401 | 2092.6699 | 2083.77 | 2083.29 | 33 | 3995.037 | 16.25 | 3.5475 | 12.176 | 0.00166 | 0.7273 |
| 544 | DPI | 150.906 | 2094 | 2094.8401 | 2084.0549 | 2083.77 | 33 | 3983.156 | 15.7911 | 3.675 | 11.9845 | 0.00189 | 0.6836 |
| 545 | DPI | 130.935 | 2094.3101 | 2094 | 2084.3 | 2084.0549 | 33 | 3983.156 | 15.5911 | 3.6595 | 11.8283 | 0.00187 | 0.6836 |
| 557 | DPI | 183.2074 | 2095.0701 | 2094.3 | 2084.8201 | 2084.46 | 30 | 3983.156 | 15.2536 | 3.7355 | 11.5362 | 0.00197 | 0.784 |
| 573 | DPI | 360.5333 | 2095.8201 | 2095.0701 | 2085.47 | 2084.8201 | 30 | 3957.846 | 15.0204 | 3.6038 | 11.3534 | 0.0018 | 0.8 |
| 581 | DPI | 181.0549 | 2096.8501 | 2095.8201 | 2085.8501 | 2085.47 | 30 | 3957.846 | 14.8926 | 3.7964 | 11.241 | 0.0021 | 0.752 |
| 583 | DPI | 226.2973 | 2096.74 | 2096.8501 | 2086.29 | 2085.8501 | 30 | 3957.846 | 14.7694 | 3.6852 | 11.1311 | 0.00194 | 0.768 |
| 585 | DPI | 141.9412 | 2096.9399 | 2096.74 | 2086.7 | 2086.29 | 30 | 3928.479 | 14.5623 | 4.2096 | 10.9549 | 0.00289 | 0.664 |
| 597 | DPI | 380.5507 | 2099.5801 | 2096.9399 | 2087.6399 | 2086.7 | 30 | 3928.479 | 14.4349 | 3.9755 | 10.842 | 0.00247 | 0.696 |
| 611 | DPI | 382.6603 | 2101.3 | 2099.5801 | 2088.5801 | 2087.6399 | 30 | 3928.479 | 14.3082 | 3.965 | 10.7348 | 0.00246 | 0.696 |
| 627 | DPI | 198.91 | 2101.3101 | 2101.3 | 2089.1201 | 2088.5801 | 30 | 3868.958 | 13.7093 | 4.0588 | 10.258 | 0.00271 | 0.656 |
| 641 | DPI | 441.6926 | 2102.5 | 2101.3101 | 2090.5 | 2089.1201 | 30 | 3868.958 | 13.5993 | 4.2505 | 10.169 | 0.00312 | 0.624 |
| 781 | DPI | 629.9797 | 2088.1599 | 2072.6899 | 2073.6144 | 2068.5 | 60 | 5026.364 | 20.5878 | 6.2169 | 15.5926 | 0.00812 | 0.228 |
| 789 | DPI | 29.1438 | 2091.52 | 2091.5801 | 2076.0575 | 2076.0284 | 27 | 973.42 | 4.2799 | 2.0357 | 3.0481 | 0.001 | 0.5244 |
| 791 | DPI | 226.953 | 2088.179 | 2091.52 | 2076.3845 | 2076.1575 | 27 | 973.42 | 4.277 | 2.0357 | 3.043 | 0.001 | 0.5244 |
| 793 | DPI | 105.0944 | 2089.104 | 2088.179 | 2076.5896 | 2076.4845 | 27 | 973.42 | 4.2728 | 2.0357 | 3.0381 | 0.001 | 0.5244 |
| 795 | DPI | 509.3665 | 2088.5 | 2089.104 | 2077.1989 | 2076.6896 | 27 | 973.42 | 4.27 | 2.0357 | 3.0326 | 0.001 | 0.5244 |
| 797 | DPI | 292.557 | 2088.8999 | 2088.5 | 2077.5915 | 2077.2989 | 27 | 973.42 | 4.2657 | 2.0357 | 3.028 | 0.001 | 0.5244 |
| 798 | DPI | 105.0944 | 2088 | 2088.8999 | 2077.7966 | 2077.6915 | 27 | 973.42 | 4.2605 | 2.0357 | 3.023 | 0.001 | 0.5244 |
| 800 | DPI | 509.3665 | 2088.8811 | 2089.6941 | 2078.8094 | 2078.3001 | 27 | 949.57 | 4.0764 | 2.0153 | 2.8945 | 0.001 | 0.5156 |
| 802 | DPI | 292.557 | 2089.842 | 2088.8811 | 2079.202 | 2078.9094 | 27 | 881.513 | 3.8487 | 1.9744 | 2.743 | 0.001 | 0.4978 |
| 1441 | DPI | 16.8193 | 2091.6001 | 2091.5801 | 2080.48 | 2080.3799 | 36 | 4001.262 | 16.804 | 5.506 | 12.4396 | 0.00595 | 0.4467 |
| 1442 | DPI | 24.488 | 2072.6899 | 2072 | 2068.5 | 2068 | 36 | 5499.725 | 27.1159 | 9.8563 | 20.9242 | 0.02042 | 0.42 |
| 1507 | DPI | 23.739 | 2094.3 | 2094.3101 | 2084.46 | 2084.3 | 30 | 3983.156 | 15.4073 | 5.7902 | 11.6707 | 0.00674 | 0.544 |
| 1549 | DPI | 303.492 | 2089.6941 | 2088 | 2078.2001 | 2077.8966 | 27 | 949.57 | 4.113 | 2.0153 | 2.9247 | 0.001 | 0.5156 |
| 1558 | DPI | 1272.7535 | 2118 | 2108 | 2106.6975 | 2101 | 24 | 3490.55 | 8.778 | 4.3708 | 6.3921 | 0.00448 | 0.62 |
| 1560 | DPI | 2500.0002 | 2122 | 2118 | 2110.2828 | 2107.7828 | 24 | 2117.055 | 6.0933 | 2.3027 | 4.3129 | 0.001 | 0.79 |
| 1562 | DPI | 1667.9778 | 2130 | 2125 | 2115.8691 | 2114.2011 | 24 | 2117.055 | 6.1109 | 2.3027 | 4.3125 | 0.001 | 0.79 |
| 1564 | DPI | 2755.8752 | 2130 | 2130 | 2119.325 | 2116.5691 | 21 | 1415.676 | 4.067 | 2.0812 | 2.8652 | 0.001 | 0.7657 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1566 | DPI | 1409.391 | 2145 | 2134 | 2126.7492 | 2122.8029 | 10 | 184.49 | 0.5055 | 1.7637 | 0.3587 | 0.0028 | 0.528 |
| 1568 | DPI | 1712.7028 | 2140 | 2145 | 2135 | 2128.1492 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1570 | DPI | 196.0862 | 2150 | 2145 | 2141.6 | 2138 | 8 | 184.49 | 0.5055 | 3.5622 | 0.3587 | 0.01836 | 0.45 |
| 1572 | DPI | 2412.6135 | 2210 | 2150 | 2197.1553 | 2143 | 8 | 184.49 | 0.5055 | 3.7913 | 0.3587 | 0.02245 | 0.42 |
| 1574 | DPI | 2352.7207 | 2130 | 2130 | 2121.6 | 2118.7767 | 15 | 599.982 | 1.7285 | 1.7912 | 1.2166 | 0.0012 | 0.736 |
| 1576 | DPI | 2485.613 | 2180 | 2130 | 2171.6 | 2123 | 12 | 599.982 | 1.7284 | 4.9878 | 1.2166 | 0.01955 | 0.48 |
| 1578 | DPI | 2485.7969 | 2280 | 2180 | 2271.6 | 2173 | 10 | 599.982 | 1.7285 | 6.4582 | 1.2168 | 0.03967 | 0.504 |
| 1580 | DPI | 2485.7969 | 2605 | 2280 | 2596.6 | 2273 | 8 | 233.908 | 0.4526 | 7.1336 | 0.3427 | 0.13018 | 0.27 |
| 1582 | DPI | 2273.1226 | 2820 | 2605 | 2813 | 2598 | 8 | 233.908 | 0.4526 | 6.0805 | 0.3427 | 0.09458 | 0.27 |
| 1584 | DPI | 2500 | 2195 | 2134 | 2182.85 | 2127 | 12 | 223.6 | 0.6387 | 3.9522 | 0.4503 | 0.02234 | 0.28 |
| 1586 | DPI | 1379.0686 | 2280 | 2195 | 2273 | 2188 | 8 | 223.6 | 0.6387 | 5.7659 | 0.4503 | 0.06164 | 0.36 |
| 1588 | DPI | 2352.4778 | 2120 | 2118 | 2110.2204 | 2107.3975 | 18 | 1373.495 | 2.8045 | 2.0194 | 2.0797 | 0.0012 | 0.7333 |
| 1590 | DPI | 2500.0005 | 2140 | 2120 | 2129.0632 | 2113 | 18 | 1223.009 | 2.2579 | 3.4519 | 1.7184 | 0.00643 | 0.4133 |
| 1592 | DPI | 1200.139 | 2280 | 2192 | 2271.6 | 2185 | 8 | 650.044 | 0.9175 | 6.7976 | 0.7497 | 0.07216 | 0.42 |
| 1595 | DPI | 843.0711 | 2345 | 2280 | 2336.6 | 2273 | 8 | 319.398 | 0.383 | 5.4304 | 0.328 | 0.07544 | 0.27 |
| 1597 | DPI | 1233.4388 | 2405 | 2345 | 2396.6 | 2338 | 8 | 319.398 | 0.3831 | 4.5695 | 0.328 | 0.04751 | 0.3 |
| 1599 | DPI | 1332.2405 | 2490 | 2405 | 2481.6 | 2398 | 8 | 319.398 | 0.3831 | 5.2516 | 0.328 | 0.06275 | 0.3 |
| 1601 | DPI | 956.3302 | 2550 | 2490 | 2541.6 | 2483 | 8 | 165.66 | 0.1508 | 3.9159 | 0.1417 | 0.06128 | 0.18 |
| 1603 | DPI | 1546.1805 | 2710 | 2550 | 2701.6 | 2543 | 8 | 165.66 | 0.1508 | 5.0665 | 0.1417 | 0.10258 | 0.18 |
| 1605 | DPI | 1087.4783 | 2810 | 2710 | 2803 | 2703 | 8 | 165.66 | 0.1508 | 4.7971 | 0.1416 | 0.09196 | 0.18 |
| 1609 | DPI | 1086.134 | 2120 | 2120 | 2107.6452 | 2103.3007 | 10 | 87.993 | 0.309 | 1.7668 | 0.2115 | 0.004 | 0.384 |
| 1611 | DPI | 988.6895 | 2120 | 2120 | 2113 | 2109.0452 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1613 | DPI | 2499.9993 | 2395 | 2280 | 2372.1369 | 2273 | 8 | 220.133 | 0.2361 | 3.6871 | 0.2095 | 0.03965 | 0.24 |
| 1615 | DPI | 3331.5762 | 2730 | 2395 | 2723 | 2388 | 8 | 104.588 | 0.0952 | 4.0539 | 0.0894 | 0.10055 | 0.12 |
| 1617 | DPI | 488.287 | 2141 | 2140 | 2132.6 | 2132.0141 | 18 | 1223.009 | 2.2628 | 1.8972 | 1.7184 | 0.0012 | 0.64 |
| 1619 | DPI | 1452.4705 | 2192 | 2141 | 2176.0677 | 2134 | 10 | 1077.089 | 1.7978 | 5.9633 | 1.3941 | 0.02896 | 0.576 |
| 1620 | DPI | 1314.5844 | 2215 | 2141 | 2206.6 | 2134 | 8 | 145.92 | 0.4678 | 5.1995 | 0.3241 | 0.05523 | 0.33 |
| 1622 | DPI | 883.8659 | 2235 | 2215 | 2226.6 | 2208 | 8 | 145.92 | 0.4678 | 3.6709 | 0.3241 | 0.02104 | 0.42 |
| 1624 | DPI | 399.556 | 2255 | 2235 | 2240.2328 | 2228 | 8 | 145.92 | 0.4678 | 4.2484 | 0.3242 | 0.03062 | 0.39 |
| 1626 | DPI | 341.7996 | 2250 | 2255 | 2243 | 2241.6328 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1628 | DPI | 761.53 | 2188 | 2192 | 2179.6 | 2177.4677 | 10 | 301.224 | 0.4505 | 1.7159 | 0.3422 | 0.0028 | 0.504 |
| 1630 | DPI | 906.6844 | 2360 | 2360 | 2351.6 | 2349.0613 | 8 | 0 | 0 | 0 | 0 | 0.0028 | 0 |
| 1633 | DPI | 963.7058 | 2420 | 2360 | 2413 | 2353 | 8 | 0 | 0 | 0 | 0 | 0.06226 | 0 |
| 1635 | DPI | 2644.7791 | 2490 | 2360 | 2483 | 2353 | 8 | 301.224 | 0.4965 | 5.149 | 0.3422 | 0.04915 | 0.36 |
| 1637 | DPI | 1662.2761 | 2360 | 2188 | 2346.4973 | 2181 | 10 | 301.224 | 0.4681 | 6.3998 | 0.3422 | 0.09956 | 0.216 |
| 1638 | DPI | 1832.3478 | 2660 | 2420 | 2653 | 2413 | 8 | 0 | 0 | 0 | 0 | 0.13098 | 0 |
| 1641 | DPI | 939.0624 | 2420 | 2360 | 2406.5353 | 2353 | 8 | 118.963 | 0.1083 | 3.4125 | 0.1017 | 0.05701 | 0.15 |
| 1643 | DPI | 575.8876 | 2400 | 2360 | 2391.6 | 2353 | 8 | 0 | 0 | 0 | 0 | 0.06703 | 0 |
| 1645 | DPI | 1015.2278 | 2490 | 2400 | 2483 | 2393 | 8 | 0 | 0 | 0 | 0 | 0.08865 | 0 |
| 1648 | DPI | 492.7132 | 2102 | 2100 | 2090.86 | 2090.121 | 15 | 471.798 | 1.5679 | 1.9005 | 1.0818 | 0.0015 | 0.65 |
| 1651 | DPI | 2499.9998 | 2120 | 2102 | 2096.5725 | 2091.0725 | 12 | 179.011 | 0.6286 | 1.7094 | 0.4303 | 0.0022 | 0.5 |
| 1653 | DPI | 2077.9714 | 2120 | 2120 | 2113 | 2107.1817 | 10 | 99.534 | 0.3495 | 1.5784 | 0.2392 | 0.0028 | 0.432 |
| 1655 | DPI | 2505.7209 | 2170 | 2102 | 2161.6 | 2095 | 10 | 292.787 | 0.9394 | 4.7098 | 0.6511 | 0.02658 | 0.408 |
| 1657 | DPI | 1290.9862 | 2205 | 2170 | 2186.5046 | 2163 | 10 | 153.455 | 0.5388 | 3.4992 | 0.3688 | 0.01821 | 0.336 |
| 1659 | DPI | 1319.7885 | 2200 | 2205 | 2191.6 | 2187.9046 | 10 | 153.455 | 0.5388 | 1.8098 | 0.3688 | 0.0028 | 0.55 |
| 1661 | DPI | 890.1867 | 2210 | 2200 | 2203 | 2193 | 8 | 0 | 0 | 0 | 0 | 0.01123 | 0 |
| 1663 | DPI | 462.2809 | 2190 | 2170 | 2167.9974 | 2163 | 10 | 139.332 | 0.4006 | 2.6964 | 0.2821 | 0.01081 | 0.336 |
| 1665 | DPI | 222.3475 | 2215 | 2215 | 2189.1329 | 2188.5103 | 10 | 139.332 | 0.4006 | 1.6715 | 0.2821 | 0.0028 | 0.48 |

| G_ID | EntityTypeName | EntityLength | GroundElevUp | GroundElevDown | InvertUp | InvertElevDown | Size | SanArea | DesignQ | DesignVel | AverageFlow | Slope | DoverD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1668 | DPI | 568.3945 | 2205 | 2215 | 2192.1244 | 2190.5329 | 10 | 139.332 | 0.4006 | 1.6715 | 0.2821 | 0.0028 | 0.48 |
| 1670 | DPI | 2196.8879 | 2305 | 2205 | 2298 | 2198 | 8 | 139.332 | 0.4006 | 4.7204 | 0.2821 | 0.04552 | 0.33 |
| 1672 | DPI | 914.8062 | 2215 | 2180 | 2187.1103 | 2173 | 10 | 139.332 | 0.4006 | 3.0895 | 0.282 | 0.01542 | 0.312 |
| 1674 | DPI | 786.6293 | 2180 | 2190 | 2171.6 | 2169.3974 | 10 | 139.332 | 0.4006 | 1.6715 | 0.2821 | 0.0028 | 0.48 |
| 1675 | DPI | 1432.735 | 2255 | 2150 | 2248 | 2143 | 8 | 0 | 0 | 0 | 0 | 0.07329 | 0 |
| 1678 | DPI | 1156.6429 | 2150 | 2100 | 2141.6 | 2093 | 8 | 71.507 | 0.2511 | 4.0528 | 0.1719 | 0.04202 | 0.27 |
| 1682 | DPI | 2499.9993 | 2140 | 2105 | 2125.073 | 2098 | 18 | 913.99 | 2.5772 | 4.3182 | 1.8091 | 0.01083 | 0.3867 |
| 1685 | DPI | 1903.9014 | 2140 | 2140 | 2130.8577 | 2128.573 | 18 | 700.287 | 1.949 | 1.8147 | 1.3648 | 0.0012 | 0.5867 |
| 1687 | DPI | 1829.5196 | 2140 | 2140 | 2133 | 2125.6819 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1690 | DPI | 3437.3247 | 2141 | 2115 | 2128.605 | 2108 | 15 | 421.426 | 1.1405 | 2.8342 | 0.7898 | 0.00599 | 0.384 |
| 1692 | DPI | 1205.552 | 2141 | 2140 | 2134 | 2129.1778 | 8 | 82.01 | 0.23 | 1.6627 | 0.1626 | 0.004 | 0.45 |
| 1695 | DPI | 2762.302 | 2150 | 2140 | 2143 | 2131.9508 | 8 | 99.611 | 0.243 | 1.6627 | 0.1663 | 0.004 | 0.45 |
| 1697 | DPI | 1032.5033 | 2150 | 2148 | 2143 | 2138.87 | 8 | 42.35 | 0.1002 | 1.3259 | 0.0729 | 0.004 | 0.3 |
| 1700 | DPI | 1694.162 | 2139 | 2148 | 2132 | 2125.2234 | 8 | 57.261 | 0.1276 | 1.3993 | 0.0939 | 0.004 | 0.33 |
| 1715 | DPI | 888.1564 | 2140 | 2115 | 2124.2819 | 2108 | 8 | 0 | 0 | 0 | 0 | 0.01833 | 0 |
| 1735 | DPI | 1179.7885 | 2140 | 2141 | 2131.3747 | 2129.605 | 15 | 421.426 | 1.1554 | 1.7212 | 0.7898 | 0.0015 | 0.544 |
| 1737 | DPI | 1083.5404 | 2141 | 2140 | 2134 | 2132.3747 | 15 | 421.426 | 1.182 | 1.7501 | 0.7899 | 0.0015 | 0.56 |
| 1738 | DPI | 951.9497 | 2140 | 2140 | 2133 | 2131.8577 | 18 | 700.287 | 1.9908 | 1.8375 | 1.3649 | 0.0012 | 0.6 |
| 1739 | DPI | 1249.9996 | 2140 | 2140 | 2127.573 | 2126.073 | 18 | 700.287 | 1.9449 | 1.8147 | 1.3647 | 0.0012 | 0.5867 |
| 1740 | DPI | 1111.1685 | 2210 | 2210 | 2203 | 2198.5553 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1742 | DPI | 1250 | 2195 | 2195 | 2186.6 | 2183.85 | 12 | 223.6 | 0.6387 | 1.7094 | 0.4503 | 0.0022 | 0.5 |
| 1743 | DPI | 1377.9376 | 2134 | 2130 | 2121.4029 | 2120.025 | 21 | 1415.676 | 4.0719 | 2.0812 | 2.8651 | 0.001 | 0.7657 |
| 1744 | DPI | 938.4497 | 2125 | 2122 | 2113.5011 | 2112.5627 | 24 | 2117.055 | 6.1084 | 2.3027 | 4.3128 | 0.001 | 0.79 |
| 1746 | DPI | 879.8587 | 2122 | 2122 | 2111.8627 | 2110.9828 | 24 | 2117.055 | 6.101 | 2.3027 | 4.313 | 0.001 | 0.79 |
| 1747 | DPI | 1149.6276 | 2120 | 2120 | 2112.3 | 2110.9204 | 18 | 1311.002 | 2.5879 | 1.985 | 1.9293 | 0.0012 | 0.7067 |
| 1748 | DPI | 1292.3953 | 2140 | 2140 | 2131.3141 | 2129.7632 | 18 | 1223.009 | 2.2599 | 1.8972 | 1.7184 | 0.0012 | 0.64 |
| 1749 | DPI | 1249.9994 | 2120 | 2120 | 2101.4725 | 2097.9725 | 10 | 99.534 | 0.3495 | 1.5784 | 0.2393 | 0.0028 | 0.432 |
| 1750 | DPI | 1038.9858 | 2120 | 2120 | 2105.7817 | 2102.8725 | 10 | 99.534 | 0.3495 | 1.5784 | 0.2393 | 0.0028 | 0.432 |
| 1751 | DPI | 1249.9992 | 2395 | 2395 | 2378.5368 | 2373.5369 | 8 | 104.588 | 0.0952 | 1.3259 | 0.0894 | 0.004 | 0.3 |
| 1752 | DPI | 1665.7876 | 2395 | 2395 | 2386.6 | 2379.9368 | 8 | 104.588 | 0.0952 | 1.3259 | 0.0894 | 0.004 | 0.3 |
| 1753 | DPI | 916.1741 | 2420 | 2420 | 2411.6 | 2407.9353 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1754 | DPI | 1322.3897 | 2360 | 2360 | 2351.6 | 2347.8973 | 10 | 301.224 | 0.4848 | 1.7637 | 0.3422 | 0.0028 | 0.528 |
| 1755 | DPI | 1098.444 | 2205 | 2205 | 2196.6 | 2193.5244 | 10 | 139.332 | 0.4006 | 1.6715 | 0.2821 | 0.0028 | 0.48 |
| 1756 | DPI | 1381.1515 | 2140 | 2140 | 2130.5508 | 2125.0262 | 8 | 99.611 | 0.2432 | 1.6627 | 0.1664 | 0.004 | 0.45 |
| 1769 | DPI | 1250 | 2125 | 2125 | 2118 | 2113 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1772 | DPI | 1250 | 2125 | 2125 | 2111.6 | 2106.6 | 8 | 50.546 | 0.1672 | 1.5356 | 0.1095 | 0.004 | 0.39 |
| 1774 | DPI | 939.43 | 2122 | 2125 | 2115 | 2111.2423 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1776 | DPI | 1202.093 | 2125 | 2125 | 2118 | 2113.1916 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1780 | DPI | 1421.0544 | 2132 | 2130 | 2115.7029 | 2111.7239 | 10 | 93.596 | 0.3734 | 1.626 | 0.2479 | 0.0028 | 0.456 |
| 1782 | DPI | 1078.9457 | 2137 | 2132 | 2128.6 | 2124.2842 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1784 | DPI | 1249.9996 | 2140 | 2137 | 2135 | 2130 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1786 | DPI | 869.5538 | 2131 | 2132 | 2120.5811 | 2117.1029 | 8 | 93.596 | 0.3043 | 1.7798 | 0.2089 | 0.004 | 0.5 |
| 1788 | DPI | 1004.732 | 2131 | 2131 | 2126 | 2121.9811 | 8 | 0 | 0 | 0 | 0 | 0.004 | 0 |
| 1790 | DPI | 1250.0001 | 2108 | 2112 | 2100.3 | 2099.05 | 30 | 3490.55 | 8.7712 | 2.504 | 6.393 | 0.001 | 0.68 |
| 1792 | DPI | 1232.5491 | 2112 | 2108.2 | 2098.95 | 2097.7175 | 30 | 3490.55 | 8.7655 | 2.504 | 6.393 | 0.001 | 0.68 |
| 1793 | DPI | 87.24 | 2102.75 | 2102.5 | 2091 | 2090.5 | 30 | 3868.958 | 13.489 | 5.2488 | 10.0784 | 0.00573 | 0.528 |
| 1795 | DPI | 1332.4517 | 2108.2 | 2102.75 | 2097.6175 | 2095.75 | 30 | 3769.957 | 11.9343 | 3.0875 | 8.8236 | 0.0014 | 0.744 |
| 1796 | DPI | 88.4577 | 2103.47 | 2102.75 | 2091.68 | 2091 | 12 | 99.001 | 1.8109 | 3.6081 | 1.2579 | 0.00769 | 0.62 |

TECHNICAL MEMORANDUM NO. 5

## City of Sandpoint Wastewater Facility Plan

# Collection System
# Capital Improvement Program

March 2007

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Appendix A Opinion of Probable Costs for General Improvements
Appendix B Opinion of Probable Costs for Westside Interceptor Alternatives

# 1 Capital Improvement Program Organization

The Capital Improvement Program for the collection system has been divided as follows:

**General improvements** to the existing system:

- Remediate areas with excessive infiltration and inflow problems
- Recurring maintenance areas with root intrusion and structural problems

**System Expansion and Capacity Improvements** to the existing system:

- Expand the system to serve the expanded future sewer service boundary
- Increase capacity in the existing system to handle flows from an expanded service area

# 2 General Improvements

The general improvements that will be required in the system were developed through a process that included an I/I analysis (discussed in Technical Memorandum No. 2) to identify areas with high I/I, discussion with collection system maintenance staff, TV inspection logs, and field observation. Using the analysis, the City's collection system was subdivided into prioritized sub-basins, with general improvement projects listed for each.

The improvements that were developed are critical to maintaining the longevity of the system and alleviating system deficiencies. These high priority areas have major recurring maintenance issues and significant I/I sources (see Figure 2-1). Opinions of probable cost for each of the recommended system upgrades are summarized in Table 2-1. To show I/I reduction to date, Figure 2-1 also presents grouting completed over the past few years. A detailed breakdown of the probable costs is provided in Appendix A.

TABLE 2-1
Opinion of Probable Cost for General Improvements
*March 2007*

| Project | Capital Cost |
|---|---|
| Phase I Project - Lower Ella Basin | $3,166,800 |
| Phase II Project - Upper Ella Basin | $4,247,500 |
| Phase III Project - First Ave. Basin | $4,432,100 |
| Phase IV Project - Lincoln Basin | $832,200 |
| Phase V Project - Boyer Basin | $2,810,400 |
| **TOTAL (all phases)** | **$15,489,000** |

Costs include engineering, mobilization, and contingency. The cost opinions are based on supplier quotations, similar projects, discussions with local contractors, standard construction cost estimating guides, professional judgment, and local experience. The cost opinions are based on current (2006) dollars and should be adjusted for inflation accordingly.

## 2.1 Phasing and CIP

A potential phasing and implementation plan for these projects is included in Table 2-2. This phasing plan groups the projects into 5-year phases. Projects have been inflated at 3 percent per year until the midpoint of construction for each phase.

TABLE 2-2
Collection System Phasing Plan
*March 2007*

| | Project Phasing Period | | | | |
|---|---|---|---|---|---|
| **Project** | **2006 to 2011** | **2011 to 2016** | **2016 to 2021** | **2021 to 2026** | **2022 to 2026** |
| Phase I Project - Lower Ella Basin | $3,409,700 | | | | |
| Phase II Project - Upper Ella Basin | | $5,301,700 | | | |
| Phase III Project - First Ave. Basin | | | $6,413,200 | | |
| Phase IV Project - Lincoln Basin | | | | $1,396,000 | |
| Phase V Project - Boyer Basin | | | | | $5,465,200 |

Notes:
a. Costs do not include financing fees, etc.
b. Costs include 3 percent interest per year to midpoint of project phase.

## 2.2 Financing and Potential Cost Savings

Based on the City's current annual collections system budget, adequate funding is unlikely for all of these projects without drawing on other sources such as bonding or applying for additional grant funds. However, the City may be able to reduce project costs by:

- **Pipe Rehabilitation**. Where the main pipe has been adequately sized and is structurally sound, cured-in-place-pipe (CIPP) or trenchless technology projects may be implemented. This has the potential of significantly reducing budgeted costs as compared to typical open-trench construction methods.
- **Use of City Crews**. The City can continue to utilize its maintenance staff to do point repair and open-trench replacement projects on deteriorating system lines.
- **Public Education**. Continued focus on the I/I problem combined with service line inspection requirements may encourage homeowners to replace their own service laterals and/or disconnect inflow sources without financial support from the City.
- **Bonding and Grants**. Revenue bonds and grants will allow larger projects to be constructed ahead of schedule. This will reduce the impact of inflation and allow larger projects to be constructed for less. Furthermore, quicker reductions in I/I will lead to reduced operations and maintenance (O&M) costs at the treatment facility as well as reduce the size of treatment facility to be constructed.
- **I/I Reduction Ordinances**. The City can pursue legislation and help to develop ordinances that will require removal of inflow sources from existing buildings and contributions from

sump pumps/foundation drains. This process likely will require extensive legal work as well as cooperation from City officials and public utilities departments.

# 3 System Expansion and Capacity Improvements

Several major upgrades to the City's collection system will be required as the collection system expands west of the current City limits. As was discussed in *Technical Memorandum No. 4 – Future Wastewater Collection Facilities and Improvements,* the recommended alignment for the proposed Westside interceptor would replace the lines in the lower end of the Ella Basin Interceptor and re-direct flow from the upper portions of the Lincoln Basin (north of Main Street) into this new "Westside Interceptor" (lower Ella Basin reconstruction). The Westside Interceptor would extend from Main Street north along the Great Northern Railroad on the west side of the railroad tracks and will terminate as a 21-inch pipe at the intersection of Mountain View Road and Great Northern Road. At this point, the lines will branch into smaller lines that will likely be constructed by new development. The alignment for the Westside Interceptor is shown on Figure 3-1.

## 3.1 Phasing and CIP

Depending on financing options, the City may choose to help fund the initial construction of this interceptor. However, this cost of design and construction ultimately should be borne and paid for by development. Two separate costs were developed for the interceptor. The first assumes the WWTP is to remain at the existing site near the Pend Oreille River, the second that the plant will be relocated to a new location near the intersection of Baldy Road and Great Northern Road (west of the current City limits). These costs include new pressure lines to convey flow from the existing plant to the new site, and new pressure lines to return flow from the new treatment plant site to the existing outfall. Pumping station costs have not been included here but are discussed elsewhere in association with the WWTP costs.

The following cost opinions are based on supplier quotations, similar projects, discussions with local contractors, standard construction cost estimating guides, professional judgment, and local experience. The cost opinions are based on current (2006) dollars and should be adjusted for inflation at the time of construction. An inflation rate of 3 percent is recommended for planning purposes.

An opinion of probable cost for the system upgrades and costs for expansion of the interceptor are summarized in Table 3-1. A detailed breakdown of the probable costs is provided in Appendix B. Costs include engineering, mobilization, and contingency. The system expansion projects have not been prioritized or scheduled as the need for the improvements will be driven primarily by growth as the City limits expand.

TABLE 3-1
Opinion of Probable Cost for Westside Interceptor Alternatives
*March 2007*

| Project | Capital Cost (2006 Dollars) |
|---|---|
| Westside Interceptor (outside current city limits)[a] | $2,792,300 |
| Westside Interceptor (inside current city limits) | |
| Alternate A: Existing WWTP site | |
| *Westside Interceptor (Ella Basin reconstruction) flow to existing WWTP site*[b] | $8,851,400 |
| Alternate B: New WWTP Site | |
| *Westside Interceptor (Ella Basin reconstruction) flow to new WWTP site* | $4,266,100 |
| *Pressure Lines (to and from new WWTP site)* | $7,194,500 |

a. This project is required regardless of WWTP location.
b. Flow from the north end of the Lincoln Interceptor will be directed to the west in a new gravity line to the new WWTP location. The cost reflects this modification and subsequent smaller pipe size required for the lower Ella Basin reconstruction.

The schedule for each of these projects will be influenced by numerous factors, including:

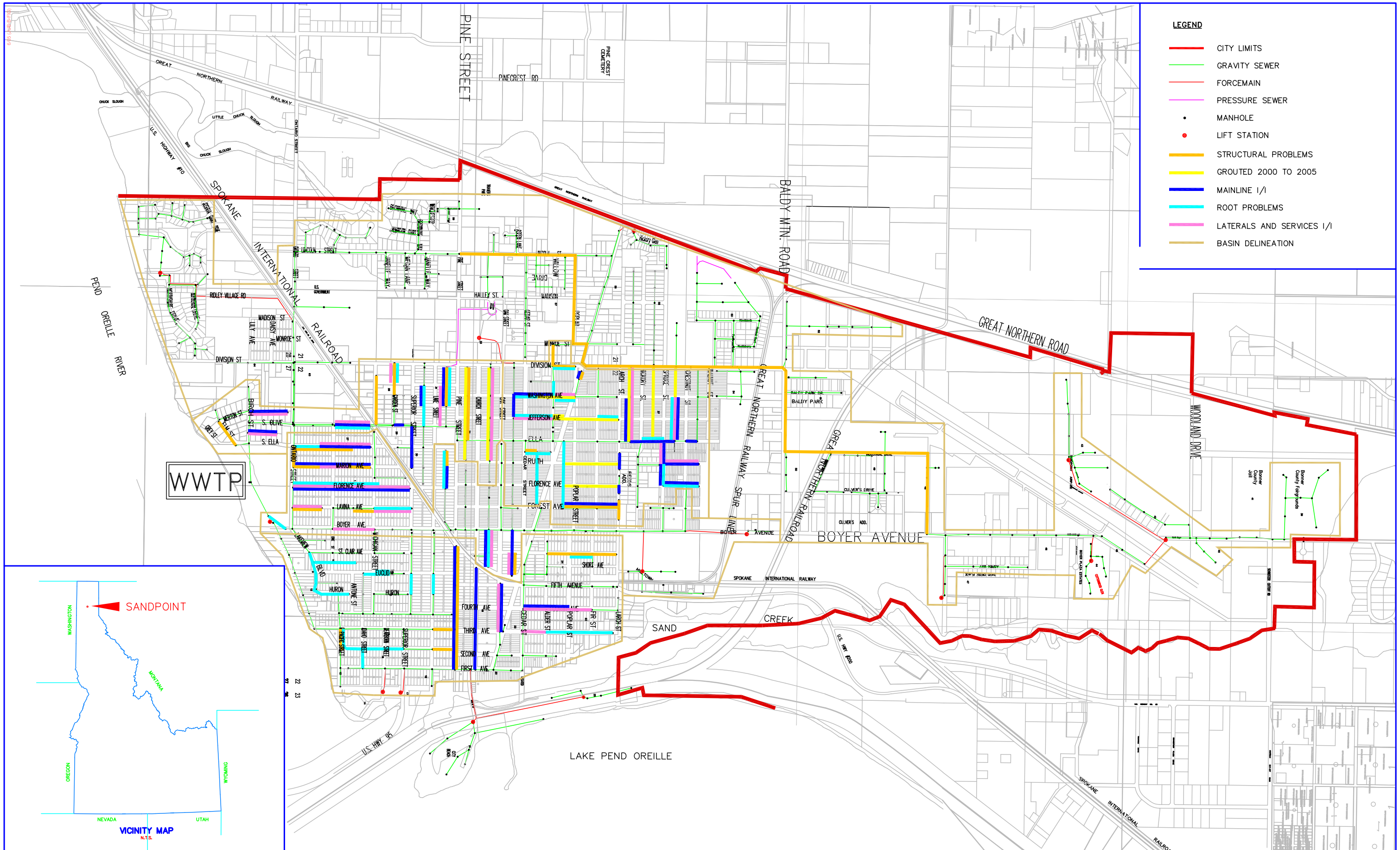
- The expectation that more easily developed land will be utilized more quickly, with steeper and more rugged ground being developed later
- Growth being contiguous with the expansion of City limits, and projects within the City limits being required sooner than those farther away (However, project development will depend more on available land than location.)
- The possible WWTP relocation and the ultimate location

The City can help minimize impacts by controlling the direction of development. The sewer system should be expanded by limiting the construction of remote, detached portions of the collection system or temporary facilities. Controlled growth and expansion will help ensure that the system is constructed according to the guidelines established in this planning document.

Figure 2-1 Existing Collection System Deficiencies

Figure 3-1 West Side Interceptor Preferred Alignment

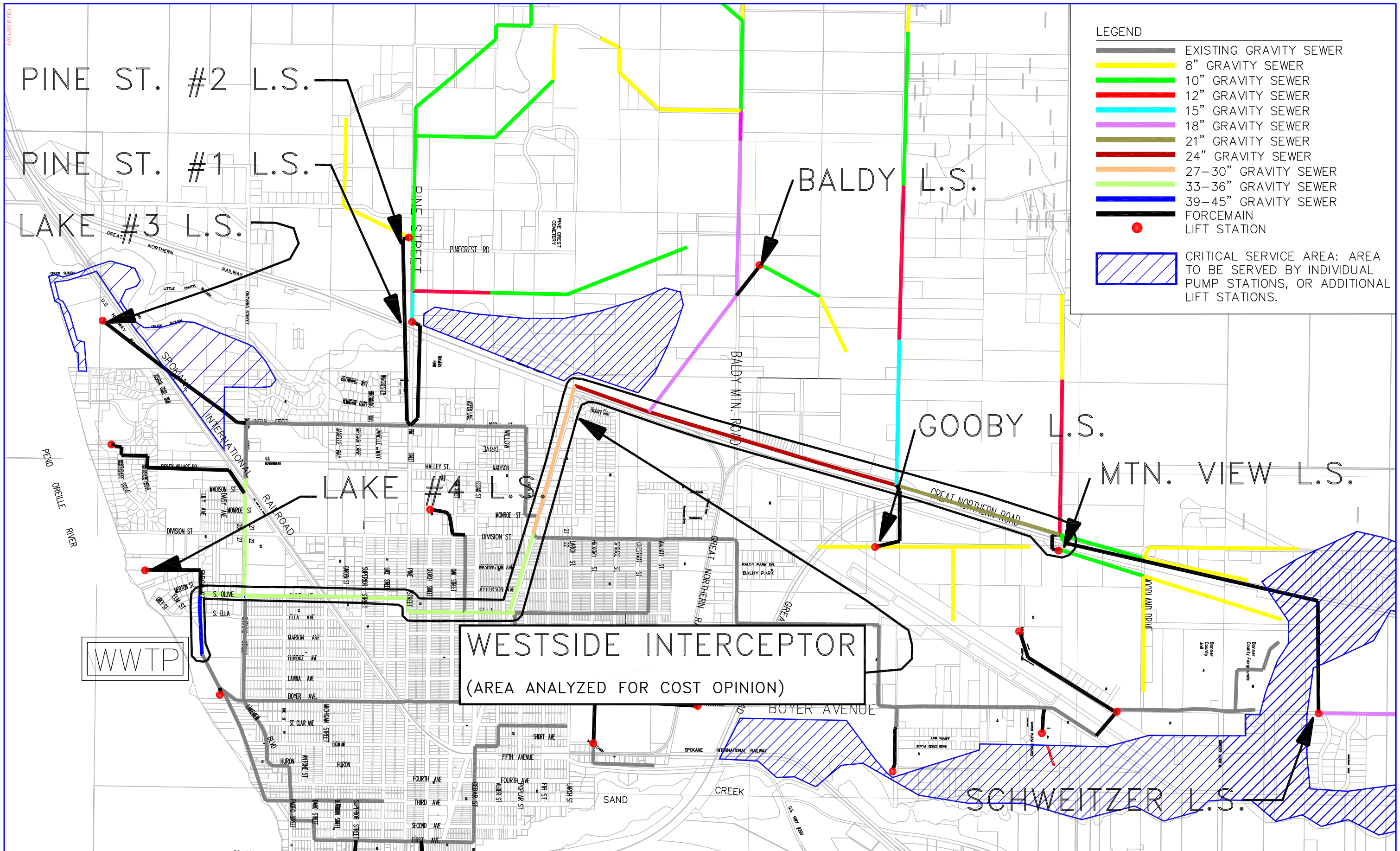
\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#5 FIGURE 2-1, 3/20/2007 4:52:43 PM, wholder, J-U-B




SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 2-1
EXISTING COLLECTION SYSTEM DEFICIENCIES

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\20-05-035b.dwg, TM#5 FIG 3-1, 3/21/2007 8:06:45 AM, wholder, J-U-B CDA




J-U-B
Engineers • Surveyors • Planners

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 3-1
WESTSIDE INTERCEPTOR - PREFERRED ALIGNMEN

CAD FILE: 20-05-035b

# Appendix A

# Opinion of Probable Costs for General Improvements

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 27-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase I - Lower Ella Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **Lower Ella Basin** | | | | | |
| 1 | Alley between Oak St. and Cedar St. | | | | |
| 2 | 8" PVC sanitary sewer | 1150 | LF | $ 75 | $ 86,250 |
| 3 | Surface repair -- assumed asphalt | 1150 | LF | $ 40 | $ 46,000 |
| 4 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 5 | Replace existing services (75 lf each @ $60/lf) | 23 | EA | $ 4,500 | $ 103,500 |
| 6 | Alley between Oak and Church St. | | | | |
| 11 | Services from Division to Ruth (75 lf each @ $60/lf) | 32 | EA | $ 4,500 | $ 144,000 |
| 12 | Alley between Church and Pine St. | | dist | | |
| 13 | 8" PVC sanitary sewer | 1200 | LF | $ 75 | $ 90,000 |
| 14 | Surface repair -- assumed asphalt | 1200 | LF | $ 40 | $ 48,000 |
| 15 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 16 | Replace existing services (75 lf each @ $60/lf) | 24 | EA | $ 4,500 | $ 108,000 |
| 17 | Alley between Pine and Lake St. | | | | |
| 18 | 8" PVC sanitary sewer | 1300 | LF | $ 75 | $ 97,500 |
| 19 | Surface repair -- assumed asphalt | 1300 | LF | $ 40 | $ 52,000 |
| 20 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 21 | Replace existing services (75 lf each @ $60/lf) | 26 | EA | $ 4,500 | $ 117,000 |
| 22 | Alley between Lake St. and Superior | | | | |
| 23 | 8" PVC sanitary sewer | 650 | LF | $ 75 | $ 48,750 |
| 24 | Surface repair -- assumed asphalt | 650 | LF | $ 40 | $ 26,000 |
| 25 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 26 | Replace existing services (75 lf each @ $60/lf) | 13 | EA | $ 4,500 | $ 58,500 |
| 27 | Superior | | | | |
| 28 | 8" PVC sanitary sewer | 650 | LF | $ 75 | $ 48,750 |
| 29 | Surface repair -- assumed asphalt | 650 | LF | $ 40 | $ 26,000 |
| 30 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 31 | Replace existing services (75 lf each @ $60/lf) | 13 | EA | $ 4,500 | $ 58,500 |
| 32 | Garden St. | | | | |
| 33 | 8" PVC sanitary sewer | 650 | LF | $ 75 | $ 48,750 |
| 34 | Surface repair -- assumed asphalt | 650 | LF | $ 40 | $ 26,000 |
| 35 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 36 | Replace existing services (75 lf each @ $60/lf) | 13 | EA | $ 4,500 | $ 58,500 |
| 37 | Michigan Ave. | | | | |
| 38 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 39 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 40 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 41 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 42 | Alley east of Olive (south of Ontario) | | | | |
| 43 | 8" PVC sanitary sewer | 650 | LF | $ 75 | $ 48,750 |
| 44 | Surface repair -- assumed asphalt | 650 | LF | $ 40 | $ 26,000 |
| 45 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 46 | Replace existing services (75 lf each @ $60/lf) | 13 | EA | $ 4,500 | $ 58,500 |

J-U-B ENGINEERS, Inc.
7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 27-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase I - Lower Ella Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 47 | Alley west of Olive (south of Ontario) | | | | |
| 48 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 49 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 50 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 51 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 52 | Elm St. | | | | |
| 53 | 8" PVC sanitary sewer | 600 | LF | $ 75 | $ 45,000 |
| 54 | Surface repair -- assumed asphalt | 600 | LF | $ 40 | $ 24,000 |
| 55 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 56 | Replace existing services (75 lf each @ $60/lf) | 12 | EA | $ 4,500 | $ 54,000 |
| 57 | *Olive Ave. (improvements to coincide with capacity* | | | | |
| 58 | *and system expansion improvements noted elsewhere)* | | | | |
| | **SUBTOTAL** | | | | **$ 1,999,300** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 199,900 |
| | **Contingency** | | | 20% | $ 439,800 |
| | **Engineering** | | | 20% | $ 527,800 |
| | **TOTAL** | | | | **$ 3,166,800** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase II Upper Ella Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **Upper Ella Basin** | | | | | |
| 1 | Upper Ella Ave. | | | | |
| 2 | 12" PVC sanitary sewer | 1050 | LF | $ 100 | $ 105,000 |
| 3 | Surface repair -- assumed asphalt | 1050 | LF | $ 40 | $ 42,000 |
| 4 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 5 | Replace existing services (75 lf each @ $60/lf) | 21 | EA | $ 4,500 | $ 94,500 |
| 6 | Alley between Chestnut and Spruce | | | | |
| 7 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 8 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 9 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 10 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 11 | Spruce St. | | | | |
| 12 | 8" PVC sanitary sewer | 750 | LF | $ 75 | $ 56,250 |
| 13 | Surface repair -- assumed asphalt | 750 | LF | $ 40 | $ 30,000 |
| 14 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 15 | Replace existing services (75 lf each @ $60/lf) | 15 | EA | $ 4,500 | $ 67,500 |
| 16 | Alley Between Hickory and Larch | | | | |
| 17 | 8" PVC sanitary sewer | 1150 | LF | $ 75 | $ 86,250 |
| 18 | Surface repair -- assumed asphalt | 1150 | LF | $ 40 | $ 46,000 |
| 19 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 20 | Replace existing services (75 lf each @ $60/lf) | 23 | EA | $ 4,500 | $ 103,500 |
| 21 | Larch St. | | | | |
| 22 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 23 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 24 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 25 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 26 | Washington Ave. | | | | |
| 27 | 8" PVC sanitary sewer | 1000 | LF | $ 75 | $ 75,000 |
| 28 | Surface repair -- assumed asphalt | 1000 | LF | $ 40 | $ 40,000 |
| 29 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 30 | Replace existing services (75 lf each @ $60/lf) | 20 | EA | $ 4,500 | $ 90,000 |
| 31 | Jefferson | | | | |
| 32 | 8" PVC sanitary sewer | 800 | LF | $ 75 | $ 60,000 |
| 33 | Surface repair -- assumed asphalt | 800 | LF | $ 40 | $ 32,000 |
| 34 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 35 | Replace existing services (75 lf each @ $60/lf) | 16 | EA | $ 4,500 | $ 72,000 |
| 36 | Alley south of Poplar | | | | |
| 37 | 10" PVC sanitary sewer | 1150 | LF | $ 85 | $ 97,750 |
| 38 | Surface repair -- assumed asphalt | 1150 | LF | $ 40 | $ 46,000 |
| 39 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 40 | Replace existing services (75 lf each @ $60/lf) | 23 | EA | $ 4,500 | $ 103,500 |
| 41 | Alley north of Cedar St. | | | | |
| 42 | 8" PVC sanitary sewer | 900 | LF | $ 75 | $ 67,500 |
| 43 | Surface repair -- assumed asphalt | 900 | LF | $ 40 | $ 36,000 |
| 44 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 45 | Replace existing services (75 lf each @ $60/lf) | 18 | EA | $ 4,500 | $ 81,000 |
| 46 | Alley Between Ruth and Ella | | | | |
| 47 | 8" PVC sanitary sewer | 600 | LF | $ 75 | $ 45,000 |
| 48 | Surface repair -- assumed asphalt | 600 | LF | $ 40 | $ 24,000 |
| 49 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 50 | Replace existing services (75 lf each @ $60/lf) | 12 | EA | $ 4,500 | $ 54,000 |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase II Upper Ella Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 51 | Ruth | | | | |
| 52 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 53 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 54 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 55 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 56 | Florence Ave. | | | | |
| 57 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 58 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 59 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 60 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 61 | Forest Ave. | | | | |
| 62 | 8" PVC sanitary sewer | 1000 | LF | $ 75 | $ 75,000 |
| 63 | Surface repair -- assumed asphalt | 1000 | LF | $ 40 | $ 40,000 |
| 64 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 65 | Replace existing services (75 lf each @ $60/lf) | 20 | EA | $ 4,500 | $ 90,000 |
| 66 | Division | | | | |
| 67 | 8" PVC sanitary sewer | 350 | LF | $ 75 | $ 26,250 |
| 68 | Surface repair -- assumed asphalt | 350 | LF | $ 75 | $ 26,250 |
| 69 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 70 | Replace existing services (75 lf each @ $60/lf) | 7 | EA | $ 4,500 | $ 31,500 |
| 71 | Alder Ave. | | | | |
| 72 | 8" PVC sanitary sewer | 350 | LF | $ 75 | $ 26,250 |
| 73 | Surface repair -- assumed asphalt | 350 | LF | $ 40 | $ 14,000 |
| 74 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 75 | Replace existing services (75 lf each @ $60/lf) | 7 | EA | $ 4,500 | $ 31,500 |
| | **SUBTOTAL** | | | | **$ 2,681,500** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 268,200 |
| | **Contingency** | | | 20% | $ 589,900 |
| | **Engineering** | | | 20% | $ 707,900 |
| | **TOTAL** | | | | **$ 4,247,500** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase III - First Avenue Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **First Avenue** | | | | | |
| 1 | Alley between St. Claire and Euclid | | | | |
| 7 | 8" PVC sanitary sewer | 700 | LF | $ 75 | $ 52,500 |
| 8 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 9 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 10 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 11 | St. Claire Ave | | | | |
| 12 | 8" PVC sanitary sewer | 1150 | LF | $ 75 | $ 86,250 |
| 13 | Surface repair -- assumed asphalt | 1150 | LF | $ 40 | $ 46,000 |
| 14 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 15 | Replace existing services (75 lf each @ $60/lf) | 23 | EA | $ 4,500 | $ 103,500 |
| 16 | Third Ave. | | | | |
| 17 | 8" PVC sanitary sewer | 1650 | LF | $ 75 | $ 123,750 |
| 18 | Surface repair -- assumed asphalt | 1650 | LF | $ 40 | $ 66,000 |
| 19 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 20 | Replace existing services (75 lf each @ $60/lf) | 33 | EA | $ 4,500 | $ 148,500 |
| 26 | Oak St. | | | | |
| 27 | 8" PVC sanitary sewer | 800 | LF | $ 75 | $ 60,000 |
| 28 | Surface repair -- assumed asphalt | 800 | LF | $ 40 | $ 32,000 |
| 29 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 30 | Replace existing services (75 lf each @ $60/lf) | 16 | EA | $ 4,500 | $ 72,000 |
| 31 | Church St. | | | | |
| 32 | 8" PVC sanitary sewer | 1750 | LF | $ 75 | $ 131,250 |
| 33 | Surface repair -- assumed asphalt | 1750 | LF | $ 40 | $ 70,000 |
| 34 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 35 | Replace existing services (75 lf each @ $60/lf) | 35 | EA | $ 4,500 | $ 157,500 |
| 36 | Pine St. | | | | |
| 37 | 8" PVC sanitary sewer | 2150 | LF | $ 75 | $ 161,250 |
| 38 | Surface repair -- assumed asphalt | 2150 | LF | $ 40 | $ 86,000 |
| 39 | 48" manhole | 7 | EA | $ 4,000 | $ 28,000 |
| 40 | Replace existing services (75 lf each @ $60/lf) | 43 | EA | $ 4,500 | $ 193,500 |
| 41 | Lake St. | | | | |
| 42 | 8" PVC sanitary sewer | 350 | LF | $ 75 | $ 26,250 |
| 43 | Surface repair -- assumed asphalt | 350 | LF | $ 40 | $ 14,000 |
| 44 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 45 | Replace existing services (75 lf each @ $60/lf) | 7 | EA | $ 4,500 | $ 31,500 |
| 46 | Superior St. | | | | |
| 47 | 8" PVC sanitary sewer | 350 | LF | $ 75 | $ 26,250 |
| 48 | Surface repair -- assumed asphalt | 350 | LF | $ 40 | $ 14,000 |
| 49 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 50 | Replace existing services (75 lf each @ $60/lf) | 7 | EA | $ 4,500 | $ 31,500 |
| 51 | Euclid Ave | | | | |
| 52 | 8" PVC sanitary sewer | 950 | LF | $ 75 | $ 71,250 |
| 53 | Surface repair -- assumed asphalt | 950 | LF | $ 40 | $ 38,000 |
| 54 | 48" manhole | 4 | EA | $ 4,000 | $ 16,000 |
| 55 | Replace existing services (75 lf each @ $60/lf) | 19 | EA | $ 4,500 | $ 85,500 |
| 56 | Second Ave. | | | | |
| 57 | 8" PVC sanitary sewer | 1350 | LF | $ 75 | $ 101,250 |
| 58 | Surface repair -- assumed asphalt | 1350 | LF | $ 40 | $ 54,000 |
| 59 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 60 | Replace existing services (75 lf each @ $60/lf) | 27 | EA | $ 4,500 | $ 121,500 |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase III - First Avenue Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 61 | Huron | | | | |
| 62 | 15" PVC sanitary sewer | 500 | LF | $ 125 | $ 62,500 |
| 63 | Surface repair -- assumed asphalt | 500 | LF | $ 40 | $ 20,000 |
| 64 | 48" manhole | 2 | EA | $ 4,000 | $ 8,000 |
| 65 | Replace existing services (75 lf each @ $60/lf) | 10 | EA | $ 4,500 | $ 45,000 |
| 66 | Lakeview | | | | |
| 67 | 15" PVC sanitary sewer | 700 | LF | $ 125 | $ 87,500 |
| 68 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 69 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 70 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| | **SUBTOTAL** | | | | **$ 2,798,000** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 279,800 |
| | **Contingency** | | | 20% | $ 615,600 |
| | **Engineering** | | | 20% | $ 738,700 |
| | **TOTAL** | | | | **$ 4,432,100** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase IV - Lincoln Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **Lincoln Basin** | | | | | |
| 1 | Manhole Point Repairs | | | | |
| 2 | *18" PVC sanitary sewer (15 LF EACH @ 175$/LF )* | *1* | *EA* | *$ 2,625* | *$ 2,625* |
| 3 | *Surface repair -- assumed asphalt* | *25* | *LF* | *$ 40* | *$ 1,000* |
| 4 | *60" manhole* | *1* | *EA* | *$ 5,500* | *$ 5,500* |
| 5 | *Subtotal Cost per point repair* | | | | *$ 9,100* |
| 6 | | | | | |
| 7 | POINT REPAIRS | 35 | EA | $ 9,100 | $ 318,500 |
| | **SUBTOTAL** | | | | **$ 318,500** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 31,900 |
| | **Contingency** | | | 20% | $ 70,100 |
| | **Engineering** | | | 20% | $ 84,100 |
| | **TOTAL** | | | | **$ 832,200** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP
Prioritized Improvements for I/I Reduction

PROJECT DESCRIPTION: Phase V - Boyer Basin

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **Boyer Basin** | | | | | |
| 1 | South Ella Ave. | | | | |
| 2 | 8" PVC sanitary sewer | 1250 | LF | $ 75 | $ 93,750 |
| 3 | Surface repair -- assumed asphalt | 1250 | LF | $ 40 | $ 50,000 |
| 4 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 5 | Replace existing services (75 lf each @ $60/lf) | 25 | EA | $ 4,500 | $ 112,500 |
| 6 | Marion Ave.. | | | | |
| 7 | 8" PVC sanitary sewer | 1350 | LF | $ 75 | $ 101,250 |
| 8 | Surface repair -- assumed asphalt | 1350 | LF | $ 40 | $ 54,000 |
| 9 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 10 | Replace existing services (75 lf each @ $60/lf) | 27 | EA | $ 4,500 | $ 121,500 |
| 11 | Florence Ave. | | | | |
| 12 | 8" PVC sanitary sewer | 1900 | LF | $ 75 | $ 142,500 |
| 13 | Surface repair -- assumed asphalt | 1900 | LF | $ 40 | $ 76,000 |
| 14 | 48" manhole | 6 | EA | $ 4,000 | $ 24,000 |
| 15 | Replace existing services (75 lf each @ $60/lf) | 38 | EA | $ 4,500 | $ 171,000 |
| 16 | Lavina Ave. | | | | |
| 17 | 8" PVC sanitary sewer | 1450 | LF | $ 75 | $ 108,750 |
| 18 | Surface repair -- assumed asphalt | 1450 | LF | $ 40 | $ 58,000 |
| 19 | 48" manhole | 5 | EA | $ 4,000 | $ 20,000 |
| 20 | Replace existing services (75 lf each @ $60/lf) | 29 | EA | $ 4,500 | $ 130,500 |
| 16 | Alley between Cedar and Oak | | | | |
| 17 | 8" PVC sanitary sewer | 700 | LF | $ 200 | $ 140,000 |
| 18 | Surface repair -- assumed asphalt | 700 | LF | $ 40 | $ 28,000 |
| 19 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 20 | Replace existing services (75 lf each @ $60/lf) | 14 | EA | $ 4,500 | $ 63,000 |
| 16 | Alley between Oak and Church | | | | |
| 17 | 8" PVC sanitary sewer | 600 | LF | $ - | $ - |
| 18 | Surface repair -- assumed asphalt | 600 | LF | $ 40 | $ 24,000 |
| 19 | 48" manhole | 3 | EA | $ 4,000 | $ 12,000 |
| 20 | Replace existing services (75 lf each @ $60/lf) | 12 | EA | $ 4,500 | $ 54,000 |
| 21 | Lower Boyer Ave. | | | | |
| 22 | 24" PVC sanitary sewer | 350 | LF | $ 200 | $ 70,000 |
| 23 | Replace existing services (75 lf each @ $60/lf) | 15 | EA | $ 4,500 | $ 67,500 |
| | **SUBTOTAL** | | | | **$ 1,774,300** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 177,400 |
| | **Contingency** | | | 20% | $ 390,300 |
| | **Engineering** | | | 20% | $ 468,400 |
| | **TOTAL** | | | | **$ 2,810,400** |

# Appendix B

# Opinion of Probable Costs for Westside Interceptor Alternatives

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP

PROJECT DESCRIPTION: Westside Interceptor - **Assuming WWTP at New Location, west of GN Railroad**

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **West Side Interceptor - Lines within Existing City Limits** | | | | | |
| 1 | Olive Ave. from Ontario St. to Superior St. | | | | |
| 2 | 21" sanitary sewer (<10' deep) | 1900 | LF | $ 165 | $ 313,500 |
| 3 | Surface repair -- assumed asphalt | 1900 | LF | $ 40 | $ 76,000 |
| 4 | 60" manhole | 6 | EA | $ 5,500 | $ 33,000 |
| 5 | Replace existing services (75 lf each @ $60/lf) | 38 | EA | $ 4,500 | $ 171,000 |
| 6 | Directional Bore Under Railroad (30" Dia. Case) | 100 | LF | $ 500 | $ 50,000 |
| 7 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 8 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| 9 | Olive Ave. from Superior St. Pine, Pine to Ella, Ella to Main St. | | | | |
| 10 | 21" sanitary sewer (<10' deep) | 2750 | LF | $ 165 | $ 453,750 |
| 11 | Surface repair -- assumed asphalt | 2750 | LF | $ 40 | $ 110,000 |
| 12 | 60" manhole | 9 | EA | $ 5,500 | $ 49,500 |
| 13 | Replace existing services (75 lf each @ $60/lf) | 55 | EA | $ 4,500 | $ 247,500 |
| 14 | Main St. from Ella to Division St. | | | | |
| 15 | 12" sanitary sewer (<10' deep) | 1350 | LF | $ 90 | $ 121,500 |
| 16 | Surface repair -- assumed asphalt | 1350 | LF | $ 40 | $ 54,000 |
| 17 | 60" manhole | 5 | EA | $ 5,500 | $ 27,500 |
| 18 | Replace existing services (75 lf each @ $60/lf) | 27 | EA | $ 4,500 | $ 121,500 |
| 19 | Main St. from Division St. to GN Railroad (west side of tracks) | | | | |
| 20 | *Tie in an re-route upper end of Lincoln Basin into* | 1 | LS | $ 20,000 | $ 20,000 |
| 21 | *new line* ***draining to west to new WWTP*** | | | | |
| 22 | 21" sanitary sewer (<10' deep) **draining to west** | 2500 | LF | $ 165 | $ 412,500 |
| 23 | Surface repair -- assumed asphalt | 2500 | LF | $ 40 | $ 100,000 |
| 24 | 48" manhole | 8 | EA | $ 4,000 | $ 32,000 |
| 25 | Replace existing services (75 lf each @ $60/lf) | 20 | EA | $ 4,500 | $ 90,000 |
| 35 | Directional Bore Under Railroad (24" Dia. Case) | 250 | LF | $ 600 | $ 150,000 |
| 36 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 37 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| 26 | | | | | |
| | **SUBTOTAL** | | | | **$ 2,693,300** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 269,300 |
| | **Contingency** | | | 20% | $ 592,500 |
| | **Engineering** | | | 20% | $ 711,000 |
| | **TOTAL** | | | | **$ 4,266,100** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP

PROJECT DESCRIPTION: Westside Interceptor - **Assuming WWTP at New Location, west of GN Railroad**

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **Forcemain and Pressure Lines (to and from new WWTP)** | | | | | |
| 1 | **Parallel 15" and 15" Pressure Lines From Ex. WWTP to New Site west of GN Railroad)** | | | | |
| 2 | 12" C905 Pressure Line (assumed common trench) | 11500 | LF | $ 75 | $ 862,500 |
| | 15" C905 Pressure Line (assumed common trench) | 11500 | LF | $ 75 | $ 862,500 |
| 3 | Pigging Port | 2 | EA | $ 20,000 | $ 40,000 |
| 4 | Isolation Valves for Pressure Testing | 10 | EA | $ 2,500 | $ 25,000 |
| 5 | Directional Bore Under Railroad (18" Dia. Case) | 350 | LF | $ 450 | $ 157,500 |
| | Directional Bore Under Railroad (18" Dia. Case) | 350 | LF | $ 451 | $ 157,850 |
| 6 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 7 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| 11 | **Parallel 24" and 15" Outfall Pressure Line From New WWTP to Existing Outfall** | | | | |
| 12 | 24" C905 Pressure Line (assumed common trench) | 12000 | LF | $ 150 | $ 1,800,000 |
| | 15" C905 Pressure Line (assumed common trench) | 12000 | LF | $ 75 | $ 900,000 |
| 10 | Pigging Port | 2 | EA | $ 20,000 | $ 40,000 |
| 11 | Isolation Valves for Pressure Testing | 10 | EA | $ 2,500 | $ 25,000 |
| 12 | Tie-in to existing outfall | 1 | LS | $ 10,000 | $ 10,000 |
| | Directional Bore Under Railroad (18" Dia. Case) | 350 | LF | $ 450 | $ 157,500 |
| 13 | Directional Bore Under Railroad (30" Dia. Case) | 350 | LF | $ 600 | $ 210,000 |
| 14 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 15 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 5,307,900** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 530,800 |
| | **Contingency** | | | 20% | $ 592,500 |
| | **Engineering** | | | 20% | $ 763,300 |
| | **TOTAL** | | | | **$ 7,194,500** |

J-U-B ENGINEERS, Inc. 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP

PROJECT DESCRIPTION: Westside Interceptor - **Assuming WWTP at Existing Location**

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **West Side Interceptor - Lines within Existing City Limits** | | | | | |
| 1 | WWTP to South Olive St. | | | | |
| 2 | 36" sanitary sewer (<10' deep) | 950 | LF | $ 325 | $ 308,750 |
| 3 | Surface repair -- assumed asphalt | 950 | LF | $ 40 | $ 38,000 |
| 4 | 72" manhole | 4 | EA | $ 7,500 | $ 30,000 |
| 5 | Olive Ave. from Birch St. to Ontario St. | | | | |
| 6 | 36" sanitary sewer (<10' deep) | 750 | LF | $ 325 | $ 243,750 |
| 7 | Surface repair -- assumed asphalt | 750 | LF | $ 40 | $ 30,000 |
| 8 | 72" manhole | 3 | EA | $ 7,500 | $ 22,500 |
| 9 | Replace existing services (75 lf each @ $60/lf) | 15 | EA | $ 7,500 | $ 112,500 |
| 10 | Olive Ave. from Ontario St. to Superior St. | | | | |
| 11 | 36" sanitary sewer (<10' deep) | 1900 | LF | $ 325 | $ 617,500 |
| 12 | Surface repair -- assumed asphalt | 1900 | LF | $ 40 | $ 76,000 |
| 13 | 72" manhole | 6 | EA | $ 7,500 | $ 45,000 |
| 14 | Replace existing services (75 lf each @ $60/lf) | 38 | EA | $ 7,500 | $ 285,000 |
| 15 | Directional Bore Under Railroad (48" Dia. Case) | 100 | LF | $ 800 | $ 80,000 |
| 16 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 17 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| 18 | Olive Ave. from Superior St. Pine, Pine to Ella, Ella to Main St. | | | | |
| 19 | 36" sanitary sewer (<10' deep) | 2750 | LF | $ 325 | $ 893,750 |
| 20 | Surface repair -- assumed asphalt | 2750 | LF | $ 40 | $ 110,000 |
| 21 | 72" manhole | 9 | EA | $ 7,500 | $ 67,500 |
| 22 | Replace existing services (75 lf each @ $60/lf) | 55 | EA | $ 10,000 | $ 550,000 |
| 23 | Main St. to Division St. | | | | |
| 24 | 36" sanitary sewer (<10' deep) | 1350 | LF | $ 325 | $ 438,750 |
| 25 | Surface repair -- assumed asphalt | 1350 | LF | $ 40 | $ 54,000 |
| 26 | 72" manhole | 5 | EA | $ 7,500 | $ 37,500 |
| 27 | Replace existing services (75 lf each @ $60/lf) | 27 | EA | $ 10,000 | $ 270,000 |
| 28 | *Tie in an re-route upper end of Lincoln Basin into* | 1 | LS | $ 20,000 | $ 20,000 |
| 29 | *new Westside Interceptor* | | | | |
| 30 | Main St. from Division St. to GN Railroad (west side of tracks) | | | | |
| 31 | 30" sanitary sewer (<10' deep) | 2500 | LF | $ 265 | $ 662,500 |
| 32 | Surface repair -- assumed asphalt | 2500 | LF | $ 40 | $ 100,000 |
| 33 | 72" manhole | 8 | EA | $ 7,500 | $ 60,000 |
| 34 | Replace existing services (75 lf each @ $60/lf) | 20 | EA | $ 10,000 | $ 200,000 |
| 35 | Directional Bore Under Railroad (42" Dia. Case) | 250 | LF | $ 700 | $ 175,000 |
| 36 | Bore and Receiving Pits at Each End | 1 | LS | $ 20,000 | $ 20,000 |
| 37 | Mobilization for Boring/Microtunneling eqpt. | 1 | LS | $ 10,000 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 5,588,000** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 558,800 |
| | **Contingency** | | | 20% | $ 1,229,400 |
| | **Engineering** | | | 20% | $ 1,475,200 |
| | **TOTAL** | | | | **$ 8,851,400** |

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# ENGINEERS OPINION OF PROBABLE COST

DATE: 23-Mar-06

PROJECT: City of Sandpoint Collection System Master Plan and CIP

PROJECT DESCRIPTION: Westside Interceptor - **Assuming WWTP at Existing Location or new Location**

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| **West Side Interceptor - Lines within Existing City Limits** | | | | | |
| 1 | From GN RR Crossing, north to Gooby Rd. | | | | |
| 2 | 24" sanitary sewer (<10' deep) | 5500 | LF | $ 175 | $ 962,500 |
| 3 | Surface repair -- assumed majority is gravel | 5400 | LF | $ 20 | $ 108,000 |
| | Surface repair -- asphalt | 100 | LF | $ 40 | $ 4,000 |
| 4 | 60" manhole | 16 | EA | $ 6,000 | $ 96,000 |
| 5 | Gooby Road, north to Mtn View Road | | | | |
| 6 | 21" sanitary sewer (<10' deep) | 2750 | LF | $ 175 | $ 481,250 |
| 7 | Surface repair -- assumed majority is gravel | 2650 | LF | $ 20 | $ 53,000 |
| 8 | Surface repair -- asphalt | 100 | LF | $ 40 | $ 4,000 |
| 9 | 60" manhole | 9 | EA | $ 6,000 | $ 54,000 |
| 10 | | | | | |
| | **SUBTOTAL** | | | | **$ 1,762,800** |
| | **Mobilization, administration, bonding, etc.** | | | 10% | $ 176,300 |
| | **Contingency** | | | 20% | $ 387,800 |
| | **Engineering** | | | 20% | $ 465,400 |
| | **TOTAL** | | | | **$ 2,792,300** |

TECHNICAL MEMORANDUM NO. 6

## City of Sandpoint Wastewater Facility Plan

# Wastewater Treatment Plant Flow and Load Projections

March 2007

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# 1 Collection System Background

Flow and load projections for the wastewater treatment plant (WWTP) are used to identify current and future capacity limitations in the existing plant, future unit process sizes, and total plant size and needs through the planning period. These projections are based on:

- Historical data collected at the WWTP
- Population projections within the current City limits and the Area of City Impact (ACI) (Technical Memorandum No. 1)
- An evaluation of infiltration and inflow (I/I) in the collection system, potential reduction in the existing collection system, and likely future I/I in new sewered areas (Technical Memorandum No. 2)

# 2 WWTP Flows

## 2.1 Flow History

The City of Sandpoint has experienced significant changes in flow due to I/I in the collection system. The 1982 Step 1 Wastewater Facilities Plan (Montgomery, 1982) indicated that base domestic flows were a small portion of the total plant flow, with I/I projected to contribute approximately 8.0 mgd. These 1982 facilities plan flow conditions were adapted and are included in Table 2-1.

TABLE 2-1
1982 Facilities Plan Flow Projections
*March 2007*

| | 1982[a] | | 2000[b, c] | |
|---|---|---|---|---|
| | **Average Day** | **Peak Day** | **Average Day** | **Peak Day** |
| Domestic Flow (mgd) | 0.40 | 0.90 | 0.83 | 2.18 |
| Infiltration (mgd) | 1.10 | 3.10 | 1.20 | 3.20 |
| Inflow (mgd) | --- | 5.00 | --- | 5.00 |
| **TOTAL (mgd)** | **1.50** | **9.00** | **2.0** | **10.38** |
| **Percent I/I** | **73%** | **90%** | **60%** | **79%** |

a. Adapted from Table 4-9 of the 1982 Facilities Plan
b. Adapted from Table 5-6 of the 1982 Facilities Plan
c. Projected flow based on a population of 10,876; current population approximately 6,829

The preliminary sizing of the headworks facility (1982 Facilities Plan, Table 6-2) and eventually the hydraulic profile of the facility in the construction drawings were based on a peak flow of 14.7 mgd, although the derivation is not clear in the facilities plan.

Historical flows from spring 1998 through spring 2005 are shown on Figure 2-1. Available flow data at the WWTP include influent, effluent, and lab-reported daily totals. The lab-reported flow is generally the same as the effluent flow data. Discussions with the operators indicate the influent and effluent flow meters are calibrated monthly. Field measurements made in the course of this study confirm the meters are calibrated well, yet the influent and effluent data do not match from mid-2001 to the present by a factor of approximately 1.5. This factor is close to the conversion factor from million gallons per day (mgd) to cubic feet per second (cfs), which is 1.547. Upon multiplying the influent data by 1.547, a very good visual fit of the influent and effluent data was obtained.

Furthermore, integration of the instantaneous flow measurements on the influent circular chart recorder matched the total effluent for the day. This indicates that a unit conversion error may exist on the influent totalizer. Therefore, the effluent data was used throughout this study.

The current yearly average flow from January 2003 through spring 2005 is 2.79 mgd. However, current base dry weather flows are on the order of 2.0 mgd. As noted in Technical Memorandum No. 2, current domestic wastewater flow is estimated to be approximately 0.79 mgd, based on water consumption in the early spring and late fall. This equates to 115 gallons per capita per day (gcpd), based on a current population of 6,829. Flows above this may be reasonably attributed to I/I.

The peak month flows also were reviewed, utilizing a 30-day moving average. The peak observed one-month flow was 5.05 mgd, observed between January and February 2003. Average flows in 2003 were 2.72 mgd. Therefore, the peak month to average month peaking factor was 1.86, or an increase of 2.33 mgd. Peak month flows also were evaluated for the months of May through October, when I/I is much less prevalent and seasonal discharge permit conditions could apply. The resulting peak month to average month peaking factor was 1.35, or an increase of 0.59 mgd. The increases in flow are recommended to be used rather than the peaking factors when projecting future flows. Most of the flow variations are the result of I/I in the existing collection system rather than demographics and may be expected to remain relatively unchanged over time.

Peak observed flows due to I/I for the period 2002 through 2005 were approximately 11 mgd. The actual peaks during this period are unknown due to the following:

- A portion of the influent above approximately 9.6 mgd (based on the 1983 construction drawings) is bypassed to the stormwater clarifier prior to measurement at the influent flow meter.
- Flow records from the metering vault on the stormwater clarifier are not available.
- The rated capacity of the effluent flow meter is 10.4 mgd. Therefore, flows in excess of 10.4 mgd may not be measured accurately.
- A portion of the effluent flow may be bypassed by the effluent pump station due to high flow conditions in the Pend Oreille River. This bypassed flow is not metered and elapsed time-of-operation records are not available.

For most plants in northern Idaho, winter and spring 1995/1996 represented the worst flow conditions on record. The original daily worksheets were reviewed to determine peak flows during that period. The only recorded bypass events occurred between February 9 and 11, 1996. Average flow to the WWTP during this period was 12.20 mgd, with a peak day flow of 12.8 mgd. Hourly flow data were not available.

The peak observed flow was less than the 1982 projected peak flow conditions. Therefore, a statistical analysis of the flow data from 2002 through 2005 was undertaken to estimate a peak day flow to the facility. Reasonable modeling of the data may be obtained by using a Log Pearsen Type III probability distribution with a weighted skew coefficient of approximately 1.4. Each year was plotted separately (as shown on Figure 2-2), with a statistical regression applied to the year 2005 data. The peak day estimated flow was approximately 14 mgd, which is similar to the design flow utilized in the 1983 construction drawings.

The current flow conditions are summarized in Table 2-2.

TABLE 2-2
Current Flow Conditions
*March 2007*

| | Average Day Dry Weather | Yearly Average | Peak Month Observed Seasonal[a] | Peak Month Observed[d] | Peak Day - Observed | Peak Day - Estimated |
|---|---|---|---|---|---|---|
| Domestic Flow (mgd)[a] | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Total I/I (mgd)[b] | 1.21[c] | 2.00 | 2.59 | 4.26 | 12.01 | 13.21 |
| **TOTAL (mgd)** | **2.00** | **2.79** | **3.38** | **5.05** | **12.80[e]** | **14.00[f]** |

a. Based on water use records as discussed in Technical Memorandum No. 2
b. Determined as the difference between total flow and domestic flow
c. Assumed to reflect base infiltration into the collection system
d. 30-day average flow. "Seasonal" value reflects flows from May 1 through October 31
e. Peak day flow observed on February 10, 1996
f. Estimated peak day flow based on a Log Pearsen Type III statistical regression of the effluent flow data

## 2.2 Flow Projections

Flows at the WWTP are expected to change in the planning period due to the following factors:

- Changes in the base domestic flow due to population growth and expansion of the service area into the ACI
- I/I in the existing collection system
- I/I in new service areas in the ACI

As discussed in Technical Memorandum No. 1, the population served by the WWTP is expected to increase from 6,829 (current) to 37,171, with build-out into sewered areas of the ACI. Interim growth to year 2015 and 2025 is projected at 4 percent per year, resulting in populations of 12,179 and 18,029, respectively. Assuming the base domestic flow remains similar to the current average of 115 gpcd, the base domestic flow is expected to increase to the levels shown in Table 2-3.

TABLE 2-3
Base Domestic Flow Projections
*March 2007*

| | Current | Year 2015 | Year 2025 | Build-out |
|---|---|---|---|---|
| Population | 6,829 | 12,179 | 18,029 | **37,171** |
| Base Domestic Flow (mgd)[a] | 0.79 | 1.40 | 2.07 | **4.27** |

a. Based on a per capita flow of 115 gpd

Changes in I/I in the existing collection system are difficult to project. I/I noted in the 1982 facilities plan was approximately 8.0 mgd, whereas current levels are 12 mgd or higher. This is presumably due to a larger present-day service area and continued deterioration of the collection system lines installed prior to the 1982 study. The City has been active in

identifying and correcting known I/I sources. Therefore, this process is expected to continue with three potential outcomes:

- No additional increase will occur in I/I in the existing collection system. The peak day I/I contribution will remain at 13.21 mgd.
- A reduction in I/I in the existing collection system of approximately 24 percent will occur, based on the results included in Technical Memorandum No. 2. Therefore, the peak day I/I contribution will be reduced to 10.04 mgd.
- An aggressive I/I identification and removal program in the existing collection system may result in a 50 percent reduction of I/I. Obtaining this level of reduction would require significantly more rehabilitation work than indicated in Technical Memorandum No. 2. If successful, the peak day I/I contribution is estimated at 6.6 mgd.

Projected I/I in the expanded service area is subject to many factors. Construction materials and practices have improved considerably, compared to the original collection system construction in the early 1900s. Initial I/I should be minimal but is expected to increase over time due to additional connections or repairs in the mainlines, gasket deterioration, and deteriorating service lines. Based on the analysis and conclusions in Technical Memorandum No. 2, an I/I component of 300 gallons per day per acre (gpd/acre) will be assumed to occur in expanded service areas on average, with a peak I/I component of 500 gpd/acre. This appears consistent with other collection systems in the area and guidance for new sewer construction (Reynolds and Richards, 1996). For a sewered service area of approximately 4,264 acres in the ACI, this results in an I/I component of 1.28 mgd on average, with a peak of 2.13 mgd.

Population growth in the interim period is assumed for new sewered areas. Therefore, relative population growth should be used to estimate the relative increase in I/I in the expanded service area. For example, a 26 percent population increase will result in 26 percent of the total I/I in the expanded service area being realized.

Flow projections for the interim period and at build-out are included in Table 2-4 through Table 2-6, respectively.

TABLE 2-4
Projected Flow Conditions at Year 2015
*March 2007*

| | No Change in I/I | | | | | Reduced I/I (moderate/aggressive) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area[a] | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Expanded Service Area[b] | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area[c] | 0.22 | 0.22 | 0.22 | 0.36 | 0.36 | 0.22 | 0.22 | 0.22 | 0.36 | 0.36 |
| **TOTAL (mgd)** | **2.83** | **3.62** | **4.21** | **6.09** | **14.97** | **2.54/2.2** | **3.14/2.62** | **3.59/2.9** | **5.05/3.9** | **11.80/8.4** |

a. Current population of 6,829, with increase of 594 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 4,756 at 115 gpcd, for a total population of 12,179
c. Based on an average I/I component of 300 gpd/acre, and a peak I/I component of 500 gpd/acre, with 17 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area
d. Moderate I/I removal reflects a 24 percent reduction in I/I with identical deficiencies from Technical Memorandum No. 2. Aggressive I/I removal reflects a 50 percent reduction in I/I that will require significantly more rehabilitation work.

TABLE 2-5
Projected Flow Conditions at Year 2025
*March 2007*

| | No Change in I/I | | | | | Reduced I/I (moderate/aggressive) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Expanded Service Area | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area | 0.46 | 0.46 | 0.46 | 0.76 | 0.76 | 0.46 | 0.46 | 0.46 | 0.76 | 0.76 |
| **TOTAL (mgd)** | **3.74** | **4.53** | **5.12** | **7.16** | **16.04** | **3.45/3.1** | **4.05/3.5** | **4.50/3.8** | **6.12/5.03** | **12.87/9.4** |

a. Current population of 6,829, with increase of 1,189 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 10,012 at 115 gpcd, for a total population of 18,029
c. Based on an average I/I component of 300 gpd/acre, and a peak I/I component of 500 gpd/acre, with 36 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area

TABLE 2-6
Projected Flow Conditions at Build-Out
*March 2007*

| | No Change in I/I | | | | | Reduced I/I (moderate/aggressive) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** | **Average Day Dry Weather** | **Yearly Average** | **Peak Month Seasonal** | **Peak Month Year Round** | **Peak Day** |
| **Domestic Flow (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| Expanded Service Area | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 |
| **I/I Contribution (mgd)** | | | | | | | | | | |
| Existing Service Area | 1.21 | 2.00 | 2.59 | 4.33 | 13.21 | 0.92/.6 | 1.52/1.0 | 1.97/1.3 | 3.29/2.2 | 10.04/6.6 |
| Expanded Service Area | 1.28 | 1.28 | 1.28 | 2.13 | 2.13 | 1.28 | 1.28 | 1.28 | 2.13 | 2.13 |
| **TOTAL (mgd)** | **6.77** | **7.56** | **8.15** | **10.74** | **19.62** | **6.48/6.2** | **7.08/6.6** | **7.53/6.9** | **9.70/8.6** | **16.45/13.01** |

a. Current population of 6,829, with additional build-out of 2,377 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 27,965 at 115 gpcd, for a total population of 37,171
c. Based on an average I/I component of 300 gpd/acre, and a peak I/I component of 500 gpd/acre, with all of the total I/I experienced corresponding to percent of in-fill in the expanded service area

# 3 WWTP Loads

## 3.1 $BOD_5$ and TSS Loads—General

The 5-day biochemical oxygen demand ($BOD_5$) and total suspended solids (TSS) data from spring 1998 through spring 2005 were reviewed to identify current loading conditions and trends. Figure 3-1 shows the loading trends through this period in pounds per day (ppd). Summaries and projections for loadings are recommended on a pounds per day basis when high levels of I/I exist because loads will remain relatively consistent, whereas flows and concentrations will tend to fluctuate considerably with I/I events.

The data show a general upward trend from 1998 through 2005, with the exception of mid-2000 when a noticeable drop occurred. This reduction in loading appears to be the result of the closure of a local brewery. The subsequent rise in 2001, which steadied in 2002, is suspected to be the result of the Litehouse Cheese Factory coming into operation. Therefore, loading conditions from January 2002 to present are assumed to reflect current baseline conditions.

### 3.1.1 $BOD_5$ Loads

The average $BOD_5$ loading from 2002 through 2005 was 3,403 pounds per day (ppd), or 0.50 ppd/capita, based on a population of 6,829. Literature values range from 0.18 to 0.22 ppd/capita, with a typical value of 0.22 ppd/capita. It appears that the City is experiencing significant organic loading from non-residential sources such as commercial users, restaurants, and industries. This non-residential load is approximately 0.28 ppd/capita (1,900 ppd) based on the current population, which more than doubles the load due to typical residential wastewater. The following two options are available for extrapolating loads for the interim and build-out conditions:

1. Extrapolate based on a constant 0.50 ppd/capita (At a build-out population of 37,171, the resulting average yearly load would be approximately 18,600 ppd.)
2. Divide the total load into residential and non-residential sources and assume non-parallel growth in each sector (Current residential loading of 0.22 ppd/capita would be assumed to remain constant through the planning period. The current non-residential load of 1,900 ppd would be assumed to grow at a different rate. The City expects these non-residential loads to double at build-out, based on recent discussions. The resulting average yearly load is developed in Table 3-1 and was used in this study.)

TABLE 3-1
Projected Average $BOD_5$ Conditions
*March 2007*

| | Current Conditions | | | Year 2015 | | Year 2025 | | Build-Out Conditions | |
|---|---|---|---|---|---|---|---|---|---|
| **$BOD_5$ Source** | **Population** | **$BOD_5$ Load (ppd)** | **$BOD_5$ Load (ppd/ capita)** | **Population** | **$BOD_5$ Load (ppd)** | **Population** | **$BOD_5$ Load (ppd)** | **Population** | **$BOD_5$ Load (ppd)** |
| Residential | 6,829 | 1,500 | 0.22 | 12,179 | 2,679 | 18,029 | 3,966 | 37,171 | 8,200 |
| Non-Residential | N/A | 1,900 | N/A | N/A | 2,375[a] | N/A | 2,850[b] | N/A | 3,800[c] |
| **TOTAL** | **6,829** | **3,400** | | **12,179** | **5,054** | **18,029** | **6,816** | **37,171** | **12,000** |

a. The projected load is 125 percent of the current estimated non-residential load.
b. The projected load is 150 percent of the current estimated non-residential load.
c. The projected load is double the current estimated non-residential load.

Peaking factors on the average conditions were developed based on observed conditions and literature values. The peak observed month $BOD_5$ load for the period of 2002 through 2005 was 4,636 ppd, resulting in a peaking factor of 1.36. This peaking factor is consistent with typical literature values and was used in this study. The peak observed day $BOD_5$ load for the same period was 11,259 ppd, resulting in a peaking factor of 3.3. This peaking factor is higher than average but is still within a reasonable range for WWTP. Therefore, a peak day factor of 3.3 was used in this study. The resulting $BOD_5$ loading conditions estimated for the interim and build-out conditions are provided in Table 3-2.

TABLE 3-2
Projected $BOD_5$ Loads
*March 2007*

| Condition | Peaking Factor | Current (ppd) | Year 2015 (ppd) | Year 2025 (ppd) | Build-Out (ppd) |
|---|---|---|---|---|---|
| Yearly Average | --- | 3,403 | 5,054 | 6,816 | 12,000 |
| Peak Month | 1.36 | 4,636 | 6,873 | 9,270 | 16,320 |
| Peak Day | 3.30 | 11,259 | 16,678 | 22,493 | 39,600 |

Because the two extrapolation methods result in a large range of potential loads (yearly average loading of 12,000 ppd to 18,000 ppd), the following activities are recommended:

- Monitor loads to the WWTP from known industrial and commercial entities or areas
- Monitor loads to the WWTP from solely residential areas to develop a domestic loading baseline specific to the City of Sandpoint
- Review actual loading conditions and trends at interim planning points, or sooner if actual yearly average loads exceed the projected values
- Review laboratory procedures for $BOD_5$ testing to verify that consistent results are obtained

### 3.1.2 TSS Loads

The average TSS loading from 2002 through 2005 was 2,206 ppd, or 0.32 ppd/capita based on a population of 6,829. Literature values range from 0.20 to 0.33 ppd/capita, with a typical value of 0.26 ppd/capita. Although the per capital TSS loading to the Sandpoint WWTP is higher than usual, it is within the typical range for TSS loading and was used in this study. Future loadings will be assumed to remain at 0.32 ppd/capita, without separating the incoming load into residential and non-residential components.

Peaking factors on the average conditions were developed based on observed conditions and literature values. The peak observed month TSS load for the period of 2002 through 2005 was 3,363 ppd, resulting in a peaking factor of 1.52. This peaking factor is consistent with typical literature values and was used in this study. The peak observed day TSS load for the same period was 10,588 ppd, resulting in a peaking factor of 4.80. This peaking factor is higher than average but still within a reasonable range for WWTPs. Therefore, a peak day factor of 4.8 was used in this study. The resulting TSS loading conditions for the interim and build-out conditions are presented in Table 3-3.

TABLE 3-3
Projected TSS Loads
*March 2007*

| Condition | Peaking Factor | Current (ppd) | Year 2015 (ppd) | Year 2025 (ppd) | Build-Out (ppd) |
|---|---|---|---|---|---|
| Yearly Average | --- | 2,206 | 3,897[a] | 5,769[b] | 11,900[c] |
| Peak Month | 1.52 | 3,363 | 5,924 | 8,769 | 18,100 |
| Peak Day | 4.80 | 10,588 | 18,707 | 27,693 | 57,100 |

a. Based on a population of 12,179 and a per capita loading of 0.32 ppd
b. Based on a population of 18,029 and a per capita loading of 0.32 ppd
c. Based on a population of 37,171 and a per capita loading of 0.32 ppd

## 3.2 Nutrients/Loading

Influent nutrient loading data is currently unavailable. Therefore, nutrient loadings are based on typical literature values. These values should be confirmed with additional sampling prior to process sizing, given the higher than usual $BOD_5$ and TSS loads at the WWTP.

TABLE 3-4
Probable Current and Future Nutrient Loading Conditions
*March 2007*

| Parameter | Value[a](lbs/day/capita) Range | Typical | Current Average Day[b] (lbs/day) | Year 2015 Average Day[c] (lbs/day) | Year 2025 Average Day[d] (lbs/day) | Build-Out Average Day[e] (lbs/day) |
|---|---|---|---|---|---|---|
| Total Kjeldahl Nitrogen | 0.020-0.031 | 0.027 | 184 | 329 | 487 | 1,003 |
| Total Phosphorus | 0.007-0.011 | 0.008 | 55 | 97 | 144 | 297 |

a. Metcalf and Eddy, 2003, Table 5-4.
b. Based on a current population of 6,829
c. Based on a projected population of 12,179
d. Based on a projected population of 18,029
e. Based on a projected build-out population of 37,171

# 4 References

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. *Recommended Standards for Wastewater Facilities (Ten States Standards).* 2004.

Metcalf and Eddy. *Wastewater Engineering: Treatment, Disposal, Reuse.* 1991 and 2003.

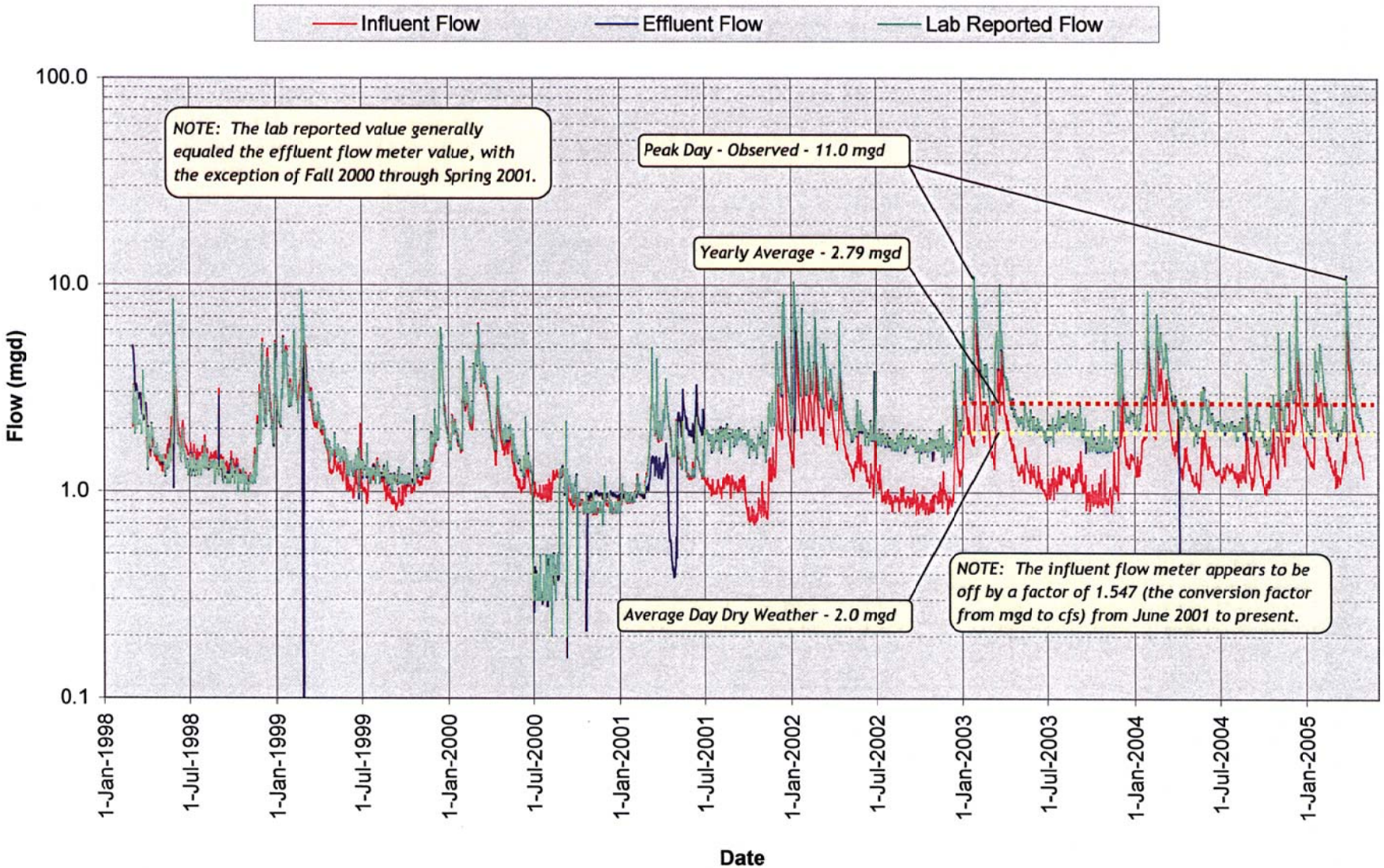
Montgomery, James M. Consulting Engineers Inc. *City of Sandpoint, Idaho: Step 1 Wastewater Facilities Plan*. January 1982.

Montgomery, James M. Consulting Engineers Inc. *City of Sandpoint, Idaho: Wastewater Treatment Plant Improvements* (Construction Drawings). 1983.

Reynolds and Richards. *Unit Operations and Processes in Environmental Engineering.* Second edition. 1996.

Figure 2-1 WWTP Historical Flows
Figure 2-2 Statistical Analysis of WWTP Flows by Year
Figure 3-1 Influent $BOD_5$ and TSS Trends

## Figure 2-1 - WWTP Historical Flows



# Figure 2-2 - Statistical Analysis of WWTP Flows by Year

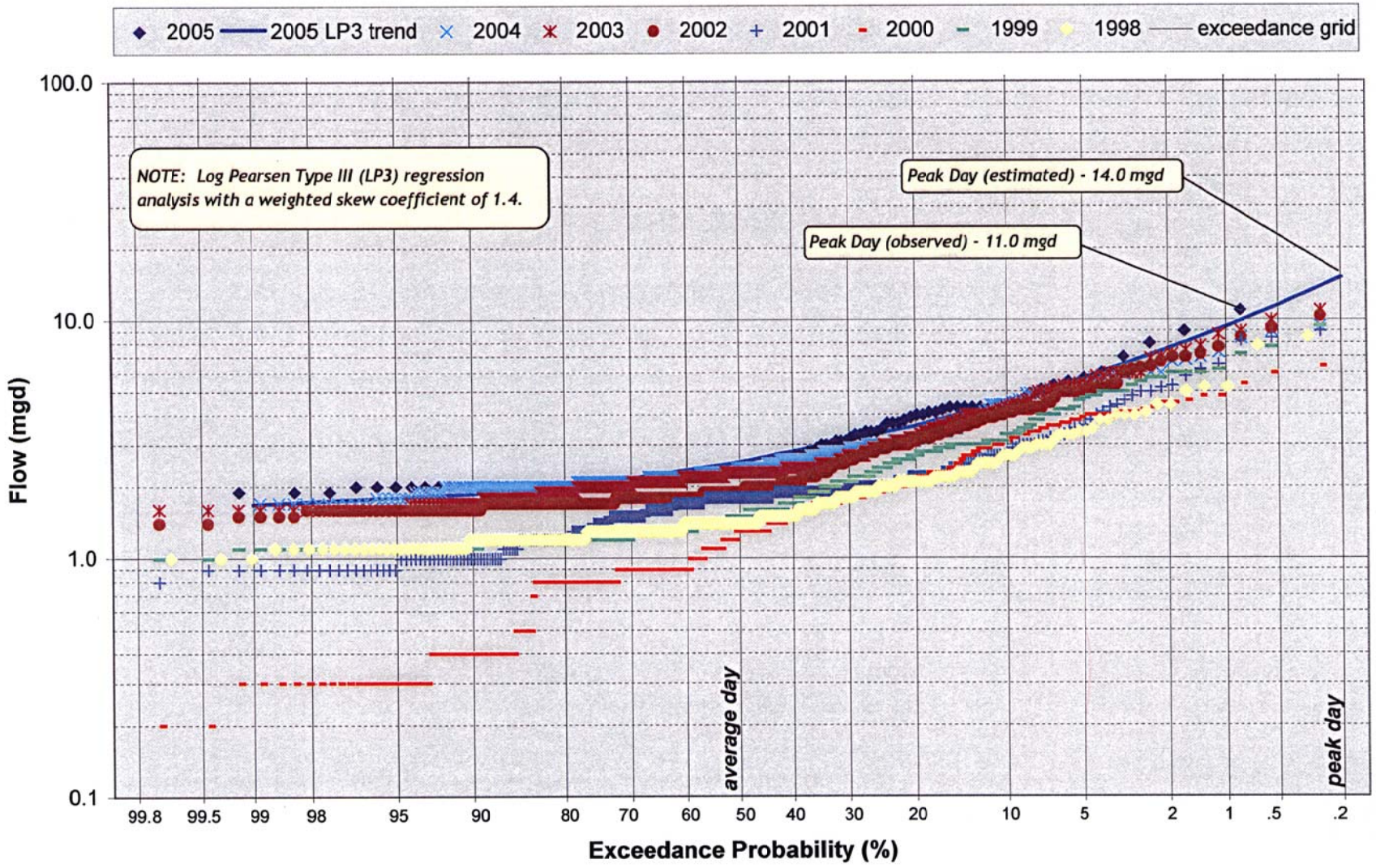



Figure 2-2 flow by year

F:\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Spreadsheets\WWTP Data\WWTP flows.xls

## Figure 3-1 - Influent $BOD_5$ and TSS Trends

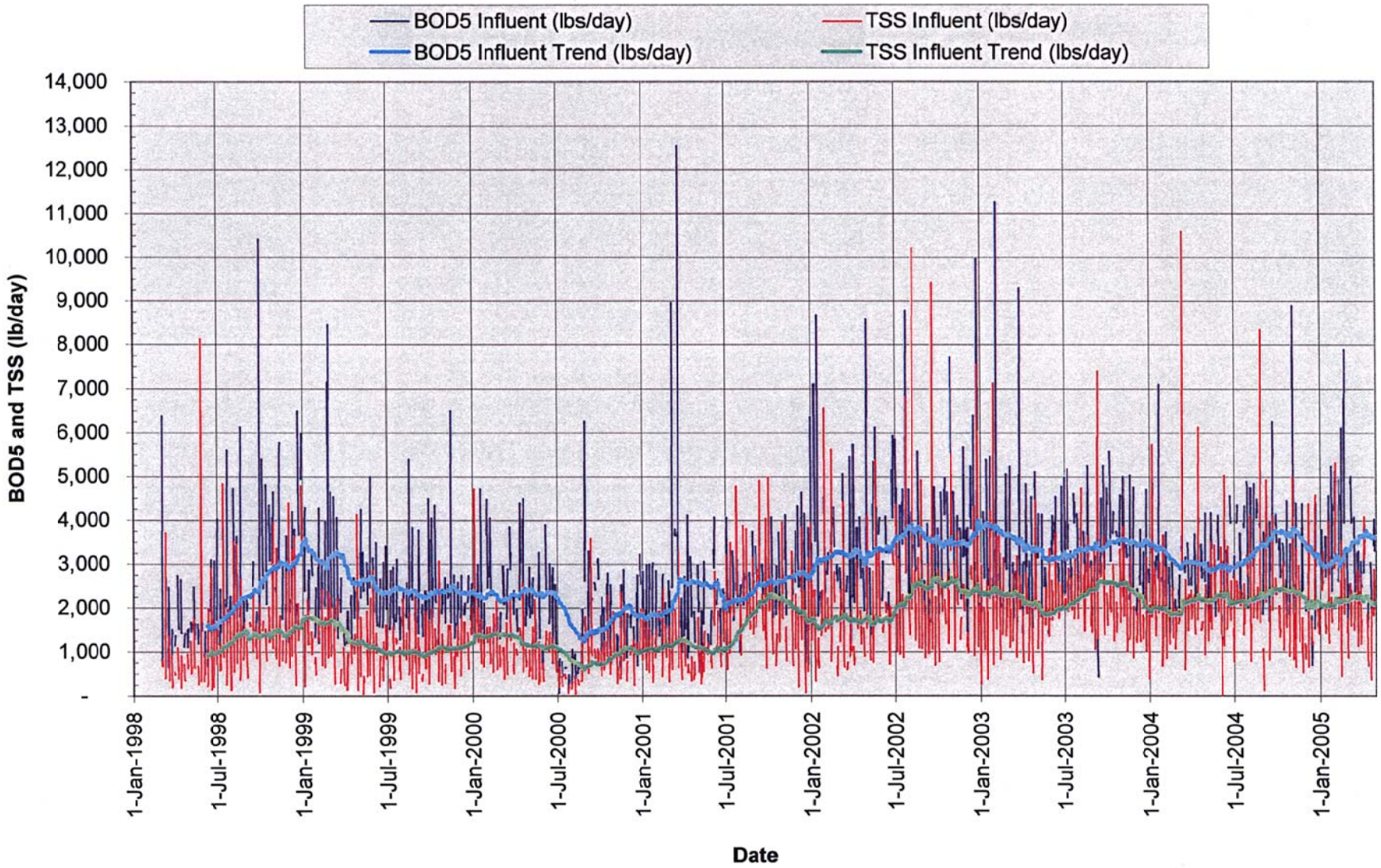



Figure 3-1 BOD5 and TSS trends

F:\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Spreadsheets\WWTP Dat[illegible]oads--BOD.xls

TECHNICAL MEMORANDUM NO. 7

## City of Sandpoint Wastewater Facility Plan

# Existing Wastewater Treatment Plant Capacity Analysis

March 2007

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## Appendixes

Appendix A NPDES Permit
Appendix B Avista Utilities *Draft Industrial Energy Efficiency Study*

# 1 Introduction and Background

The Sandpoint wastewater treatment plant (WWTP) was originally constructed in 1976 to provide secondary treatment of sewage prior to discharge to the Pend Oreille River. The original facility included:

- Screening
- Primary clarification
- Oxidation tower
- Secondary clarification
- Chlorine contact chamber
- Chlorination
- Outfall to Pend Oreille River
- Gravity sludge thickener
- Anaerobic digestion and sludge storing tank
- Sludge drying beds
- Control building

Excessive infiltration and inflow (I/I), due to an aging collection system and high groundwater conditions, resulted in overloading conditions at the WWTP and poor performance. A consent decree was originally issued by the U.S. Environmental Protection Agency (USEPA) in 1978 and finalized in 1981. The final consent decree specified interim discharge and monitoring guidelines and ultimately resulted in the January 1982 *City of Sandpoint, Idaho: Step 1 Wastewater Facilities Plan* (Montgomery, 1982). The upgrades identified at that time and subsequently implemented included:

- New screening and grit removal
- Addition of a stormwater clarifier downstream of screening and grit removal to handle peak flows
- Addition of overflow pump system downstream of the primary clarifiers
- Secondary pump station upgrades
- New activated sludge basins
- New return activated sludge (RAS) and blower building
- New chlorine building
- New anaerobic digester and boiler
- Removal of the sludge drying beds and construction of dewatering facilities using a belt filter press
- Flood stage pumps at the end of the chlorine contact chamber

- Outfall extension
- New generator building

No major upgrades have been completed at the Sandpoint WWTP since the 1983 upgrades. Current process schematics of the liquid stream and solids stream are included in Figures 1-1 and 1-2, respectively.

Sandpoint discharges to the Pend Oreille River under National Pollutant Discharge Elimination System (NPDES) Permit No. ID-002084-2, issued January 5, 2002. The permit is scheduled to expire on January 5, 2007. Current permit conditions are summarized in Table 1-1, and a copy of the current permit is included in Appendix A.

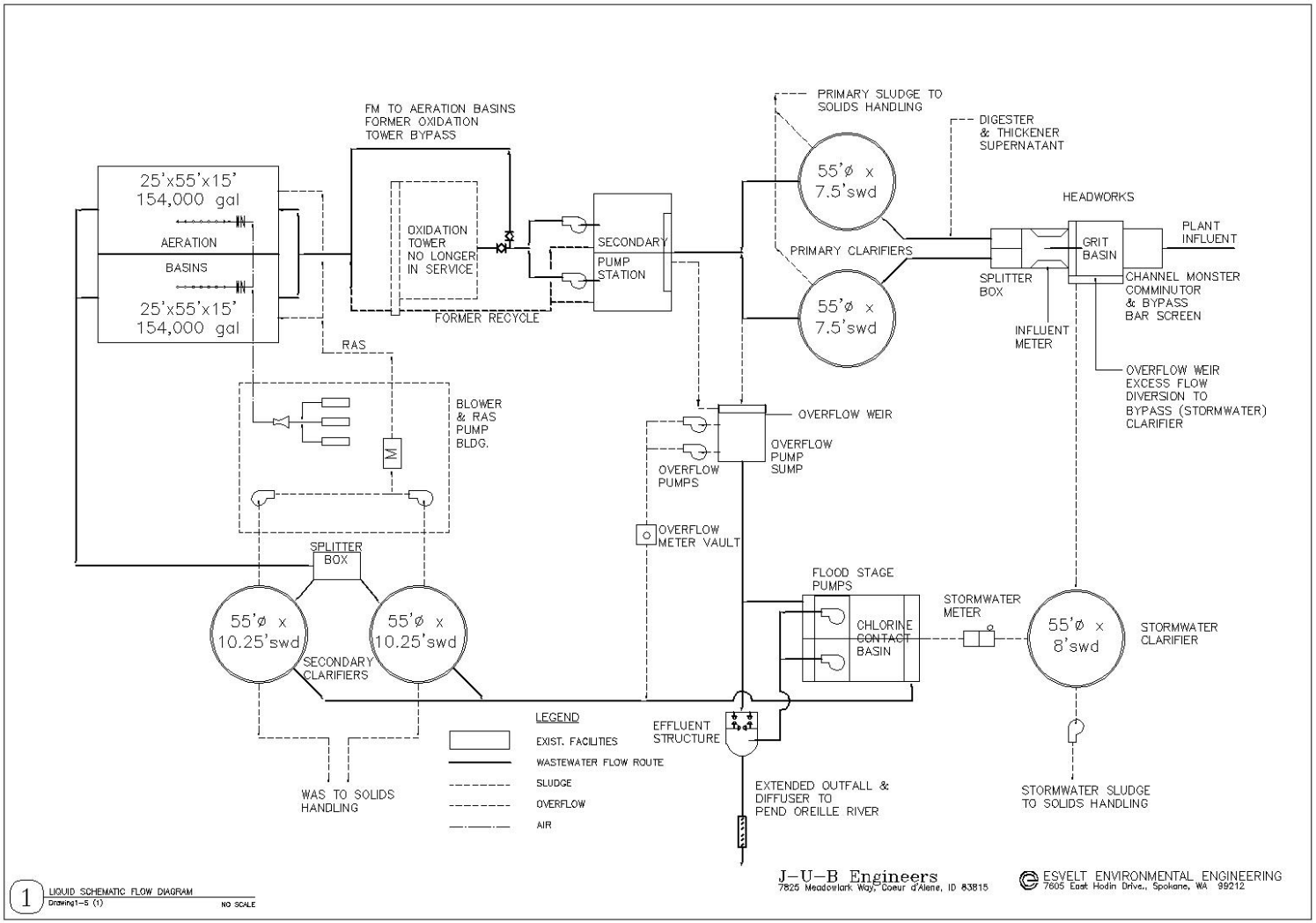
The Sandpoint NPDES Permit is based on a design flow of 3.0 mgd (Section 1.F). This permit section further requires that when the average annual flow reaches 85 percent of that value (2.6 mgd), a facility plan and schedule must be prepared for maintaining adequate capacity and compliance with the specified effluent limits. As noted in Technical Memorandum No. 6, the current annual average flow is 2.79 mgd, or 93 percent of the design flow, substantiating this new City of Sandpoint Wastewater Facility Plan (the plan).

TABLE 1-1
NPDES Permit Summary
Permit No. ID-002084-2
*March 2007*

| Parameter | Average Monthly Limit[a] | | Average Weekly Limit[a] | | Daily Limit |
|---|---|---|---|---|---|
| $BOD_5$[b] | 30 mg/l | 750 lb/day | 45 mg/l | 1,100 lb/day | -- |
| TSS[b] | 30 mg/l | 750 lb/day | 45 mg/l | 1,100 lb/day | -- |
| E. coli Bacteria | 126/100 ml | -- | -- | -- | 406/100 ml |
| Total Res $Cl_2$ | 0.45 mg/l | -- | -- | -- | 1.1 mg/l |
| pH | Shall be within the range 6.0 to 9.0 standard units | | | | |

a. Average limits are arithmetic mean, except for bacteriological, which are geometric mean, for the time period.
b. Monthly average $BOD_5$ and TSS shall not exceed 15% of monthly average influent concentration.

FIGURE 1-1
Liquid Stream Process Schematic
*March 2007*



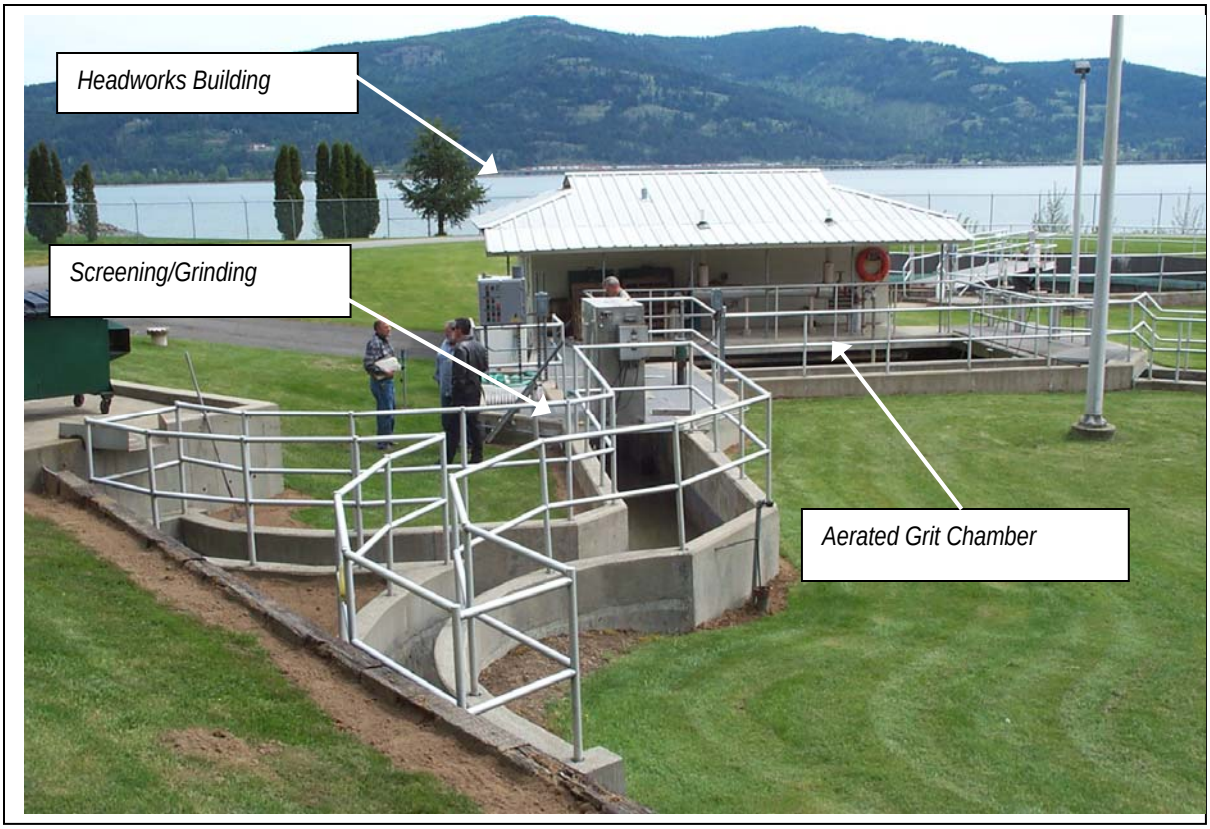
# 2 Primary Treatment

## 2.1 Screening

### 2.1.1 Component Description

Preliminary treatment of the influent wastewater is performed in the headworks, which consists of a rock box and screening/grinder. Grinding consists of a JWC Environmental Channel Monster (JWC) and a comminutor. A bypass channel houses a hand-cleaned bar rack. A gravity fed deodorant system has recently been installed to reduce odors. Influent samples are pumped to the laboratory directly from the headworks. A photo of the headworks area is shown in Figure 2-1.

FIGURE 2-1
Headworks Area
*March 2007*




### 2.1.2 Observed Deficiencies

- The headworks structure is generally in good condition, with the only noticeable deficiencies being damaged hand-railing sockets caused by freeze-thaw conditions.
- The JWC is the primary grinding unit in service, with screening not frequently used. Debris is not collected and removed from the waste stream, which results in debris accumulation in downstream processes.
- During high flow conditions, the grinder is overtopped. This magnifies the problem because high flows reportedly carry more debris.

- The lower portions of the grinder assembly in the JWC screen wear out frequently. Although the manufacturer claims the grinder assembly can be re-stacked to rotate worn teeth, this has proven unsuccessful. The City currently replaces the grinder teeth every 5 to 6 years, at a current cost of $12,500.

### 2.1.3 Capacity

The primary unit is the JWC, with a capacity of 4.9 mgd. This unit does not have adequate capacity to handle current peak flows without overflowing the unit or bypassing a portion of the flow through the bar rack. Under either circumstance, a considerable amount of debris, rags, and other material cannot be ground up. Under all circumstances, the material in the raw sewage is returned to the wastewater flow following grinding. Rags can, and usually do, recombine into "ropes" in downstream treatment units after grinding. Most treatment plant operation personnel prefer to remove the material completely from the wastewater stream with a fine screen system.

## 2.2 Grit Removal

### 2.2.1 Component Description

The grit removal system consists of an aerated grit chamber downstream of the screen/grinders and upstream of the primary clarifiers. Two 15-hp blowers are used to introduce air near the bottom at one side of the basin to create a rolling motion of the water. The rolling action is intended to keep organic material suspended while allowing the higher specific gravity grit and sand to settle at the bottom of the basin. Accumulated grit is pumped to a classifier in the adjacent headworks building for washing and disposal. The grit chamber and headworks building is shown in Figure 2-1.

### 2.2.2 Observed Deficiencies

- The primary deficiency in this system is the generation of noxious odors due to organic material in the grit. Odors contained within the building are vented directly to the north, with no odor control.
- The blowers generally have a life expectancy of three years and are due for replacement.
- The grit classifier shows signs of excessive corrosion and will need replacement in the near future.

### 2.2.3 Capacity

The grit chamber has a hydraulic capacity of approximately 14.7 mgd. However, its performance is compromised at all flow levels compared to current grit removal techniques. The lower removal efficiency results in operational problems in downstream units, with considerable grit accumulation suspected in the primary anaerobic digester.

## 2.3 Influent Flow Measurement

Effluent from the grit chamber is directed either to the stormwater clarifier or to the primary clarifiers. A majority of the plant flows are routed through the 18-inch Parshall flume for primary and secondary treatment. The influent flume has a rated free-flow capacity of 15.9 mgd, provided no backwater effects exist. Field measurements were taken to assess current calibration of the flume and sensor equipment. The sensor appears to be properly reading the flow depth based on output on the circular chart recorder, but a conversion error may exist in the totalizer output.

## 2.4 Primary Clarification

### 2.4.1 Component Description

The primary clarifiers are downstream of the influent Parshall flume and upstream of the secondary pump station beneath the control building. A division box downstream of the influent Parshall flume receives raw wastewater, overflow from the gravity thickener and secondary anaerobic digester, and drainage from the dewatering building. The primary clarifiers are shown in Figure 2-2.

During most conditions, all influent flow is routed through the primary clarifiers. However, during peak flow events a portion of the flow is diverted to the stormwater clarifier. The clarifier drives were replaced several years ago, and the scrapers were cleaned and painted at that time.

FIGURE 2-2
Primary Clarifiers
*March 2007*

### 2.4.2 Observed Deficiencies

- The primary deficiency is frequent plugging in the underflow piping at solids concentrations above 3 percent solids, based on input from the operators. This often occurs during the spring when flows are high and additional debris enters the WWTP. The lines can be cleaned with the plant air compressor, but the cleaning negatively affects the solids handling components.
- The division box is a source of odors due to the raw wastewater and return flows from the solids handling processes.
- The piping at the division box is aged and in need of replacement.
- The scraper box on the north primary clarifier needs to be raised.

### 2.4.3 Capacity

The capacity of the primary clarifiers when both are in service is approximately 9.5 mgd based on an overflow rate of 2,000 gallons per day per square foot (gpd/sf). Based on the process schematic from the 1983 construction drawings, flow to the clarifiers is limited to approximately 9.3 mgd (4.3 mgd to the aeration basins from the secondary pump station and a rated capacity of 5.0 mgd in the overflow sump pumps).

Table 2-1 summarizes the primary clarifier loading and performance under current conditions compared to literature design guidance. With the limiting capacity at 9.3 mgd, primary clarification can be provided to include a majority of the flows that reach the treatment plant. During normal flows in the range of 2.5 to 5.0 mgd, the units are loaded more lightly, allowing good efficiency and removal of suspended solids and $BOD_5$.

The plant currently diverts flow during peak flow periods to the stormwater clarifier. Maximum day flows from 1998 through 2005 were reported limited to 7.0 to 7.5 mgd. Based on data available from the facility, up to 50 percent of TSS and BOD will be removed from the direct discharged bypass clarifier effluent, which will assist in protection of receiving water (Pend Oreille River) quality. The primary clarifiers could be expected to remove about 30 percent of influent BOD on a 90th percentile basis. This performance will be used to assess the capability of the biological treatment system.

TABLE 2-1
Primary Clarifiers Performance Summary
*March 2007*

| Parameter | Actual Condition | Typical Design Condition |
|---|---|---|
| Diameter (ft) | 55 | |
| Surface Area (sf) | 2,375 | - |
| Volume (gal), Each | 140,000 | - |
| $BOD_5$ Removal (%) | 54% ± 15% | 25-40% |
| TSS Removal (%) | 54% ± 15% | 50-70% |
| Overflow Rate with Both Units in Service (gpd/sf) | | |
| Average Flow – 2.79 mgd | 587 | 800-1,200 |
| Peak Day – 9.3 mgd[a] | 1,960 | 2,000-3,000 |
| Hydraulic Residence Time, HRT (hr) | | |
| Average Flow – 2.79 mgd | 2.6 | 1.5-2.5 |
| Peak Day – 9.3 mgd[a] | 0.72 | 1.0 |

a. Peak minus selective diversion to stormwater clarifier allowable for downstream pumping

## 2.5 Overflow Pumps and Overflow Meter Vault

A portion of the influent wastewater may be diverted, prior to the aeration basins, to protect the downstream biological process from washout during high flows. The overflow sump receives primary clarifier effluent that is in excess of the amount pumped to the activated sludge secondary treatment system. The excess flow enters the pumping basin by overflowing a divider wall that cannot be adjusted. Two 7.5 hp vertical turbine pumps

rated at 1,725 gpm each (2.5 mgd) at 10 feet TDH pump the excess flow from the influent pipe to the chlorine contact chamber. There, the flow is combined with the secondary clarifier effluent for disinfection and discharge to the Pend Oreille River. The overflow pumps are shown in **Figure 2-3**.

FIGURE 2-3
Overflow Pump Station
*March 2007*

## 2.6 Stormwater Clarifier

### 2.6.1 Component Description

The stormwater clarifier was constructed in the mid-1980s to treat influent flows that exceed the capacity of the primary clarifiers and secondary treatment units. The stormwater clarifier allows for settling prior to flow entering the chlorine contact chamber for disinfection. This process is very important for maintaining the integrity of the secondary (biological) treatment system during extreme I/I flows. As noted, the capacity of the primary clarifiers is 9.3 mgd. Flows in excess of 9.3 mgd are diverted to the stormwater clarifier, using downward opening slide gates.

Effluent flow from the stormwater clarifier is measured over a 4-foot weir, using an ultrasonic transducer. A submersible sludge pump is located on the northwest corner of the clarifier and pumps settled solids upstream of the primary clarifiers.

### 2.6.2 Observed Deficiencies

- The stormwater clarifier is used infrequently during the winter and spring. When not in operation, standing water freezes and causes damage to the clarifier's grout, concrete, and mechanical components.

- Sun exposure also is causing general deterioration to the clarifier.
- Flow through the clarifier is not automatically recorded. Consequently, total plant flow is difficult to ascertain during extreme I/I events.

### 2.6.3 Capacity

The bypass capacity of the stormwater clarifier is approximately 4.8 mgd, based on an overflow rate of 2,000 gpd/sf. A summary of operating conditions is shown in **Table 2-2**.

TABLE 2-2
Stormwater Clarifier Bypass
*March 2007*

| Parameter | Actual | Recommended | Units |
|---|---|---|---|
| Diameter | 55 | - | feet (ft) |
| Surface Area | 2,375 | - | square feet (sf) |
| Volume | 157,000 | - | Gallons (g) |
| Overflow Rate | | | |
| Peak Day (observed)[a] | 1,473 | 2,000 | gpd/sf |
| Peak Day (estimated)[b] | 1,979 | 2,000 | gpd/sf |

a. Peak Day (observed) flow of 12.8 mgd minus 9.3 mgd assumed to the primary clarifiers and aeration basin
b. Peak Day (estimated) flow of 14.0 mgd minus 9.3 mgd assumed to the primary clarifiers and aeration basin

# 3 Secondary Treatment

## 3.1 Secondary Pump Station

The secondary pump station pumps primary clarifier effluent to the biological treatment system. There are two independent sumps with two pumps each for redundancy. The pumps were originally installed to pump to the oxidation tower, which was abandoned in the mid-1980s with construction of the current aeration basins.

The pumps currently installed are rated at 750 gpm and 22 ft TDH, and discharge through an 18-inch force main. The static lift is approximately 10 feet to the aeration basins. The design influent rate for the aeration basins was approximately 4.8 mgd, according to the design criteria in the 1983 construction plans.

No deficiencies were noted during site visits and discussions with WWTP personnel.

## 3.2 Oxidation Tower

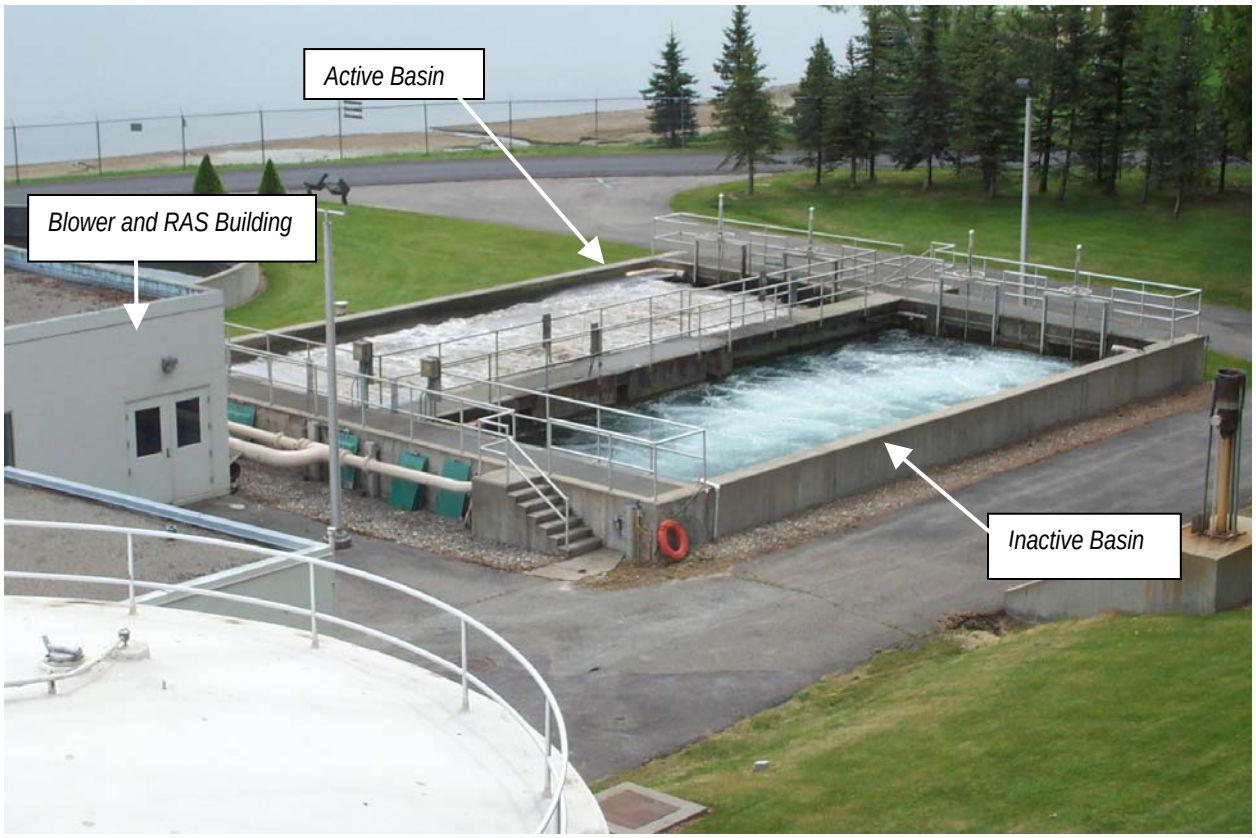
A wood (with wood slat media) oxidation tower was constructed in the 1970s as the first biological treatment locale. The tower has been out of service for some time, with no plan to return it to service. The repair cost and return to service would probably be greater than any intrinsic value.

## 3.3 Aeration Basins

### 3.3.1 Component Description

The two aeration basins are constructed of concrete and configured to be operated in parallel. Each basin is 25 feet wide and 55 feet long, with a side water depth of 15 feet resulting in a volume of approximately 154,000 gallons each. Aeration is provided by two 100 hp and one 50 hp centrifugal blowers, which were overhauled approximately seven years ago. The 50 hp blower is the primary blower in use through the winter, when oxygen demand is lower; one 100 hp blower is used in the summer months. The aeration basins are mixed and oxygenated with coarse bubble diffusers. **Figure 3-1** is a photograph of the aeration basins**.**

FIGURE 3-1
Aeration Basins
*March 2007*




### 3.3.2 Observed Deficiencies

- The blowers were originally operated with a dissolved oxygen probe and a variable inlet valve to adjust blower output. The system did not track effectively and was abandoned.
- Only Blower No. 3 can be used with standby power.
- Excess air from the blowers is diverted to the parallel basin.
- The adjacent basin is filled with potable water from the City's water system.

- Mixed liquor suspended solids (MLSS) vary from 800 to 1500 mg/L. At higher MLSS levels, a cyclical nitrification process begins, resulting in incomplete nitrification. This creates nitrite blocking in the chlorine disinfection process, impeding disinfection.
- Chlorinated water must be injected in the flow prior to entry into the aeration basin, to control filamentous bacteria growth.

### 3.3.3 Capacity

The activated sludge system apparently was designed for organics (BOD) removal, but not for nitrification of nitrogen compounds (e.g. conversion of total Kjedahl nitrogen [TKN] and ammonia to nitrates). The 1982 wastewater facilities plan indicated a capacity of 1,500 lb/day of $BOD_5$, presumably for average day conditions. The design indicated an food to microorganism (F:M) rate of 0.27 to 0.31 lb $BOD_5$/lb mixed liquor volatile suspended solids (MLVSS), with a MLSS of 2,500 to 3,000 mg/l.

Aeration of the activated sludge basins is accomplished by "coarse bubble" diffused aeration. The oxygen transfer capability of the system limits the actual oxygen transfer to about 5,600 pounds per day, with one air blower operation providing air to the system. The current maximum day oxygen demand is estimated at 5,400 pounds per day, based on BOD demand only and no nitrogenous oxygen demand. If two basins are used, the oxygen demand capability doubles. The principal oxygen demand is incurred by the influent BOD and does not increase significantly with added MLSS.

The basins normally are operated at approximately 1,000 mg/l MLSS, with a single basin used for treatment. Flow to the aeration basins is limited to 4.3 mgd (3,000 gpm), according to plant operators. The design criteria for the 1983 upgrades indicated a capacity of 4.8 mgd. At current loading of $BOD_5$ on the treatment plant, and $BOD_5$ removal of 30 to 50 percent by the primary clarifiers, the operating parameters of the activated sludge system are as shown in **Table 3-1**. The treatment plant currently appears to be meeting permit requirements for $BOD_5$ and TSS removal under these operating conditions; however, the current operating parameters are not within typical design ranges.

TABLE 3-1
Single Aeration Basin Loading Parameters
*March 2007*

| | **Primary Clarifier - 50% $BOD_5$ Removal** | | **Primary Clarifier - 30% $BOD_5$ Removal** | | |
|---|---|---|---|---|---|
| BOD Loading | F:M[a] | SRT[b] | F:M[a] | SRT[b] | HRT[c] |
| Average Annual Load | 1.3 | 1.0 | 1.9 | 0.7 | 0.95 hr |
| Maximum Month Load | 1.8 | 0.7 | 2.6 | 0.5 | 0.57 hr |
| Maximum Day Load | 4.9 | | 6.8 | | 0.57 hr |

a. Based on MLSS = 1,000 mg/l
b. Assumed $Y_N$ (net sludge yield) = 0.8 lb MLSS growth/lb BOD
c. Based on average annual flow and on flow limited to 4.3 mgd plus 50 percent RAS recycle

The treatment plant currently is meeting the $BOD_5$ and TSS limits of the discharge permit, with the activated sludge operating parameters shown in **Table 3-1**. $BOD_5$ removal is possibly limited after the F:M loading rate reaches about 3 lb BOD/lb MLSS, on an average (e.g., maximum month average) basis.

Using accepted carbonaceous BOD (CBOD) removal kinetic parameters and an effluent soluble CBOD objective of 15 mg/l, the limiting CBOD loading rate on the aeration basins is calculated as shown in **Table 3-2**. The loading rates are presented for a reasonable range of MLSS concentrations, and the range of temperatures experienced from 2002 to 2005, based on plant records. **Table 3-2** also contains calculated solids retention time (SRT) for the noted temperatures. The calculated loading capacity of the activated sludge system with two basins in operation during winter months is approximately 2,600 lb/day of CBOD (with an MLSS of 2,000 mg/L), and 3,900 lb/day (with an MLSS of 3,000 mg/L). The maximum calculated capacity is 640 lb/day during winter operation, with a single basin in operation at an MLSS of 1,000 mg/L.

TABLE 3-2
Aeration Basin $BOD_5$ Loading Capacity (maximum month)
*March 2007*

| | | **Capacity CBOD, lb/day, for 15 mg/l effluent soluble CBOD** | | | | |
|---|---|---|---|---|---|---|
| **# Basins** | **MLSS, mg/l** | **T = 20°C** | **T = 15°C** | **T = 12°C** | **T = 10°C** | **T = 8°C** |
| 1 | 1,000 | 1,150 | 910 | 790 | 700 | 640 |
| 1 | 2,000 | 2,300 | 1,820 | 1,580 | 1,400 | 1,280 |
| 2 | 2,000 | 4,600 | 3,700 | 3,200 | 2,800 | 2,600 |
| 2 | 3,000 | 6,900 | 5,500 | 4,800 | 4,200 | 3,900 |
| Calculated SRT, days | | 2.2 | 3.2 | 4.1 | 4.9 | 6.1 |

Performance to date has exceeded these calculated limits, however. The plant is currently operating satisfactorily with a single aeration basin in operation and a loading of approximately 1,700 lb/day (with an MLSS of 1,000 mg/L). Because this level of operation is greater than expected by kinetic modeling, the basins are assumed to be organically limited at current flows and loads. Use of the second aeration basin will allow for additional capacity.

The aeration basin SRT (also referred to as mean cell residence time [MCRT] and sludge age) is the limiting factor for maintenance of viable bacterial populations. Generation time for organisms capable of oxidizing carbonaceous BOD is relatively fast, much less than one day, which allows operation at SRT of one day or less while still achieving good $BOD_5$ removal. However, the required SRT is longer for organisms that are capable of oxidizing reduced nitrogen (TKN and ammonia) to nitrates (nitrification). By operating with SRT less than approximately 2 days, the bacterial population capable of nitrification will not be sustained and minimal or no nitrification will take place. Complete nitrification only can be assured at SRT greater than approximately 5 days in the summer and approximately 12 to 17 days during winter operation (depending on temperature). Below these values, partial nitrification occurs, causing production of nitrites which inhibits chlorine disinfection. The chlorine is consumed by partial nitrification byproducts, nitrites, and low concentrations of ammonia, causing the disinfection system to fail in its

primary function, bacterial kill. Because the degree of nitrification varies through the diurnal cycle of treatment system operation, it becomes a daunting task to control the chlorine residual and achieve consistent disinfection.

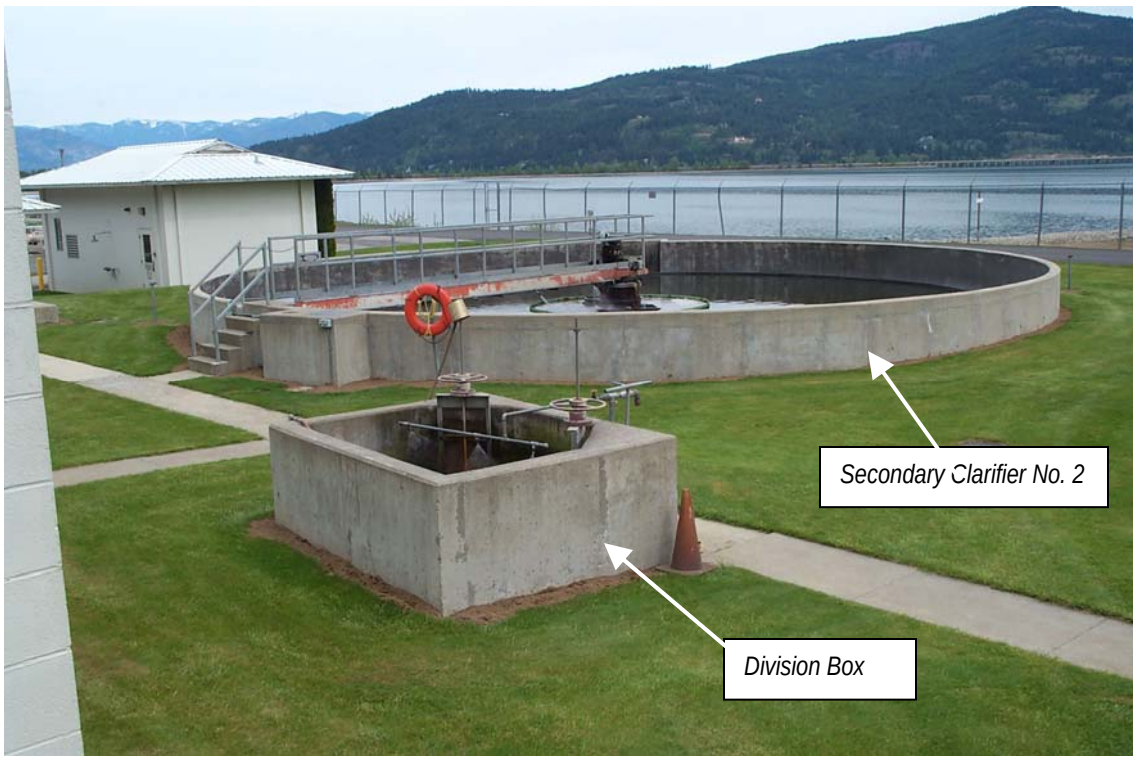
In order to maintain BOD removal rates at higher loadings, increasing MLSS concentration and operating the second aeration basin appears to be necessary. This will create conditions where SRT sometimes will be high enough for nitrifying bacterial populations to become established and partially oxidize nitrogen compounds at least a portion of the time during summer temperature conditions. This will cause the chlorine disinfection system to become more difficult to operate. The system does not appear to be adequate for assured year-round nitrification performance, due to the inability to maintain adequate SRT at low temperatures.

## 3.4 Secondary Clarification

### 3.4.1 Component Description

Two 55-foot diameter secondary clarifiers were constructed for use with the filter tower, and they were converted to use with the aeration basins as activated sludge clarifiers. Both of these clarifiers are normally used. The clarifier mechanisms employ rapid sludge withdrawal for RAS. Because rapid sludge withdrawal is not normally used with filter tower treatment, these mechanisms appear to be new with the activated sludge system. A photo of one secondary clarifier and the division box is included in **Figure 3-2**.

FIGURE 3-2
Secondary Clarification
*March 2007*



### 3.4.2 Observed Deficiencies

- Flow control to the secondary clarifiers is accomplished by adjusting the opening of the slide gates in the division box to balance the hydraulic load to each clarifier. This approach can lead to overloading one of the clarifiers as hydraulic conditions change.
- The concrete is generally in good condition, but some hand railing sockets on the nearby structures have been damaged due to freeze-thaw action.

### 3.4.3 Capacity

Activated sludge clarifiers are limited by two factors, overflow rate (OR) and solids loading rate (SLR), for proper performance. Hydraulic retention time (HRT) also is of interest. Operating parameters under current conditions for the activated sludge system are shown on **Table 3-3**. In addition to operating parameters at existing flow and MLSS conditions, SLR (if MLSS is increased to 3,000 mg/l) also is shown.

TABLE 3-3
Secondary Clarifier Operating Characteristics
*March 2007*

| Parameter | Current | Recommended | Units |
|---|---|---|---|
| Diameter | 55 | --- | feet (ft) |
| Surface Area | 2,375 | --- | square feet (sf) |
| Overflow Rate | | | |
| Average Annual Flow[a] | 587 | 400 | gpd/SF |
| Peak Flow[b] | 905 | 1,000 | gpd/SF |
| Hydraulic Residence Time | | | |
| Average Annual[a, c] | 2.4 | 2 | hr |
| Peak Flow[b, c] | 1.5 | 1.5 | hr |
| Solids Loading Rate (MLSS=1,000 mg/L) | | | |
| Average Annual[a, c] | 7 | 20 | lb/day/SF |
| Peak Flow[b, c] | 11 | 40-60 | lb/day/SF |
| Solids Loading Rate (MLSS=3,000 mg/L) | | | |
| Average Annual[a, c] | 22 | 20 | lb/day/SF |
| Peak Flow[b, c] | 34 | 40-60 | lb/day/SF |

a. Total flow 2.79 mgd with two clarifiers in operation
b. Total flow of 4.3 mgd with two clarifiers in operation
c. Assuming RAS return rate of 50 percent

Under current conditions, the clarifiers are operating at slightly higher overflow rates than normal design, but at lower solids loading rates. Because the SLR is well within design rates, this may be a significant factor in the success of the clarifiers in maintaining acceptable TSS in the secondary effluent. The clarifiers are hydraulically limited to current flows.

## 3.5 Return Activated Sludge Pumping

Three RAS pumps were installed when the aeration basins were constructed. One pump serves each clarifier, and the third is on standby. The rated pump capacities are 750 gpm at 21.5 ft TDH, for a total of approximately 2.15 mgd with two pumps in operation. The flow rate may be manually adjusted via variable frequency drives (VFDs). The RAS pumps measure flow and output on a circular chart recorder. **Figure 3-3** is a photo of the RAS pump room.

These pumps provide a sludge recirculation rate of 50 percent, for a maximum flow of 4.3 mgd as currently limited to the activated sludge system. Ten States Standards (Great Lakes, 2004) recommends that RAS pumping systems be designed for 20 to 100 percent. Consequently, the RAS pumps appear to be adequate for current operating conditions, including the maximum flow to the activated sludge system as currently limited to 4.3 mgd.

FIGURE 3-3
RAS Pump Room
*March 2007*

## 3.6 Chlorine Disinfection

The current disinfection system consists of gas chlorination and retention in the chlorine contact tank. The chlorine feed systems have been replaced as previous systems wore out and parts became difficult to obtain for maintenance. The chlorine feed system consists of a vacuum chlorinator, operating from plant water, that draws chlorine gas from 150-lb cylinders for solution injection to the wastewater before entering the contact chamber (shown in **Figure 3-4**). Currently only a single chlorinator is in operation (without any

backup), but previously used chlorinators could potentially be put into service in the event of equipment failure. Chlorine dose is paced to influent flow. Based on discussions with the operators, typical usage is 12 ppd, depending on flows; during peak I/I events, the usage increases to 30 to 40 ppd. Chlorinated water can be discharged to the secondary clarifier effluent prior to entering the chlorine contact chamber, RAS for filamentous control, and the headworks upstream of the rock box.

Chlorine probes exist for effluent concentration measurement, but they are difficult to maintain and do not provide reliable and consistent readings. Although the operators manually track and control the chlorine residual to maintain adequate kill of microorganisms, by doing so has resulted in violating the residual chlorine limit specified in the NPDES permit.

FIGURE 3-4
Chlorine Contact Chamber and Flood Stage Pumps
*March 2007*

Ten States Standards (Great Lakes, YEAR) recommends 15 minutes of retention time in chlorine contact tanks after initial mixing of wastewater flow with chlorine dose. Based on this criterion, the design flow limit is 7.9 mgd. Recent peak observed flows of 12.4 mgd result in a detention time of less than 10 minutes. The chlorine contact chamber is undersized for current peak flows.

## 3.7 Effluent Flow Measurement

WWTP effluent flow measurement is accomplished in a 12-inch Parshall flume downstream of the chlorine contact chamber, immediately before the outfall structure. Field measurements were taken in May 2005 to verify the accuracy of the flume and recording instruments. Although no errors were observed, the rated free-flow capacity of a 12-inch Parshall flume is 10.4 mgd, which cannot accurately capture peak day flows. An additional concern is that the flood stage pumps, which are required during high flows in the Pend Oreille River, bypass the effluent Parshall flume by pumping from the chlorine contact chamber directly to the outfall structure. These bypass flows are not measured with a flow meter; therefore, determining the exact amount of total plant discharge is not possible.

## 3.8 Flood Stage Pumps

The flood stage pumps were constructed in 1983, to allow discharge of treated effluent during high flows in the Pend Oreille River. The pumps are located at the end of the chlorine contact chamber and pump directly to the outfall structure, bypassing the effluent Parshall flume. The pumps are rated at 5,175 gpm at 13.5 feet TDH each, to meet the peak flow condition of 14.7 mgd (as noted in the 1982 wastewater facilities plan).

No operational problems have been noted; however, use of the flood stage pumps results in no flow measurement during operation and potentially reduced contact time during the chlorination process. Both shortcomings potentially compromise the effluent quality to the receiving waters.

## 3.9 Outfall Structure

The WWTP outfall structure was built in the 1970s and extended in the 1983 upgrades, to a total length of approximately 925 feet. The outfall structure currently consists of a 3-foot-diameter steel-coated line, partially buried in the Pend Oreille River, with 3-inch-diameter ports spaced at 4 feet on center for the last 165 feet of the line. A diver was commissioned by the City to record the current condition of the outfall line. The inspection revealed a leak at the junction manhole, approximately 400 feet from the shore. The remainder of the outfall line appeared to be in satisfactory condition.

The outfall structure functions by evenly distributing flow to all diffusers in the river. The nominal diffuser port velocity is approximately 3.4 times greater than the nominal outfall pipe velocity. This increased port velocity results in a sizeable head loss at the diffuser rather than at the main pipe, which effectively maintains an equal discharge condition throughout the line. However, the high port velocities lead to high head loss. At a peak flow of 14.7 mgd (1982 wastewater facilities plan), head loss in the diffusers may reach 4.9 feet. This head loss, in addition to the losses in the outfall structure and outfall pipe during flood stages in the Pend Oreille River, could potentially overtop the outfall structure. The capacity of the existing outfall structure is conservatively estimated at 12.4 mgd during a 100-year flood event in the river (flood stage elevation 2071.0). During normal high water conditions, adequate freeboard exists in the outfall structure to pass a peak flow of approximately 20.0 mgd.

### 3.10 Solids Production

An attempt was made to perform a solids balance through the treatment system, but it only was marginally successful due to flow and concentration inconsistencies.

Historical primary treatment efficiency for TSS removal was 54 percent plus/minus 15 percent during the period 2000 through mid-2005. Approximately 60 percent removal of the influent TSS is expected to continue to be experienced.

Primary $BOD_5$ removal of 30 percent can be expected for normal operation. The $BOD_5$ provides the substrate for growth of sludge organisms in the activated sludge system. This results in a net yield of organisms that must be removed periodically.

An estimate of solids yield (production), based on current loadings is shown in **Table 3-4**.

TABLE 3-4
Sludge Yield Estimate
*March 2007*

| | Influent Solids (ppd[a]) | Primary Removal (percent) | Yield (µg/mg) | Sludge (ppd dry solids) | Conc'n. (percent) | Sludge WS (gpd) |
|---|---|---|---|---|---|---|
| **Primary Sludge** | | | | | | |
| Avg. Annual | 2,250 | 60 | 1.0 | 1,350 | 2 | 8,100 |
| Max. Month | 3,040 | 60 | 1.0 | 1,820 | 2 | 10,900 |
| **Secondary Sludge** | | | | | | |
| Avg. Annual | 3,410 | 30 | 0.8 | 1,910 | 1 | 22,900 |
| Max. Month | 4,670 | 30 | 0.8 | 2,620 | 1 | 31,400 |
| **Combined Sludge** | | | | | | |
| Avg. Annual | | | | 3,260 | | 31,000 |
| Max. Month | | | | 4,440 | | 42,300 |

a. Influent = $BOD_5$ for secondary sludge
b. Secondary sludge production = Yield x $BOD_5$ remaining after primary clarification

## 4 Solids Handling

The solids handling equipment was evaluated using the average annual and the peak 30-day flows and loads, as summarized in **Table 4-1**. The 30-day peak flows and loads were used to evaluate the existing solids handling facilities because the solids residence time in the WWTP is approximately one month.

TABLE 4-1
Solids Handling Analysis Flows and Loads
*March 2007*

| | Flow | $BOD_5$ | TSS |
|---|---|---|---|
| Average annual | 2.67 mgd | 175 mg/l | 114 mg/l |
| 30-day peak | 5.05 mgd | 90 mg/l | 65 mg/l |

## 4.1 Solids Handling Facilities

The WWTP removes solids from the liquid wastewater in the primary and secondary clarifiers. Solids are processed and eventually dewatered into a wet cake, then hauled offsite and land applied. Currently, the WWTP has the following solids handling facilities:

1. Primary Sludge Pumping
2. Secondary Sludge Pumping
3. Sludge Thickening
4. Thickened Sludge Pumping
5. Anaerobic Sludge Digestion
   a. Primary Digester
   b. Abandoned Digester
6. Anaerobic Sludge Heating
7. Sludge Mixing Pump
8. Sludge Heating
9. Digested Sludge Holding Tank
10. Digested Sludge Pumping
11. Sludge Dewatering
12. Biosolids Disposal

A process schematic of the solids handling facilities is shown on **Figure 4-1**. Approximate mass balances for the average daily flow and peak-month are shown on **Figure 4-2** and **Figure 4-3**, respectively. Specifics regarding the solids handling equipment are discussed next.

## 4.2 Primary Sludge Pumping

### 4.2.1 Component Description

Primary solids settle out of the liquid flow stream in the primary clarifier. Solids are removed from the clarifiers by the primary sludge pumps, located in the primary sludge pump station. There are two primary sludge pumps, each pump dedicated to one primary clarifier. The primary sludge pump station conveys settled sludge from the two primary clarifiers to the gravity sludge thickener or the anaerobic digester. Two different force mains can convey sludge to the anaerobic digester. Current operating procedure is to pump primary sludge to the thickener. A photo of the primary sludge pumps is shown in **Figure 4-1**, and details of the lift station are summarized in **Table 4-2**.

FIGURE 4-1
Primary Sludge Pumps
*March 2007*

TABLE 4-2
Primary Sludge Pump Station Summary
*March 2007*

| Item | Pump 1 | Pump 2 | Units |
|---|---|---|---|
| Manufacture | Marlow | Marlow | |
| Hp | 1.5 | 1.5 | |
| Rated Capacity | 39 | 39 | gpm |
| Rated Head | 13 | 13 | feet |
| Type | 7-inch piston | 7-inch piston | |
| Model Number | MPE 61A-2 | MPE 61A-2 | |
| Flow Metered | no | no | gpm |
| VFD | no | yes | |
| Sequence Time | 3 on -18 off, typical | No | minutes |

#### 4.2.2 Observations

- The pumps are high maintenance because debris collects in them, causing frequent ragging.
- The piping plugs, often during the spring when flows are high.
- Cleaning negatively affects the solids handling components.
- The check valves may need to be replaced because they are making a loud clanging noise.
- A VFD controls one pump, which is not necessary because the timer control is acceptable.
- The pump room is small, allowing limited access to the pumps and valves.
- The primary solids concentration is not determined on a regular basis, which makes the mass balance approximate.
- Based on operator experience, the piston pumps cannot effectively pump sludge with a solids concentration greater than 3 percent.
- Based on operator experience, the primary clarifier generates odors if the sludge blanket solids concentration is greater than 3 percent.

#### 4.2.3 Capacity

If each pump ran continuously at the rated capacity of 39 gallons per minute, 112,000 gallons per day could be pumped. At a solids concentration of 3 percent, 28,000 pounds of solids could be removed from the primary clarifiers if the pumps ran continuously. The daily solids loading to the primary clarifiers during a peak-month flow event is approximately 2,750 pounds, which is less than the rated capacity of the primary sludge pumps; therefore, the existing primary sludge pumps have sufficient capacity. However, the piston pumps should be replaced because they cannot pump solids greater than 3 percent and, therefore, limit optimal clarifier performance. If the primary pumps could pump a liquid slurry with a solids concentration greater than 3 percent, the hydraulic residence time in the anaerobic digesters would increase, resulting in improved performance.

### 4.3 Waste-Activated Sludge Pumping

#### 4.3.1 Component Description

There are two waste-activated sludge pumps. Typically, one pump on a timer control removes solids from the secondary treatment process. The waste-activated sludge pumps convey settled sludge from the two secondary clarifiers to the gravity sludge thickener or the anaerobic digester. The current operating procedure is to pump sludge to the thickener.

Waste-activated sludge pump information is provided in **Table 4-3**.

TABLE 4-3
Waste Activated Sludge Pumps Summary
*March 2007*

| Item | Pump 1 | Pump 2 | Units |
|---|---|---|---|
| Year Installed | 1983 | 1983 | |
| Hp | 1.5 | 1.5 | |
| Rated Capacity | 100 | 100 | gpm |
| Rated Head | 20 | 20 | feet |
| Type | 2-inch centrifugal | 2-inch centrifugal | |
| Rated RPM | 1,100 | 1,100 | |
| Make | Fairbanks Morse | Fairbanks Morse | |
| Flow Metered | yes | yes | gpm |
| VFD | no | no | |
| Sequence Time[a] | 3 on 20 off | 3 on 20 off | minutes |
| Solids Pumped | 500 - 4000 | 500 - 4000 | mg/l |

a. Varies depending on operating procedures at the WWTP

### 4.3.2 Observations

- One of the pumps is downstream from the chlorine injection port, allowing chlorinated waste activated sludge (WAS) to be pumped to the gravity thickener.
- WAS concentration varies between 500 and 4,000 mg/l.
- MLSS concentration often is less than 1,000 mg/l.

### 4.3.3 Capacity

Approximately 19,000 gallons per day of WAS currently are pumped by one WAS pump set to run for 3 minutes out of 23. If one pump operated full time, the pump could convey 144,000 gallons per day while the other pumps remained as standby units.

## 4.4 Gravity Thickener

### 4.4.1 Component Description

The existing gravity thickener receives settled sludge and floating scum from the primary and secondary clarifiers. The purpose of the gravity thickener is to increase the concentration of solids entering the digester by separating the solids from the liquid. Solids settle into a sump in the gravity thickener and are pumped to the anaerobic digester via the thickened sludge transfer pumps. Supernatant is returned to the distribution box upstream from the primary clarifiers. A photo of the gravity thickener is presented in **Figure 4-2;** current conditions are summarized in **Table 4-4**.

FIGURE 4-2
Gravity Thickener
*March 2007*

TABLE 4-4
Gravity Thickener Summary
*March 2007*

| Item | Gravity Thickener | Recommended Range | Units |
|---|---|---|---|
| Diameter | 16 | | feet |
| Area | 201 | | square feet |
| Hydraulic Loading | 270[a]<br>316[b] | 100-200 (WAS)<br>380-760 (primary solids) | gpd/sf |
| Solids Loading | 19[a]<br>22[b] | 5-14 | lb/(ft$^2$-day) |
| Date Constructed | 1973 | | |
| Construction Material | concrete | | |
| Volume | 15,800 | | gallons |
| Depth | 10.5 | | feet |
| Bottom Slope | 2.75:12 | 2:12 to 3:12 | vertical rise: horizontal run |

a. Average day
b. Daily load during a peak month event

### 4.4.2 Observations

- The gravity thickener can be a source of odors, especially if the secondary sludge age is greater than approximately one day or the activated sludge mixed liquor is greater than 1,000 mg/l.
- The bottom is sloped to a sump, which has clogged with rags and grit.
- The gravity thickener does not adequately thicken sludge, which compromises the performance of the anaerobic digester.
- The gravity thickener can receive chlorinated WAS to reduce odor.
- Typical underflow TSS concentration is 1.5 to 2 percent. At TSS concentrations above 2 percent, excessive odor generation occurs.
- The structure should be drained and inspected.

### 4.4.3 Capacity

The gravity thickener currently is operating above the maximum recommended solids and hydraulic loading rates (refer to Table 4-4). This elevated loading reduces the efficiency of the unit and compromises the performance of the anaerobic digester. The average concentration of primary sludge entering the thickener is estimated to be approximately 2.8 percent, while the secondary solids concentration is only 0.5 percent. Because the WAS flow rate is very high due to the diluted secondary solids, the solids concentration leaving the thickener is estimated to be approximately 0.85 percent. The WWTP performance may benefit if the primary solids are sent straight to the digester.

## 4.5 Thickened Sludge Transfer Pumps

### 4.5.1 Component Description

There are two thickened sludge transfer pumps. Typically, one pump on a timer pumps thickened primary and secondary sludge from the gravity sludge thickener to the anaerobic digester. These pumps and the primary sludge pumps are alike. Thickened sludge transfer pump information is documented in **Table 4-5**.

TABLE 4-5
Thickened Sludge Pumps Summary
*March 2007*

| Item | Pump 1 | Pump 2 | Units |
|---|---|---|---|
| Manufacture | Marlow | Marlow | |
| Hp | 1.5 | 1.5 | |
| Rated Capacity | 39 | 39 | gpm |
| Rated Head | 13 | 13 | ft |
| Type | 7-inch piston | 7-inch piston | |
| Model Number | MPE 61A-2 | MPE 61A-2 | |
| Rebuilt/Upgraded | yes | yes | |
| Flow Metered | no | no | gpm |
| VFD | no | no | |
| Sequence Time | 3 on 18 off | 3 on 18 off | minutes |
| Gallons Per Day | 8022 | standby | gallons per day |

### 4.5.2 Observations

- The pumps are high maintenance because debris collects in the pumps and causes frequent ragging.
- The piping plugs, often during the spring when flows are high.
- Cleaning negatively affects the solids handling components.
- Based on operator experience, the piston pumps cannot handle solids greater than 3 percent.
- The check valves may need to be replaced because they are making a loud clanging noise.
- The structure is small, allowing limited access to the pumps and valves.

### 4.5.3 Capacity

Approximately 8,000 gallons per day of thickened sludge currently are pumped by one pump set to run for 3 minutes out of 21. If one pump operated full time, the pump could convey 56,000 gallons per day while the other pump remained as a standby unit. Even though the pumps have sufficient capacity, the piston pumps should be replaced because they cannot pump solids greater than 3 percent and, therefore, limit optimal performance of downstream facilities.

## 4.6 Abandoned Primary Digester

The old primary digester has been abandoned due to unsafe structural integrity. The old digester does not receive or discharge sludge. Because the old digester is unsafe to operate, it is not considered in this report.

## 4.7 Primary Anaerobic Digester

### 4.7.1 Component Description

The primary anaerobic digester receives thickened sludge from the gravity thickener. This digester also can receive settled sludge directly from the primary and secondary clarifiers. The digester anaerobically metabolizes solids that enter it. The digested solids flow by gravity to the sludge holding tank.

The primary anaerobic digester operates on a single-stage, high-rate system. There is only one digestion vessel and that vessel is “completely mixed” without an intentional zone of separation. Settling is accomplished in the sludge holding tank, prior to dewatering. Primary anaerobic digester information is documented in **Table 4-6**.

TABLE 4-6
Primary Anaerobic Digester Summary
*March 2007*

| Item | Primary Anaerobic Digester | Recommended Range | Units |
|---|---|---|---|
| Diameter | 40 | | feet |
| Side Water Depth | 24 | | feet |
| Volume | 225,000 | | gallons |
| Capacity, recommended | 4200 | | lb of VSS/day |
| Capacity, recommended | 15,000 | | gallons/day |
| Solids Residence Time | 16[a]<br>13[b] | 10-20 | days |
| Volatile Solids Reduction | 50 | 40-60 | percent |
| Hydraulic Loading | 14,000[a]<br>17,300[b] | | gallons/day |
| Solids Loading | 0.09[a]<br>0.1[b] | 0.12 - 0.16 | lb VSS/($ft^3$-day) |
| Operating Temp | 95 | | degrees F |
| Construction Material | concrete wall, steel cover | | |
| General Condition | unknown; inspection required | | |

a. Average day
b. Daily load during a peak month event

### 4.7.2 Observations

- The effective volume was reduced due to accumulated grit. The accumulated grit should be quantified by inspection. Only two 6-inch ports exist for inspection, and a single access hatch on the roof.
- Treated biosolids generally meet Class B requirements for 40 CFR 503.b regulations.
- One of the plug valves on the suction side of the mixing pump does not seal and needs to be replaced. The digester must be taken off-line and drained to replace the valves.
- Heated sludge from the heat exchanger can be added into only one of the two mixing pump suction lines. Piping modifications are required so that heated sludge can be added to the digester regardless of which suction pipe is used.
- Volatile solids loading rates below 0.08 lb VS/($ft^3$-d) should be avoided to maintain efficient operation. Low loading rates cause the SRT to be low.
- The digester pipe gallery is crowded and some of the piping cannot be isolated for repair. Piping modifications are required to provide better access and flow isolation during repair and maintenance activity.

### 4.7.3 Capacity

The solids loading rates for the average and peak-month flows are under the suggested design criteria, and the hydraulic loading is within the recommended range. The low solids loading rate is an indication of diluted sludge feed. Peak flow loading rates are approaching the upper recommended range, which can lower the HRT below recommended values while lowering the solids loading rate to levels that interfere with efficient digester operation. Adequate solids thickening will help minimize digester peak flows and efficiently utilize available capacity.

## 4.8 Digester Mixing Pump

### 4.8.1 Component Description

The primary digester sludge is mixed with a 15 hp centrifugal pump that draws sludge from the bottom center and the top center of the digester and pumps it back into the digester along the periphery in three different locations. The sludge, entering the digester at an angle, provides rotational energy for tank mixing. The mixing pump is located in the primary digester equipment room. Digester mixing pump information is documented in **Table 4-7**.

TABLE 4-7
Sludge Mixing Pump Summary
*March 2007*

| Item | Mixing pump | Recommended Range | Units |
|---|---|---|---|
| Type | Hayward Gordon | | |
| Size | 15 | | hp |
| Rated Capacity | 1500 | | gpm |
| Rated Head | 20 | | feet |
| Rated Rpm | 1150 | | rpm |
| Mixing Energy | 0.5 | 0.2-0.3 | hp/1000 $ft^3$ |

### 4.8.2 Observations

- The mixing piping cannot be isolated easily for maintenance.
- The suction piping is clogged with rags.

### 4.8.3 Capacity

The mixing pump appears to have sufficient capacity to mix the digester, assuming the mixing piping functions adequately. Mixing should be verified by inspecting the digester for accumulated grit. Redundant mixing should be provided, as well as the ability to isolate critical piping.

## 4.9 Digester Heating

### 4.9.1 Component Description

The digester is heated by heating the digester sludge with an Alfa Laval spiral heat exchanger. A sludge recirculation pump pulls sludge from the digester and pumps it through the heat exchanger. Heated sludge is forced from the heat exchanger to the sludge mixing pump suction line, where it is circulated back into the digester. Hot water

is heated by one of two boilers and pumped through the heat exchanger. To heat the incoming sludge and make up for the loss of heat through the digester's concrete walls and a steel cover, the digester can require up to 345,000 BTU per hour to maintain optimal warmth during cold winter conditions. The heating system is not set up to handle steam; therefore, the maximum allowable temperature differential across the heat exchanger is less than 212° F. Typically, the boilers only produce 140º F water. The heat exchanger is located in the primary digester building. Heat exchanger information is documented in **Table 4-8**.

TABLE 4-8
Heat Exchanger Summary
*March 2007*

| Item | Heat Exchanger | Units |
|---|---|---|
| Type | Alfa Laval | |
| Size | 52 | square feet |
| Circulation Pump | 2 hp Paco | |
| Approximate Capacity | 2340 | BTU/(hr-ºF) |
| Approximate Rate | 267,000 | BTU/ hr (@ ΔT=114ºF) |

The boilers are located in the boiler building, next to the primary sludge pump building. Boiler information is documented in **Table 4-9**.

TABLE 4-9
Boiler Summary
*March 2007*

| Item | Boiler 1 | Boiler 2 | Units |
|---|---|---|---|
| Type | Bryan | American Standard | |
| Size | 360,000 | 216,000 | BTU/ hr |

### 4.9.2 Observations

During the winter months, the digester heating system can barely maintain digester temperature, as noted by WWTP staff.

### 4.9.3 Capacity

The boilers have a combined output of 576,000 BTU per hour, which can provide the heat exchanger with approximately 460,000 BTU per hour, assuming a 20 percent loss between the boiler room piping and the hot water piping to the digester. This 460,000 BTU per hour is sufficient to heat the digester, assuming standard heat loss coefficients for concrete and steel. However, the heat exchange can deliver only 267,000 BTU per hour, which is less than the estimated 345,000 BTU per hour required to maintain digester temperature during winter conditions. Consequently, the heat exchanger is inadequate to meet existing needs. Additionally, the heat exchanger needs general repairs due to wear and should be replaced with a larger unit and a standby unit.

## 4.10 Digested Sludge Holding Tank

### 4.10.1 Component Description

The anaerobic sludge holding tank receives digested sludge from the primary digester, storing the sludge until it is dewatered and hauled offsite for disposal. Typically, the WWTP dewaters sludge three days a week, for a total dewatering time of approximately 24 hours per week. Digested sludge flows by gravity to the anaerobic sludge transfer pumps, where it is pumped to the dewatering facilities. The holding tank has a floating cover. The tank head space is used to store digester gas. The burner and the boiler draw gas from the head space.

Digested sludge holding tank information is documented in **Table 4-10**.

TABLE 4-10
Sludge Holding Tank Summary
*March 2007*

| Item | Sludge Holding Tank | Units |
|---|---|---|
| Diameter | 30 | feet |
| Construction Material | concrete | |
| Volume | 77,800 | gallons |
| Cover | floating | |
| General Condition | Unknown; inspection required | |

### 4.10.2 Observations

- The floating cover seal water emanates odorous gas.
- Digested sludge in the holding tank often leaves the tank via the overflow piping. Because the overflow is not metered, the mass balance around the solids handling equipment is approximate.

### 4.10.3 Capacity

The plant dewaters an average of 5,500 gallons of digested sludge per day, which provides an average hydraulic residence time in the holding tank of 14 days. Because the plant typically dewaters sludge every 3 to 4 days, the holding tank has sufficient capacity to buffer dewatering activity. However, the holding tank often overflows digested sludge back to the headworks.

## 4.11 Digested Sludge Transfer Pumps

The digested sludge transfer pump station pumps sludge from the holding tank to the dewatering facilities. Digested sludge transfer pump information is documented in **Table 4-11**. Each pump has a dedicated 2 hp JWC grinder on the suction piping, and the pumps have recently been overhauled. Their overall condition is good, and the system has adequate capacity for current flows and loads.

TABLE 4-11
Primary Sludge Pump Station
*March 2007*

| Item | Pump 1 | Pump 2 | Units |
|---|---|---|---|
| Year Installed | 1983 | 1983 | |
| Maker | Moyno | Moyno | |
| Hp | 5 | 5 | |
| Rated Capacity | 40 | 40 | gpm |
| Rated Head | 35 | 35 | feet |
| Type | Screw | Screw | |
| | Progressive Cavity | Progressive Cavity | |
| Flow Metered | Totalizer | Totalizer | |
| VFD | yes | yes | |

## 4.12 Biosolids Dewatering

### 4.12.1 Component Description

Biosolids dewatering is accomplished by one of two 1-m belt filter presses. Digested solids are pumped from the holding tank to the dewatering facilities via the digested solids transfer pumps. The dewatered cake is discharged from the belt filter press directly into a truck for offsite disposal. The filtrate water flows by gravity back to the headworks. Dewatering facilities information is documented in **Table 4-12**.

TABLE 4-12 -
Sludge Dewatering Facilities Summary
*March 2007*

| Item | Current | Typical | Units |
|---|---|---|---|
| Number of Presses | 2.0 | | |
| Size | 1.0 | | meter |
| Loading | 1,800 | 9,600 | lb/day |
| Sludge Concentration Feed | 2.2 | | percent |
| Polymer Dose | 5-18 | | lb/ton |
| Solids Capture | 90 | | percent |

### 4.12.2 Observations

- The 4-inch drain piping in the dewatering building plugs frequently. Plugging also occurs immediately outside the building.
- The dewatering building is a source of odors at the WWTP.

### 4.12.3 Capacity

The dewatering facilities currently process an average of 341 pounds of biosolids per day. Because the facilities are able to handle 1,800 pounds per day, the operations are under 20 percent of full capacity. The BFP units capacity appears to be adequate for existing sludge production, with some capacity for growth and redundancy of units for operation.

# 5 Support Facilities

## 5.1 Control Building

The existing control building is a multifunctional facility, incorporating office and laboratory space, mechanical rooms, pumping stations, and storage areas. However, the office space is limited, with no area for a break room and little space for equipment manuals.

## 5.2 Electrical Systems

### 5.2.1 Electrical Utility

The existing treatment facility is fed by Avista Utilities under Rate Schedule 021, Large General Service, Account Number 2127888. The utility transformer is a 300kVA, 12.47kV-480/277Y pad mount transformer, installed as part of the 1983 plant improvement project. The existing electrical service is located in the digester equipment building (panel MDP). Panel MDP is a square D, power style switchboard and is rated at 1600A, 480V, 42KAIC. The main circuit breaker is a 1600A LIG.

### 5.2.2 Electrical Distribution

The main normal distribution panel (MDP) distributes 480-volt three-phase power to transformer T-1, MCC-6, MCC-7, and the facility's 600A, 3-pole automatic transfer switch (ATS) that feeds the main emergency distribution panel (EMDP). Transformer T-1 steps the voltage down to 240-volt, three-phase, four- wire, and then feeds panel 2MDP. Power is distributed from panel 2MDP to the original (prior to 1983) plant loads MCC-2, MCC-3, MCC-4, and MCC-5 via overhead feeders.

The MDP is adequately sized for the current load and has capacity for an additional load of approximately 900 amperes. Panel EMDP is alternately fed through the ATS by a 330kW, 480/277V, three-phase, four-wire, diesel-fueled stand-by generator and distributes 480-volt, three-phase power to MCC-6E, MCC-8E, and MCC-9E. The 330kW stand-by generator is adequately sized to run the loads connected to panel EMDP, as follows:

- The loads connected to MCC-6E include Panel-board 6EL, Exhaust Fan F6, RAS Pump P-20, and Blower ME-31.
- The loads connected to MCC-8E include the chlorine building and disinfection system, the overflow pumps, and the flood stage pumping systems.
- The loads connected to MCC-9E include the headworks building, screening equipment, the grit removal system, and the primary clarifiers.

A 76kW, 240/120V, three-phase, four-wire, natural gas-fueled stand-by generator provides backup power to the automatic transfer switch, located in the secondary control building. The loads connected to this system include the operations building and the secondary pump station.

The two stand-by generators are each approximately 20 years old, and should have complete servicing and load testing to ensure proper operation.

The electrical distribution equipment installed as part of the 1983 upgrades appears to be in good serviceable condition. However, any significant upgrades to controls or configuration changes will be costly as replacement parts are limited. The electrical equipment installed as part of the 1983 project includes:

- MDP, Digester Building – Square D, Power Style Switchboard
- Main 600A ATS, Digester Building – Lake Shore Electric
- EMDP, Digester Building – Square D
- MCC 7, Digester Building – Square D, Model 4
- MCC 6, Blower Building – Square D, Model 4
- MCC 6E, Blower Building – Square D, Model 4
- MCC 9E, Headworks Building – Square D, Model 4
- MCC 8E, Chlorine Building – Square D Model 4
- Dewatering Building MCC – Cutler Hammer F10-series Unitrol

The original (prior to 1983) distribution equipment is 240-volt, three-phase and has reached the end of it useful life. This equipment ranges in vintage from 1958 to 1972. While still functional, it would be difficult and costly to repair or upgrade, and replacement parts will become increasingly difficult to obtain. Because of possible access restrictions, the overhead feeder system for the 240-volt distribution system is a concern for reliability and maintenance. The older electrical gear includes:

- MCC and ATS in Secondary Control – Cutler Hammer 9800 series Unitrol
- Boiler Building Switchboard – General Electric
- Boiler Building MCC – Cutler Hammer 9800 series Unitrol
- 2MDP, outside at old service location – Cutler Hammer

### 5.2.3 Estimated Existing Electrical Load Calculation

The following (existing) load information was calculated, based on the utility billing summary:

- The current average electrical usage is 102,146 kW hrs/month; the current electrical demand is 180 kW at an average power factor of 0.752. This equates to an average load of 240kVA or 288 amperes at 480 volts.

- The existing connected load at the plant is approximately 903kVA or 1086 amperes, according to the 1983 improvement project drawings. Based on these kVA values, the existing treatment plant demand factor is: {Demand Factor = (240/903) = 0.27}. Thus, only 27 percent of the existing connected load is required under normal operation.

An energy audit was performed by Avista Utilities in November 2005, and a draft report detailing this audit is included in **Appendix B**. The findings indicate a potential energy savings based on replacing the coarse bubble diffusers with fine bubble diffusers, implementing automatic dissolved oxygen control in the aeration basins, utilizing digester gas, and replacing the primary solids piston pumps. Approximately half of the projected savings would result from the use of digester gas. Avista will provide financial assistance on the order of 50 percent of the project cost, or $0.04 to $0.14 kilowatt-hour savings for the first year, whichever is least. Incentives would be paid upon project completion; however, an agreement must be in-place prior to ordering materials for the project.

### 5.2.4 Electrical Code Analysis

In general, no major electrical codes issues exist that involve equipment observed during a site survey. However, several areas may have classification and separation issues. A complete area classification analysis and drawing is recommended as part of any future expansion or upgrade project. The following is a partial listing of some of the area classification deficiencies:

- Influent channel and grinder locations are class 1, division 2 areas and require additional conduit seals.
- The grit removal area is located in the headworks building with MCC 9E and is an unclassified area; however, this building requires adequate ventilation to prevent corrosion of the electrical equipment.
- The primary clarifiers are class 1, division 2 areas and require additional conduit seals.
- The pump room in the basement of the boiler building may be a class 1, division 2 area because of ventilation deficiencies. The basement and main floor are not physically separated and, therefore, the ventilation system needs to be addressed.
- The pump room in the digester control building may be a class 1, division 2 area because of ventilation deficiencies. MCC 7 is located in this room as well as other electrical equipment; therefore, the ventilation system needs to be addressed.

### 5.3 Control Systems

Current process monitoring is accomplished with chart recorders and manual readings. The WWTP also has a functional Adatek data acquisition system. The system monitors a variety of process points, run-times, and equipment status; however, it is an antiquated system and cannot be easily expanded or modified.

### 5.4 Water Use

The WWTP currently utilizes potable City water for all make-up activities, including filling the inactive aeration basin. A water meter was installed in summer 2005, with water use on the order of 247,000 gpd. The operators noted this high potable water demand as a point of concern and are interested in pursuing reuse of treated effluent.

## 6 Odor Generation

### 6.1 General

The existing WWTP occasionally generates nuisance odors that negatively impact nearby residences. The following processes typically emanate nuisance odors, determined by interviewing WWTP personnel and visiting the site:

- Headworks
- Solids Thickener
- Solids Holding Tank
- Solids Dewatering Facilities
- Waste Gas Flare

### 6.2 Headworks Building

At the headworks, grit and screenings material are removed from the raw wastewater. This material often has putrescible material attached, when it is taken from the flow stream. Once removed, the material is stored in a bag until being transported to a landfill. The putrid material generates odors that escape the headworks building and occasionally leave the site.

A project currently is underway to construct an odor control biofilter near the headworks building, to remove odors from the foul air being emanated. A biofilter vessel has been

constructed and a location has been selected. The fan, media support, ducting, and plumbing equipment are awaiting installation.

### 6.3 Solids Thickener

Raw primary solids and secondary waste activated solids are pumped to the solids thickener prior to digestion. The material entering the thickener comes from the bottom of the clarifiers where conditions are anaerobic and conducive to the formation of odorous compounds. When the sludge enters the thickener, the anaerobic liquid and some solids are exposed to the atmosphere, where odors escape. Insufficient hydraulic capacity exists to add aerated water to the thickener influent to maintain aerobic conditions in the thickener. WWTP operation currently is manipulated to minimize odors; however, this manipulation may decrease performance in other processes.

The thickener currently is overloaded and may be replaced, depending on the conclusions of this plan. Consequently, no permanent odor control facility is projected at this time. However, the headworks biofilter can be used to temporarily treat the foul air emanating from the thickener. The thickener will have to be covered and ducting will need to be installed. The fan will be located at the headworks.

### 6.4 Solids Holding Tank

The solids holding tank has a floating cover with a liquid seal. The liquid seal water is often septic and odorous. The odorous air could be collected and treated to remove odorous compounds. No odor control treatment is planned at this time.

### 6.5 Solids Dewatering Facilities

Digested solids are dewatered using a belt filter press, two to three times a week. The dewatering building has ventilation equipment but does not have any odor control equipment. Odors emanating from the anaerobic solids during the dewatering process are vented directly to the air outside. No odor control treatment is planned at this time.

### 6.6 Waste Gas Flare

Methane and other gases generated in the digester are burned by the waste gas flare. The burning methane gas fortuitously destroys malodorous gases in the process. However, only one waste gas flare exists and, when the flare is being maintained, the excess gases are vented directly to the atmosphere, allowing the odorous gases to escape. To prevent the release of odorous digester gases, a standby flare or sufficient gas storage should be added. Additionally, **methane is potent greenhouse gas** and efforts should be made to minimize its release.

## 7 Summary

### 7.1 Primary and Secondary Treatment Conclusions

The treatment capacity of the WWTP primary and secondary units generally is adequate for existing loads and for some growth into the future, as long as the diversion of excess flow to the stormwater clarifier meets permit requirements. Recent actions taken by the courts and the federal legislative branch imply that at some point, this operation may not be allowed. Until is the legal issues are resolved, blending of peak flows should be continued due to the uncertainty regarding how the ruling will be interpreted, and how soon new regulations may be mandated. **Figure 7-1** summarizes current loadings and capacities under the existing operating conditions.

The current WWTP operations status, deficiencies in the primary and secondary treatment systems, and recommendations are summarized as follows:

- Inefficient screening/grinding and grit removal allow debris and grit to pass through to the remainder of the treatment system, plugging pipes and equipment, and causing wear to moving equipment. New fine screening, in conjunction with a new vortex grit removal system, would reduce loads to the treatment plant and reduce wear on downstream equipment.
- Significant odors are present at the headworks building. A biofilter project is underway to address this issue.
- The primary clarifiers are limited to current peak flows, assuming diversion to the stormwater clarifier at flows greater than 9.3 mgd.
- The aeration basin is operating at its current limit without increasing the MLSS in the basins.
- The secondary clarifiers are currently operating at or above recommended hydraulic loads. However, because solids loading is relatively low, some additional hydraulic loading may be permissible.
- Chlorination of the effluent is difficult to control due to partial nitrification in the aeration basins. Also, the contact chamber has insufficient capacity to treat peak flows.

## 7.2 Solids Handling Conclusions

A summary of the solids handling system is presented in **Figure 7-2**. The main deficiencies and recommendations are as follows:

- The primary sludge pumps should be replaced with units that can pump a solids concentration greater that 3 percent. Replacing these pumps will reduce maintenance problems and allow the operators to optimize performance of the primary clarifiers, to increase the hydraulic residence time in the both the gravity thickener and the digester. A greater hydraulic residence time will improve solids destruction in the digester.
- The existing gravity thickener actually thins the primary solids because the hydraulic loading rate from the secondary clarifiers is high, and primary and WAS solids are mixed in the thickener. The existing piping arrangement at the WWTP allows the primary solids to be routed directly to the anaerobic digester rather than to the gravity thickener while allowing the WAS to be pumped to the gravity thickener. Without the primary sludge entering the thickener, the hydraulic loading rate will decrease, which may improve the WAS thickening in the gravity thickener. Additionally, odors associated with primary sludge will not be exposed to the atmosphere above the thickener.
- The heat exchanger is not adequate to transfer sufficient heat during cold climate conditions. Additionally, the plates have worn through a few times and have required repairs. The operators feel that the heat exchanger is delicate and, therefore, do not operate it above about 140º F to reduce pressure and its potential to fail, which reduces its ability to heat the digester. A larger heat exchanger is needed and a back-up heat exchanger should be evaluated. The boiler efficacy and system heat loss should be evaluated in conjunction with the new heat exchanger.

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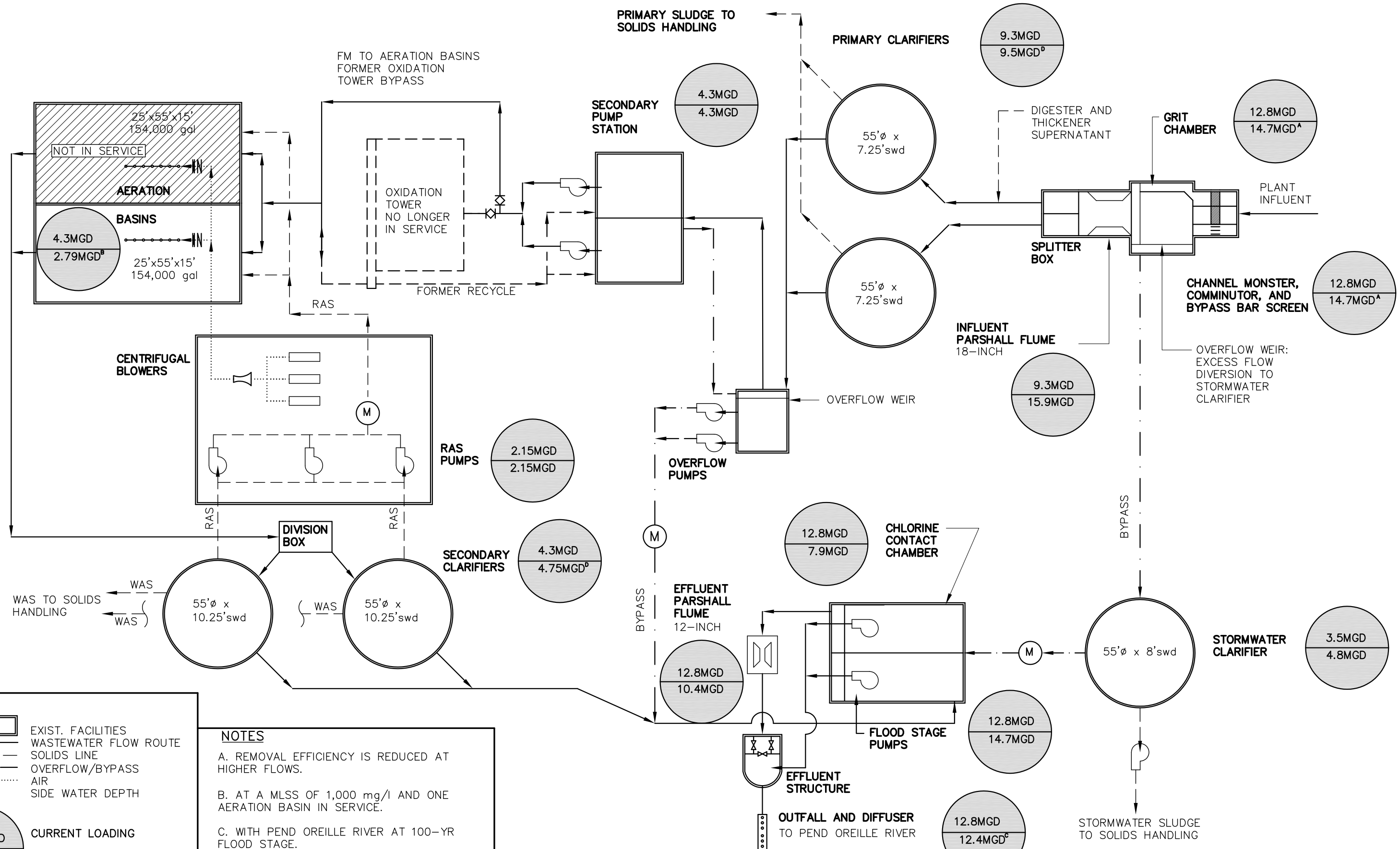


## LEGEND

- EXIST. FACILITIES
- WASTEWATER FLOW ROUTE
- SOLIDS LINE
- OVERFLOW/BYPASS
- AIR
- swd — SIDE WATER DEPTH
- 12.8MGD / 7.9MGD — CURRENT LOADING / LIMITING LOADING

## NOTES

A. REMOVAL EFFICIENCY IS REDUCED AT HIGHER FLOWS.

B. AT A MLSS OF 1,000 mg/l AND ONE AERATION BASIN IN SERVICE.

C. WITH PEND OREILLE RIVER AT 100-YR FLOOD STAGE.

D. BASED ON TWO CLARIFIERS IN OPERATION UNDER PEAK FLOWS.

ESVELT ENVIRONMENTAL ENGINEERING
7605 East Hodin Drive., Spokane, WA 99212

CAD FILE: SCHEMATIC

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 7-1
LIQUID STREAM CAPACITY SUMMARY

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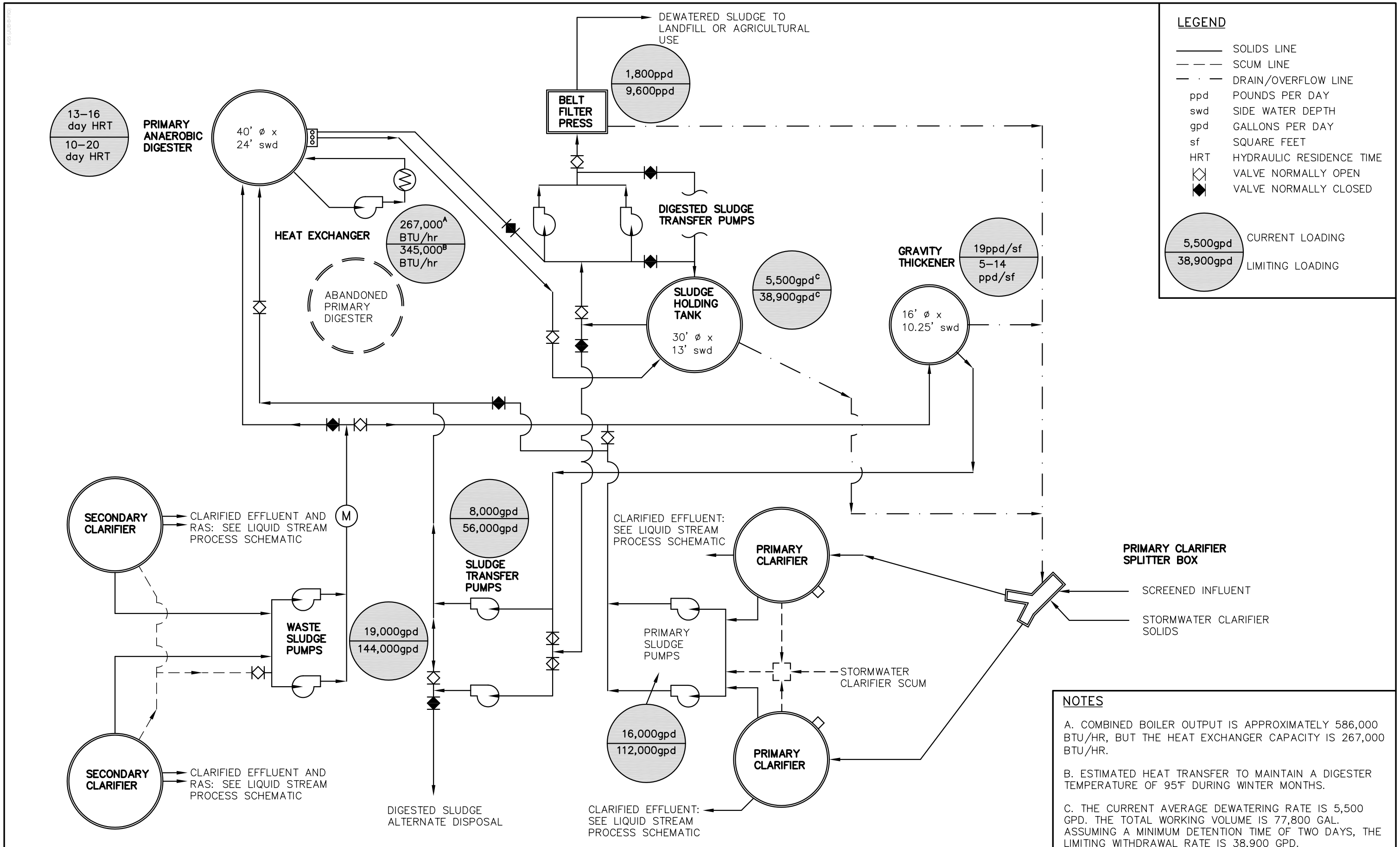


NOTES

A. COMBINED BOILER OUTPUT IS APPROXIMATELY 586,000 BTU/HR, BUT THE HEAT EXCHANGER CAPACITY IS 267,000 BTU/HR.

B. ESTIMATED HEAT TRANSFER TO MAINTAIN A DIGESTER TEMPERATURE OF 95°F DURING WINTER MONTHS.

C. THE CURRENT AVERAGE DEWATERING RATE IS 5,500 GPD. THE TOTAL WORKING VOLUME IS 77,800 GAL. ASSUMING A MINIMUM DETENTION TIME OF TWO DAYS, THE LIMITING WITHDRAWAL RATE IS 38,900 GPD.

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7605 East Hodin Drive., Spokane, WA 99212

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 7-2
SOLIDS HANDLING CAPACITY SUMMARY

CAD FILE: SCHEMATIC

# 8 References

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. *Recommended Standards for Wastewater Facilities (Ten States Standards).* 2004.

Montgomery, James M., Consulting Engineers Inc. *City of Sandpoint, Idaho: Step 1 Wastewater Facilities Plan.* January 1982.

Montgomery, James M., Consulting Engineers Inc. *City of Sandpoint, Idaho: Wastewater Treatment Plant Improvements (Construction Drawings)*. 1983.

# Appendix A

# NPDES Permit

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

# AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, the "Act",

City of Sandpoint

is authorized to discharge from a wastewater treatment facility located in Sandpoint, Idaho,

to receiving waters named Pend Oreille River,

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective **January 5, 2002**

This permit and the authorization to discharge shall expire at midnight, **January 5, 2007.**

Signed this **30th** day of **November, 2001.**

/s/ Mike Bussell
for Randall F. Smith
Director
Office of Water, Region 10
U.S. Environmental Protection Agency

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# I. SPECIFIC LIMITATIONS AND MONITORING REQUIREMENTS

## A. Effluent Limitations and Monitoring Requirements.

1. During the period beginning on the effective date of this permit the Permittee is authorized to discharge wastewater to the Pend Oreille River from Outfall 001 provided the discharge meets the limitations and monitoring requirements set forth herein. This permit does not authorize the discharge of any waste streams, including spills and other unintentional or non-routine discharges of pollutants, that are not part of the normal operation of the facility as disclosed in the permit application.

| PARAMETER | EFFLUENT LIMITATIONS | | | MONITORING REQUIREMENTS | | |
|---|---|---|---|---|---|---|
| | Average Monthly Limit | Average Weekly Limit | Daily Maximum Limit | Sample Location | Sample Frequency | Sample Type |
| Flow, MGD | — | — | — | Influent or Effluent | Continuous | Recording |
| Temperature, °C | — | — | — | Effluent | 1/day | grab |
| Biological Oxygen Demand ($BOD_5$) | 30 mg/l | 45 mg/l | — | Influent and Effluent | 3/week | 24-hour composite |
| | 750 lb/day | 1100 lb/day | — | | | |
| Total Suspended Solids (TSS) | 30 mg/l | 45 mg/l | — | Influent and Effluent | 3/week | 24-hour composite |
| | 750 lb/day | 1100 lb/day | — | | | |
| E.coli Bacteria[1] | 126/100 ml | — | 406/100 ml | Effluent | 3/week | grab |
| Total Residual Clorine[2] | 0.45 mg/L | — | 1.1 mg/L | Effluent | 1/day | grab |
| Total Ammonia as N | — | — | — | Effluent | 1/month | 24-hour composite |
| Nitrate as N, mg/L | — | — | — | Effluent | 1/quarter | 24-hour composite |
| Nitrite as N, mg/L | — | — | — | Effluent | 1/quarter | 24-hour composite |
| Total Kjeldahl Nitrogen, mg/L | — | — | — | Effluent | 1/quarter | 24-hour composite |
| Total Phosphorus as P, mg/l | — | — | — | Effluent | 1/quarter | 24-hour composite |
| Dissolved Orthophosphate as P | — | — | — | Effluent | 1/quarter | 24-hour composite |

| PARAMETER | EFFLUENT LIMITATIONS | | | MONITORING REQUIREMENTS | | |
|---|---|---|---|---|---|---|
| | Average Monthly Limit | Average Weekly Limit | Daily Maximum Limit | Sample Location | Sample Frequency | Sample Type |
| Metals[3] | — | — | — | Influent, Effluent, and Sludge | 2/year | 24-hour composite (sludge-grab) |
| Whole Effluent Toxicity[4] | — | — | — | Effluent | 1/quarter, fourth year of permit | 24-hour composite |

1. Monthly and weekly averages are geometric means of all samples measured during the respective time period.
2. The chlorine limit is based on a mixing zone which includes twenty-five percent of the critical low flow volume of the Pend Oreille River.
3. See Part II. Pretreatment Program for additional metals testing requirements.
4. See Part I.C. Whole Effluent Toxicity for additional toxicity testing requirements.

2. The pH range shall be between 6.5 - 9.0 standard units. The Permittee shall monitor for pH daily. Sample analysis shall be conducted on a grab sample from the effluent.

3. There shall be no discharge of floating solids or visible foam other than trace amounts.

4. Removal Requirements for $BOD_5$ and TSS: For any month, the monthly average effluent concentration shall not exceed 15 percent of the monthly average influent concentration.

   Percent removal of $BOD_5$ and TSS shall be reported on the Discharge Monitoring Reports (DMRs). The monthly average percent removal shall be calculated from the arithmetic mean of the influent value and the arithmetic mean of the effluent value for that month. Influent and effluent samples shall be taken over approximately the same time period.

B. Receiving Water Monitoring. The permittee shall develop and implement a receiving water monitoring program which meets the following requirements. A receiving water monitoring program plan, including identification of monitoring stations, shall be submitted within 180 days after permit issuance to the Idaho

Department of Environmental Quality (DEQ), Coeur d'Alene Regional Office and EPA Region 10 for review. The permittee shall receive DEQ approval of the plan prior to implementation of the monitoring program. Monitoring must commence within twelve months after permit issuance. The receiving water monitoring program shall meet the following minimum requirements:

1. Monitoring stations on the Pend Oreille River shall be established upstream of the Sandpoint outfall. These stations shall be selected following consultation with DEQ. Sites shall be selected so as to provide a degree of spatial integration across the receiving water.

2. Monitoring shall start within one year after the effective date of the permit and shall last for a period of one year.

3. River samples shall be grab samples collected once per month (a total of twelve sampling events).

4. The samples shall be analyzed for the following: Temperature, pH, total ammonia as N, nitrate an N, nitrite as N, total Kjeldahl nitrogen, total phosphorous, ortho phosphorus, and hardness as $CaCO_3$.

5. To the extent practicable, sampling of the Sandpoint effluent for nutrients shall be conducted on the same day as river sampling.

6. Results from the receiving water monitoring program shall be submitted in a report to the EPA and the DEQ at the addresses listed in Part III.C. of this permit within 60 days of completion of the monitoring program. Monthly reporting of receiving water results is not required.

C. Whole Effluent Toxicity Testing

During the fourth year of the permit, the permittee shall conduct quarterly toxicity tests on 24-hour composite effluent samples.

1. Organisms and protocols

   a. The permittee shall conduct short-term tests with the water flea, *Ceriodaphnia dubia* (survival and reproduction test), and the fathead minnow, *Pimephales promelas* (larval survival and growth test).

b. The presence of chronic toxicity shall be estimated as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (the "manual"), Third Edition, EPA/600-4-91-002, July 1994.

c. Results shall be reported in TUc (chronic toxic units). TUc = 100/No Observed Effect Concentration (NOEC) in percent effluent concentration.

2. Toxicity Trigger

Chronic toxicity testing requirements are triggered when the NOEC equals or exceeds 100 TUc. When chronic toxicity testing requirements are triggered, the permittee shall comply with the requirements set out in Parts 5 and 6 below.

3. Quality Assurance

a. A series of five dilutions and a control shall be tested. The dilution series shall include 0.5 percent, 1 percent, 25 percent, 50 percent, and 100 percent.

b. If organisms are not cultured in-house, concurrent testing with reference toxicants shall be conducted. Where organisms are cultured in-house, monthly reference toxicant testing is sufficient.

c. If either the reference toxicant tests or the effluent tests do not meet all test acceptability criteria (TAC) as specified in the test methods manual, then the permittee must re-sample and re-test as soon as possible.

d. Reference toxicant tests shall be conducted using the same test conditions as the effluent toxicity test (i.e., same test duration, etc.).

e. Control and dilution water shall be laboratory water as described in the manual. If the dilution water used is different from the culture water, a second control, using culture water shall also be used. Receiving water may be used as control and dilution water upon notification of EPA. In no case shall water that has not met test acceptability criteria be used as dilution water.

f. Chemical testing for the parameters listed in Part I.A.1 of this permit shall be performed on a split sample collected for WET testing. To the extent that the timing of sample collection coincides with that of the sampling required in Part I.A.1. of this permit, chemical analysis of the split sample will fulfill the requirements of Part I.A.1.

4. Preparation of initial investigation toxicity reduction evaluation (TRE) plan

Prior to initiation of the toxicity testing required by this permit, the permittee shall submit to EPA a copy of the permittee's initial investigation TRE workplan. This plan shall describe the steps the permittee intends to follow in the event that toxicity testing requirements as described in Part I.C.2. above, are detected, and should include at a minimum:

a. A description of the investigation and evaluation techniques that would be used to identify potential causes/sources of toxicity, effluent variability, treatment system efficiency;

b. A description of the facility's method of maximizing in-house treatment efficiency, good housekeeping practices, and a list of all chemicals used in operation of the facility; and

c. If a toxicity identification evaluation (TIE) is necessary, who will conduct it (i.e., in-house or other).

5. Accelerated testing

a. If chronic toxicity testing requirements as defined in Part I.C.2. above are triggered, the permittee shall implement the initial investigation workplan. If implementation of the initial investigation workplan indicates the source of toxicity (for instance, a temporary plant upset), then only one additional test is necessary. If toxicity is detected in this test, then the following paragraph (C.5.b.) shall apply.

b. If chronic toxicity testing requirements as defined in Part I.C.2. above are triggered, and toxicity is detected in the test required

under Part I.C.5.a. above, then the permittee shall conduct six more tests, bi-weekly (every two weeks), over a twelve-week period. Testing shall commence within two weeks of receipt of the sample results of the exceedance

6. Toxicity Reduction Evaluation (TRE)

a. If chronic toxicity, as defined Part I.C.2., is detected in any of the six additional tests required under Part I.C.5.b., then, in accordance with the permittee's initial investigation workplan and EPA manul EPA 833-B-99-002 (Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants), the permittee shall initiate a TRE within fifteen (15) days of receipt of the sample results of the exceedance. The permittee will develop as expeditiously as possible a more detailed TRE workplan, which includes:.

i. further actions to investigate and identify the cause of toxicity;
ii. actions the permittee will take to mitigate the impact of the discharge and to prevent the recurrence of toxicity; and
iii. a schedule for these actions.

b. The permittee may initiate a toxicity identification evaluation (TIE) as part of the overall TRE process described in the EPA acute and chronic TIE manuals EPA/600/6-91/005F (Phase I), EPA/600/R-92/080 (Phase II), and EPA-600/R-92/081 (Phase III).

c. If none of the six tests required under Part I.C.5.b. above indicated toxicity, then the permittee may return to the normal testing frequency.

d. If a TIE is initiated prior to completion of the accelerated testing, the accelerated testing schedule may be terminated, or used as necessary in performing the TIE.

7. Reporting:

a. Results of toxicity tests, including any accelerated testing conducted during the month, shall be reported on the Discharge Monitoring Report (DMR) for the month in which the tests are

conducted.

b. The full report shall be submitted by the end of the month in which the DMR is submitted.

c. The full report shall consist of : (1) the toxicity test results; (2) the dates of sample collection and initiation of each toxicity test; (3) the flow rate at the time of sample collection; and (4) the results of the effluent analysis for chemical parameters required for the outfall as defined in Part I.A.1. of the permit.

d. Test results for chronic tests shall be reported according to the chapter on Report Preparation found in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Third Edition, EPA/600-4-91-002, July 1994.

D. Quality Assurance Requirements

1. The Permittee shall develop a Quality Assurance Plan. The primary purpose of the Quality Assurance Plan shall be to assist in planning for the collection and analysis of samples in support of the permit and in explaining data anomalies when they occur.

2. Throughout all sample collection and analysis activities, the Permittee shall use the EPA approved quality assurance, quality control, and chain-of-custody procedures described in:

   1. *Requirements for Quality Assurance Project Plans,* EPA QA/R-5 EPA, and
   2. *Guidance on Quality Assurance Project Plans*, EPA QA/G-5

   The following reference may be helpful in preparing the Quality Assurance Plan for this permit: *The Volunteer Monitors Guide to Quality Assurance Project Plans* EPA 841-B-96-003, September 1996.

3. The plan shall be completed within 60 days of the effective date of this NPDES permit. The Permittee shall keep a copy of the permit on site at all times.

4. At a minimum the plan shall include the following:

- Sampling techniques (field blanks, replicates, duplicates, control samples, etc).
- Sampling preservation methods.
- Sampling shipment procedures.
- Instrument calibration procedures and preventive maintenance (frequency, standard, spare parts).
- Qualification and training of personnel.
- Analytical methods (including quality control checks, quantification/detection levels).

5. Name(s), address(es) and telephone number(s) of the laboratories, used by or proposed to be used by the Permittee, shall be specified in the Quality Assurance Plan.

E. Operation and Maintenance Plan

1. Within 180 days of the effective date of the permit, the permittee shall review their operation and maintenance (O&M) plan and ensure that it includes appropriate best management practices (BMPs). The O&M Plan shall include measures which prevent or minimize the potential for the release of pollutants to the Pend Oreille River. The Plan shall be retained on site and made available to EPA or IDEQ upon request.

2. The permittee shall develop a description of pollution prevention measures and controls appropriate for the facility, and implement such controls. The appropriateness and priorities of controls in the O & M Plan shall reflect identified potential sources of pollutants at the facility. The description of BMPs shall address, to the extent practicable, the following minimum components:

   a. Spill prevention and control;

   b. Optimization of chemical use;

   c. Preventive maintenance program

   d. Research, development and implementation of a public information and education program to control the introduction of household hazardous materials to the sewer system; and

   e. Water conservation.

F. Design Criteria Requirements

The design criterion for the permitted facility is an annual average flow of 3 mgd. Each month, the permittee shall compute an annual average value for flow entering the facility based on the previous twelve months data. If the average annual value exceeds 85% of the design criterion value (2.6 mgd), the permittee shall develop a facility plan and schedule within one year from the date of the first exceedance. The plan must include the permittees' strategy for continuing to maintain compliance with effluent limits and will be made available to the Director, IDEC, or an authorized representative upon request.

G. Definitions.

1. "Average monthly discharge limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

2. "Average weekly discharge limitation" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

3. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

4. "Chronic toxic unit (TUc)" is a measure of chronic toxicity. The number of chronic toxic units in the effluent is calculated as 100/NOEC, where the NOEC is measured in percent effluent.

5. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

6 "Geometric mean" of "n" quantities is the "nth" root of the product of the quantities. For example the geometric mean of 100, 200 and 300 is $(100 \times 200 \times 300)^{1/3} = 181.7$

7. A "Grab" sample is a single sample or measurement taken at a specific time or over as short a period of time as is feasible.

8. "Maximum daily discharge limitation" means the highest allowable "daily discharge."

9. "Method Detection Limit (MDL)" means the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero as determined by a specific laboratory method.

10. "Minimum Level (ML)" is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified weights, volumes and processing steps have been followed.

11. "No observed effect concentration (NOEC)" is the highest tested concentration of an effluent at which no adverse effects are observed on the test organisms at the specific time of observation.

12. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

13. "Twenty four (24) hour composite" sample means a flow-proportioned mixture of not less than eight (8) discrete aliquots. Each aliquot shall be a grab sample of not less than 100 ml and shall be collected and stored in accordance with procedures prescribed in the most recent edition of *"Standard Methods for the Examination of Water and Wastewater."*

14. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

II. Pretreatment Program Requirements

A. Implementation. The permittee must implement the pretreatment program in accordance with the legal authorities, policies, procedures, staffing levels and financial provisions described in the original approved pretreatment program submission entitled *Industrial Pretreatment Program for the City of Sandpoint, Idaho, dated January 6, 1984*, any program amendments submitted thereafter and approved by EPA, and the General Pretreatment Regulations (40 CFR §403) and any amendments thereof. At a minimum, the permittee must carry out the following activities:

1. Enforce categorical pretreatment standards promulgated pursuant to Section 307(b) and (c) of the Act, prohibitive discharge standards as set forth in 40 CFR §403.5, and local limitations developed by the permittee in accordance with 40 CFR §403.5(c), whichever are more stringent and are applicable to non-domestic users discharging wastewater into the permittee's collection system. Locally derived limitations must be defined as pretreatment standards under Section 307(d) of the Act.

2. Implement and enforce the requirements of the most recent EPA approved portions of local law and regulations (e.g. municipal code, sewer use ordinance) addressing the regulation of non-domestic users.

3. Update the inventory of non-domestic users at a frequency and diligence adequate to ensure proper identification of non-domestic users subject to pretreatment standards, but no less than once per year. The permittee must notify these users of applicable pretreatment standards in accordance with 40 CFR §403.8(f)(2)(iii).

4. Issue, reissue, and modify, in a timely manner, industrial wastewater discharge permits to at least all Significant Industrial Users (SIUs) and categorical industrial users. These documents must contain, at a minimum, conditions identified in 40 CFR §403.8(f)(1)(iii). The permittee must follow the methods described in its implementation procedures for issuance of individual permits.

5. Develop and maintain a data management system designed to track the status of the permittee's non-domestic user inventory, non-domestic user discharge characteristics, and their compliance with applicable pretreatment standards and requirements. The permittee must retain all records relating to the pretreatment program activities for a minimum of

three years and must make such records available to EPA upon request. The permittee must also provide public access to information considered effluent data under 40 CFR Part 2.

6. Establish, where necessary, contracts or legally binding agreements with contributing jurisdictions to ensure compliance with applicable pretreatment requirements by non-domestic users within these jurisdictions. These contracts or agreements must identify the agency responsible for the various implementation and enforcement activities in the contributing jurisdiction. In addition, the permittee may be required to develop a Memorandum of Understanding that outlines the specific roles, responsibilities and pretreatment activities of each jurisdiction.

7. Carry out inspections, surveillance, and monitoring of non-domestic users to determine compliance with applicable pretreatment standards and requirements. A complete inspection of all SIUs and sampling of all SIUs' effluent must be conducted at least annually.

8. Require SIUs to conduct wastewater sampling as specified in 40 CFR §403.12(e) or (h). Frequency of wastewater sampling by the SIUs must be appropriate for the character and volume of the wastewater, but not less than twice per year. Sample collection and analysis must be performed in accordance with 40 CFR §403.12 (b)(5)(ii) through (v) and 40 CFR §136. If the permittee elects to conduct all the non-domestic user monitoring for any SIU instead of requiring self-monitoring, the permittee must conduct sampling in accordance with the requirements of this paragraph.

9. Enforce and obtain remedies for any industrial user's noncompliance with applicable pretreatment standards and requirements. This must include timely and appropriate reviews of industrial reports to identify all violations of the user's permit, the local ordinance, and federal pretreatment standards and requirements. Once violations have been uncovered, the permittee must take timely and appropriate action to address the noncompliance. The permittee's enforcement actions must follow its EPA-approved enforcement response procedures.

10. Publish, at least annually in the largest daily newspaper in the permittee's service area, a list of all non-domestic users which, at any time in the previous 12 months, were in Significant Noncompliance as defined in 40 CFR §403.8 (f)(2)(vii).

11. Maintain adequate staff, funds and equipment to implement its pretreatment program.

12. Conduct an analysis annually to determine whether influent pollutant loadings are approaching the maximum allowable headworks loadings calculated in the permittee's most recent local limits evaluation. Any local limits found to be inadequate by this analysis must be revised. The permittee may be required to revise existing local limits or develop new limits if deemed necessary by EPA.

B. Spill Prevention. The permittee must implement an accidental spill prevention program to reduce and prevent spills and slug discharges of pollutants from non-domestic users.

C. Enforcement Requirement. Whenever, on the basis of information provided to EPA, it is determined that any source contributes pollutants to the permittee's facility in violation of subsection (b), (c), or (d) of Section 307 of the Act, EPA will notify the permittee. Failure by the permittee to commence an appropriate enforcement action within 30 days of this notification may result in appropriate enforcement action by the EPA against the source and permittee.

D. Modification of the Pretreatment Program. If the permittee elects to modify any components of the pretreatment program, it must comply with the requirements of 40 CFR §403.18. No substantial program modification, as defined in 40 CFR §403.18(b), may be implemented prior to receiving written authorization from EPA.

E. Control of Undesirable Pollutants. The permittee must not allow the introduction of the following pollutants into the POTW:

1. Pollutants which will create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a closed cup flashpoint of less than 140° F or 60° C using the test methods specified in 40 CFR 261.21;

2. Pollutants which will cause corrosive structural damage to the POTW, but in no case, discharges with a pH lower than 5.0, unless the POTW is specifically designed to accommodate such discharges;

3. Solid or viscous pollutants in amounts which cause obstruction to the flow in the POTW (including sewers) resulting in interference with the proper

operation of the treatment works;

4. Wastewater at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so that there is a treatment process upset and subsequent loss of treatment efficiency;

5. Any pollutant, including oxygen demanding pollutants ($BOD_5$, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference in the POTW;

6. Heat in amounts which inhibit biological activity in the POTW, resulting in interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40°C (104°F) unless EPA Region 10, upon request of the POTW, approves alternate temperature limits;

7. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

8. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in quantities that may cause acute worker health and safety problems; and

9. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

F. Requirements for Industrial Users. The permittee must require any industrial user of its treatment works to comply with any applicable requirements in 40 CFR §403 through §471.

G. Sampling Requirements.

1. Parameters. The permittee must sample influent, effluent, and sludge from the POTW for arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, silver, zinc. Metals must be analyzed and reported as total metals. Sludge must also be analyzed for percent solids.

2. Frequency. Sampling must be conducted twice per year: once during the month of May and once during the month of November.

3. Sample Locations and Sample Type. The permittee must sample as described in Table 2.

| Table 2: Pretreatment Monitoring - Sample Types and Frequency | | |
|---|---|---|
| **Wastestream** | **Sample Type** | **Frequency** |
| Influent | 24-hour Composite[1] | 3 days within a week (Mon - Fri) |
| Effluent | 24-hour Composite[1] | 3 days within a week (Mon - Fri) |
| Sludge | Grab | Once, during the same time period that influent and effluent samples are being taken |
| 1 Influent and effluent samples for cyanide must be collected and analyzed as required in paragraph 8.h. | | |

4. Analytical Methods. For influent and effluent pretreatment sampling, the permittee must use EPA-approved analytical methods that achieve the method detection limits (MDLs) or minimum level (MLs) in Table 3, unless higher detection limits are approved by EPA.

| Table 3: Method Detection Limits | |
|---|---|
| **Parameter** | **MDL, µg/l** |
| Arsenic | 1.0 |
| Cadmium | 0.1 |
| Chromium | 1.0 |
| Copper | 1.0 |
| Cyanide | 5.0[1] |
| Lead | 1.0 |
| Mercury | 0.2 |
| Nickel | 5.0 |
| Silver | 0.2 |
| Zinc | 5.0 |

1 This value represents a minimum level, not an MDL.

Requests for higher MDLs must be submitted in writing to the Pretreatment Coordinator at the address in paragraph H.1., below.

5. Sludge Sampling. Sludge samples must be taken as the sludge leaves the dewatering device or digesters.

6. Sludge Reporting. Metals concentrations in sludge must be reported in mg/kg, dry weight.

7. Reporting Results. Analytical results for each day's samples must be reported separately. Sample results must be submitted with the pretreatment annual report required in paragraph 10., below.

8. Cyanide Sampling. Influent and effluent sampling for cyanide must be conducted as follows. Eight discrete grab samples must be collected over a 24-hour day. Each grab sample must be at least 100 ml. Each sample must be checked for the presence of chlorine and/or sulfides prior to preserving and compositing (refer to *Standard Methods*, 4500-CN B). If chlorine and/or sulfides are detected, the sample must be treated to remove any trace of these parameters. After testing and treating for the interference compounds, the pH of each sample must be adjusted, using sodium hydroxide, to 12.0 standard units. Each sample can then be composited into a larger container which has been chilled to 4 degrees

Celsius, to allow for one analysis for the day.

H. Pretreatment Report.

1. The permittee must submit an annual report that describes the permittee's program activities over the report year which runs from September 1 to August 31. This report must be submitted to the following address no later than October 1 of each year:

   Pretreatment Coordinator
   U.S. Environmental Protection Agency
   Region 10
   1200 Sixth Avenue, OW-130
   Seattle, WA 98101

2. The pretreatment report must be compiled following the *Region 10 Annual Report Guidance*. At a minimum, the report must include:

   a. An updated non-domestic user inventory, including those facilities that are no longer discharging (with explanation), and new dischargers, appropriately categorized and characterized. Categorical users should have the applicable category noted as well as cases where more stringent local limits apply instead of the categorical standard.

   b. Results of wastewater sampling at the treatment plant as specified in Part G.8. (above).

   c. Calculations of removal rates for each pollutant for each day of sampling.

   d. An analysis and discussion of whether the existing local limitations in the permittee's sewer use ordinance continue to be appropriate to prevent treatment plant interference and pass through of pollutants that could affect water quality or sludge quality. This should include a comparison between influent loadings and the most recent relevant maximum allowable headworks loadings calculated for the treatment plant.

   e. Status of program implementation, including:

1) Any planned modifications to the pretreatment program originally approved by EPA, including staffing and funding updates.

2) A description of any POTW interference, pass through, or NPDES permit violations experienced at the facility, which were directly or indirectly attributable to non-domestic users, including:

   (a) Date & time of the incident;
   (b) Description of the effect on the POTW's operation;
   (c) Effects on the POTW's effluent and biosolids quality;
   (d) Identification of suspected or known sources of the discharge causing the upset;
   (e) Steps taken to remedy the situation and to prevent recurrence.

3) Listing of non-domestic users inspected and/or monitored during the report year with dates and an indication of compliance status.

4) Listing of non-domestic users planned for inspection and/or monitoring for the coming year along with associated frequencies.

5) Listing of non-domestic users whose permits have been issued, reissued, or modified during the report year along with current permit expiration dates.

6) Listing of non-domestic users notified of promulgated pretreatment standards and/or local standards during the report year as required in 40 CFR §403.8(f)(2)(iii).

7) Listing of non-domestic users notified of promulgated pretreatment standards or applicable local standards who are on compliance schedules. The listing must include the final date of compliance for each facility.

f. Status of enforcement activities including:

1) Listing of non-domestic users who failed to comply with applicable pretreatment standards and requirements, including:

a) Summary of the violation(s).

b) Enforcement action taken or planned by the permittee.

c) Present compliance status as of the date of preparation of the pretreatment report.

2) Listing of those users in Significant Noncompliance during the report year as defined in 40 CFR 403.8(f)(2)(vii) and a copy of the newspaper publication of those users' names. EPA may require more frequent reporting on those users who are determined to be in Significant Noncompliance.

## III. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. Reporting of Monitoring Results. Monitoring results shall be summarized each month on the Discharge Monitoring Report (DMR) form (EPA No. 3320-1). The reports shall be submitted monthly and are to be postmarked by the 15th day of the following month. Legible copies of these, and all other reports, shall be signed and certified in accordance with the requirements of Part IV.J., Signatory Requirements, and submitted to the Director, Office of Water and the State agency at the following addresses:

original to: United States Environmental Protection Agency (EPA) Region 10
1200 Sixth Avenue, OW-133
Seattle, Washington 98101

copy to: Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, Idaho 83814

D. Additional Monitoring by the Permittee. If the Permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

E. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;

2. The individual(s) who performed the sampling or measurements;

3. The date(s) analyses were performed;

4. The individual(s) who performed the analyses;

5. The analytical techniques or methods used; and

6. The results of such analyses.

F. Retention of Records. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time. Data collected on-site, copies of Discharge Monitoring Reports, and a copy of this NPDES permit must be maintained on-site.

G. Twenty-four Hour Notice of Noncompliance Reporting.

1. The following occurrences of noncompliance shall be reported by telephone, to the EPA hotline at 206-553-1846, within 24 hours from the time the Permittee becomes aware of the circumstances:

a. Any noncompliance which may endanger health or the

environment;

b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G., Bypass of Treatment Facilities.);

c. Any upset which exceeds any effluent limitation in the permit (See Part III.H., Upset Conditions.); or

d. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit to be reported within 24 hours.

2. A written submission shall also be provided within five days of the time that the Permittee becomes aware of the circumstances. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Compliance Section in Seattle, Washington.

4. Reports shall be submitted to the addresses in Part II.C., Reporting of Monitoring Results.

H. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.C. are submitted. The reports shall contain the information listed in Part II.G.2.

I. Inspection and Entry. The Permittee shall allow the Director or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

## IV. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions.

1. Civil and Administrative Penalties. Any person who violates a permit condition implementing Sections Penalty. The Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall be subject to a civil or administrative penalty, not to exceed the maximum amounts specified in Sections 309(d) and 309(g) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S. C. § 2461 note) as amended by the Debt collection Improvement Act (31 U.S.C. § 3701 note).

2. Criminal Penalties:

a. Negligent Violations. Any person who negligently violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall, upon conviction, be punished by a fine and/or imprisonment as specified in Section 309(c)(1) of the Act.

b. Knowing Violations. The Act provides that any person who knowingly violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall, upon conviction, be punished by a fine and/or imprisonment as specified in Section 309(c)(2) of the Act.

c. Knowing Endangerment. Any person who knowingly violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine and/or imprisonment as specified in Section 309(c)(3) of the Act.

d. False Statements. Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this Act or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this Act, must be punished by a fine and/or imprisonment as specified in Section 309(c)(4) of the Act.

Except as provided in permit conditions in Part III.G., Bypass of Treatment Facilities and Part III.H., Upset Conditions, nothing in this permit shall be construed to relieve the Permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The Permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance

also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances. Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

G. Bypass of Treatment Facilities.

1. Bypass not exceeding limitations. The Permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this section.

2. Notice:

a. Anticipated bypass. If the Permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The Permittee shall submit notice of an unanticipated bypass as required under Part II.G., Twenty-four Hour Notice of Noncompliance Reporting.

3. Prohibition of bypass.

a. Bypass is prohibited and the Director may take enforcement action against a Permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in

the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The Permittee submitted notices as required under paragraph 2 of this section.

b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determine that it will meet the three conditions listed above in paragraph 3.a. of this section.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph 2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A Permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the Permittee can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The Permittee submitted notice of the upset as required under Part II.G., Twenty-four Hour Notice of Noncompliance Reporting; and

d. The Permittee complied with any remedial measures required under Part III.D., Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants

within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

## V. GENERAL REQUIREMENTS

A. Notice of New Introduction of Pollutants. The Permittee shall provide adequate notice to the Director, Office of Water of:

1. Any new introduction of pollutants into the treatment works from an indirect discharger which would be subject to Sections 301 or 306 of the Act if it were directly discharging those pollutants; and

2. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of the permit.

3. For the purposes of this section, adequate notice shall include information on:

   a. The quality and quantity of effluent to be introduced into such treatment works; and

   b. Any anticipated impact of the change on the quantity or quality of effluent to be discharged from such publicly owned treatment works.

B. Control of Undesirable Pollutants. Under no circumstances shall the Permittee allow introduction of the following wastes into the waste treatment system:

1. Wastes which will create a fire or explosion hazard in the treatment works;

2. Wastes which will cause corrosive structural damage to the treatment works, but in no case, wastes with a pH lower than 5.0, unless the works is designed to accommodate such wastes;

3. Solid or viscous substances in amounts which cause obstructions to the flow in sewers, or interference with the proper operation of the treatment works;

4. Wastewaters at a flow rate and/or pollutant discharge rate which is

excessive over relatively short time periods so that there is a treatment process upset and subsequent loss of treatment efficiency; and

5. Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge of such volume or strength as to cause interference in the treatment works.

C. Requirements for Industrial Users. The Permittee shall require any industrial user of these treatment works to comply with any applicable requirements of Sections 204(b), 307, and 308 of the Act, including any requirements established under 40 CFR Part 403.

D. Planned Changes. The Permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit.

E. Anticipated Noncompliance. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

F. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

G. Duty to Reapply. If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

H. Duty to Provide Information. The Permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

I. Other Information. When the Permittee becomes aware that it failed to submit

any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

J. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Director, and

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.J.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.J.2. must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for

gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Director. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

L. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties to which the Permittee is or may be subject under Section 311 of the Act.

M. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

N. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

O. Transfers. This permit may be automatically transferred to a new Permittee if:

1. The current Permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new Permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

3. The Director does not notify the existing Permittee and the proposed new Permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

P. State Laws. Nothing in this permit shall be construed to preclude the institution

of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

Q. Reopener Provision. This permit is subject to modification, revocation and reissuance, or termination at the request of any interested person (including the Permittee) or upon EPA initiative. However, permits may only be modified, revoked or reissued, or terminated for the reasons specified in 40 CFR §122.62 or 122.64, and 40 CFR §124.5. This includes new information which was not available at the time of permit issuance and would have justified the application of different permit conditions at the time of issuance including future monitoring results. All requests for permit modification must be addressed to EPA in writing and must contain facts or reasons supporting the request.

# Appendix B

# Avista Utilities
# Draft Industrial Energy Efficiency Study

# DRAFT

# Industrial Energy Efficiency Study

**City of Sandpoint**

**Wastewater Treatment Facility**

Sandpoint, Idaho

Prepared by
Rob Gray, P.E.

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Energy Solutions
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Spokane, WA 99220-3727
(509) 495-8752

November 2005

# IMPORTANT NOTICE

The purpose of this Energy Efficiency Evaluation report is to give you an indication as to the viability of pursing efficiency upgrades. The Market Services Department of AVISTA Utilities is dedicated to making accurate predictions of potential energy savings. However, it should be noted that the potential energy savings, the estimated projects cost, as well as incentives offered by AVISTA Utilities, are ESTIMATES ONLY. Actual project engineering design recommendations may differ from those in AVISTA's report, and project labor and material cost will vary among vendors and contractors.

AVISTA believes the attached report is a reasonable accurate representation of energy usage and opportunities in your facility. However, because of the limited scope of our visits, AVISTA UTILITIES CANNOT AND WILL NOT GUARANTEE THE ACCURACY, COMPLETENESS OR USEFULNESS OF THE INFORMATION CONTAINED IN THIS REPORT, NOR ASSUME ANY LIABILITY FOR DAMAGES RESULTING FROM THE USE OF ANY INFORMATION, EQUIPMENT, METHOD OR PROCESS DISCUSSED IN THIS REPORT.

Should you decide to proceed with a project listed in this report, you will need to complete the following steps:

1. Request an Energy Efficiency Agreement (EEA) from your Avista Account Executive. This agreement allows Avista to pay an incentive and guarantees this incentive rate while you are under construction.
2. Be sure to keep all of your invoices for materials and labor. You will need to provide Avista with copies of these invoices when the project completes.
3. Call your Avista Account Executive when the project is complete. Avista will need to schedule a post-verification to ensure proper installation of the proposed measures.

Once the project completes, the invoices have been provided to Avista, and Avista has post-verified the installation, a final incentive amount will be calculated. This will be the amount you receive in the time period noted below.

It is not recommended that you use the analysis or other information contained in this report for bid specifications or to compare vendors project costs. To protect the integrity of the bid process, you agree not to share this report with contractors or vendors.

If you decide to proceed with a project, based on AVISTA Utilities analysis, you should consider contacting a design-engineering firm. Their recommendations may vary from that of AVISTA Utilities. Where it is appropriate the cost of engineering design can be included in the project costs and may be eligible for certain incentives offered by AVISTA Utilities.

You will be selecting and working with contractors and vendors of your choice. AVISTA Utilities does not recommend specific contractors or vendors, nor will it supervise any implementation of energy efficiency projects. During the project and/or once the project is complete, AVISTA Utilities may conduct one or more site visits to verify the installed equipment, determine the appropriate incentives and measure energy savings. The purpose of any visit by an AVISTA representative is not to check on contractor or vendor work.

In selecting a contractor or vendor, you should make sure the contractor or vendor is properly qualified, is licensed and bonded, has references and will perform work for you in a timely manner and in accordance with applicable codes and standards.

**Incentives are paid when the project is substantially complete, but require that an EEA between Avista Utilities and the customer be in place prior to ordering project materials.**

# Introduction

Avista Utilities has an interest in promoting economic competitiveness through energy efficiency. Avista Utilities offers a variety of the financial and technical services. These services include:

- Technical assistance where an Avista Utilities engineer works with the customer to identify potential efficiency measures, perform field measurements, analyze the potential for energy savings and determine the cost benefits. This report is a result of this service and provides you with information that will help you take advantage of the financial services discussed below.
- Financial assistance in the form of a direct financial incentive for customers who implement energy efficiency measures or purchase high efficiency equipment. The incentive is based on either 50% of the cost of a project, or $0.04 to $0.14 for the first year kilowatt-hour savings, which ever is least. More detailed discussion of the guidelines for incentives is provided in Appendix A.

  Incentives are not paid until after the project is complete, but require that an agreement between Avista Utilities and the customer be in place prior to ordering materials for the project.
- A Premium Efficiency Motors Rebate program is currently available. A Prescriptive Lighting Rebate program is to be released by the start of 2006.

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# Executive Summary

Table A1 is a summary of proposed energy efficiency measures we consider to be cost effective and advantageous for the plant. Implementing the proposed measures will provide:

- Estimated electricity savings of 249,140 kWh per year
- Estimated electric demand reduction of 19.4 kW
- Estimated natural gas savings of 23,028 therms per year
- Estimated energy cost savings of $26,450 per year

The cost to implement these measures is:

- $182,760 Total estimated cost

To assist the implementation of these projects, Avista Utilities will provide estimated incentives of $89,710. The simple payback, to the plant, will be about three and a half years. The internal rate of return is expected to be about 28 percent.

Prior to implementing this project, the customer's Account Executive, at Avista, should be notified, so that an Energy Efficiency Agreement (EEA) can be completed. The EEA is necessary to be eligible for incentives.

Electricity cost savings are all based on the Sch.21 rates for Idaho of $0.0423 per kWh, and $3.00 per kW demand. The Sch.21 rate does include adjustments for Sch.65, Sch.66 and Sch.91.

Table B1 contains a list of other measures that were considered. Though these measures are not listed as "Proposed" the estimated incentives are available.

## *Sandpoint Wastewater Treatment Facility*
## *Table A1*
# SUMMARY OF PROPOSED ENERGY EFFICIENCY MEASURES

| Opti No. | Brief EEM Description | Project Cost (Inc. Labor) | Total Cost Savings | Non-Energy Cost Savings | Energy Cost Savings | Elect. Savings [kwh /yr] | Dem -and [kW] Savings | Nat'l Gas Savings [therms] | Project EEM Life [yrs] | Est. Avista Funding | Industry First Cost | SPB [yrs] | IRR [pct.] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1A | *Replace course bubble diffusers with fine bubble in the south aeration basin, and operate Blower #2 through out the year, shutting down Blower #1.* | *$41,250* | *$7,526* | | *$7,526* | *166,600* | *13.3* | | *15* | *$19,992* | $21,258 | 2.8 | 35% |
| | | | | | | Demand savings is an average, and accounts for the 7 add'l months when Blower #2 will be used in lieu of Blower #1 | | | | | | | |
| 2A | *Restore auto. D.O. control with state-of-the-art probes and install VFD control of Blower #2* | *$13,360* | *$3,443* | | *$3,443* | *76,200* | *6.1* | | *15* | *$6,680* | $6,680 | 1.9 | 51% |
| 3 | *Clean digester gas and utilized in boiler* | *$109,750* | *$13,691* | | *$13,691* | | | *20604* | *15* | *$54,875* | $54,875 | 4.0 | 24% |
| 4 | *Replace exg. piston primary thicken sludge pump with electric diaphragm pump and increase thickened sludge solids content to 3-4% (based on utilization of biogas)* | *$18,400* | *$1,879* | | *$1,879* | *6,343* | | *2,424* | *15* | *$8,160* | $10,240 | 5.4 | 16% |
| TOTAL PACKAGE | | $182,760 | $26,540 | $0 | $26,540 | 249,140 | 19.4 | 23,028 | 15 | $89,710 | $93,050 | 3.5 | 28% |

***NOTES:***

(1) *Energy cost savings are based on* ID *October 2002 electric schedule* Elec 21 *rates of* $ 0.04230 */kWh and* $ 3.00 */kW* *and natural gas schedule* NatlGas 111 *high block rate of* $ 0.6645 */therm.*

Revised 04-Nov-05

## *Sandpoint Wastewater Treatment Facility*
## *Table B1*
# SUMMARY OF OTHER ENERGY EFFICIENCY MEASURES CONSIDERED

| Opti No. | Brief EEM Description | Project Cost (Inc. Labor) | Total Cost Savings | Non-Energy Cost Savings | Energy Cost Savings | Elect. Savings [kwh /yr] | Dem -and [kW] Savings | Nat'l Gas Savings [therms] | EEM Life [yrs] | Project Comp -letion Date | Est. Avista Funding | Industry First Cost | SPB [yrs] | IRR [pct.] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1B | *Replace course bubble diffusers with fine bubble in the south aeration basin.* | *$41,250* | *$8,447* | | *$8,447* | *199,700* | *0.0* | *0* | *15* | *4-1-06* | *$20,625* | $20,625 | 2.4 | 41% |
| 2B | *Install VFD control of both blowers & restore auto. D.O. control with state-of-the-art probes* | *$29,000* | *$5,709* | | *$5,709* | *134,960* | *0.0* | *0* | *15* | *4-1-06* | *$14,500* | $14,500 | 2.5 | 39% |
| 5 | *Anoxic selection, using 25ft.x25ft.tank, 3.2hp mixer & reducing aeration basin D.O. to 2.0 mg/l* | *$84,350* | *$3,877* | *$392* | *$3,485* | *77,100* | *6.2* | *0* | *15* | *4-1-06* | *$3,084* | $81,266 | 21 | N/A |
| 6 | *Replace existing gravity thickener with a gravity belt thickener* | *$386,100* | *($2,336)* | (2) *($3,198)* | *$862* | *(56)* | *-0.1* | *1308* | *15* | *4-1-06* | *$3,922* | $382,178 | N/A | N/A |

***NOTES:***

(1) *Energy cost savings are based on October 2002 electric schedule and natural gas schedule* — *ID Elec 21 rates of $0.04230 /kWh and NatlGas 111 high block rate of $0.66447 /therm.* — *$3.00 /kW*

(2) *Increased polymer costs*

Revised 04-Nov-05

# Utility Summary

An essential component of any energy management program is a continuing account of energy use and its cost. This can best be done by keeping up-to-date graphs of energy consumption and costs on a monthly basis. When utility bills are received, we recommend that energy use be immediately plotted on a graph. A separate graph will be required for each type of energy used, such as oil, gas, or electricity. A combination will be necessary, for example, when both gas and oil are used interchangeably in a boiler. A single energy unit should be used to express the heating values of the various fuel sources so that a meaningful comparison of fuel types and fuel combinations can be made. From these graphs, trends and irregularities in energy usage and costs can be detected and the relative merits of energy conservation can be assessed.

The facility is billed on electric Schedule 21 and natural gas Schedule 111.

# Avista Utilities

## Previous 12 Month Bill Comparison (September 6, 2005)

CITY OF SANDPOINT

Route Box

Rural Address
SEWAGE PLANT

SANDPOINT, ID 83864

Account #: 2127888
Elec. Rate Schedule: 021

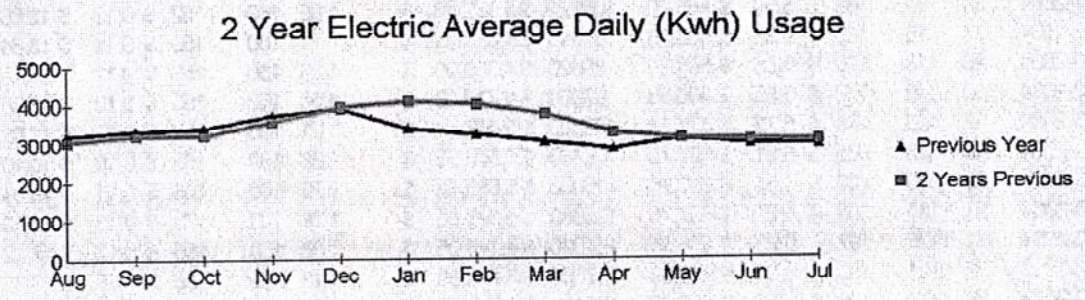
Nat. Gas Rate Schedule: 111

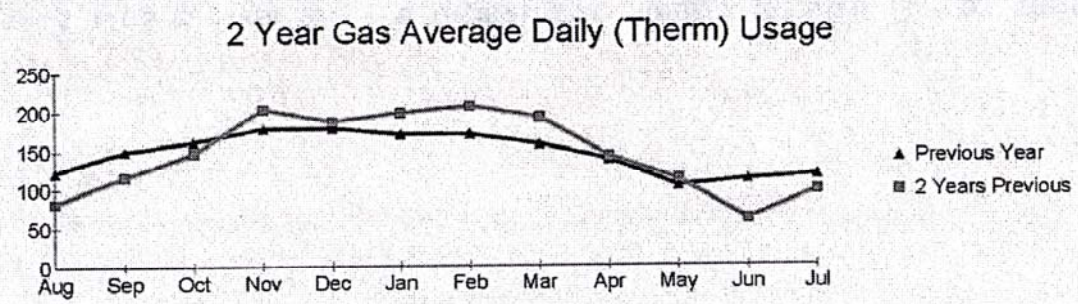
### Previous 12 Months

| End Date | Kwh Use | Kwh Cost | Therm Use | Therm Cost |
|---|---|---|---|---|
| 08/01/2005 | 90720 | 4519.97 | 3600 | 3068.67 |
| 07/01/2005 | 85600 | 4264.88 | 3214 | 2751.13 |
| 06/02/2005 | 105120 | 5237.43 | 3479 | 2969.13 |
| 04/29/2005 | 79040 | 3938.03 | 3846 | 3271.05 |
| 04/01/2005 | 84480 | 4209.07 | 4402 | 3728.44 |
| 03/04/2005 | 93280 | 4647.52 | 4926 | 4159.51 |
| 02/03/2005 | 104160 | 5189.59 | 5278 | 4449.08 |
| 01/03/2005 | 124320 | 6194.04 | 5692 | 4789.66 |
| 12/02/2004 | 126720 | 6312.37 | 6052 | 5084.87 |
| 10/29/2004 | 94880 | 4726.27 | 4515 | 3820.68 |
| 10/01/2004 | 99840 | 4994.53 | 4468 | 3642.70 |
| 09/01/2004 | 105920 | 5372.49 | 4026 | 2879.43 |
| Total >> | 1194080 | 59606.19 | 53498 | 44614.35 |

### 2 Years Previous

| End Date | Kwh Use | Kwh Cost | Therm Use | Therm Cost |
|---|---|---|---|---|
| 07/30/2004 | 91040 | 4617.75 | 2901 | 2101.77 |
| 06/30/2004 | 85920 | 4358.05 | 1682 | 1259.14 |
| 06/02/2004 | 92960 | 4715.13 | 3327 | 2396.25 |
| 05/03/2004 | 107200 | 5437.42 | 4663 | 3319.76 |
| 03/31/2004 | 108480 | 5502.35 | 5565 | 3943.27 |
| 03/02/2004 | 116000 | 5883.78 | 5996 | 4241.20 |
| 02/02/2004 | 126080 | 6395.06 | 6148 | 4346.27 |
| 01/02/2004 | 121920 | 6184.05 | 5785 | 4095.35 |
| 12/02/2003 | 117600 | 5964.93 | 6711 | 4735.46 |
| 10/30/2003 | 96160 | 4877.45 | 4388 | 3123.79 |
| 09/30/2003 | 102560 | 5202.07 | 3703 | 2581.59 |
| 08/29/2003 | 91520 | 4642.09 | 2461 | 1748.07 |
| Total >> | 1257440 | 63780.13 | 53330 | 37891.92 |



Demand Billing History for DEMAND SVC No. 70579298
at: SEWAGE PLANT SANDPOINT ID 83864
Route: 030922 Premise No.: 3236

Current account #2127888 Customer: CITY OF SANDPOINT,
Mailing address:

W 1123 LAKE ST
SANDPOINT ID 83864

Service status: OPEN 11-03-1959
Rate schedule: 021 LARGE GENERAL SERVICE

From 2003-07-30 to 2005-08-01 (733 days of service)
Total usage: 4,320 Total billing: $14,743.52

KVAR Billing History for KVAR SVC No. 86289847
at: SEWAGE PLANT SANDPOINT ID 83864
Route: 030922 Premise No.: 3236

Current account #2127888 Customer: CITY OF SANDPOINT,
Mailing address:

W 1123 LAKE ST
SANDPOINT ID 83864

Service status: OPEN 05-08-1984
Rate schedule: 021 LARGE GENERAL SERVICE

From 2003-07-30 to 2005-08-01 (733 days of service)
Total usage: 3,787 Total billing: $301.51

| Begin Date | Read Date | Dys Svc | Deg Dys | Dmd Usage | Tax Amt | Dmd Amt | Elec Usage | Elec Amt | PVD Amt | Dmd Read | Mult | KVAR Usage | Tax Amt | KVAR Amt | KVAR Read |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07-01-2005 | 08-01-2005 | 31 | 11 | 155 | $ 5.65 | $ 570.65 | 90720 | $4,519.97 | $- | 0.97 | 160 | 157 | $ 0.16 | $ 16.16 | 0.98 |
| 06-02-2005 | 07-01-2005 | 29 | 150 | 176 | $ 6.28 | $ 634.28 | 85600 | $4,264.88 | $- | 1.1 | 160 | 152 | $ 0.12 | $ 11.62 | 0.95 |
| 04-29-2005 | 06-02-2005 | 34 | 295 | 182 | $ 6.46 | $ 652.46 | 105120 | $5,237.43 | $- | 1.14 | 160 | 166 | $ 0.14 | $ 14.39 | 1.04 |
| 04-01-2005 | 04-29-2005 | 28 | 468 | 163 | $ 5.89 | $ 594.89 | 79040 | $3,938.03 | $- | 1.02 | 160 | 155 | $ 0.14 | $ 14.39 | 0.97 |
| 03-04-2005 | 04-01-2005 | 28 | 642 | 198 | $ 6.94 | $ 700.94 | 84480 | $4,209.07 | $- | 1.24 | 160 | 158 | $ 0.10 | $ 9.85 | 0.99 |
| 02-03-2005 | 03-04-2005 | 29 | 853 | 192 | $ 6.76 | $ 682.76 | 93280 | $4,647.52 | $- | 1.2 | 160 | 141 | $ 0.07 | $ 6.57 | 0.88 |
| 01-03-2005 | 02-03-2005 | 31 | 1084 | 171 | $ 6.13 | $ 619.13 | 104160 | $5,189.59 | $- | 1.07 | 160 | 157 | $ 0.14 | $ 13.64 | 0.98 |
| 12-02-2004 | 01-03-2005 | 32 | 1060 | 197 | $ 6.91 | $ 697.91 | 124320 | $6,194.04 | $- | 1.23 | 160 | 157 | $ 0.10 | $ 9.85 | 0.98 |
| 10-29-2004 | 12-02-2004 | 34 | 982 | 190 | $ 6.70 | $ 676.70 | 126720 | $6,312.37 | $- | 1.19 | 160 | 160 | $ 0.12 | $ 11.62 | 1 |
| 10-01-2004 | 10-29-2004 | 28 | 423 | 179 | $ 6.37 | $ 643.37 | 94880 | $4,726.27 | $- | 1.12 | 160 | 152 | $ 0.11 | $ 11.36 | 0.95 |
| 09-01-2004 | 10-01-2004 | 30 | 212 | 168 | $ 5.91 | $ 597.20 | 99840 | $4,994.53 | $- | 1.05 | 160 | 149 | $ 0.12 | $ 12.12 | 0.93 |
| 07-30-2004 | 09-01-2004 | 33 | 34 | 168 | $ 5.50 | $ 555.00 | 105920 | $5,372.49 | $- | 1.05 | 160 | 152 | $ 0.13 | $ 12.88 | 0.95 |
| 06-30-2004 | 07-30-2004 | 30 | 16 | 160 | $ 5.28 | $ 532.78 | 91040 | $4,617.75 | $- | 1 | 160 | 150 | $ 0.14 | $ 13.64 | 0.94 |
| 06-02-2004 | 06-30-2004 | 28 | 116 | 170 | $ 5.55 | $ 560.55 | 85920 | $4,358.05 | $- | 1.06 | 160 | 150 | $ 0.12 | $ 12.12 | 0.94 |
| 05-03-2004 | 06-02-2004 | 30 | 319 | 170 | $ 5.55 | $ 560.55 | 92960 | $4,715.13 | $- | 1.06 | 160 | 155 | $ 0.13 | $ 13.38 | 0.97 |
| 03-31-2004 | 05-03-2004 | 33 | 465 | 176 | $ 5.72 | $ 577.22 | 107200 | $5,437.42 | $- | 1.1 | 160 | 157 | $ 0.13 | $ 12.88 | 0.98 |
| 03-02-2004 | 03-31-2004 | 29 | 613 | 205 | $ 6.51 | $ 657.76 | 108480 | $5,502.35 | $- | 1.28 | 160 | 163 | $ 0.10 | $ 10.10 | 1.02 |
| 02-02-2004 | 03-02-2004 | 29 | 919 | 205 | $ 6.51 | $ 657.76 | 116000 | $5,883.78 | $- | 1.28 | 160 | 165 | $ 0.11 | $ 10.61 | 1.03 |
| 01-02-2004 | 02-02-2004 | 31 | 1185 | 205 | $ 6.51 | $ 657.76 | 126080 | $6,395.06 | $- | 1.28 | 160 | 173 | $ 0.13 | $ 12.63 | 1.08 |
| 12-02-2003 | 01-02-2004 | 31 | 1105 | 197 | $ 6.29 | $ 635.54 | 121920 | $6,184.05 | $- | 1.23 | 160 | 166 | $ 0.12 | $ 12.12 | 1.04 |
| 10-30-2003 | 12-02-2003 | 33 | 1161 | 189 | $ 6.07 | $ 613.32 | 117600 | $5,964.93 | $- | 1.18 | 160 | 166 | $ 0.13 | $ 13.38 | 1.04 |
| 09-30-2003 | 10-30-2003 | 30 | 377 | 170 | $ 5.55 | $ 560.55 | 96160 | $4,877.45 | $- | 1.06 | 160 | 163 | $ 0.15 | $ 15.40 | 1.02 |
| 08-29-2003 | 09-30-2003 | 32 | 151 | 166 | $ 5.44 | $ 549.44 | 102560 | $5,202.07 | $- | 1.04 | 160 | 165 | $ 0.16 | $ 16.41 | 1.03 |
| 07-30-2003 | 08-29-2003 | 30 | 1 | 168 | $ 5.50 | $ 555.00 | 91520 | $4,642.09 | $- | 1.05 | 160 | 158 | $ 0.14 | $ 14.39 | 0.99 |

Gas Billing History for GAS SVC No. 00084221
at: SEWAGE PLANT SANDPOINT ID 83864
Route: 030922 Premise No.: 3236

Current account #2127888 Customer: CITY OF SANDPOINT,
Mailing address:

W 1123 LAKE ST
SANDPOINT ID 83864

Service status: OPEN 06-17-1975
Rate schedule: 111 FIRM-LARGE GENERAL SERVICE

From 2003-07-30 to 2005-08-01 (733 days of service)
Total usage: 106,828 Total billing: $82,506.27

| Usage | Tax Amt | Billed Amt | Mult | Begin Read | End Read | Reading Time |
|---|---|---|---|---|---|---|
| 3600 | $ 30.38 | $ 3,068.67 | 0.967 | 78073 | 81796 | 12:53:52 PM |
| 3214 | $ 27.24 | $ 2,751.13 | 0.979 | 74790 | 78073 | 9:41:56 AM |
| 3479 | $ 29.40 | $ 2,969.13 | 0.962 | 71174 | 74790 | 1:17:47 PM |
| 3846 | $ 32.39 | $ 3,271.05 | 0.966 | 67193 | 71174 | 2:04:14 PM |
| 4402 | $ 36.92 | $ 3,728.44 | 0.966 | 62636 | 67193 | 11:40:25 AM |
| 4926 | $ 41.18 | $ 4,159.51 | 0.966 | 57537 | 62636 | 11:03:15 AM |
| 5278 | $ 44.05 | $ 4,449.08 | 0.968 | 52085 | 57537 | 11:48:08 AM |
| 5692 | $ 47.42 | $ 4,789.66 | 0.97 | 46217 | 52085 | 11:50:49 AM |
| 6052 | $ 50.35 | $ 5,084.87 | 0.968 | 39965 | 46217 | 10:47:54 AM |
| 4515 | $ 37.83 | $ 3,820.68 | 0.965 | 35286 | 39965 | 10:05:56 AM |
| 4468 | $ 36.07 | $ 3,642.70 | 0.968 | 30670 | 35286 | 10:22:52 AM |
| 4026 | $ 28.51 | $ 2,879.43 | 0.967 | 26507 | 30670 | 9:20:34 AM |
| 2901 | $ 20.81 | $ 2,101.77 | 0.968 | 23510 | 26507 | 11:29:08 AM |
| 1682 | $ 12.47 | $ 1,259.14 | 0.971 | 21778 | 23510 | 12:19:32 PM |
| 3327 | $ 23.73 | $ 2,396.25 | 0.965 | 18330 | 21778 | 12:31:20 PM |
| 4663 | $ 32.87 | $ 3,319.76 | 0.965 | 13498 | 18330 | 11:39:24 AM |
| 5565 | $ 39.04 | $ 3,943.27 | 0.966 | 7737 | 13498 | 10:53:14 AM |
| 5996 | $ 41.99 | $ 4,241.20 | 0.965 | 1524 | 7737 | 11:36:34 AM |
| 6148 | $ 43.03 | $ 4,346.27 | 0.966 | 95160 | 1524 | 11:43:16 AM |
| 5785 | $ 40.55 | $ 4,095.35 | 0.97 | 89196 | 95160 | 11:48:00 AM |
| 6711 | $ 46.89 | $ 4,735.46 | 0.969 | 82270 | 89196 | 12:03:46 PM |
| 4388 | $ 30.93 | $ 3,123.79 | 0.967 | 77732 | 82270 | 12:01:40 PM |
| 3703 | $ 25.56 | $ 2,581.59 | 0.969 | 73911 | 77732 | 10:44:01 AM |
| 2461 | $ 17.31 | $ 1,748.07 | 0.971 | 71377 | 73911 | 10:04:30 AM |

# Proposed Energy Efficiency Measures

# Fine Bubble Aeration & Shutdown the Large Blower

### EEM No. 1

## Description

The surface area to volume ratio is greater for small bubbles than large bubbles. Consequently, smaller bubbles can provide a greater oxygen transfer efficiency (OTE) than large bubbles. For example, the OTE, in actual wastewater, for fine bubble diffusers in a cross roll configuration has been measured at 2.3 to 2.5 lb $O_2$/hp-hr. This compares to 1.3 to 2.0 lb $O_2$/hp-hr for course bubble diffusers.

Issues to be addressed with a conversion to fine bubble diffusers include:

- Capability of the existing blowers to meet any increased pressure requirements of the fine bubble diffusers
- Replacement of the distribution grid in the basins to accommodate a larger number of required diffusers
- Potential increased maintenance due to increased fouling susceptibility

It is believed that the existing blowers can meet the anticipated static pressure requirements of the fine bubble diffusers, provided that the diffusers are selected with a low pressure drop and an oxygen transfer efficiency (OTE) of at least 2.3 lbs. O2 / hp-hr.

Excess air is currently exhausted into the second aeration basin. The second aeration basin is filled with city water, and functions as nothing more than a muffler. Consequently, the blowers operate constantly at full flow. Under this control scheme, the reduced air flow for the fine bubble diffusers would provide no energy savings. However, two alternate control schemes should be able to take advantage of the reduced air requirements:

- Variable speed control
- Shut down the 100 hp blower and operate solely with the small blower

The estimated energy savings for this measure is based on shutting down the 100 hp blower and only using the 50 hp blower, throughout the year.

## Energy Analysis

The Fine Bubble Aeration Analysis spreadsheet, in Appendix C, was used to estimate aeration power savings. Notice that the projected, average air flow requirement for the 100 hp blower drops to less than 800 cfm. This is within the capability of the 50 hp blower. The implication is that the 50 hp blower could be used entirely in lieu of the 100 hp blower.

The spreadsheet shows a second entry for the 50 hp blower, which was used to reflect the energy usage of this blower during the summer months, when it is not now operated.

## Economic Analysis

The Fine Bubble Aeration Analysis spreadsheet, in Appendix C, also contains a rough cost estimate. This is a very rough budget estimate, used to classify the economic viability of this project.

Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table A1.

# Aeration Blower VFD & Restore Automatic D.O. Control

### EEM No. 2

## Description

Implement variable speed drive (VSD) control of the existing 50 hp centrifugal aeration blower. Restore automatic dissolved oxygen (D.O.) control using state-of-the-art probes. The automatic D.O. control is necessary to achieve the full benefit of the VSD.

## Energy Analysis

Air flow requirements used in this analysis are based on a prior conversion to fine bubble diffusers.

As the speed of a centrifugal blower is reduced, the pressure curve is reduced by the square of the speed reduction. In a constant static head situation, the flow will be reduced to zero, even though the blower is still turning at a relatively high speed. Blower curves were available for the 50 hp Lamson 558-5-3-AD. Curves for the 50 hp blower are provided in Appendix D. Two graphs are provided. One graph shows the blower efficiency, pressure and brake horsepower, plotted against flow. The second graph shows just the pressure plotted against flow. Both graphs show a system pressure curve and a minimum operating limit. The minimum operating limit is based on the estimated static pressure requirements of the basins.

Blower curves were not available for the 100 hp Lamson 817-0-7-A blowers. Lamson blowers are now produced by Gardner Denver. At the time of this report, Gardner Denver had not provided a curve for the 100 hp blowers. Consequently, a typical blower curve was used and modified for the number of stages involved. Curves for the 100 hp blower are provided in Appendix I. Though not relevant to this measure, the curves for the 100 hp blower were provided for future reference.

The static pressure requirements were estimated to be 15 ft to 16 ft., accounting for basin water depth, as well as filter and diffuser pressure drops. A minimum operating static pressure of 15 ft. resulted in a system curve that somewhat approximated the observations that the 50 hp blower ran at 7 psig and 33.4 to 35.3 kW, while the 100 hp blower ran at about 8 psig and 66 kW. The indication is that the design operating point was a bit conservative, and that the blowers are running at a slightly lower static and higher flow than anticipated in the design.

The Automatic D.O. Control spreadsheet in Appendix D was used to predict the reduced air flow required by reducing the target D.O. level from 5.0 mg/l, down to 4.5 mg/l. This would simply represent a conservative estimate of the result of tightening the D.O. control, over the current manual measurement and adjustment method. In other words, the valve that diverts excess air to the second basin is manually controlled and is not frequently adjusted. Consequently, the D.O. level is not tightly controlled. A 0.5 mg/l average D.O. reduction should be easily attainable with automatic control. The average required air flow was conservatively estimated to be 700 cfm, following the conversion to fine bubble diffusers.

The Blower VFD Evaluation, given at the front of Appendix D, was used to compare the existing and proposed operation for the blower. The Summary section shows what annual energy savings was estimated for the VFD control. The required input power to the blower, at the proposed reduced speed was determined using the Blower Performance Analysis spreadsheet and Blower Performance graphs, in Appendix D. Specifically, this analysis predicted power requirements for the 50 hp blower, operating at an average of 630 cfm, as predicted by the Automatic D.O. Control spreadsheet.

# Economic Analysis

A Construction Cost Estimate spreadsheet has been provided in Appendix D. This is considered to be only a schematic level cost estimate. Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table A1.

Note that Appendix G contains an analysis of the benefits of reducing the D.O. levels to 2.0 mg/l. This was done as part of the anoxic selection analysis. However, if this can be done without anoxic selection, the energy savings would then be 100,800 kWh/yr, since the mixer would not be required. Annual cost savings would then be $4,480, without the large investment in either the anoxic tank or the mixer.

# Digester Biogas Utilization in Boilers

**EEM No. 3**

## Description

Digester biogas is currently flared off. Instead of wasting this resource, the gas can be scrubbed, filtered and used in one or both of the existing boilers. In fact, a gas line and valve are now in place that allows the use of digester gas in the boilers. However, digester gas is not now currently used due to the increased maintenance costs on the boiler.

Digester biogas can contain 50 to 70 percent methane ($CH_4$), 20 to 30 percent carbon dioxide ($CO_2$) and up to 5 percent water vapor, hydrogen sulfide ($H_2S$) and other trace gases.

A scrubber and filter are necessary to reduce the $H_2S$ and water in the digester biogas, so that it can be used in the boiler without increasing maintenance costs. The hydrogen sulfide is very corrosive. Water is also corrosive, and reduces the heating value of the gas.

Natural gas can still be utilized to meet peak loads and function as a backup.

## Energy Analysis

The Biogas Utilization Analysis spreadsheet in Appendix E was used to predict the current production of digester biogas, based on the destruction of volatile suspended solids (VSS). A typical plant will produce 2,300 lbs. dry sludge per day per million gallons of wastewater treated. Typically, volatile solids will compose 70 percent of the dry sludge. Approximately 50 percent of these solids will be reduced in the digester. In turn, 14 to 15 cu.ft. of biogas will be produced for every lb. of reduced volatile solids. The heating value this biogas is significantly lower than natural gas, and is typically estimated to be about 600 BTU per std. cu.ft.

The spreadsheet limits the biogas utilization to the estimated annual boiler usage.

## Economic Analysis

A Construction Cost Estimate spreadsheet has been provided in Appendix E. This is considered to be only a schematic level cost estimate.

Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table A1.

**Reference:** Idaho Dept.of Water Resources, Idaho Biogas Utilization Handbook for Wastewater Treatment Facilities, 1985

# Replace Primary Thicken Sludge Pumps

### EEM No. 4

## Description

Replace the existing piston sludge pumps with direct electric motor driven diaphragm pumps. Increase sludge blanket depth in the primary clarifiers to produce sludge of three to four percent solids, thereby reducing the volume of sludge to be pumped.

Currently, four gear reduced, piston sludge pumps are used to move sludge from the primary clarifiers to the gravity thickener and from the gravity thickener to the primary digester. One of these pumps functions solely as a backup to the others. According to the plant superintendent, these pumps are not only high maintenance pumps, but also are incapable of pumping sludge thicker than two percent solids. Sludge from the primary clarifiers is pumped at only ½ to 1-1/2 percent solids. Sludge from the gravity thickener is pumped at only 1 to 2 percent solids.

Electric motor driven diaphragm pumps are recommended, rather than pneumatic driven diaphragm pumps. This is because of the lost efficiency of operating an air compressor. A 1-1/2 hp motor is between 79 percent and 87.5 percent efficient. Using a premium efficient motor and an estimated pump efficiency of 59 percent, the end use energy transfer should be 52 percent. A compressed air system transfers energy, to the end use, at an efficiency closer to 12 percent.

## Energy Analysis

The Sludge Thickening Analysis in Appendix F, was used to estimate energy savings for both:

- Reduced electric energy required to drive the pumps
- Natural gas savings due to increased methane yield

The natural gas savings is predicated on the scrubbing and utilization of digester biogas in the boilers. The utilization of digester biogas is recommended as a separate EEM.

The spreadsheet first estimates the sludge production for the plant. Flow requirements are then estimated based on the given solids content of the sludge for both existing and proposed conditions. Measured pump power, revised flow conditions and pump efficiency are used to predict electricity savings.

The increased biogas production estimate is based on the estimated volatile solids destruction. Brett Converse, of JUB Engineering, estimated that the volatile solids destruction can be improved from an existing level of perhaps 60 percent, up to perhaps 70 percent. This improvement would be a result of increased solids loading in the digester. The improvement for increasing the solids concentration, enabled with the pump replacement, was estimated using the Solids Balance spreadsheets in Appendix I.

## Economic Analysis

A Construction Cost Estimate spreadsheet has been provided in Appendix F. This is considered to be only a schematic level cost estimate.

Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table A1.

# Other Energy Efficiency Measures Considered

# Anoxic Selection

### EEM No. 5

## Description

The current D.O. target of 5.0 mg/l is considerably higher than the 2.0 mg/l levels generally seen in municipal WWTFs. Apparently, the higher D.O. levels have been needed to produce sludge with good settling characteristics. One means to improve sludge quality is with anoxic selection. Anoxic selection tends to improve sludge settling characteristics and improve effluent quality with reduced TSS and TKN.

From an energy standpoint, anoxic selection allows the plant operator to recover some of the energy required to dissolve oxygen, by utilizing particular classes of microbes, which take the oxygen directly from nitrite and nitrate to take up carbonaceous BOD. In this case, anoxic selection should enable the plant to run a much lower D.O. level.

Anoxic selection will require the addition of a separate anoxic tank, for each aeration basin in use. A mixer will be needed in the anoxic tank to keep the solids in suspension. The cost of the tank represents the major cost to implement anoxic selection. Only one anoxic tank is proposed since only one aeration basin is currently in use.

## Energy Analysis

First, the Automatic DO Control spreadsheet, in Appendix G, was used to determine the air flow that would be required, if the D.O. level was reduced from 4.5 mg/l down to 2.0 mg/l. The Blower Performance Analysis spreadsheet, also in Appendix F, was used to determine the blower power, if the blower were run at the speed necessary to produce the required air flow. The Blower Performance chart displays both the system curve and the blower's pressure curve at the reduced speed. Notice that the system and pressure curves intersect at the required air flow.

The Anoxic Selection Analysis spreadsheet, in Appendix G, was then used to estimate the aeration power savings for implementing an anoxic cycle to complete denitrification. The energy requirement of a mixer has been incorporated into the analysis. The baseline energy usage for the aeration blowers has been reduced to account for fine bubble aeration and automatic D.O. control. Thus the synergetic effects of these two measures has been accounted for.

Nitrification depresses alkalinity, where denitrification releases alkalinity. Since the plant is not incurring any chemical costs to increase alkalinity, control bulking sludge, or foam, there won't

be any chemical savings. However, there may be a reduction in solids production, resulting in some solids handling savings.

## Economic Analysis

The Construction Cost Estimate spreadsheet, in Appendix G, provides a schematic level cost estimate for the project. A chemical cost savings has been included for elimination of the need to use chlorine to control filamentous bacteria.

Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table B1.

Note that the energy savings is based solely on the ability to reduce the D.O. levels down to 2.0 mg/l. If this can be done without anoxic selection, the energy savings would then be 100,800 kWh/yr, since the mixer would not be required. Annual cost savings would then be $4,480, without the large investment in either the anoxic tank or the mixer.

# Replace Gravity Thickener with Gravity Belt Thickener

## EEM No. 6

## Description

The existing gravity thickener is undersized for the current loading. Replacement of this thickener with a new gravity belt thickener, along with the proposed primary thicken sludge pump replacement, would result in increased digester biogas production and prolonged digester life.

## Energy Analysis

Appendix H contains a series of Solids Balance spreadsheets. These spreadsheets follow the following progression:

- Reported solids balance for 2000
- Approximate solids balance for 2005
- Proposed solids balance for 2006
- Proposed solids balance for 2006 with a new gravity belt thickener

These spreadsheets are all approximate and don't accomplish a true mass balance, as the recirculation from the thickener and belt filter press are not calculated. However, they were used to give a reasonable estimate of the solids content of the sludge, discharged from the clarifiers and thickener, and digester VSS destruction effectiveness. Digester VSS destruction was estimated to be proportional to the solids concentration of the influent to the digester.

The approximate solids balance for 2005 is an adjustment of the solids balance given for 2000, based on current flows and concentrations given by the plant operator. The proposed solids balance for 2006, is based on the recommendations given for the replacement of the piston pumps with diaphragm pumps. Gravity thickener removal rates were estimated. The current removal rate was estimated to be degraded from the original 90 percent due the increased flows and reduced retention time of recent years. Some of this lost effectiveness, was estimated to be regained with the proposed increase in feed solids concentration.

The Solids Handling Analysis spreadsheet in Appendix H, was used to estimate

- Differences in thickener electricity requirements
- Differences in thickener polymer requirements
- Energy savings for natural gas savings due to increased methane yield

This spreadsheet also estimates the sludge production for the plant. Thickener feed flow requirements are then estimated based on the given solids content of the sludge. Thickener energy requirements are then estimated using typical specific power requirements for several common thickeners.

The increased biogas production estimate is based on the estimated increased volatile solids destruction. Brett Converse, of JUB Engineering, estimated that the volatile solids destruction can be improved from an existing level of perhaps 60 percent, up to 70 percent. This improvement would be a result of increased solids loading in the digester. The estimated volatile solids destruction, for each of the two progressions proposed for 2006, is based on the increased feed solids concentration to the digester.

Impact on pump energy is assumed to be negligable since water entering the thickener must be pumped to either the digester or the headworks. Increased thickener effectiveness will reduced the pumping of sludge to the digester, but require an equal increase in pumping of water to the headworks.

# Economic Analysis

A Construction Cost Estimate spreadsheet has been provided in Appendix H. This is considered to be only a schematic level cost estimate.

Project cost, cost savings, utility incentives, net simple payback and internal rate of return are summarized in Table B1.

# APPENDICES

# Appendix A

## Energy Efficiency Program

# Avista Utilities Energy Efficiency Programs

Avista Utilities has available Tariff Schedule 90 and Schedule 190 that offers energy efficiency programs to residential, commercial and industrial customers who receive retail electric and natural gas distribution services from Avista.

Avista works with specific customer segments (i.e. – Retail, Food Service, and Office) to identify opportunities within their facilities that may offer more efficient operation of the end use. Examples of efficiency measures that may be identified include lighting, heating, ventilating and air conditioning equipment, controls or other processes that may be unique to the facility.

Avista provides incentives directly to the customer for hard-wired improvements that are made (i.e. lighting retrofit, high efficiency equipment) for the energy savings that the customer will achieve by making that improvement. The incentive is based on the first year energy savings (either in kilowatt-hours or therms).

The incentive level provided by the Company to a customer for electric or natural gas efficiency measure(s) is based upon the simple payback of the measure prior to the application of an incentive, as calculated by Company staff and based upon standardized measure cost(s). Simple payback is defined as the capital cost of the project divided by the energy savings per year. The incentives shall be as follows:

All incentives will be capped at 50% of total project cost as determined by the Company based upon industry standards. Below is the incentive level breakdown for electric and natural gas efficiency measures.

| **Measures** | **Simple Pay-Back Period** | **Incentive Level (cents [dollars] per first year kWh [therms] saved)** |
|---|---|---|
| Electric Efficiency | 1 to under 2 years | 6 cents |
| | 2 to under 4 years | 10 cents |
| | 4 to under 6 years | 12 cents |
| | 6 to under 10 years | 14 cents |
| | Over 10 years | 4 cents |
| Fuel-Conversion | 1 to under 2 years | 1 cents |
| | 2 to under 4 years | 2 cents |
| | 4 to under 6 years | 3 cents |
| | 6 to under 10 years | 4 cents |
| | Over 10 years | 1 cents |
| Natural Gas Efficiency | 18 to under 48 months | $2.00/therm |
| | 48 to under 72 months | $2.50/therm |
| | 72 months and longer | $3.00/therm |

To be eligible for incentives, the Customer needs to contact Avista in the early stages of project development. Incentives can not be paid on projects that are already under construction or that are being developed without Avista's involvement.

Customers will benefit from a variety of different services with this program including incentives, technical analysis, product samples, training and other educational materials.

For more information call 1-800-727-1970 and ask for the Customer Solutions Department and inquire about our Energy Efficiency Programs.

# Appendix B

## Motor Load Profile Analysis

**ENERGY END USE MODEL**

***City of Sandpoint WWTP***

| | | Nameplate Data | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Quan | HP | Volts | Amps | Ph | Hz | RPM | Encl | Frame | SF | Nom. Effic. |
| *Muffin Monster* | *1* | *3* | *230* | *9* | *3* | *60* | *1725* | | | *1.15* | *82.5* |
| *Muffin Monster screen* | *1* | *0.33* | *230* | *1.8* | *3* | *60* | *1725* | | | *1.35* | *62* |
| *Channel Monster* | *1* | *2* | *230* | *2.3* | *3* | *60* | *1750* | | | *1.15* | *81* |
| *Grit Basin Blowers* | *2* | *15* | *230* | *40* | *3* | *60* | *1750* | | *245T* | *1.15* | *87.5* |
| *Auger Motor* | *1* | *0.5* | *230* | *2* | *3* | *60* | *1760* | | | | |
| *SWC Drive* | *1* | *1* | *230* | *4.4* | *3* | *60* | *1740* | | | | |
| *Sample Pump* | *1* | *0.5* | *115* | *7.4* | *1* | *60* | *1725* | | | | |
| *Utility Water Pump* | *2* | *7.5* | *230* | *20.2* | *3* | *60* | *3500* | | | *1.15* | |
| *Overflow CL2* | *2* | *30* | *460* | *37* | *3* | *60* | *1170* | | | *1* | *87.5* |
| *Flood Pumps* | *2* | *5* | *220* | *14.4* | *3* | *60* | *1160* | | | *1.15* | |
| *Primary Diversion Pump* | *2* | *7.5* | *460* | *11* | *3* | *60* | *1165* | | | *1* | *85.5* |
| *Clarifiers, South & North* | *2* | *0.5* | *230* | *2* | *3* | *60* | *1725* | | | *1.25* | *74* |
| *Gravity Thickener* | *1* | *0.75* | *230* | *2.8* | *3* | *60* | *1775* | | | *1.25* | *77* |
| *Muffin Mons.* | *2* | *2* | *230* | *6.2* | *3* | *60* | *1725* | | | *1.15* | *80* |
| *Sludge Pumps* | *2* | *5* | *230* | *16.8* | *3* | *60* | *1165* | | | *1.15* | *81.5* |
| *Primary Thickener Sludge Pumps* | *3* | *1.5* | *230* | *5.4* | *3* | *60* | *1140* | | | *1* | |
| *Primary Thickener Sludge Pump* | *1* | *1.5* | *230* | *6.2* | *3* | *60* | *1170* | | | | |
| *Ground Water Sump* | *1* | *0.5* | *230* | *6.5* | *3* | *60* | *3450* | | | *2.8* | |
| *Air Compressor Motor* | *1* | *3* | *460* | *4.2* | *3* | *60* | *1730* | | *182T* | *1.15* | |
| *Heater Fan Motor* | *2* | *0.07* | *115* | *2.2* | *1* | *60* | | | | | |
| *Heater Vapor Extract Motor* | *2* | *0.11* | *115* | *1.5* | *1* | *60* | *3000* | | | | |
| *Bldg. Exhaust Fan* | *2* | *0.25* | *115* | *4.8* | *1* | *60* | *1725* | | | *1* | |
| *Blower Motors 1&3* | *2* | *100* | *460* | *120* | *3* | *60* | *3540* | *DP* | *365TS* | *1.15* | *90.2* |
| *Blower Motor 2* | *1* | *50* | *460* | *61* | *3* | *60* | *3515* | *DP* | *324TS* | *1.15* | *91* |
| *RAS Pumps #2 & #3* | *2* | *7.5* | *460* | *12.9* | *3* | *60* | *875* | | | *1.15* | |
| *RAS Pump, New #1* | *1* | *7.5* | *460* | *12.9* | *3* | *60* | *875* | | | *1.15* | |
| *Heater Fan Motor* | *2* | *0.07* | *115* | *2.2* | *1* | *60* | *1060* | | | | |
| *Heater Vapor Extract* | *2* | *0.11* | *115* | *1.5* | *1* | *60* | *3000* | | | | |
| *Polymer Pump* | *2* | *1* | *460* | *0.3* | *1* | *DC* | *1750* | | *56C* | | |
| *Polymer Transfer Pump* | *1* | *2* | *460* | *3.55* | *3* | *60* | *1160* | | *184T* | *1.15* | *78.5* |
| *Polymer Tank Agitator* | *1* | *1* | *460* | *1.8* | *3* | *60* | *1725* | | *356CZ* | *1* | |
| *Heater Fan Motor* | *3* | *0.05* | *115* | *2* | *1* | *60* | *1050* | | | | |
| *Roll Up Door Motor* | *2* | *0.75* | *115* | | *1* | *60* | *1725* | | *56C* | *1.25* | *66* |
| *Conveyor Drive Motor* | *1* | *2* | *460* | *3.5* | *3* | *60* | *1155* | | *184T* | *1* | |
| *Hydraulic Pump Motor* | *2* | *1.5* | *460* | *2.5* | *3* | *60* | *1725* | | *56C* | *1.15* | *73* |
| *Belt Press Drive Motor* | *2* | *3* | *460* | *14.5* | *1* | *DC* | *1750* | | | *1* | |
| *Heater Fan Motor* | *1* | *0.07* | *120* | *1.8* | *1* | *60* | | | | | |
| *Heater Vapor Exhaust Fan* | *1* | *0.11* | *115* | *0.4* | *1* | *60* | *1550* | | | | |
| *Digester Mix Pump* | *1* | *15* | *460* | *18.6* | *3* | *60* | *1175* | *TEFC* | | | *92.4* |
| *Sec. Lift Pump 3MGD N&S* | *2* | *25* | *460* | *31.7* | *3* | *60* | *1755* | *ODP* | | | |
| *Sec. Lift Pump 2MGD N&S* | *2* | *15* | *460* | *20.2* | *3* | *60* | *1750* | *ODP* | | | |
| *Sec. Mix Pump* | *1* | *3* | *460* | | | | | *TEFC* | | | |
| *W. WAS Pump* | *1* | | | | | | | | | | |
| *E. WAS Pump* | *1* | | | | | | | | | | |
| *Thickened Sludge Pump* | *1* | | | | | | | | | | |

## ENERGY END USE MODEL

***City of Sandpoint WWTP***

| Name | Field Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Volts | Amps | PF | kW | Est. LF | Use Factor | Daily Usage | Usage |
| *Muffin Monster* | 488 | 2.7 | 0.21 | 0.46 | | 100% | 24 | 24 hr/day |
| *Muffin Monster screen* | 488 | 3.4 | 0.23 | 0.65 | | 100% | 24 | 24 hr/day |
| *Channel Monster* | | | | | 90% | | 24 | 24 hr/day |
| *Grit Basin Blowers* | 486 | 6.5 | 0.91 | 4.93 | | 50% | 12 | 12 hr/day |
| *Auger Motor* | | | | | 90% | 100% | 24 | 24 hr/day |
| *SWC Drive* | | | | | 90% | 50% | 12 | 12 hr/day |
| *Sample Pump* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Utility Water Pump* | | | | | 90% | 50% | 12 | 12 hr/day |
| *Overflow CL2* | | | | | 90% | 29% | 6.0 | 2 times/wk |
| *Flood Pumps* | | | | | 90% | 29% | 6.0 | 2 times/wk |
| *Primary Diversion Pump* | | | | | 90% | 29% | 6.0 | 2 times/wk |
| *Clarifiers, South & North* | | | | | 90% | 100% | 24 | 24 hr/day |
| *Gravity Thickener* | | | | | 90% | 100% | 24 | 24 hr/day |
| *Muffin Mons.* | | | | | 90% | 100% | 24 | 24 hr/day |
| *Sludge Pumps* | | | | | 90% | 100% | 24 | 24 hr/day |
| *Primary Thickener Sludge Pumps* | 242 | 5.3 | 0.29 | 0.64 | | 100% | 24 | 24 hr/day |
| *Primary Thickener Sludge Pump* | | | | | 90% | 67% | 24 | 24 hr/day |
| *Ground Water Sump* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Air Compressor Motor* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Heater Fan Motor* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Heater Vapor Extract Motor* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Bldg. Exhaust Fan* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Blower Motors 1&3* | 488 | 95.4 | 0.82 | 66 | | 29% | 24 | 24 hr/day |
| *Blower Motor 2* | 490 | 46.5 | 0.85 | 33.4 | | 42% | 24 | 24 hr/day |
| *RAS Pumps #2 & #3* | 490 | 8.8 | 0.26 | 1.9 | | 25% | 24 | 24 hr/day |
| *RAS Pump, New #1* | 490 | 2.7 | 0.78 | 1.79 | | 50% | 24 | 24 hr/day |
| *Heater Fan Motor* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Heater Vapor Extract* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Polymer Pump* | | | | | 90% | 29% | 6.0 | 6hrsx2 times/w |
| *Polymer Transfer Pump* | | | | | 90% | 29% | 6.0 | 6hrsx2 times/w |
| *Polymer Tank Agitator* | | | | | 90% | 29% | 6.0 | 6hrsx2 times/w |
| *Heater Fan Motor* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Roll Up Door Motor* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Conveyor Drive Motor* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Hydraulic Pump Motor* | | | | | 90% | 1% | 12 | 12 hr/day |
| *Belt Press Drive Motor* | | | | | 90% | 29% | 6.0 | 6hrsx2 times/w |
| *Heater Fan Motor* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Heater Vapor Exhaust Fan* | | | | | 90% | 50% | 24 | 24 hr/day |
| *Digester Mix Pump* | 488 | 11.3 | 0.65 | 3.6 | | 100% | 24 | 24 hr/day |
| *Sec. Lift Pump 3MGD N&S* | 241 | 13.4 | 0.9 | 5.1 | | 25% | 24 | 24 hr/day |
| *Sec. Lift Pump 2MGD N&S* | | | | | 90% | 25% | 24 | 24 hr/day |
| *Sec. Mix Pump* | | | | | 90% | 100% | 24 | 24 hr/day |
| *W. WAS Pump* | | | | | 90% | 21% | 24 | 24 hr/day |
| *E. WAS Pump* | | | | | 90% | 42% | 24 | 24 hr/day |
| *Thickened Sludge Pump* | | | | | 90% | 33% | 24 | 24 hr/day |

**ENERGY END USE MODEL** 05-Oct-05

***City of Sandpoint WWTP*** WWTFEEMS.xls

| Name | Calculated Data Est. Effic. | Demand kW | Energy kWh | Comment |
|---|---|---|---|---|
| *Muffin Monster* | 82.3% | 0.5 | 4,030 | |
| *Muffin Monster screen* | 72.0% | 0.7 | 5,694 | |
| *Channel Monster* | 80.3% | 1.3 | - | |
| *Grit Basin Blowers* | 86.9% | 4.9 | 21,593 | |
| *Auger Motor* | 72.0% | 0.3 | 2,941 | |
| *SWC Drive* | 77.0% | 0.7 | 1,470 | |
| *Sample Pump* | 72.0% | 0.3 | 15 | |
| *Utility Water Pump* | 85.7% | 10.1 | 44,111 | |
| *Overflow CL2* | 89.9% | 40.3 | 50,413 | *Emergency overflow usage only* |
| *Flood Pumps* | 83.9% | 6.7 | 8,402 | *Emergency overflow usage only* |
| *Primary Diversion Pump* | 85.7% | 10.1 | 12,603 | *Emergency overflow usage only* |
| *Clarifiers, South & North* | 72.0% | 0.7 | 11,763 | |
| *Gravity Thickener* | 72.0% | 0.5 | 4,411 | |
| *Muffin Mons.* | 80.3% | 2.7 | 47,052 | |
| *Sludge Pumps* | 83.9% | 6.7 | 117,629 | |
| *Primary Thickener Sludge Pumps* | 79.0% | 0.6 | 16,819 | |
| *Primary Thickener Sludge Pump* | 79.0% | 1.0 | 5,881 | |
| *Ground Water Sump* | 72.0% | 0.3 | 15 | |
| *Air Compressor Motor* | 82.3% | 2.0 | 88 | |
| *Heater Fan Motor* | 72.0% | 0.1 | 784 | |
| *Heater Vapor Extract Motor* | 72.0% | 0.1 | 1,307 | |
| *Bldg. Exhaust Fan* | 72.0% | 0.3 | 2,941 | |
| *Blower Motors 1&3* | 92.2% | 66.0 | 337,260 | |
| *Blower Motor 2* | 91.0% | 33.4 | 121,910 | |
| *RAS Pumps #2 & #3* | 85.7% | 1.9 | 8,322 | |
| *RAS Pump, New #1* | 85.7% | 1.8 | 7,840 | |
| *Heater Fan Motor* | 72.0% | 0.1 | 784 | |
| *Heater Vapor Extract* | 72.0% | 0.1 | 1,307 | |
| *Polymer Pump* | 77.0% | 1.3 | 1,680 | |
| *Polymer Transfer Pump* | 80.3% | 1.3 | 840 | |
| *Polymer Tank Agitator* | 77.0% | 0.7 | 420 | |
| *Heater Fan Motor* | 72.0% | 0.1 | 1,323 | |
| *Roll Up Door Motor* | 72.0% | 1.0 | 88 | |
| *Conveyor Drive Motor* | 80.3% | 1.3 | 59 | |
| *Hydraulic Pump Motor* | 79.0% | 2.0 | 176 | |
| *Belt Press Drive Motor* | 82.3% | 4.0 | 5,041 | *Twice per week, 6 hrs/time* |
| *Heater Fan Motor* | 72.0% | 0.0 | 196 | |
| *Heater Vapor Exhaust Fan* | 72.0% | 0.1 | 327 | |
| *Digester Mix Pump* | 86.9% | 3.6 | 31,536 | |
| *Sec. Lift Pump 3MGD N&S* | 89.5% | 5.1 | 22,338 | |
| *Sec. Lift Pump 2MGD N&S* | 86.9% | 20.1 | 88,222 | |
| *Sec. Mix Pump* | 82.3% | 2.0 | 17,644 | |
| *W. WAS Pump* | 72.0% | - | - | |
| *E. WAS Pump* | 72.0% | - | - | |
| *Thickened Sludge Pump* | 72.0% | - | - | |
| | | 237 | 1,007,277 | |

# Appendix C

## Fine Bubble Aeration Analysis

## FINE BUBBLE AERATION ANALYSIS

05-Oct-05

*City of Sandpoint WWTP*

WWTFEEMS.xls

### General Data:

*Replace course bubble diffusers with fine bubble in the south aeration basin & shutdown Blower #1.*

| | | | | | |
|---|---|---|---|---|---|
| Annual operating days..... | *365* | days/year | Electricity rate..... | *$0.0423* | /kWh |
| Demand coincidence factor..... | *70%* | | Demand rate..... | *$3.00* | /kW/month |
| Oxygen Transfer Efficiency (OTE): | | | | | |
| Existing aeration | *1.3* | lbs O2 / hp-hr | | | |
| Proposed aeration | *2.3* | lbs O2 / hp-hr | | | |
| Tank surface area ..... | *1,375* | sq.ft. | Material cost per tank area ..... | *$15.00* | /sq.ft. |
| Project cost..... | | | Installation cost per tank area ..... | *$15.00* | /sq.ft. |

### Schedules: Calculations:

| Location | Equipment | Qty. | Load Exg. [kW] | Load Prop. [kW] | Avg. Air Delivery Exg. [cfm] | Avg. Air Delivery Prop. [cfm] | Annual Oper. Exg. [hrs/yr] | Annual Oper. Prop. [hrs/yr] | Annual Usage: Exg. [kWh/yr] | Annual Usage: Prop. [kWh/yr] | Demand: Exg. [kW] | Demand: Prop. [kW] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Blower room* | *Blower #1* | *1* | *66.0* | *66.0* | *1400* | 790 | *5110* | *0* | 337,260 | 0 | 66.0 | 0.0 |
| | *Blower #2* | *1* | *33.4* | *33.4* | *700* | 400 | *3650* | 3,650 | 121,910 | 121,910 | 33.4 | 33.4 |
| | *Blower #3* | *1* | *66.0* | *66.0* | *0* | 0 | *0* | | 0 | | 0.0 | 0.0 |
| | *Blower #2* | *1* | *33.4* | *33.4* | | *800* | *0* | *5,110* | 0 | 170,670 | 0.0 | 33.4 |
| | | | | | | | | | 459,200 | 292,600 | 66.0 | 33.4 |

Blower #2 is listed a second time, because the reduced air requirements should allow the smaller blower to be used in lieu of Blower #1, even during the summer.

Peak demand is the maximum for exg. & prop. scenarios, since both blowers aren't run at the same time.

### Summary:

| | | | | | | |
|---|---|---|---|---|---|---|
| Annual electricity savings | = | 166,600 | kWh/yr | Est. total project cost | = | $41,250 |
| Coincident demand savings | = | 22.8 | kW | | | |
| Annual cost savings | = | $7,050 | /year | Projected energy cost savin | = | $7,870 /year |
| Demand cost savings | = | $820 | /year | Total cost savings | = | $7,870 /year |
| Energy cost savings | = | $7,870 | /year | Simple payback | = | 5.2 years |

Rob Gray, WWP, 1997

# Appendix D

## Automatic D.O. Control & Blower VFD Analysis

**AUTOMATIC DO CONTROL**

05-Oct-05

***City of Sandpoint WWTP***

WWTFEEMS.xls

Recommendation: *Restore automatic D.O. control by replacing probes with state of the art models*

**INPUT DATA:**

| | | | | | |
|---|---|---|---|---|---|
| Elect_pwr_cost | *$0.0423* | /kWh | Max. aeration power demand | *33.4* | kW |
| Demand_cost | *$3.00* | /kW/mo. | 1st step aeration pwr reduction | | kW |
| Demand coincidence factor | *70%* | | 2nd step aeration pwr reduction | | kW |
| Blower #2 | | | Min. aeration power demand | *0.0* | kW |
| Annual_oper_hrs | *8,760* | hr/yr | Aeration_power_usage | *292,600* | kWh/yr |
| Use_factor | *100%* | | Aux. mixer power demand | *0.0* | kW |
| Avg. air flow | *700* | cfm | Existing avg. DO | *5.0* | mg/l |
| | | | Proposed avg. DO | *4.5* | mg/l |
| Project_cost | *$4,000* | | Aerator_part_load_effic_ratio | *100%* | |

**CALCULATIONS:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Reduced air flow required | = | 700 | cfm x ( | 4.5 mg/l / | 5.0 mg/l)) |
| | = | 630 | cfm | | |

## BLOWER VFD EVALUATION

2-Nov-05

*Sandpoint WWTF*

WW-BlowerCalc.xls

**Recommendation:** *Install VFD control on 50 hp Blower #2, with automatic D.O. control*

**INPUT DATA**

| | | | | | |
|---|---|---|---|---|---|
| Elect_cost | *$0.04230* | /kWh | Motor_horsepower | *100* | hp |
| Demand_cost | *$3.00* | /kW/mo. | Use_factor | *100%* | |
| Demand coincidence factor | *70%* | | | | |
| | | | Project cost | *$13,000* | |
| **Blower #1 Existing Operation:** | | | **Blower #1 Proposed Operation:** | | |
| Operating speed | *3,550* | rpm | Avg. operating speed | *3,420* | rpm |
| Motor input power | *65.3* | kW | Avg. motor input power | *50.9* | kW |
| Annual_oper_hrs | *0* | hrs/yr | | | |
| Operating_months | *7* | mos/yr | | | |
| **Blower #2 Existing Operation:** | | | **Blower #2 Proposed Operation:** | | |
| Operating speed | *3,500* | rpm | Avg. operating speed | *3,200* | rpm |
| Motor input power | *33.4* | kW | Avg. motor input power | *24.7* | kW |
| Annual_oper_hrs | *8,760* | hrs/yr | | | |
| Operating_months | *12* | mos/yr | | | |

**CALCULATIONS**

| | | Blower #1 | | Blower #2 | |
|---|---|---|---|---|---|
| Existing annual blower power usage | = | - | kWh/yr | 292,600 | kWh/yr |
| Proposed annual blower power usage | = | - | kWh/yr | 216,400 | kWh/yr |
| Avg. coincident demand reduction | = | - | kW | 6.1 | kW |

**SUMMARY**

| | | | |
|---|---|---|---|
| Estimated annual energy savings | = | 76,200 | kWh/yr |
| Estimated demand savings | = | 6.1 | kW |
| Estimated energy cost savings | = | $ 3,440 | |
| Simple payback | = | 3.8 | years |

Rob Gray, Avista, 2005

## BLOWER PERFORMANCE ANALYSIS

06-Oct-05
WW-BlowerCalc.xls

Sandpoint WWTF

**Input Data:**

**Existing Condition:**

Fluid density ..... 0.066 lbs/cu.ft.
Speed ..... 3,500 rpm

| Flow [icfm] | Static Pressure [psig] | BHP | Static Pressure [ft.H2O] |
|---|---|---|---|
| 0 | 8.2 | 15 | 18.9 |
| 200 | 8.1 | 16 | 18.7 |
| 400 | 7.8 | 25 | 18.0 |
| 600 | 7.6 | 33 | 17.6 |
| 700 | 7.4 | 37 | 17.1 |
| 800 | 7.2 | 41 | 16.6 |
| 900 | 6.8 | 44 | 15.7 |
| 1,000 | 6.4 | 48 | 14.8 |
| 1,100 | | | |

**Blower Data:**

Model ..... Lamson 558
Motor HP ..... 50 hp

**Proposed Condition:**

Fluid density ..... 0.066 lbs/cu.ft.
Speed ..... 3,370 rpm = 4% decrease

**Design Operating Point:**

Flow..... 800 cfm
Static pressure..... 7.2 psig = 16.6 ft.H2O
Min. operating static pressure ..... 6.5 psig = 15.0 ft.H2O

Prop. system press. drop reduction ..... - psig
at the existing flow of 800 cfm

**Calculations:**

Min. speed to maintain flow = 3,110 rpm

**Existing Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency | System Pressure Curve [psig] |
|---|---|---|---|---|
| 0 | 8.2 | 15.0 | 0.0% | 6.5 |
| 200 | 8.1 | 16.0 | 44.2% | 6.5 |
| 400 | 7.8 | 25.0 | 54.4% | 6.7 |
| 600 | 7.6 | 33.0 | 60.3% | 6.9 |
| 700 | 7.4 | 37.0 | 61.1% | 7.0 |
| 800 | 7.2 | 41.0 | 61.3% | 7.2 |
| 900 | 6.8 | 44.0 | 60.7% | 7.4 |
| 1,000 | 6.4 | 48.0 | 58.1% | 7.6 |
| 1,100 | | | | 7.8 |

[PROJECT NOTES:
1) Min. operating static pressure of 15 ft. resulted in a system curve that somewhat approximated the observations that the 50 hp blower ran at 7 psig and 33.4 to 35.3 kW, while the 100 hp blower ran at about 8 psig and 66 kW. The indication is that the design operating point was a bit conservative, and that the blowers are running at a slightly lower static and higher flow than anticipated in the design.

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency |
|---|---|---|---|
| 0 | 7.6 | 13.4 | 0.0% |
| 193 | 7.5 | 14.3 | 44.2% |
| 385 | 7.2 | 22.3 | 54.4% |
| 578 | 7.0 | 29.5 | 60.3% |
| 674 | 6.9 | 33.0 | 61.1% |
| 770 | 6.7 | 36.6 | 61.3% |
| 867 | 6.3 | 39.3 | 60.7% |
| 963 | 5.9 | 42.8 | 58.1% |
| 1,059 | - | 0.0 | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency | Prop. System Curve [psig] |
|---|---|---|---|---|
| 0 | 7.6 | 13.0 | 0.0% | 6.5 |
| 200 | 7.4 | 15.6 | 41.7% | 6.5 |
| 400 | 7.3 | 22.0 | 57.8% | 6.7 |
| 600 | 7.0 | 30.1 | 60.9% | 6.9 |
| 700 | 6.8 | 34.2 | 60.8% | 7.0 |
| 800 | 6.5 | 37.8 | 60.3% | 7.2 |
| 900 | 6.2 | 40.9 | 59.5% | 7.4 |
| 1,000 | 5.8 | 43.0 | 58.5% | 7.6 |
| 1,100 | 5.2 | 44.0 | 57.1% | 7.8 |

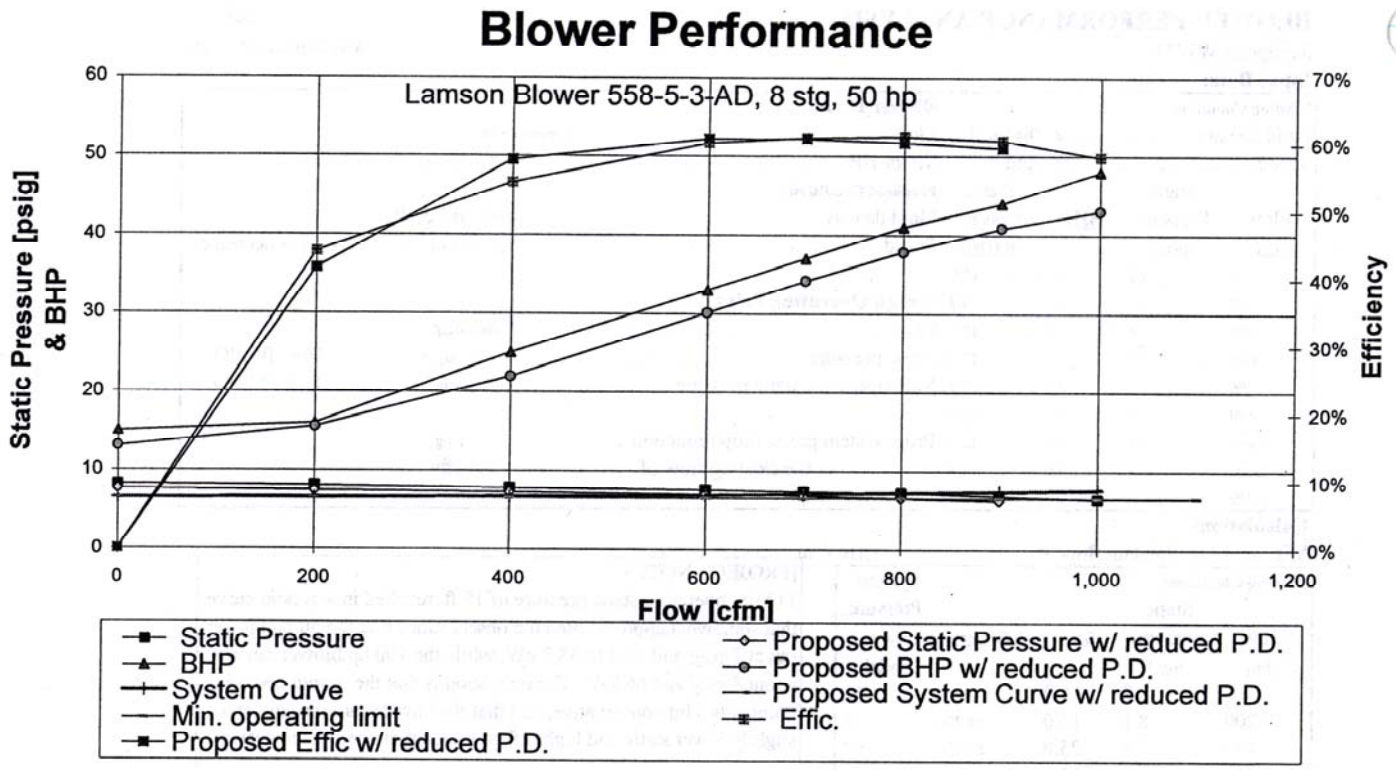
**Existing Condition:**

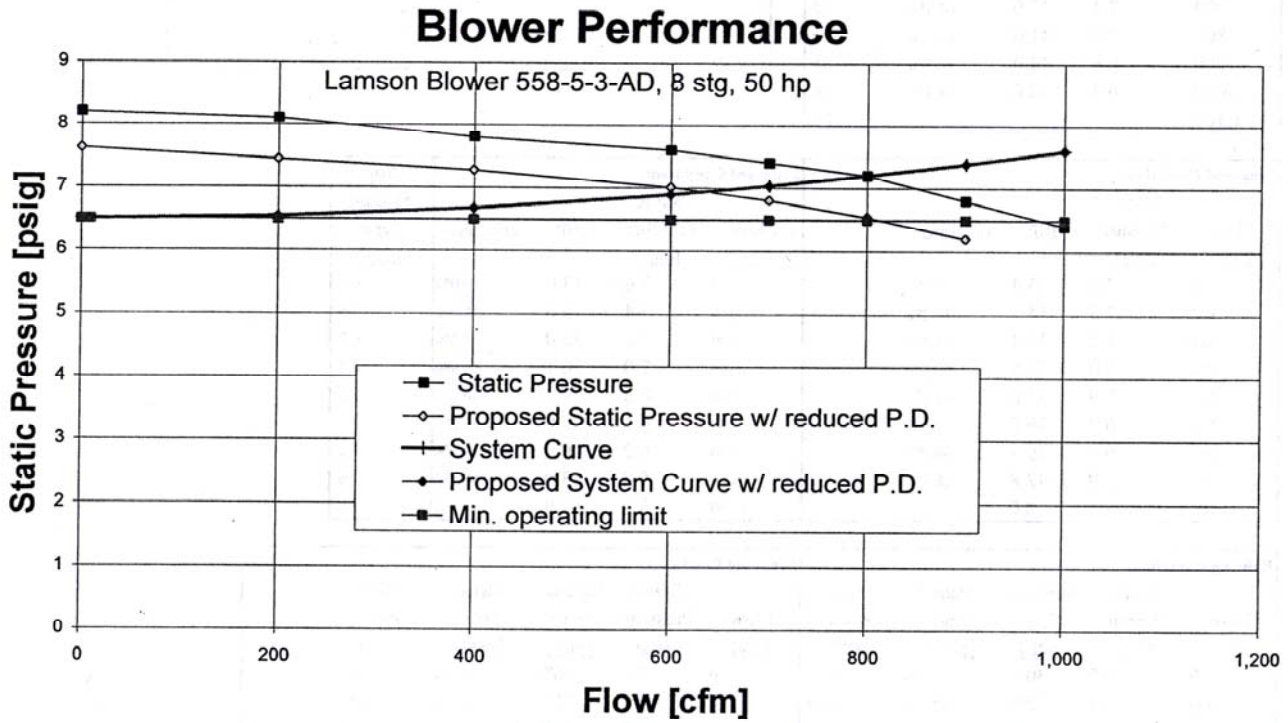
| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 8.2 | 30% | 92.2% | 12.1 |
| 200 | 8.1 | 32% | 92.2% | 12.9 |
| 400 | 7.8 | 50% | 93.7% | 19.9 |
| 600 | 7.6 | 66% | 93.7% | 26.3 |
| 700 | 7.4 | 74% | 93.8% | 29.4 |
| 800 | 7.2 | 82% | 93.8% | 32.6 |
| 900 | 6.8 | 88% | 93.5% | 35.1 |
| 1,000 | 6.4 | 96% | 93.5% | 38.3 |
| 1,100 | | | | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 7.6 | 26% | 92.2% | 10.5 |
| 200 | 7.4 | 31% | 92.2% | 12.6 |
| 400 | 7.3 | 44% | 93.7% | 17.5 |
| 600 | 7.0 | 60% | 93.7% | 24.0 |
| 700 | 6.8 | 68% | 93.8% | 27.2 |
| 800 | 6.5 | 76% | 93.8% | 30.1 |
| 900 | 6.2 | 82% | 93.8% | 32.5 |
| 1,000 | 5.8 | 86% | 93.5% | 34.3 |
| 1,100 | 5.2 | 88% | 93.5% | 35.1 |

Rob Gray, Avista, 2005


Blower Performance
Lamson Blower 558-5-3-AD, 8 stg, 50 hp
Static Pressure [psig] & BHP
Efficiency
Flow [cfm]
Static Pressure
BHP
System Curve
Min. operating limit
Proposed Effic w/ reduced P.D.
Proposed Static Pressure w/ reduced P.D.
Proposed BHP w/ reduced P.D.
Proposed System Curve w/ reduced P.D.
Effic.


Blower Performance
Lamson Blower 558-5-3-AD, 8 stg, 50 hp
Static Pressure [psig]
Flow [cfm]
Static Pressure
Proposed Static Pressure w/ reduced P.D.
System Curve
Proposed System Curve w/ reduced P.D.
Min. operating limit

## CONSTRUCTION COST ESTIMATE

14-Oct-05
CostEst.xls

Report No.: Sandpoint WWTF

Project: Restore automatic D.O. control in conjunction with VFD control of 50 blower

**General Data**

Location specific labor cost adjustment ..... *100%*

**Itemized Data**

| Component | Size | Materials | Unit | Labor | Unit | Quant | Materials Subtotal | Labor Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| Automatic D.O. control | | | | | | | | | |
| monitor and sensor | N/A | $1,500 | ea. | $500 | ea. | 1 | $1,500 | $500 | $2,000 |
| mounting kits | N/A | $185 | ea. | $400 | ea. | 0 | $0 | $0 | $0 |
| wiring | | | ea. | | ea. | 1 | | | |
| I/O board and | | $800 | ea. | $200 | ea. | 1 | $800 | $200 | $1,000 |
| software upgrade to exg. PLC | | | ea. | | ea. | 1 | | | |
| Variable frequency drive | 50 | $5,360 | ea. | $1,200 | ea. | 1 | $5,360 | $1,200 | $6,560 |
| Manual bypass with circuit breaker & | | $2,132 | ea. | | ea. | 1 | $2,132 | | $2,132 |
| Motor, inverter duty | 40 hp | $1,745 | ea. | $130 | ea. | 0 | $0 | $0 | $0 |

| | | | | | |
|---|---|---|---|---|---|
| | | Subtotals: | $9,792 | $1,900 | |
| Cost | Rate | Adjusted totals: | $9,792 | $1,900 | $11,692 |
| Construction | N/A | $11,690 | | | |
| Inflation | 0.0% | $0 | | | |
| Unlisted | 5.0% | $580 | | | |
| Contingency | 5.0% | $580 | | | |
| Overhead | 0.0% | $0 | | | |
| Profit | 0.0% | $0 | | | |
| Sales tax | 4.0% | $510 | | | |
| Design fee | 0.0% | $0 | | | |
| | | --- | | | |
| | Total | $13,360 | | | |

# Appendix E

# Digester Gas Utilization Analysis

## BIOGAS UTILIZATION ANALYSIS

14-Oct-05

*City of Sandpoint WWTP*

WWTFEEMS.xls

### General Data:

| | | | | | |
|---|---|---|---|---|---|
| Annual operating days | *365* | days/year | Electricity rate | *$0.0423* | /kWh |
| Average plant influent | *2* | mgd | Demand rate | *$3.00* | /kW/month |
| Volatile content of sludge | *70%* | | Demand coincidence factor | | *70%* |
| Volatile solids reduction | *50%* | | | | |
| Digester gas production rate | *14.0* | cu.ft./lb.VSS reduced | Natural gas rate | *$0.66447* | /therm |
| Biogas energy content | *600* | BTU/cu.ft. | Plant natural gas use | *53,498* | therms/yr |
| Project cost | *$111,160* | | Est. boiler natural gas use | *42,798* | therms/yr |

### Calculations:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Plant VSS production | 3,220 | lbs.VSS/day | | | | | |
| VSS reduction | 1,610 | lbs.VSS/day | | | | | |
| Est. digester gas production | = | 22,540 | cu.ft./day | Est. energy cost savings | = | $28,438 | /yr |
| Est. digester gas energy | = | 563,500 | BTU/hr | Est. simple payback | = | 3.9 | years |
| | = | 49,363 | equiv. therms/yr | | | | |
| Est. digester gas energy potential utilization | = | 42,798 | equiv. therms/yr | | | | |

NOTES:

1) VSS - volatile suspended solids

2) A typical plant will produce 2,300 lbs. dry sludge per day per million gallons of wastewater treated. (Reference: Idaho Dept.of Water Resources, *Idaho Biogas Utilization Handbook for Wastewater Treatment Facilities*, 1985 )

## CONSTRUCTION COST ESTIMATE

04-Nov-05

Report No.: Sandpoint WWTF

CostEst.xls

Project: Scrub and filter digester gas for use in existing boilers.

| Component | Size | Materials | Unit | Labor | Unit | Quan | Materials Subtotal | Labor Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Scrubber** | | | | | | | | | |
| Pacific Environmental | | $48,000 | ea. | | ea. | 1 | $48,000 | | $48,000 |
| PVC scrubber packed column | | | | | | | | | |
| Integral 1000 gallon recycle sump with 3/4 Hp pump | | | | | | | | | |
| Instrumentation including pH controls | | | | | | | | | |
| Scrubbing solution 40% K2CO3 (Potassium Carbonate) | | | | | | | | | |
| Scrubbing solution charging pump | | | | | | | | | |
| Control panel | | | | | | | | | |
| Installation | | $40,000 | ea. | | ea. | 1 | $40,000 | | $40,000 |
| Unloading, assembly, bolt down, local connections, transitions, stack, tanks, etc | | | | | | | | | |
| **Piping** | | | | | | | | | |
| Black steel, Sch.40, | 1.25 ir | $2.79 | ea. | $5.10 | l.f. | 50 | $140 | $255 | $395 |
| elbows | 1.25 ir | $3.18 | ea. | $20.50 | ea. | 4 | $13 | $82 | $95 |
| ball valves, | 1.25 ir | $20.50 | ea. | $15.65 | ea. | 2 | $41 | $31 | $72 |
| couplings | 1.25 ir | incl. | ea. | incl. | ea. | 5 | $0 | $0 | $0 |
| tees | 1.25 ir | $5.35 | ea. | $32.50 | ea. | 2 | $11 | $65 | $76 |
| hangers | 1.25 ir | incl. | ea. | incl. | ea. | 5 | $0 | $0 | $0 |
| Ditchwork | | | | | | | | | |
| Backhoe dirt ditch, 30 in. | | | | $1.86 | l.f. | 0 | | $0 | $0 |
| Ashphalt cut & rep | | $12.32 | l.f. | | l.f. | 0 | $0 | | $0 |
| **Electrical** | | | | | | | | | |
| Steel conduit | 1/2" | $1.14 | l.f. | $4 | l.f. | 25 | $29 | $89 | $117 |
| Wire 600V type, TI | #12 | $0.06 | l.f. | $0.22 | l.f. | 50 | $3 | $11 | $14 |
| Junction box | | $23.00 | ea. | $19.55 | ea. | 1 | $23 | $20 | $43 |
| **Pad** | | | | | | | | | |
| Concrete | | $850 | cu.yd. | | | 3 | $2,550 | | $2,550 |
| | | | | | Totals: | | $90,809 | $552 | $91,361 |

| Cost | Rate | |
|---|---|---|
| Construction | N/A | $91,360 |
| Inflation | 0.0% | $0 |
| Unlisted | 5.0% | $4,570 |
| Contingency | 5.0% | $4,570 |
| Overhead | 0.0% | $0 |
| Profit | 0.0% | $0 |
| Sales tax | 4.0% | $4,020 |
| Design fee | 5.0% | $5,230 |
| | Total | $109,750 |

# Appendix F

# Sludge Thickening Analysis

## SLUDGE THICKENING ANALYSIS

4-Nov-05

*City of Sandpoint WWTP*

WWTFEEMS.xls

*Recommendation:* *Replace exg. piston primary thicken sludge pumps with electric diaphragm pump and increase thickened sludge solids content to 3-4%*

### Input Data:

| | | | | | |
|---|---|---|---|---|---|
| Annual operating days | *365* | days/year | Electricity rate | *$0.0423* | /kWh |
| Average plant influent | *2.4* | mgd | Demand rate | *$3.00* | /kW/month |
| Max. plant influent | *14.7* | mgd | Demand coincidence factor | *70%* | |
| Dry sludge production rate | *800* | lbs./day/mgd | | | |
| Sludge type | *primary* | | | | |
| Plant sludge production per type | *65%* | | | | |
| Digester gas production rate | *9,408* | cu.ft./day | Natural gas rate | *$0.66447* | /therm |
| Biogas energy content | *600* | BTU/cu.ft. | Plant natural gas use | *53,498* | therms/yr |
| Volatile solids destruction: | | | | | |
| Existing | *60%* | | | | |
| Proposed | *68%* | | | | |
| **Existing Thickened Sludge Pump** | | | **Proposed Thickened Sludge Pump** | | |
| Solids content | *1.5%* | | Solids content | *3.5%* | |
| Pump type | *piston* | | Pump type | *elect. diaphragm* | |
| Est pump efficiency | *60%* | | Est. pump efficiency | *59%* | |
| Qty of pumps | *3* | | | | |
| Rated HP | *1.5* | hp | | | |
| Input power | *0.64* | kW | | | |
| Duty cycle | *67%* | | | | |
| Project cost | *$18,400* | | | | |

### Calculations:

**Sludge Production**

| | | | |
|---|---|---|---|
| Est. plant sludge production | = | 1,920 | lbs.dry sludge/day |
| Est. primary sludge production | = | 1,248 | lbs.dry sludge/day |

| | | Existing | | Proposed | |
|---|---|---|---|---|---|
| Avg. Sludge pumpage | = | 83,200 | lbs.wet sludge/day | 35,657 | lbs.wet sludge/day |
| | = | 7.0 | avg. gpm | 3.0 | avg. gpm |
| Max. Sludge pumpage | = | 43 | avg. gpm | 18 | avg. gpm |

**Increased Biogas Production**

| | | | |
|---|---|---|---|
| Est. increased digester gas prod. | = | 1,107 | cu.ft./day |
| Total proposed digester gas prod. | = | 10,515 | cu.ft./day |
| Est. increased digester gas energy | = | 27,671 | BTU/hr |
| | = | 2,424 | equiv. therms/yr |

**Pump Energy Savings**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Exg. energy usage | = | 11,213 | kWh/yr | Prop. energy usage | = | 4,870 | kWh/yr |
| | | | | Electricity savings | = | 6,343 | kWh/yr |

**Summary**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Est. natural gas cost savings | = | $1,611 | /yr | Est. energy cost savings | = | $1,879 | /yr |
| Est. electricity cost savings | = | $268 | /yr | Est. simple payback | = | 9.8 | years |

NOTES:

1) A typical plant will produce 2,300 lbs. dry sludge per day per million gallons of wastewater treated. (Reference: Idaho Dept.of Water Resources, *Idaho Biogas Utilization Handbook for Wastewater Treatment Facilities*, 1985 )

2) Typically 2/3 of a plant's sludge production is from the primary clarifiers.

## CONSTRUCTION COST ESTIMATE

04-Nov-05
CostEst.xls

Report No.: Sandpoint WWTF

Project: Replace the four existing piston primary thicken sludge pumps with electric driven diaphragm pumps

**General Data**

Location specific labor cost adjustment ..... *100%*

**Itemized Data**

| Component | Size | Materials | Unit | Labor | Unit | Quantity | Materials Subtotal | Labor Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| Piping, PVC, Sch.80, welded | | | | | | | | | |
| pipe | 4 in. | $6.50 | ea. | $9.90 | l.f. | 0 | $0 | $0 | $0 |
| elbows | 4 in. | $12.50 | ea. | $38.00 | ea. | 0 | $0 | $0 | $0 |
| ball valves, PVC, three | 4 in. | $320 | ea. | $23 | ea. | 0 | $0 | $0 | $0 |
| couplings | 4 in. | incl. | ea. | incl. | ea. | 0 | $0 | $0 | $0 |
| tees | 4 in. | $17.55 | ea. | $57.00 | ea. | 0 | $0 | $0 | $0 |
| hangers | 4 in. | incl. | ea. | incl. | ea. | 0 | $0 | $0 | $0 |
| flowmeters | 4 in. | $620.00 | ea. | $100.00 | ea. | 0 | $0 | $0 | $0 |
| Diaphragm pump | | | | | | | | | |
| 3in, 1 hp, 9 gpm, 6 psi | | $3,500 | ea. | $150 | ea. | 4 | $14,000 | $600 | $14,600 |

| | | | | | |
|---|---|---|---|---|---|
| | | Subtotals: | $14,000 | $600 | |
| Cost | Rate | Adjusted totals: | $14,000 | $600 | $14,600 |
| Construction | N/A | $14,600 | | | |
| Inflation | 0.0% | $0 | | | |
| Unlisted | 15.0% | $2,190 | | | |
| Contingency | 5.0% | $730 | | | |
| Overhead | 0.0% | $0 | | | |
| Profit | 0.0% | $0 | | | |
| Sales tax | 5.0% | $880 | | | |
| Design fee | 0.0% | $0 | | | |
| | | Total $18,400 | | | |

# Appendix G

## Anoxic Selection Analysis

**AUTOMATIC DO CONTROL**

02-Nov-05

***City of Sandpoint WWTP***

WWTFEEMS.xls

Recommendation: *Reduce D.O. levels to 2.0 mg/l, in conjunction with anoxic selection.*

**INPUT DATA:**

| | | | | | |
|---|---|---|---|---|---|
| Elect_pwr_cost..... | *$0.0423* | /kWh | Max. aeration power demand ..... | *33.4* | kW |
| Demand_cost ..... | *$3.00* | /kW/mo. | 1st step aeration pwr reduction ..... | | kW |
| Demand coincidence factor..... | *70%* | | 2nd step aeration pwr reduction ..... | | kW |
| Blower #2 | | | Min. aeration power demand ..... | *0.0* | kW |
| Annual_oper_hrs ..... | *8,760* | hr/yr | Aeration_power_usage ..... | *292,600* | kWh/yr |
| Use_factor ..... | *100%* | | Aux. mixer power demand ..... | *0.0* | kW |
| Avg. air flow ..... | *700* | cfm | Existing avg. DO ..... | *4.5* | mg/l |
| | | | Proposed avg. DO ..... | *2.0* | mg/l |
| Project_cost ..... | *$63,800* | | Aerator_part_load_effic_ratio ..... | *100%* | |

**CALCULATIONS:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Reduced air flow required | = | 700 | cfm x ( | 2.0 mg/l / | 4.5 | mg/l)) |
| | = | 311 | cfm | | | |

## BLOWER PERFORMANCE ANALYSIS

02-Nov-05

Sandpoint WWTF

WW-BlowerCalc.xls

**Input Data:**

**Existing Condition:**

Fluid density ..... 0.066 lbs/cu.ft.

Speed ..... 3,500 rpm

| Flow [icfm] | Static Pressure [psig] | BHP | Static Pressure [ft.H2O] |
|---|---|---|---|
| 0 | 8.2 | 15 | 18.9 |
| 200 | 8.1 | 16 | 18.7 |
| 400 | 7.8 | 25 | 18.0 |
| 600 | 7.6 | 33 | 17.6 |
| 700 | 7.4 | 37 | 17.1 |
| 800 | 7.2 | 41 | 16.6 |
| 900 | 6.8 | 44 | 15.7 |
| 1,000 | 6.4 | 48 | 14.8 |
| 1,100 | | | |

**Blower Data:**

Model ..... Lamson 558

Motor HP ..... 50 hp

**Proposed Condition:**

Fluid density ..... 0.066 lbs/cu.ft.

Speed ..... 3,200 rpm = 9% decrease

**Design Operating Point:**

Flow..... 800 cfm

Static pressure..... 7.2 psig = 16.6 ft.H2O

Min. operating static pressure ..... 6.5 psig = 15.0 ft.H2O

Prop. system press. drop reduction ..... - psig

at the existing flow of 800 cfm

**Calculations:**

Min. speed to maintain flow = 3,110 rpm

**Existing Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency | System Pressure Curve [psig] |
|---|---|---|---|---|
| 0 | 8.2 | 15.0 | 0.0% | 6.5 |
| 200 | 8.1 | 16.0 | 44.2% | 6.5 |
| 400 | 7.8 | 25.0 | 54.4% | 6.7 |
| 600 | 7.6 | 33.0 | 60.3% | 6.9 |
| 700 | 7.4 | 37.0 | 61.1% | 7.0 |
| 800 | 7.2 | 41.0 | 61.3% | 7.2 |
| 900 | 6.8 | 44.0 | 60.7% | 7.4 |
| 1,000 | 6.4 | 48.0 | 58.1% | 7.6 |
| 1,100 | | | | 7.8 |

[PROJECT NOTES:

1) Min. operating static pressure of 15 ft. resulted in a system curve that somewhat approximated the observations that the 50 hp blower ran at 7 psig and 33.4 to 35.3 kW, while the 100 hp blower ran at about 8 psig and 66 kW. The indication is that the design operating point was a bit conservative, and that the blowers are running at a slightly lower static and higher flow than anticipated in the design.

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency |
|---|---|---|---|
| 0 | 6.9 | 11.5 | 0.0% |
| 183 | 6.8 | 12.2 | 44.2% |
| 366 | 6.5 | 19.1 | 54.4% |
| 549 | 6.4 | 25.2 | 60.3% |
| 640 | 6.2 | 28.3 | 61.1% |
| 731 | 6.0 | 31.3 | 61.3% |
| 823 | 5.7 | 33.6 | 60.7% |
| 914 | 5.3 | 36.7 | 58.1% |
| 1,006 | - | 0.0 | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency | Prop. System Curve [psig] |
|---|---|---|---|---|
| 0 | 6.9 | 11.2 | 0.0% | 6.5 |
| 200 | 6.7 | 13.5 | 43.2% | 6.5 |
| 400 | 6.5 | 19.5 | 58.5% | 6.7 |
| 600 | 6.3 | 26.9 | 61.0% | 6.9 |
| 700 | 6.1 | 30.5 | 60.7% | 7.0 |
| 800 | 5.8 | 33.6 | 60.0% | 7.2 |
| 900 | 5.4 | 36.0 | 59.1% | 7.4 |
| 1,000 | 5.0 | 37.4 | 57.8% | 7.6 |
| 1,100 | 4.4 | 37.6 | 56.1% | 7.8 |

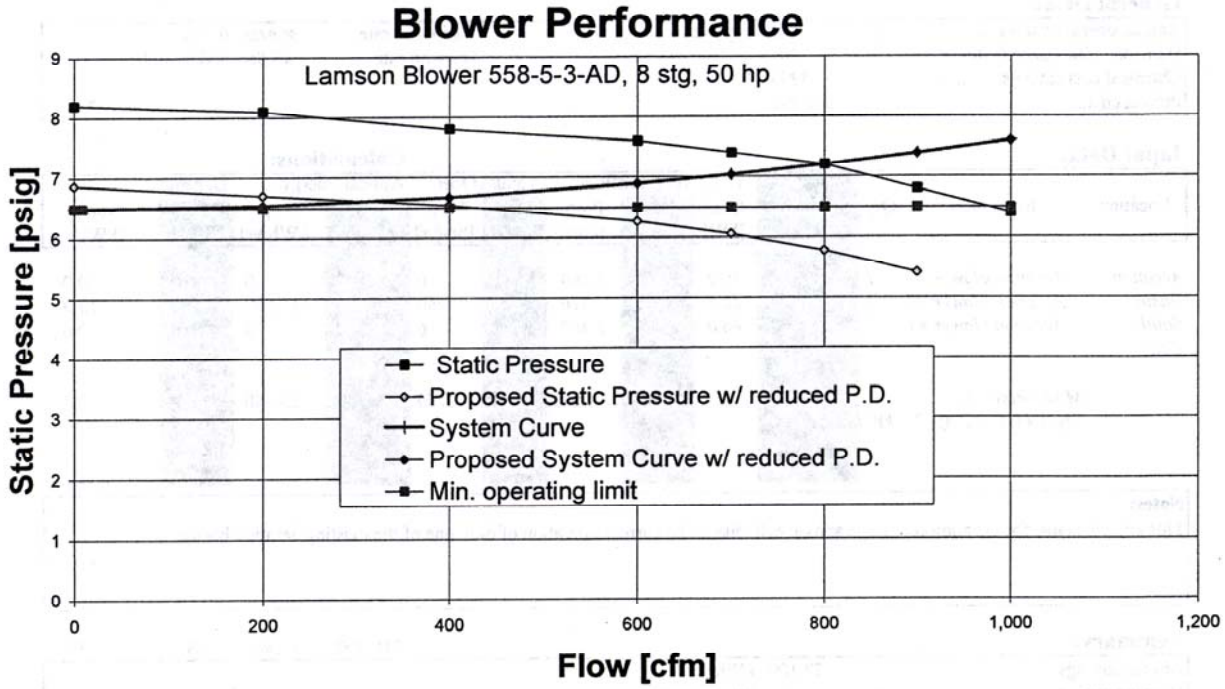
**Existing Condition:**

| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 8.2 | 30% | 92.2% | 12.1 |
| 200 | 8.1 | 32% | 92.2% | 12.9 |
| 400 | 7.8 | 50% | 93.7% | 19.9 |
| 600 | 7.6 | 66% | 93.7% | 26.3 |
| 700 | 7.4 | 74% | 93.8% | 29.4 |
| 800 | 7.2 | 82% | 93.8% | 32.6 |
| 900 | 6.8 | 88% | 93.5% | 35.1 |
| 1,000 | 6.4 | 96% | 93.5% | 38.3 |
| 1,100 | | | | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 6.9 | 22% | 92.2% | 9.0 |
| 200 | 6.7 | 27% | 92.2% | 11.0 |
| 400 | 6.5 | 39% | 93.7% | 15.5 |
| 600 | 6.3 | 54% | 93.7% | 21.4 |
| 700 | 6.1 | 61% | 93.7% | 24.3 |
| 800 | 5.8 | 67% | 93.7% | 26.7 |
| 900 | 5.4 | 72% | 93.8% | 28.6 |
| 1,000 | 5.0 | 75% | 93.8% | 29.7 |
| 1,100 | 4.4 | 75% | 93.8% | 29.9 |

Rob Gray, Avista, 2005


Blower Performance
Lamson Blower 558-5-3-AD, 8 stg, 50 hp
Static Pressure [psig]
Flow [cfm]
0
1
2
3
4
5
6
7
8
9
0
200
400
600
800
1,000
1,200
Static Pressure
Proposed Static Pressure w/ reduced P.D.
System Curve
Proposed System Curve w/ reduced P.D.
Min. operating limit

## ANOXIC SELECTION ANALYSIS

*City of Sandpoint WWTP*

02-Nov-05
WWTFEEMS.xls

### General Data:

| | | | | | |
|---|---|---|---|---|---|
| Annual operating days..... | *365* | days/year | Electricity rate..... | *$0.0423* | /kWh |
| Demand coincidence factor..... | *70%* | | Demand rate..... | *$3.00* | /kW/month |
| Chemical cost savings..... | *$392* | /year | | | |
| Project cost..... | *$84,350* | | | | |

### Input Data: / Calculations:

| Location | Equipment | Qty. | Exg. Load [kW] | Prop Load [kW] | Avg. Airflow Exg. [cfm] | Avg. Airflow Prop. [cfm] | Annual Oper. Exg. [hrs/yr] | Annual Oper. Prop. [hrs/yr] | Annual Energy: Exg. [kWh/yr] | Annual Energy: Prop. [kWh/yr] | Demand: Exg. [kW] | Demand: Prop. [kW] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Aeration* | *Aeration blower #1* | *1* | *66.0* | *66.0* | *1,400* | *1,400* | *0* | *0* | 0 | 0 | 0.0 | 0.0 |
| *Basin* | *Aeration blower #2* | *1* | *24.7* | *13.2* | *630* | *310* | *8760* | *8760* | 216,370 | 115,630 | 24.7 | 13.2 |
| *South* | *Aeration blower #3* | *1* | *66.0* | *66.0* | *1,400* | *1,400* | *0* | *0* | 0 | 0 | 0.0 | 0.0 |
| *Cell* | | | | | | | | | | | | |
| | *Mixer motor #1* | *1* | | *2.7* | *N/A* | *N/A* | *0* | *8760* | 0 | 23,650 | | 2.7 |
| | *Flygt 4410, 3.2 hp, 2.7 kW input* | | | | | | | | | | | |

**Notes:**
This analyis is just for the addition of one anoxic cell, due to the current operation of only one of the existing aeration basins.

### Summary:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 216,400 | 139,300 | 24.7 | 15.9 |
| Annual savings | = | 77,100 | kWh/yr | | | | | |
| Demand savings | = | 8.8 | kW | gross | | | | |
| | = | 6.2 | kW | incl. coincidence | | | | |
| Annual cost savings | = | $3,260 | /year | Projected energy cost savir | = | $3,480 | /year | |
| Demand cost savings | = | $220 | /year | Total cost savings | = | $3,872 | /year | |
| Energy cost savings | = | $3,480 | /year | Simple payback | = | 21.8 | years | |

Rob Gray, WWP, 1997

## CONSTRUCTION COST ESTIMATE

14-Oct-05
CostEst.xls

Report No.: Sandpoint WWTF

Project: Install a 3.2 hp mixers in the new anoxic basin for aeration basin #1.

| Component | Size | Materials | Unit | Labor | Unit | Quant | Materials Subtotal | Labor Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| Mixer | | | | | | | | | |
| 6.2 hp submersible, Flygt ‹ | | $20,000 | ea. | | ea. | 0 | $0 | | $0 |
| 3.2 hp submersible, Flygt ‹ | | $15,000 | ea. | | ea. | 1 | $15,000 | | $15,000 |
| Crane and drill kit | | $2,171 | ea. | | ea. | 1 | $2,171 | | $2,171 |
| Mixer base plate | | | | $1,500 | | 1 | | $1,500 | $1,500 |
| Hoist rails | | $180 | ea. | | | | $180 | | $180 |
| Base plate | | $40 | ea. | | | | $40 | | $40 |
| Galvanizing | | $1,000 | ea. | | | | $1,000 | | $1,000 |
| Transportation for galvani: | | $500 | ea. | | | | $500 | | $500 |
| Catwalk and mixer base plate | | | | $1,500 | | 0 | | $0 | $0 |
| Rect. tube, 10"x4"c 0.25 w | | $1,500 | ea. | | | 0 | $0 | | $0 |
| Grating | | $1,000 | ea. | | | | $0 | | $0 |
| Handrail and kickplate | | $230 | ea. | | | | $0 | | $0 |
| Electrical | | | | $667 | | 1 | | $667 | $667 |
| Std. 480v disk knife SWT | | $93.50 | ea. | | ea. | 2 | $187 | | $187 |
| Fuses | | $0.50 | ea. | | ea. | 6 | $3 | | $3 |
| #10 wire, 500 ft. rolls | | $8.75 | ea. | | ea. | 3 | $23 | | $23 |
| Motor starters | | $500.00 | ea. | | ea. | 1 | $500 | | $500 |
| Tank | | | | | | | | | |
| Concrete | | $850 | cu.yd. | | | 57 | $48,450 | | $48,450 |
| | | | | | Totals: | | $68,054 | $2,167 | $70,221 |

| Cost | Rate | |
|---|---|---|
| Construction | N/A | $70,220 |
| Inflation | 0.0% | $0 |
| Unlisted | 5.0% | $3,510 |
| Contingency | 5.0% | $3,510 |
| Overhead | 0.0% | $0 |
| Profit | 0.0% | $0 |
| Sales tax | 4.0% | $3,090 |
| Design fee | 5.0% | $4,020 |
| | Total | $84,350 |

# Appendix H

## Solids Handling Analysis

**SOLIDS BALANCE**

*City of Sandpoint WWTP*

*Reported Solids Balance for 2000*

04-Nov-05

WWTFEEMS.xls

| Equipment | TSS Removal / VSS Destruction Rate [pct.] | Influent Flow [mgd] | Influent TSS [lbs. /day] | Effffluent Flow [mgd] | Effluent TSS [lbs. /day] | Influent Solids Content [pct] | Effffluent Solids Content [pct] | Sludge Removal [mgd] | Solids Removal [lbs /day] | Sludge Solids Content [pct] |
|---|---|---|---|---|---|---|---|---|---|---|
| Grit chamber | 5% | 2.2 | 2,600 | 2.2 | 2,470 | 0.014% | 0.014% | | 130 | |
| Primary clarifiers | 60% | 2.216 | 2,844 | 2.211 | 1,138 | 0.015% | 0.006% | 0.0050 | 1,706 | 4.107% |
| Secondary clarifiers | 60% | 2.211 | 1,138 | 2.2 | 455 | 0.006% | 0.002% | 0.0130 | 683 | 0.632% |
| Gravity thickener | 90% | 0.0180 | 2,389 | 0.0095 | 239 | 1.597% | 0.303% | 0.0085 | 2,150 | 3.044% |
| Digester | 70% | 0.0085 | 2,150 | 0.0075 | 1,505 | 3.044% | 2.415% | | | |
| Belt filter press | 90% | 0.0075 | 1,505 | 0.0065 | 151 | 2.415% | 0.279% | 0.0010 | 1,355 | 16.300% |

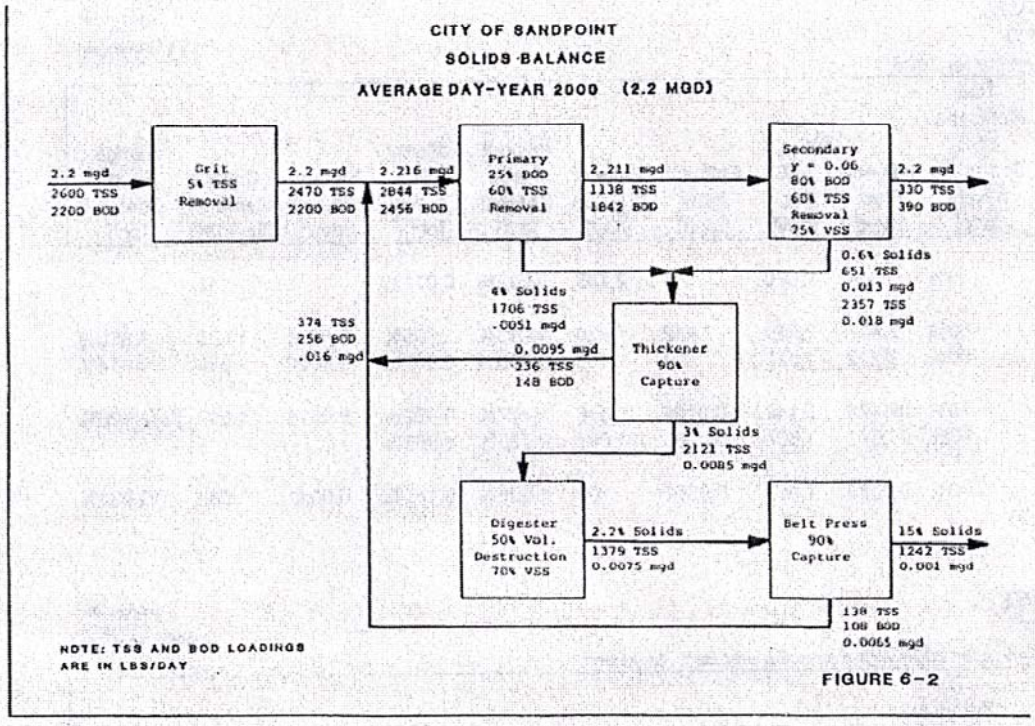



FIGURE 6-2

**SOLIDS BALANCE**

*City of Sandpoint WWTP*

*Approx. Solids Balance for 2005*

04-Nov-05

WWTFEEMS.xls

| Equipment | TSS Removal / VSS Destruction Rate [pct.] | Influent Flow [mgd] | Influent TSS [lbs. /day] | Effflent Flow [mgd] | Effluent TSS [lbs. /day] | Influent Solids Content [pct] | Effflent Solids Content [pct] | Sludge Removal [mgd] | Solids Removal [lbs /day] | Sludge Solids Content [pct] |
|---|---|---|---|---|---|---|---|---|---|---|
| Grit chamber | 5% | 2.4 | 2,300 | 2.4 | 2,185 | 0.012% | 0.011% | | 115 | |
| Primary clarifiers | 18% | 2.417 | 2,550 | 2.412 | 2,091 | 0.013% | 0.010% | 0.0055 | 459 | 1.013% |
| Secondary clarifiers | 60% | 2.412 | 2,091 | 2.4 | 836 | 0.010% | 0.004% | 0.0142 | 1,255 | 1.065% |
| Gravity thickener | 68% | 0.0196 | 1,714 | 0.01036 | 548 | 1.050% | 0.637% | 0.0093 | 1,165 | 1.512% |
| Digester | 60% | 0.0093 | 1,165 | 0.00818 | 699 | 1.512% | 1.028% | | | |
| Belt filter press | 90% | 0.0082 | 699 | 0.00709 | 70 | 1.028% | 0.119% | 0.0011 | 629 | 6.941% |

**SOLIDS BALANCE**

*City of Sandpoint WWTP*

*Proposed Solids Balance for 2006*

04-Nov-05

WWTFEEMS.xls

| Equipment | TSS Removal / VSS Destruction Rate [pct.] | Influent Flow [mgd] | Influent TSS [lbs. /day] | Effflent Flow [mgd] | Effluent TSS [lbs. /day] | Influent Solids Content [pct] | Effflent Solids Content [pct] | Sludge Removal [mgd] | Solids Removal [lbs /day] | Sludge Solids Content [pct] |
|---|---|---|---|---|---|---|---|---|---|---|
| Grit chamber | 5% | 2.4 | 2,300 | 2.4 | 2,185 | 0.012% | 0.011% | | 115 | |
| Primary clarifiers | 60% | 2.417 | 2,550 | 2.412 | 1,020 | 0.013% | 0.005% | 0.0055 | 1,530 | 3.375% |
| Secondary clarifiers | 60% | 2.412 | 1,020 | 2.4 | 408 | 0.005% | 0.002% | 0.0120 | 612 | 0.614% |
| Gravity thickener | 75% | 0.0175 | 2,142 | 0.0104 | 536 | 1.477% | 0.622% | 0.0071 | 1,607 | 2.726% |
| Digester | 68% | 0.0071 | 1,607 | 0.0082 | 1,091 | 2.726% | 1.605% | | | |
| Belt filter press | 90% | 0.0082 | 1,091 | 0.0071 | 109 | 1.605% | 0.185% | 0.0011 | 982 | 10.834% |

**SOLIDS BALANCE**

*City of Sandpoint WWTP*

*Proposed Solids Balance for 2006 with a new Gravity Belt Thickener*

04-Nov-05

WWTFEEMS.xls

| Equipment | TSS Removal / VSS Destruction Rate [pct.] | Influent Flow [mgd] | Influent TSS [lbs. /day] | Effflent Flow [mgd] | Effluent TSS [lbs. /day] | Influent Solids Content [pct] | Effflent Solids Content [pct] | Sludge Removal [mgd] | Solids Removal [lbs /day] | Sludge Solids Content [pct] |
|---|---|---|---|---|---|---|---|---|---|---|
| Grit chamber | 5% | 2.4 | 2,300 | 2.4 | 2,185 | 0.012% | 0.011% | | 115 | |
| Primary clarifiers | 60% | 2.417 | 2,550 | 2.412 | 1,020 | 0.013% | 0.005% | 0.0055 | 1,530 | 3.375% |
| Secondary clarifiers | 60% | 2.412 | 1,020 | 2.4 | 408 | 0.005% | 0.002% | 0.0120 | 612 | 0.614% |
| Gravity belt thickener | 92% | 0.0175 | 2,142 | 0.0104 | 171 | 1.477% | 0.199% | 0.0071 | 1,971 | 3.344% |
| Digester | 72% | 0.0071 | 1,971 | 0.0082 | 1,418 | 3.344% | 2.086% | | | |
| Belt filter press | 90% | 0.0082 | 1,418 | 0.0071 | 142 | 2.086% | 0.241% | 0.0011 | 1,276 | 14.079% |

## SOLIDS HANDLING ANALYSIS

04-Nov-05
WWTFEEMS.xls

***City of Sandpoint WWTP***

EEM Desc.: *Replace gravity thickener with a gravity belt press thickener.*

**INPUT DATA:**

| | | | | | |
|---|---|---|---|---|---|
| Annual operating days | *365* days/year | | Electricity rate | *$0.0423* | /kWh |
| Thickener use factor | *95%* | | Demand rate | *$3.00* | /kW/month |
| Average plant influent | *2.4* mgd | | Demand coincidence factor | *70%* | |
| Max. plant influent | *14.7* mgd | | Natural gas rate | *$0.66447* | /therm |
| Dry sludge production rate | *800* lbs./mgd | | Implementation Cost: | | |
| Sludge type | Primary | Secondary | Equipment | GBT | *$125,000* |
| Plant sludge production | *65%* | 35% | | labor | *$64,000* |
| | Existing | Proposed | | misc | *$66,900* |
| Thickener type | *GT* | *GBT* | | building | *$120,000* |
| Discharge solids content | *2.7%* | *3.3%* | | | |
| Feed solids content | | *1.5%* | Tax @ *4%* | | $10,200 |
| Digester gas production rate | | *10,752* cu.ft./day | | Total | $386,100 |
| Biogas energy content | | *600* BTU/cu.ft. | | | |
| Volatile solids destruction: | | | | | |
| Existing | | *68%* | | | |
| Proposed | | *72%* | | | |
| Polymer cost | *$3.04* /lb. | | | | |

Assume:
*4* lbs. polymer / ton dry sludge for dissolved air flotation (DAF) thickeners
*5* lbs. polymer / ton dry sludge for gravity belt (GB) thickeners
*2* lbs. polymer / ton dry sludge for gravity (G) thickeners

**CALCULATIONS:**

**Sludge Production**

| | | | |
|---|---|---|---|
| Est. plant sludge production | = | 1,920 | lbs.dry sludge/day |
| Est. Primary sludge production | = | 1,248 | lbs.dry sludge/day |
| Est. Secondary sludge production | = | 672 | lbs.dry sludge/day |

| | | Thickener Feed | |
|---|---|---|---|
| Avg. feed rate | = | 129,993 | lbs.wet sludge/day |
| | = | 10.9 | avg. gpm |
| Max. feed rate | = | 67 | avg. gpm |

**Thickener Energy**

Assume:
50 hp/100 gpm for DAF thickeners
3 hp/100 gpm for GB thickeners
1 hp/100 gpm for G thickeners

| | | DAFT | GBT | GT | |
|---|---|---|---|---|---|
| Thickener power | = | 4.1 | 0.24 | 0.08 | kW |
| Thickener energy | = | 33,720 | 2,023 | 674 | kWh/yr |

**Increased Biogas Production**

| | | | |
|---|---|---|---|
| Est. increased digester gas prod. | = | 597 | cu.ft./day |
| Total proposed digester gas prod. | = | 11,349 | cu.ft./day |
| Est. increased digester gas energy | = | 14,933 | BTU/hr |
| | = | 1,308 | equiv. therms/yr |

**Polymer Usage**

| | DAFT | GBT | GT | |
|---|---|---|---|---|
| Polymer Usage = | 4 | 5 | 2 | lbs./day |
| | 1,402 | 1,752 | 701 | lbs./yr |
| Polymer Cost = | $4,264 | $5,330 | $2,132 | |

**Summary**

| Comparison: | Proposed GBT | versus | Existing GT | | | |
|---|---|---|---|---|---|---|
| Demand savings | = | -0.16 kW | | Est. electricity cost savings | = | ($7) /yr |
| Coin. demand savings | = | -0.11 kW | | Est. natural gas cost savings | = | $869 /yr |
| Electricity savings | = | -56 kWh/yr | | Est. polymer cost savings | = | -$3,198 /yr |
| Demand cost savings | = | -$4 | | Est. total cost savings | = | ($2,335) /yr |
| Elect. energy cost savings | = | -$2 | | Est. simple payback | = | N/A years |

NOTE:
Impact on pump energy is assumed to be negligable since water entering the thickener must be pumped to either the digester or the headworks. Increased thickener effectiveness will reduced the pumping of sludge to the digester, but require an equal increase in pumping of water to the headworks.

## CONSTRUCTION COST ESTIMATE

04-Nov-05
CostEst.xls

Report No.: Sandpoint WWTF

Project: Replace existing gravity thickener with a gravity belt thickener

**General Data**

Location specific labor cost adjustment ..... *100%*

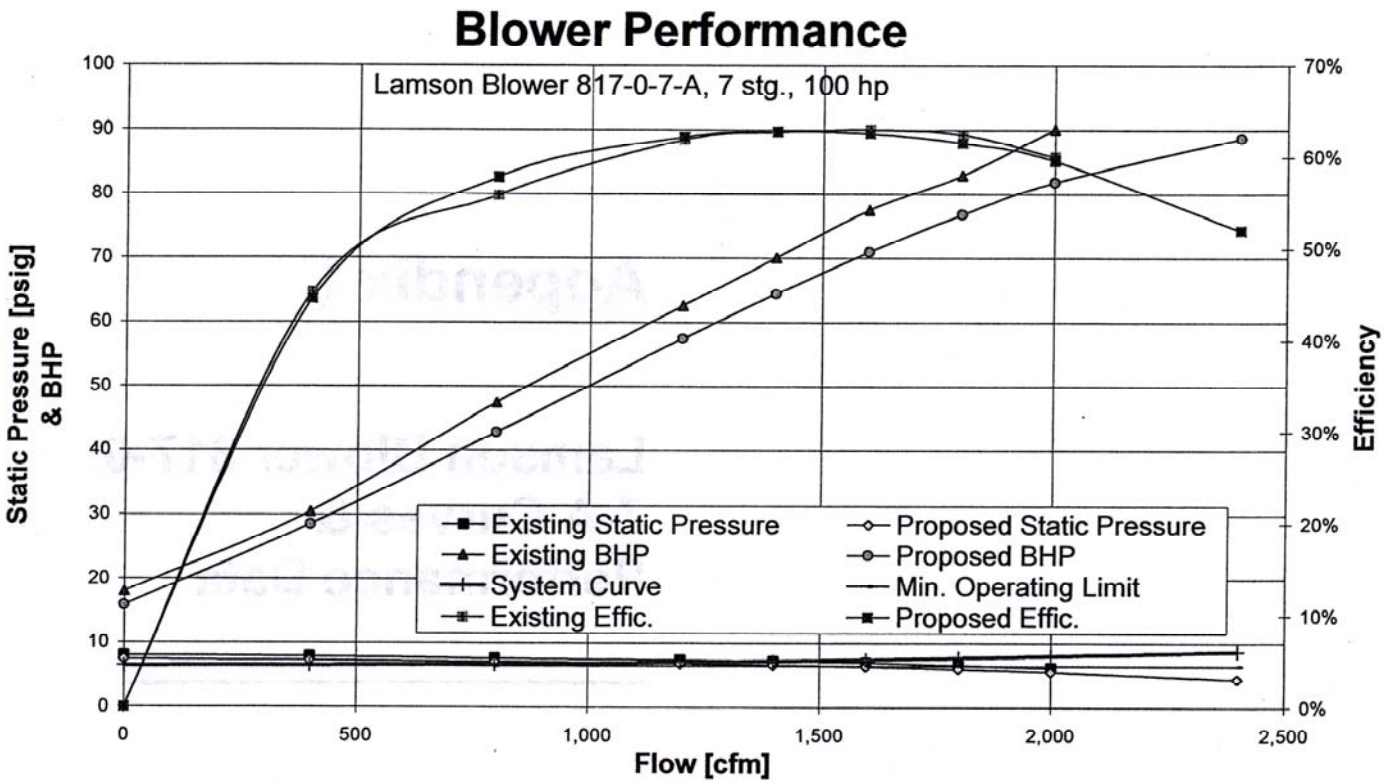
**Itemized Data**

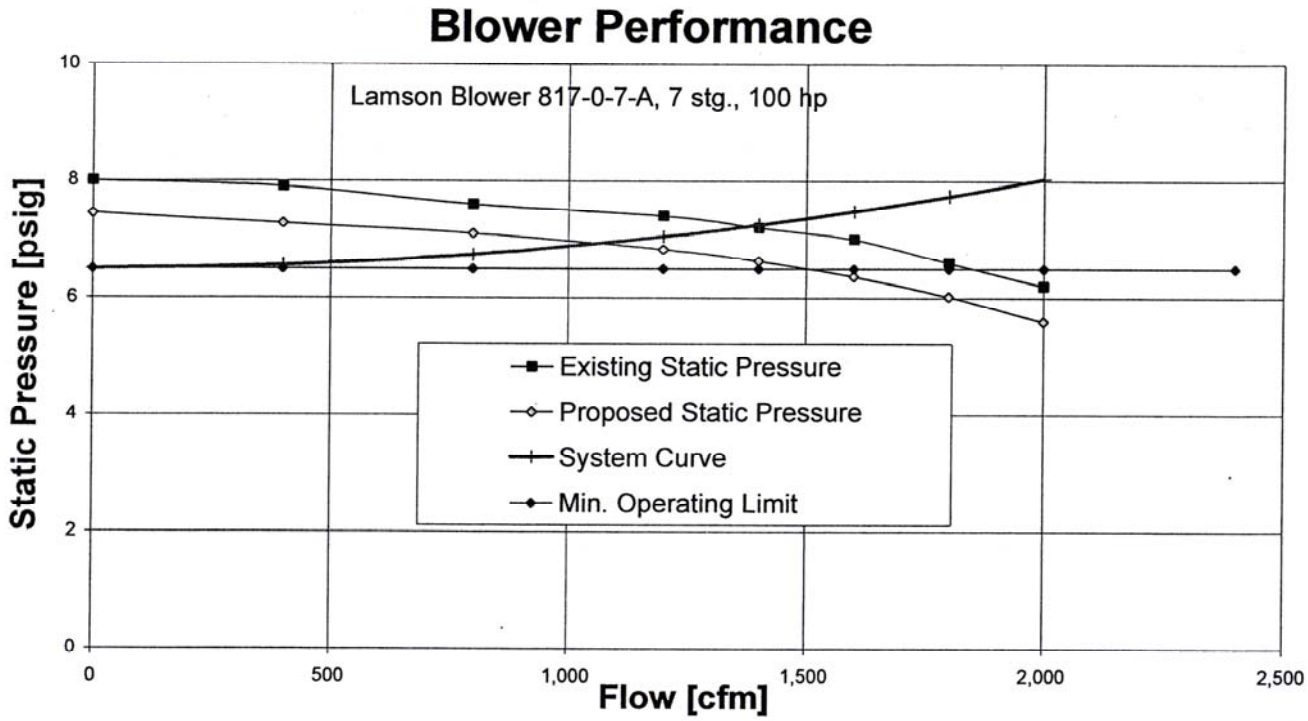
| Component | Size | Materials | Unit | Labor | Unit | Quanti | Materials Subtotal | Std. Labor Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| Piping, Black. steel, Sch.40, welded | | | | | | | | | |
| butterfly valves, iron | 8 in. | $405 | ea. | $157 | ea. | 1 | $405 | $157 | $562 |
| pipe | 8 in. | $25.50 | ea. | $24.50 | l.f. | 40 | $1,020 | $980 | $2,000 |
| elbows | 8 in. | $282.00 | ea. | $88.50 | ea. | 2 | $564 | $177 | $741 |
| couplings | 8 in. | incl. | ea. | incl. | ea. | 0 | $0 | $0 | $0 |
| tees | 8 in. | $395.00 | ea. | $142.00 | ea. | 4 | $1,580 | $568 | $2,148 |
| butterfly valves, iron | 8 in. | $405 | ea. | $157 | ea. | 3 | $1,215 | $471 | $1,686 |
| elect. act. valve iron | | $2,125 | ea. | $243 | ea. | 2 | $4,250 | $486 | $4,736 |
| Ditchwork | | | | | | | | | |
| Backhoe dirt ditch, 30 in. | | | | $1.86 | l.f. | 20 | | $37 | $37 |
| Backhoe refill, 30 in. | | | | $1.86 | l.f. | 20 | | $37 | $37 |
| Gravity belt thickener | | | | | | | | | |
| Roediger | 1.2 meter | $125,000 | ea. | $64,000 | ea. | 1 | $125,000 | $64,000 | $189,000 |
| Wash water booster pump | | incl. | | | | | | | |
| Air compressor | | incl. | | | | | | | |
| Control panel | | incl. | | | | | | | |
| Freight & service (1-trip, 3-d | | incl. | | | | | | | |
| Electrical | | | | | | | | | |
| Steel conduit | 1/2" | $1.64 | l.f. | $2.84 | l.f. | 50 | $82 | $142 | $224 |
| Wire 600V type, THWN-THH | #14 | $0.0445 | l.f. | $0.20 | l.f. | 200 | $9 | $39 | $48 |
| | #12 | $0.0630 | l.f. | $0.23 | l.f. | 0 | $0 | $0 | $0 |
| | #10 | $0.0970 | l.f. | $0.26 | l.f. | 0 | $0 | $0 | $0 |
| Circuit breaker, 20amp, 3ph. 1pole, 2 | | $202.00 | ea. | $40 | ea. | 1 | $202 | $40 | $242 |
| Building | 1000 sq.ft. | $120.00 | s.f. | incl. | s.f. | 1,000 | $120,000 | $0 | $120,000 |
| | | | | Subtotals: | | | $254,327 | $67,135 | |
| | | | | Adjusted totals: | | | $254,327 | $67,135 | $321,462 |

| Cost | Rate | Adjusted totals: |
|---|---|---|
| Construction | N/A | $321,460 |
| Inflation | 0.0% | $0 |
| Unlisted | 5.0% | $16,070 |
| Contingency | 5.0% | $16,070 |
| Overhead | 0.0% | $0 |
| Profit | 0.0% | $0 |
| Sales tax | 4.0% | $14,140 |
| Design fee | 5.0% | $18,390 |
| | Total | $386,100 |

# Appendix I

## Lamson Blower 817-0-7-A Curves & Performance Data


Blower Performance
Lamson Blower 817-0-7-A, 7 stg., 100 hp
Static Pressure [psig] & BHP
Efficiency
Flow [cfm]
Existing Static Pressure
Existing BHP
System Curve
Existing Effic.
Proposed Static Pressure
Proposed BHP
Min. Operating Limit
Proposed Effic.
0
10
20
30
40
50
60
70
80
90
100
0%
10%
20%
30%
40%
50%
60%
70%
0
500
1,000
1,500
2,000
2,500


Blower Performance
Lamson Blower 817-0-7-A, 7 stg., 100 hp
Static Pressure [psig]
Flow [cfm]
Existing Static Pressure
Proposed Static Pressure
System Curve
Min. Operating Limit
0
2
4
6
8
10
0
500
1,000
1,500
2,000
2,500

# BLOWER PERFORMANCE ANALYSIS

05-Oct-05
WW-BlowerCalc.xls

*Sandpoint WWTF*

**Input Data:**

**Existing Condition:**

Fluid density ..... *0.066* lbs/cu.ft.
Speed ..... *3,550* rpm

| Flow [icfm] | Static Pressure [psig] | BHP | Static Pressure [ft.H2O] |
|---|---|---|---|
| *0* | *8* | *18.0* | 18.5 |
| *400* | *7.9* | *30.4* | 18.2 |
| *800* | *7.6* | *47.5* | 17.6 |
| *1,200* | *7.4* | *62.6* | 17.1 |
| *1,400* | *7.2* | *70.1* | 16.6 |
| *1,600* | *7* | *77.5* | 16.2 |
| *1,800* | *6.6* | *82.9* | 15.2 |
| *2,000* | *6.2* | *90.1* | 14.3 |
| *2,400* | | | |

**Blower Data:**

Model ..... *Lamson 817*
Impeller diameter ..... *22* in.
Impeller width..... *6* in
Number of stages..... *7*
Motor HP ..... *100* hp

**Proposed Condition:**

Impeller diameter ..... *22* in
Impeller width..... *6* in
Fluid density ..... *0.066* lbs/cu.ft.
Speed ..... *3,420* rpm = 4% decrease

**Design Operating Point:**

Flow..... *1,355* cfm
Static pressure..... *7.2* psig = 16.6 ft.H2O
Min. oper. static pressure ..... *6.5* psig = 15.0 ft.H2O

**Calculations:**

Min. speed to maintain flow = 3,200 rpm

**Existing Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency | System Pressure Curve [psig] |
|---|---|---|---|---|
| 0 | 8.0 | 18.0 | 0.0% | 6.5 |
| 400 | 7.9 | 30.4 | 45.3% | 6.6 |
| 800 | 7.6 | 47.5 | 55.9% | 6.7 |
| 1,200 | 7.4 | 62.6 | 61.9% | 7.0 |
| 1,400 | 7.2 | 70.1 | 62.8% | 7.2 |
| 1,600 | 7.0 | 77.5 | 63.0% | 7.5 |
| 1,800 | 6.6 | 82.9 | 62.5% | 7.7 |
| 2,000 | 6.2 | 90.1 | 60.0% | 8.0 |
| 2,400 | | | | 8.7 |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency |
|---|---|---|---|
| 0 | 7.4 | 16.1 | 0.0% |
| 385 | 7.3 | 27.2 | 45.3% |
| 771 | 7.1 | 42.4 | 55.9% |
| 1,156 | 6.9 | 55.9 | 61.9% |
| 1,349 | 6.7 | 62.6 | 62.8% |
| 1,541 | 6.5 | 69.3 | 63.0% |
| 1,734 | 6.1 | 74.1 | 62.5% |
| 1,927 | 5.8 | 80.6 | 60.0% |
| 2,312 | | | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | BHP | Efficiency |
|---|---|---|---|
| 0 | 7.4 | 15.8 | 0.0% |
| 400 | 7.3 | 28.5 | 44.5% |
| 800 | 7.1 | 42.8 | 57.8% |
| 1,200 | 6.8 | 57.5 | 62.2% |
| 1,400 | 6.6 | 64.4 | 62.8% |
| 1,600 | 6.4 | 70.9 | 62.6% |
| 1,800 | 6.0 | 76.8 | 61.6% |
| 2,000 | 5.6 | 81.8 | 59.6% |
| 2,400 | 4.4 | 88.7 | 52.0% |

**Existing Condition:**

| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 8.0 | 18% | 93.4% | 14.4 |
| 400 | 7.9 | 30% | 93.4% | 24.3 |
| 800 | 7.6 | 47% | 94.4% | 37.5 |
| 1,200 | 7.4 | 63% | 94.4% | 49.4 |
| 1,400 | 7.2 | 70% | 94.7% | 55.2 |
| 1,600 | 7.0 | 78% | 94.7% | 61.1 |
| 1,800 | 6.6 | 83% | 94.7% | 65.3 |
| 2,000 | 6.2 | 90% | 94.7% | 71.0 |
| 2,400 | | | | |

**Proposed Condition:**

| Flow [cfm] | Static Pressure [psig] | Mtr Load Factor [pct.] | Motor Effic. [pct.] | Motor Power [kW] |
|---|---|---|---|---|
| 0 | 7.4 | 16% | 93.4% | 12.7 |
| 400 | 7.3 | 28% | 93.4% | 22.8 |
| 800 | 7.1 | 43% | 94.4% | 33.9 |
| 1,200 | 6.8 | 57% | 94.4% | 45.4 |
| 1,400 | 6.6 | 64% | 94.4% | 50.9 |
| 1,600 | 6.4 | 71% | 94.7% | 55.9 |
| 1,800 | 6.0 | 77% | 94.7% | 60.5 |
| 2,000 | 5.6 | 82% | 94.7% | 64.5 |
| 2,400 | 4.4 | 89% | 94.7% | 69.9 |

Rob Gray, Avista, 2005

TECHNICAL MEMORANDUM NO. 8

## City of Sandpoint Wastewater Facility Plan

# Facility Planning
# Effluent Limits

March 2007

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Table 8-2 Projected Permit Limits for Planning

# 1 Proposed Effluent Limits—Initial

The City of Sandpoint WWTF plan preparation depends on identification and evaluation of various alternatives to serve the future needs of the City. Effluent criteria are needed for alternatives development and evaluation. Discussions will be necessary among the engineering consultant team members, the City, and the Idaho Department of Environmental Quality (IDEQ) to establish criteria appropriate to the receiving water environment, including its future potential needs.

Table 8-1 shows the current permit limits and the current performance of the wastewater treatment plant toward meeting the limits, according to analysis of data from discharge monitoring reports from January 2002 through March 2005.

TABLE 8-1
Current Permit Limits and Current Performance
*March 2007*

| | Current Permit Limit | | | 2002-2005 Performance Range | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **Weekly** | **Daily** | **Monthly** | **Max Week** | **Max Day** |
| BOD | 30 mg/l | 45 mg/l | * | 7-18 mg/l | 12-26 mg/l | ** |
| BOD Rem | 85% | * | * | 75-90% | ** | ** |
| TSS | 30 mg/l | 45 mg/l | * | 4-12 mg/l | 9-34 mg/l | ** |
| TSS Rem | 85% | * | * | 82-97% | ** | ** |
| Total N | * | * | * | *** | *** | *** |
| $NH_3$-N | * | * | * | *** | *** | *** |
| Total P | * | * | * | *** | *** | *** |
| O-$PO_4$-P | * | * | * | *** | *** | *** |
| Temp. | * | * | * | 6-22 ºC | *** | *** |
| pH | Within the Range 6.5 – 9.0 | | | Range = 6.6 – 7.7 | | |
| $Cl_2$ | 0.45 mg/l | * | 1.01 mg/l | 0.34-0.49 mg/l | *** | 0.6-1.0 mg/l |
| E-coli | 126 cfu/100 ml | * | 406 cfu/100 ml | 2-35 cfu/100 ml | 2-434 cfu/100 ml | 2-680 cfu/100 ml |

* No limits
** Data not compiled
*** Data not available

## 2 Future Effluent Limits

Table 8-2 presents the effluent quality standards proposed for use in evaluation of alternatives for the current wastewater treatment plant, expansion at the existing site, or a new facility located remotely from the existing site. It is assumed that some of the limits (e.g., nutrients nitrogen and phosphorus) will be seasonal, to protect water quality in the Pend Oreille River. The assumed seasonal limits are noted in Table 8-2, with a

proposed season of May 1 to October 31 to coincide with the growing season and to avoid the peak flow period.

TABLE 8-2
Projected Permit Limits for Planning
*March 2007*

| | Short Term (10 years) Permit Limit | | | Long Term (20-50 years) Permit Limit | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **Weekly** | **Daily** | **Monthly** | **Max Week** | **Max Day** |
| BOD | 30 mg/l | 45 mg/l | NL | 15 mg/l | 23 mg/l | NL |
| BOD Rem. | 85% | NL | NL | 85% | NL | NL |
| TSS | 30 mg/l | 45 mg/l | NL | 15 mg/l | 23 mg/l | NL |
| TSS Rem | 85% | NL | NL | 85% | NL | NL |
| Total N | NL | NL | NL | 10 mg/l* | 15 mg/l* | NL |
| $NH_3$-N | 1 mg/l* | NL | 3 mg/l* | 1 mg/l* | NL | 3 mg/l* |
| Total P | NL | NL | NL | 1 mg/l* | 2 mg/l* | NL |
| O-$PO_4$-P | NL | NL | NL | NL | NL | NL |
| Temp. | NL | NL | NL | NL | NL | NL |
| pH | Within the Range 6.5 – 9.0 | | | Within the Range 6.5 – 9.0 | | |
| $Cl_2$ | 0.1 mg/l | NL | 0.2 mg/l | 0.1 mg/l | NL | 0.2 mg/l |
| E-coli | 126 cfu/100 ml | NL | 406 cfu/100 ml | 126 cfu/100 ml | NL | 406 cfu/100 ml |

NL = No limits
* = Seasonal limits (May 1 through October 31)

Differences between the current limits and those proposed for use during future planning are primarily for ammonia, chlorine toxicity, phosphorus, and total nitrogen removal. Chlorine toxicity limits will apply year-round. Ammonia and total nitrogen and phosphorus limits will be seasonal (May 1 through October 31 annually).

The **ammonia removal** requirement will be associated with potential requirements to reduce toxicity in the effluent, and/or potential requirement for removal of total nitrogen, when ammonia removal will be necessary to reduce total nitrogen in the discharge. Additional attention is anticipated to be given to potential toxicants as future discharge permits are issued. A seasonal ammonia removal requirement for toxicity reduction can be imposed in the next or following permit renewal period, which will become effective in 2007 and 2012 respectively. Implementation will be required prior to the beginning of the following permit period (e.g., before 2012 or 2017). Year-round ammonia removal will not be necessary, due to the higher flow in the Pend Oreille River and its lower temperature during the winter season.

The **chlorine residual toxicity removal** requirement also will be associated with potential requirements to reduce toxicity in the effluent. Most municipal dischargers are being

charged with reducing chlorine associated toxicity reduction, as it has been documented to be the primary agent imparting toxicity to effluents. A requirement for chlorine toxicity removal can be imposed in the next or following permit renewal period, which will become effective in 2007 and 2012 respectively. Implementation will be required before the beginning of the following permit period (e.g., before 2012 or 2017).

The **phosphorus removal** requirement will be associated with water quality criteria to reduce the potential for algae growth in the Pend Oreille River during the summer months. Currently, a limitation exists on phosphorus discharges to the lake body, which is that portion east of the Highway 95 Long Bridge. That limit can be extended westward if signs of excessive algae growth appear in the river portion of the lake. Imposition of this requirement, for phosphorus reduction in the effluent, can be imposed in the permit period beginning in 2012 or 2017. For planning purposes, imposition before these dates and implementation required before the initiation of the following permit period (e.g., 2017 or 2022) will not be assumed.

The **total nitrogen removal** requirement will be associated with a conclusion by the States of Washington and/or Idaho that excessive dissolved nitrogen in the Pend Oreille River in Washington is promoting macrophyte (bottom growing plants) growth in the river. The Washington Total Maximum Daily Load (TMDL) study on the river is not expected to be completed for about 5 years, after which recommendations will be developed and a water quality improvement implementation plan developed. Imposition of total nitrogen removal requirements can be with the 2012 or 2017 permit renewals, which will call for implementation prior to the start of the following permit period (e.g., 2017 or 2022).

# 3 Use of Projected Requirements in Planning

Based on best information available, planning for wastewater improvements for the WWTF plan will include each of these potential future requirements for the following implementation dates:

- Chlorine toxicity removal—2012
- Ammonia removal—2017
- Phosphorus removal—2017
- Total nitrogen removal—2022

Design criteria for the potential seasonal requirements will be based on flow projections for the May through October period, and not on the annual flow projections (peak flows).

TECHNICAL MEMORANDUM NO. 9

## City of Sandpoint Wastewater Facility Plan

# Alternative Wastewater Treatment Analysis

March 2007

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## Appendixes

Appendix A Detailed Opinion of Probable Cost

# 1 Introduction

As discussed in Technical Memorandum 7, the existing treatment plant requires upgrading to continue to provide adequate service. The combination of new growth, tightening permit conditions, and peak flows due to inflow and infiltration will require additional capacity and unit processes. This memorandum reviews treatment options to meet these future discharge requirements. The location of the plant is also reviewed in light of future capacity requirements, permit limits, and aesthetic concerns such as odor.

The treatment options are divided into major biological processes, tertiary treatment to meet permit conditions, solids handling, peak flow handling, and required ancillary processes. Overall treatment trains are recommended, with preliminary opinions of construction cost.

Each of the major treatment options was developed by a team of wastewater process engineers considering specific permit and future capacity requirements. The best alternatives have been retained for further evaluation.

# 2 Expected Treatment Requirements

As discussed in Technical Memorandum 8, the future discharge permit is likely to require nutrient removal; therefore, wastewater treatment technologies that can meet the projected nutrient limitations are considered.

This memorandum summarizes treatment facility sizing to meet the 2025 projected maximum-month flows and loads and ultimate build-out.

# 3 No Action Alternative

The existing facilities are not able to fully treat peak wastewater events and have limited remaining capacity to treat additional domestic flows. As flows to the plant increase due to growth, the City will see additional permit excursions during normal operation and potential wash out of the plant during extreme weather events.

The existing plant will be unable to meet the projected permit changes without periodic discharge violations. Current plant peak flow operation is based on blending of primary and secondary effluent. Depending on the final form that EPA's blending policy takes, the City may need to treat all flow to secondary standards. The plant does not have sufficient process capacity to meet these limits, and attempting to treat all the peak flows will result in significant hydraulic overloads, process washout, and flooding.

The existing facilities also lack nutrient removal capabilities. The anticipated future permit will likely have both nitrogen and phosphorus limits that the City cannot currently meet, resulting in significant and ongoing permit violations, and degradation of receiving water quality will be experienced.

# 4 Wastewater Treatment Categories

Wastewater treatment unit process selection is driven by both projected wastewater flows/loads and expected permit conditions. These processes are divided into basic biological treatment, peak flow handling, nutrient removal, and tertiary treatment. Basic biological treatment is assumed to include all of the components of a conventional treatment plant including headworks, aeration, clarification, disinfection, and solids handling. Peak flow handling is expected to be required for flows that exceed 100 percent of the maximum

domestic flow component because the influent wastewater is too dilute for successful biological treatment. Tertiary treatment is required to meet effluent quality goals prior to discharging. Nutrient removal is required to meet the projected phosphorus and nitrogen limits.

A summary of the major treatment processes considered to meet expected future capacity requirements and permit conditions is presented in Table 9-1.

TABLE 9-1
Pre-Screened Alternatives
*March 2007*

| Element | Alternatives |
|---|---|
| **Biological Treatment** | Conventional activated sludge with primary treatment |
| | Conventional activated sludge without primary treatment |
| | Membrane bioreactors |
| **Tertiary Treatment** | Upflow granular media filtration |
| | Membrane microfiltration |
| | Chemical addition with settling |
| **Disinfection** | Chlorination |
| | Ultraviolet light |
| | Ozonation |
| **Peak Flow Handling** | Peak flow storage with plant return for treatment |
| | Upflow granular media filtration |
| | Stormwater clarification |
| **Effluent Discharge** | Land application (fodder crops) |
| | Natural systems/wetlands |
| | River discharge (Pend Oreille River) |
| | Water reuse (lawn irrigation, wetlands) |
| **Solids Thickening** | Gravity thickening |
| | Mechanical thickening (GBT) |
| **Solids Treatment** | Aerobic digestion |
| | Anaerobic digestion |
| **Solids Disposal** | Land Application |
| **Plant Location** | Current location |
| | Relocate entire facility |
| | Retain existing facility and stage construction of new plant |

# 5 Wastewater Treatment Alternatives

Based on projected permit conditions, future flexibility, and growth, three major treatment alternatives were considered including:

- Conventional activated sludge
- Conventional activated sludge without primary treatment
- Membrane biological reactor without primary treatment

In addition to conventional secondary treatment components, biological nutrient removal components are included to meet future permit requirements.

Ancillary processes such as screening, grit removal, flow measurement, pumping, etc. are similar for all options and are not specifically addressed here but are summarized in Table 9-2.

TABLE 9-2
Wastewater Treatment Alternatives
*March 2007*

| | Major Treatment Alternative | | |
|---|---|---|---|
| Treatment Process | Conventional | Conventional Without Primary Treatment | Membrane Biological Reactor |
| Pre-treatment | | | |
| Screening | ● | ● | ● |
| Grit Removal | ● | ● | ● |
| Primary Treatment | ● | | |
| Methanol Injection (nitrogen removal) | ● | | |
| Secondary Treatment | | | |
| Anaerobic Basins | ● | ● | ● |
| Anoxic Basins | ● | ● | ● |
| Aerobic Basins | ● | ● | ● |
| Solids Separation | | | |
| Clarification | ● | ● | |
| Membrane Barrier | | | ● |
| Solids Management | | | |
| RAS pumping | ● | ● | ● |
| WAS pumping | ● | ● | ● |
| Disinfection | ● | ● | ● |
| Solids Handling | | | |
| Anaerobic Digestion | ● | | |
| Gas Management | ● | | |
| Aerobic Digestion | | ● | ● |
| Thickening | ● | ● | ● |
| Dewatering | ● | ● | ● |
| Hauling/Transporting | ● | ● | ● |
| Composting | | ● | ● |
| Peak Flow Handling | ● | ● | ● |
| Effluent Disposal | ● | ● | ● |
| Odor Control | ● | ● | ● |

## 5.1 Conventional Activated Sludge

Conventional activated sludge uses primary clarification followed by biological treatment in the activated sludge tanks and solids removal in the secondary clarifiers, as shown in Figure 9-1. Biological nutrient removal is accomplished through use of anoxic and anaerobic tanks, immediately prior to the aeration basins. Solids from the primary and secondary settling are thickened and treated in anaerobic digesters.

Advantages:

- Primary clarification reduces the load to the secondary system by 25–50 percent, which reduces the oxygen required in the secondary treatment process and can reduce operating costs.
- Residual biosolids are more likely to meet Class B requirements without additional treatment.
- Methane produced during digestion could be reused to heat the digesters or to generate electricity.

Disadvantages:

- Capital costs are 5–10 percent higher than conventional activated sludge without primary treatment.
- Reduction of organic material to the secondary system could reduce the ability to remove nutrients without the addition of an external carbon source (typically methanol).
- Anaerobic digesters, gas handling, and associated equipment are necessary to manage the primary solids.

## 5.2 Conventional Activated Sludge without Primary Treatment

This alternative has wastewater entering the biological treatment process directly following screening and grit removal as shown in Figure 9-2. Similar to conventional activated sludge, biological solids are subsequently removed in the secondary clarifiers. Biological nutrient removal also is accomplished through use of anoxic, anaerobic, and aerobic tanks. Because there is no primary treatment, only secondary solids are removed from the system. They are then thickened and digested aerobically.

Advantages:

- Lowest capital cost.
- The increased organic load aids the biological nutrient removal process.
- Primary solids do not have to be managed which means anaerobic digesters and associated equipment are not needed.

Disadvantages:

- More oxygen is required in the biological treatment process because of higher organic loads.
- Aerobic digestion requires longer storage times to meet Class B requirements for solids disposal which increases land requirements, and capital and O&M costs.

## 5.3 Membrane Biological Reactor

A membrane-biological-reactor (MBR) activated sludge plant uses a physical barrier (membrane) to separate the secondary solids from the effluent rather than a gravity type clarifier, as shown on Figure 9-3. Because the solids separation process is not limited by solids settling characteristics, the concentration of active biological mass in the reactors can be higher (10,000 mg/l MLSS vs. 2,500 mg/l MLSS), reducing the required reactor volume. Additionally, the membrane pore size is sufficiently small to remove virtually all particulate matter, providing a much higher quality effluent. This contrasts with conventional activated sludge which requires sand filtration to achieve the same solids removal. Because the solids concentration is generally higher in the aeration basins, solids thickening may not be required.

Advantages:

- Highest quality effluent.
- Smaller overall plant footprint.
- No secondary clarifiers.
- Thicker waste activated sludge.

Disadvantages:

- Short performance history because membranes are relatively new to wastewater treatment.
- Highest capital cost. Capital costs are currently 15–20 percent higher than conventional activated sludge without primary treatment. (Note: Membrane prices are becoming more attractive as more manufacturers produce them; therefore, cost will have to be further evaluated closer to time of construction.)
- Increased operation and maintenance cost due to higher energy costs and membrane replacement every 7-10 years. O & M costs are generally 15–25 percent greater than conventional activated sludge.
- Generally deeper basins which creates dewatering challenges in high groundwater.

## 5.4 Recommendations

The overall lifecycle costs of the three major alternatives are presented in Table 9-3.

TABLE 9-3
Lifecycle Costs
*March 2007*

| | | Capital Cost | Annual O&M | Present Worth |
|---|---|---|---|---|
| 1. | Conventional Activated Sludge | $70,500,000 | $1,838,000 | $98,750,000 |
| 2. | Conventional Activated Sludge without Primary Clarification | $67,500,000 | $1,862,000 | $96,100,000 |
| 3. | Membrane Bioreactor | $80,000,000 | $2,344,000 | $116,000,000 |

a. Based on 30-year lifecycle, 5% rate of return, and 7¢/kwh electrical cost

Based on cost, flexibility, and ease of operation, conventional activated sludge without primary treatment is the preferred treatment technology. However, decreasing costs of MBR membranes and energy efficiency benefits of rensing biogas may make the other two technologies more cost competitive in the future.

# 6 Nutrient Removal and Tertiary Treatment

Tertiary treatment may be required to meet future phosphorus and nitrogen limitations and is required if the wastewater is to be reused to irrigate land that the public may come into contact with. The City's current permit does not require tertiary treatment, nor is it expected to be required until 2017. Nonetheless, adequate land area and hydraulic head should be allocated to allow construction of tertiary treatment facilities, if required.

The projected phosphorus limits can be met through either filtration or chemical precipitation. Filtration will be required to produce high quality water suitable for reuse.

## 6.1 Phosphorus Removal

The projected phosphorus limits can be met using secondary treatment with biological phosphorus removal (BPR), chemical addition, or a combination of the two. BPR involves creating an environment that encourages the growth of micro-organisms that can store and remove large amounts of phosphorus under aerobic conditions. BPR can reliably remove phosphorus to 1 mg/l to 2 mg/l at the lowest O&M cost. The primary disadvantage is the solids must be maintained in aerobic conditions so phosphorus is not returned to the system.

Chemical phosphorus removal involves precipitating phosphorus and improving settling of solids to remove organic material. By using higher chemical doses, phosphorus levels can be decreased to 0.5 mg/l. The primary disadvantages include increased O&M costs and additional waste sludge, but this requires significantly less capital expense than biological ambient removal or filtration.

Chemical addition combined with BPR and filtration can reduce total phosphorus levels to between one and about 0.1 mg/l. To meet phosphorus limits below 0.1 mg/l, dual pass sand filtration with chemical addition is the only technology that has currently been shown effective. The efficacy of dual pass sand filtration and membranes to meet phosphorus limits near 0.05 mg/l is currently being evaluated. To date, pilot testing has indicated ultra-low levels are possible (<0.05 mg/l), but periodic exceedances should be expected.

## 6.2 Nitrogen Removal

The projected nitrogen limits can be met through secondary treatment with biological nitrogen removal. This will require a substantial recycle rate (4x – 5x) between an anoxic basin and the aeration basins but has the benefit of lowering operating costs through recovery of oxygen in the anoxic basins.

## 6.3 Wastewater Reuse

Final effluent (tertiary) filtration is required to produce a Class A effluent which is suitable for reuse (irrigation of parks and lawns with no restrictions). Tertiary treatment can be provided by either gravity sand filters or single pass up-flow sand filters following conventional activated sludge secondary treatment. An MBR is assumed to produce tertiary effluent without an additional filtration step.

### 6.4 Recommendations

Based on the City's projected permit conditions and long-term considerations, biological nutrient removal for phosphorus and nitrogen is recommended with the potential to add supplemental chemical addition to enhance settling and aid phosphorus removal. Tertiary filtration should not be necessary unless the City chooses to pursue a Class A reuse program.

## 7 Disinfection

Disinfection is required to inactivate pathogenic organisms in the effluent prior to discharge. In all cases, the disinfection system will be sized to handle peak flow. Three disinfection technologies were evaluated.

### 7.1 Chlorine Disinfection

Chlorine is a strong oxidant which can oxidize the organic matter associated with effluent microorganisms, thereby killing them. The chlorine needs at least 30 minutes of contact time at peak flows for effective disinfection, which requires a large plug flow tank. Because chlorine is toxic to aquatic life, effluent limits are placed on total chlorine residual levels to prevent chlorine from entering the environment. To consistently meet current and future discharge chlorine limits while adequately disinfecting the wastewater, the effluent will require dechlorination facilities consisting of a reaction chamber (60-second detention time) and dechlorination chemical injection equipment.

Chlorine gas for disinfection used in conjunction with sulfur dioxide for dechlorination is the lowest cost option, but the chemical forms are hazardous and require special storage, handling, and safety equipment. A higher cost, but safer alternative, is onsite chlorine generation for disinfection and liquid dechlorinating agent such as sodium bisulfite. Although less hazardous, these processes require additional handling of salt for chlorine generation and barrels of dechlorinating agent.

### 7.2 Ultraviolet Disinfection

Ultraviolet (UV) disinfection inactivates microorganisms by altering their DNA, inactivating the reproduction process. Because UV requires less time in contact with a UV source than typical chlorine disinfection, UV disinfection requires less reactor volume and, therefore, less space. Additional benefits are that it does not utilize chlorine eliminating the need for dechlorination facilities. UV has a slightly higher capital cost than other technologies, is more energy intensive, and has a higher operation and maintenance cost. UV does not provide residual disinfectant levels downstream of the treatment process, which is required with reuse.

### 7.3 Ozone Disinfection

Ozone ($O_3$) disassociates in water to produce $HO_2$ and OH, which are very strong free-radical oxidants. These free radicals oxidize the organic matter associated with microorganisms (protoplasmic membrane), resulting in cell rupture. Ozone is typically generated onsite, using electricity with air or pure oxygen. Ozone is very unstable and, therefore, does not provide residual disinfectant levels downstream of the treatment process. One potential future advantage of ozone is that currently it is under investigation to oxidize endocrine-disrupting compounds.

### 7.4 Recommendations

UV disinfection provides good disinfection that meets the City's existing permit requirements without the need to handle hazardous chemicals. Subsequent chlorine addition can be used as required for water reuse.

## 8 Peak Flow Management

During rain events and/or snow melt events, flows entering the treatment plant can increase five to seven times the normal dry weather flow. These weather related peak flows have to be managed by the treatment plant. For the purpose of this evaluation, peak flows are defined as any flows greater than the design flow of the facility (maximum month), or 8.9 mgd. Three options were evaluated to handle these peak flows:

1. Provide biological treatment for all flows including peak flows.
2. Divert peak flows to a side-stream treatment process (clarification or filtration) and blend the side-stream flow with the fully treated effluent prior to disinfection and discharge.
3. Divert the peak flows to storage and fully treat the diverted wastewater during periods of low flow.

### 8.1 Plant Oversizing

Plant oversizing to accommodate peak wet weather flows requires a plant with a capacity approximately ten times the base domestic flow rate in 2015, and five times the base domestic flow at build out. As a result, all of the plant components would have to be oversized by this amount to maintain treatment. Furthermore, the generally dilute nature of the waste during these events results in severe operational difficulties because inadequate organic material exists to maintain the secondary biological treatment process and nutrient removal process.

Currently, the City's permit allows blending of partially treated effluent with fully treated effluent because the peak flows are very dilute and often meet numeric discharge requirements with minimal treatment. At this point, the peak flows are too extreme to treat in the biological process, so oversizing the plant to handle current peak flows is not considered a feasible option. As the City continues to remove extraneous flow from the collection system, this option becomes viable. If the City is successful in limiting peak flows to approximately 200 percent of base domestic flow, peak flow handling within the plant should be reevaluated.

### 8.2 Peak-Flow Clarifiers

Peak wet weather flows have been diluted with excess groundwater and/or rainwater; therefore, in most circumstances, excess flow can be adequately treated by diverting peak flows to side-stream treatment clarifiers, removing the settleable solids and disinfecting the effluent prior to discharge.

The City currently has one 55-foot diameter stormwater clarifier. To meet the projected peak of 8.9 mgd, two 60-foot stormwater clarifiers are recommended.

In this scenario, solids are removed from raw wastewater through stormwater clarifiers. The clarified effluent is then blended with the fully treated plant flow, disinfected, and discharged. The blended effluent typically will meet numeric discharge requirements as specified in the discharge permit but may not meet percent removal requirements

(85 percent) because the incoming waste is very dilute. The solids removed by the clarifiers would be sent either directly to the solids handling process or back to the aerobic system, depending on the final process chosen.

This is the process currently used by the City and has proven successful under extreme events. However, proposed changes to EPA's blending policy may require changes to the City's system. Specifically, the proposed policy requires that the blended discharge meet the following criteria:

1. Meets all NPDES permit requirements, based on secondary treatment requirements.
2. Has a treatment scenario that is consistent with generally accepted practices and long-term design criteria.
3. Must meet the equivalent of primary clarification.
4. Is used only during peak wet weather, when the capacity of the biological treatment process and storage/equalization facilities is fully utilized.
5. Includes sufficient monitoring in the NPDES permit to ensure compliance with applicable water quality-based effluent limitations and the Clean Water Act.
6. Is served by a properly operated and maintained collection system.

These criteria emphasize the need for inflow/infiltration reduction. The first criteria may require the City to meet 85 percent removal at all times, which is not possible with stormwater clarification.

A variation of this process is the use of ballasted sedimentation. This process uses a micro sand, introduced into the flow, which improves settling of suspended material. The settled sand and waste solids are separated. The solids are sent to the solids handling process and then reused. Removals are significantly higher and the space required is lower. This is a relatively new technology and should be evaluated in more detail once additional performance data are available.

## 8.3 Peak-Flow Filters

Because the peak wet weather flows are dilute, waste solids can be removed through granular media filtration or membrane filtration. Similar to clarifiers (discussed above), the filtered effluent would be blended with fully treated effluent, disinfected, and discharged. The filter backwash would be returned to the plant headworks for further treatment or sent to the solids handling process. Approximately 20 filters are required to meet the projected peaks. This number of filters becomes difficult to operate and maintain.

This option could allow use of filters for tertiary treatment during dry weather periods and peak flow handling during wet weather periods. However, finding a media that works for both scenarios may be difficult. There are also concerns that the raw wastewater could blind the filters during peak flow events, requiring frequent backwashes. This would need to be evaluated in more detail with pilot testing.

## 8.4 Off-Line Storage

This alternative would divert peak wet weather flows above the design capacity of the wastewater treatment plant to storage lagoons during the duration of the event. After the peak flow event passed and plant influent flow dropped below the design capacity of the

plant, the stored wastewater would be slowly returned to the plant for treatment. Based on preliminary evaluations, the required storage volume is approximately 200 million gallons. The high cost of property and potential for catastrophic flooding make this option less viable.

### 8.5 Recommendations

Based on the cost and current success of stormwater clarification for peak flow handling and the relative disadvantages of other options, we recommend that clarification continue to be used for peak flow handling. However, clarification of EPA's blending policy may result in more stringent requirements. In this case, ballasted sedimentation or filtration may be preferable.

## 9 Effluent Discharge

Four effluent disposal alternatives were considered in order of treatment required (lowest to highest):

1. Discharge to surface water (Pend Oreille River) – secondary plus nutrient removal
2. Land application (agricultural farm crops irrigation, silviculture) - secondary
3. Natural systems/wetlands application (habitat development) - tertiary treatment
4. Reuse (recreational field irrigation, residential irrigation) – secondary plus filtration and storage

The final disposal option will drive required effluent quality. Specific considerations for each alternative follow.

### 9.1 Discharge to Surface Water

This option evaluates continued discharge to the existing river outfall. Final treated wastewater would be conveyed from the treatment plant to the existing outfall. This option requires that the effluent meet the existing permit conditions at the outfall. Based on current permit requirements and land cost, this is the lowest cost option.

### 9.2 Land Application

Land application can either be seasonal, where wastewater is applied to crops during the growing season (June-September) and discharged the remainder of the year, or year-round, which requires storage of the effluent during the non-growing season. Based on projected flows and growth, this option would require 2,700 acres of application area for seasonal land application, and 7,500 acres for year-round application at build out. Due to the shortage of available land and rapidly escalating land prices, this option does not appear viable.

### 9.3 Natural Systems/Wetland Application

Discharge to a natural system or wetland could be either for final disposal or final polishing. For final disposal, the application rate would match agronomic rates of water uptake during the growing season. This option would require the same land area as land application.

A second alternative would be final polishing using wetlands. In this scenario, the wastewater would receive secondary treatment at the wastewater treatment plant, followed by final polishing in a constructed wetland. Due to the wide range of flows from the plant, operation of this facility would be problematic. Adequate planted area would be necessary to treat peak flows, but it would be difficult to provide adequate water during low flows, requiring supplemental irrigation. The large treatment also would facilitate algae growth during the

low flow summer months, which could result in permit violations. For these reasons, this option does not appear viable.

A variation of this alternative would be to provide tertiary treatment of the wastewater at the treatment plant, followed by discharge to the wetlands for the purpose of enhancing habitat and potentially creating a wetlands bank for use in trading for other projects. The actual flow to this wetlands could be controlled by operations personnel as necessary, to both meet permit conditions and create a benefit to the ambient environment.

### 9.4 Class A Reuse

Full reuse of the water for residential and/or park irrigation is considered Class A reuse. This option requires the highest levels of treatment and system control to protect human health but allows irrigation of existing areas. This option requires development of a separate irrigation system throughout the area where the water will be utilized.

### 9.5 Recommendations

Until a viable water reuse program or constructed wetland can be established, river discharge remains the most viable alternative.

## 10 Solids Handling/Treatment/Disposal

All of the treatment processes evaluated will produce waste biological solids that will require additional treatment and disposal. The main treatment categories being evaluated have different solids handling processes. This section summarizes the required solids handling processes required for each treatment scenario. In each case, biosolids are expected to meet EPA 503b Class B requirements.

### 10.1 Conventional Activated Sludge

Conventional activated sludge utilizes the following general solids handling facilities:

- Primary solids settling with primary sludge pumps
- Secondary solids settling with solids thickening using gravity belt thickeners prior to digestion
- Anaerobic digestion with gas handling equipment for gas reuse
- Dewatering using centrifuges to obtain the highest solids content

### 10.2 Conventional Activated Sludge or Membrane Bioreactor without Primary Treatment

As discussed above, these options do not generate primary solids. This alternative has the following solids handling facilities:

- Secondary solids settling with solids thickening using gravity belt thickeners prior to digestion
- Aerobic digestion with a minimum 30-day detention time
- Dewatering using belt filter presses for ease of operation

### 10.3 Final Solids Disposal

The City's current disposal to farmland has a total cost of $10 per ton. This cost is significantly below that of contract disposal ($50 to $100 per ton), composting ($200 to $400 per ton), and other solids disposal options. According to the City, adequate farmland remains available for land application, thus continued land disposal is the only option considered.

# 11 Plant Location

## 11.1 Existing Site

Reuse of the existing site is attractive because the existing infrastructure currently drains to it, and the City currently owns the property. However, it is located in the middle of a residential area and is limited in area.

Based on the projected permit conditions and considering plant requirements to the year 2025, the technology most likely to work at this site is a membrane bioreactor because of the reduced "footprint." The future nitrogen limit of 1-3 mg/l and phosphorus limit of 1-2 mg/l will require new anaerobic and anoxic basins with a total area of 1.0 acre, including piping. These should be constructed on existing open areas at the plant to allow continued operation during construction and to keep costs to a minimum. The final plant buildout will require a total available area of 2.0 acres. The existing open area at the plant is approximately 1.0 acre and is not adjacent to the existing aeration basins. As a result, the projected area required exceeds the available open area at the plant.

## 11.2 New Site

The optimal new sites for treatment facilities are flat, low lying areas adjacent to the existing collection system, to reduce pumping and construction costs. The treatment plant site should be 15-20 acres in size to permit future expansion. The area that best meets these criteria is to the west of the Great Northern Road.

Assuming an adequate site, any of the biological treatment processes could be utilized, providing flexibility at the time of design and construction to adapt to the latest, most cost-effective technology. The primary disadvantage is approximately half of the existing flow would be pumped from the existing site to the new plant location.

Because so much will have to be pumped, the City will need to embark on a significant I/I removal project. In the interim, peak I/I flows either will need to be pumped to the new facility or continue to be treated at the existing plant and discharged.

## 11.3 Partial Relocation/Plant Retention

Because the bulk of new construction will occur northwest of the existing facility, construction of the new facility could be completed in stages as required to meet new growth and then gradually expanded to ultimately accommodate the entire City flow. This option would allow the City to continue treating existing flows at the existing plant while I/I reduction projects are implemented, reducing the overall size of the new plant to be constructed.

As funds become available, the City could gradually add treatment capacity until the existing facility could either be abandoned or used exclusively for peak weather flow handling. The existing peak flow handling equipment (primary clarification and chlorine disinfection) are physical processes which are well suited to periodic operation with long periods of non-use.

This option would significantly reduce the initial cost of the new treatment facilities, but would result in the operation of two separate treatment plants for an extended period.

# 12 Final Cost Comparison

Costs based on projected build-out conditions are presented in Table 9-4.

TABLE 9-4
Treatment Plant Build-out Opinions of Cost
*March 2007*

| | | **2006 Capital Cost** |
|---|---|---|
| Secondary Treatment | | |
| | Conventional w/o Primary Treatment | $67,500,000 |
| Tertiary Treatment | | |
| | Single Pass Filtration | $9,750,000 |
| Nutrient Removal | | |
| | Biological Nutrient Removal | $9,600,000 |
| Peak Flow Handling | | |
| | Plant Oversizing | N/A |
| | Stormwater Clarifiers | $3,000,000 |
| | Peak Flow Filters | $5,800,000 |
| | Off Line Storage | $5,400,000 |
| Effluent | | |
| | Land Application (Growing Season) | $60,930,000 |
| | Land Application (No Discharge) | $204,400,000 |
| | Surface Water Discharge | $3,275,000 |

# 13 Recommendation

Upon review of planning level unit costs, available land, economics, and future projected growth, many of the options have similar costs. Also, many of the disposal options are outside of the City's ability to control at this point. Therefore, it is recommended that the City construct a new treatment facility that can meet its existing permit, but has the flexibility to meet upcoming permit conditions and can accommodate future effluent disposal options.

The treatment process that best meets these criteria is conventional activated sludge without primary treatment or membrane bioreactors with river disposal. Biological nutrient removal components including anaerobic and anoxic tanks and effluent filtration can be added to either process, as new permit limits warrant.

This option does not preclude future addition of any of the disposal options discussed. Once the wastewater receives tertiary treatment, water reuse or wetlands creation are still feasible if adequate land can be identified. Final selection of the treatment process should be completed during design because construction and equipment costs may be dramatically different when the facility is constructed.

Final technology selection will also depend on advances in wastewater treatment technology when the new facilities are upgraded. These facilities should be evaluated on the basis of ability to meet future permits, present worth cost (including energy usage), and other factors selected by the City.

Figure 9-1 - Conventional Flow Schematic

Figure 9-2 - Convention Flow Schematic without Primary Treatment

Figure 9-3 - Membrane Biological Reactor

F:\PROJECTS\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\Fig 9.1 Conventional schematic.dwg

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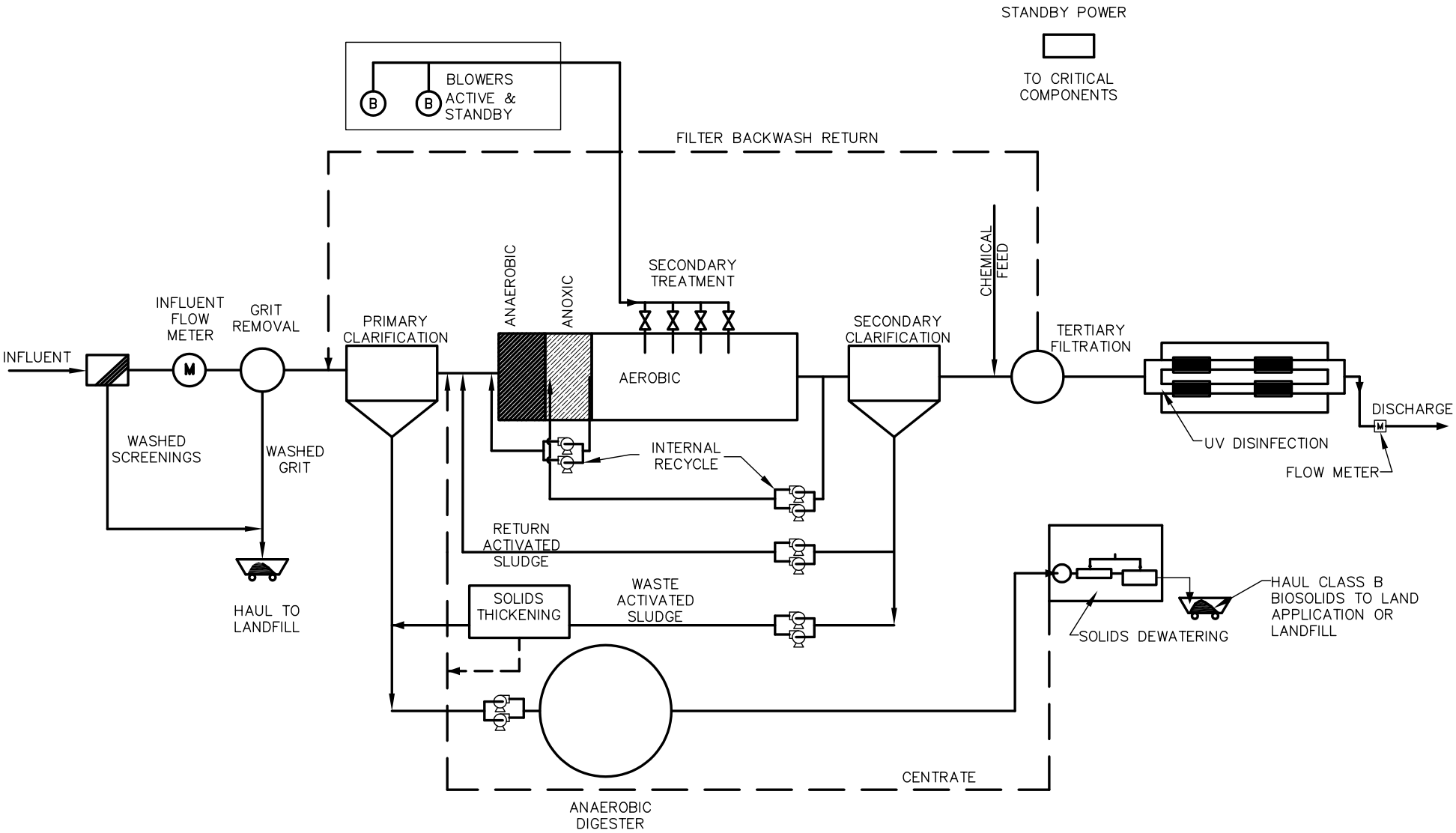


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CAD FILE: Fig 9.1 Conventional schematic

# CITY OF SANDPOINT
# WASTEWATER FACILITY MASTER PLAN

## CONVENTIONAL TREATMENT PROCESS SCHEMATIC
## FIGURE 9.1

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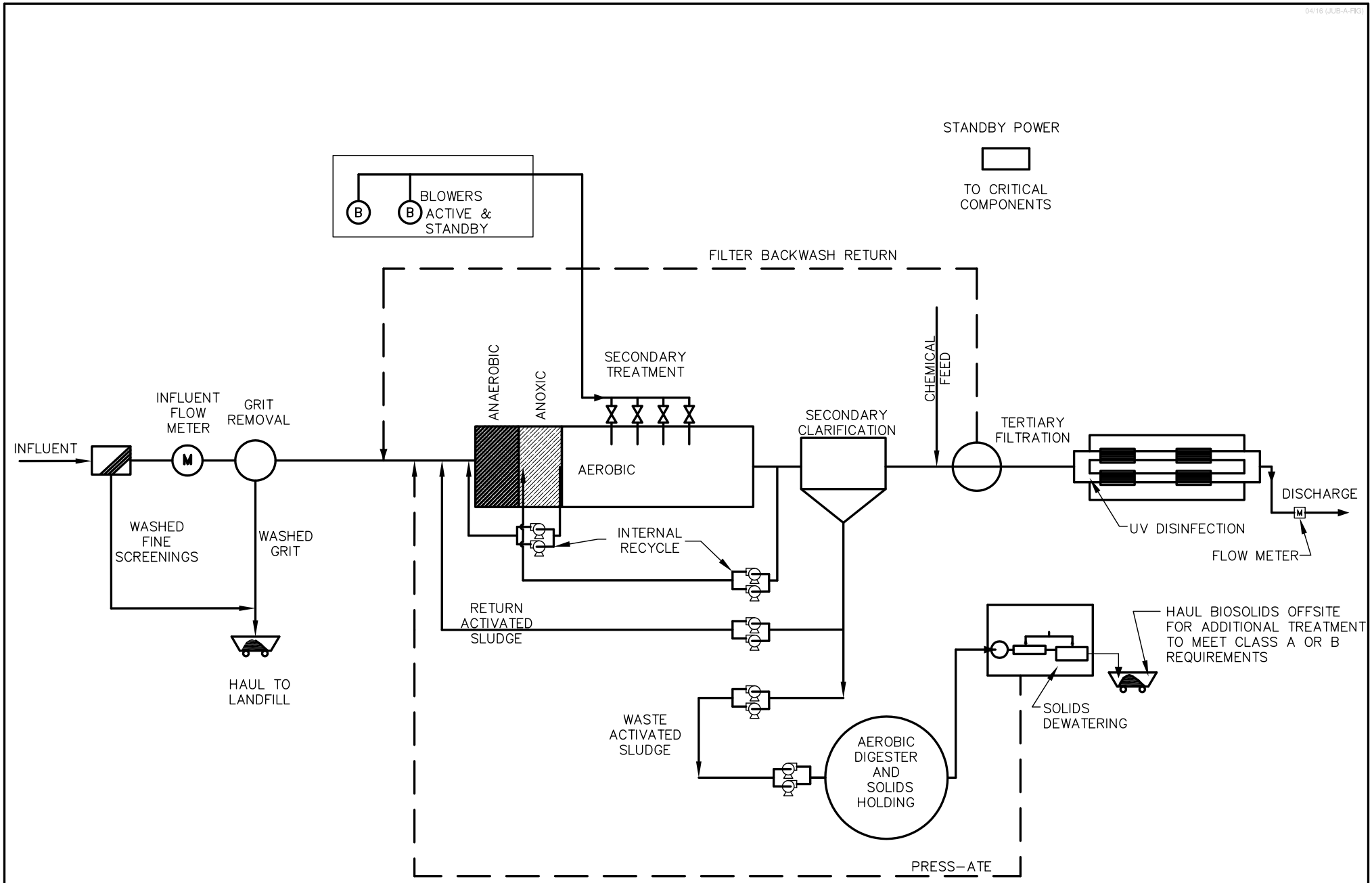


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CAD FILE: Fig 9.2 WITHOUT PRIMARY.chemical

# CITY OF SANDPOINT
# WASTEWATER FACILITY MASTER PLAN

## CONVENTIONAL, WITHOUT PRIMARY PROCESS SCHEMATIC
## FIGURE 9.2

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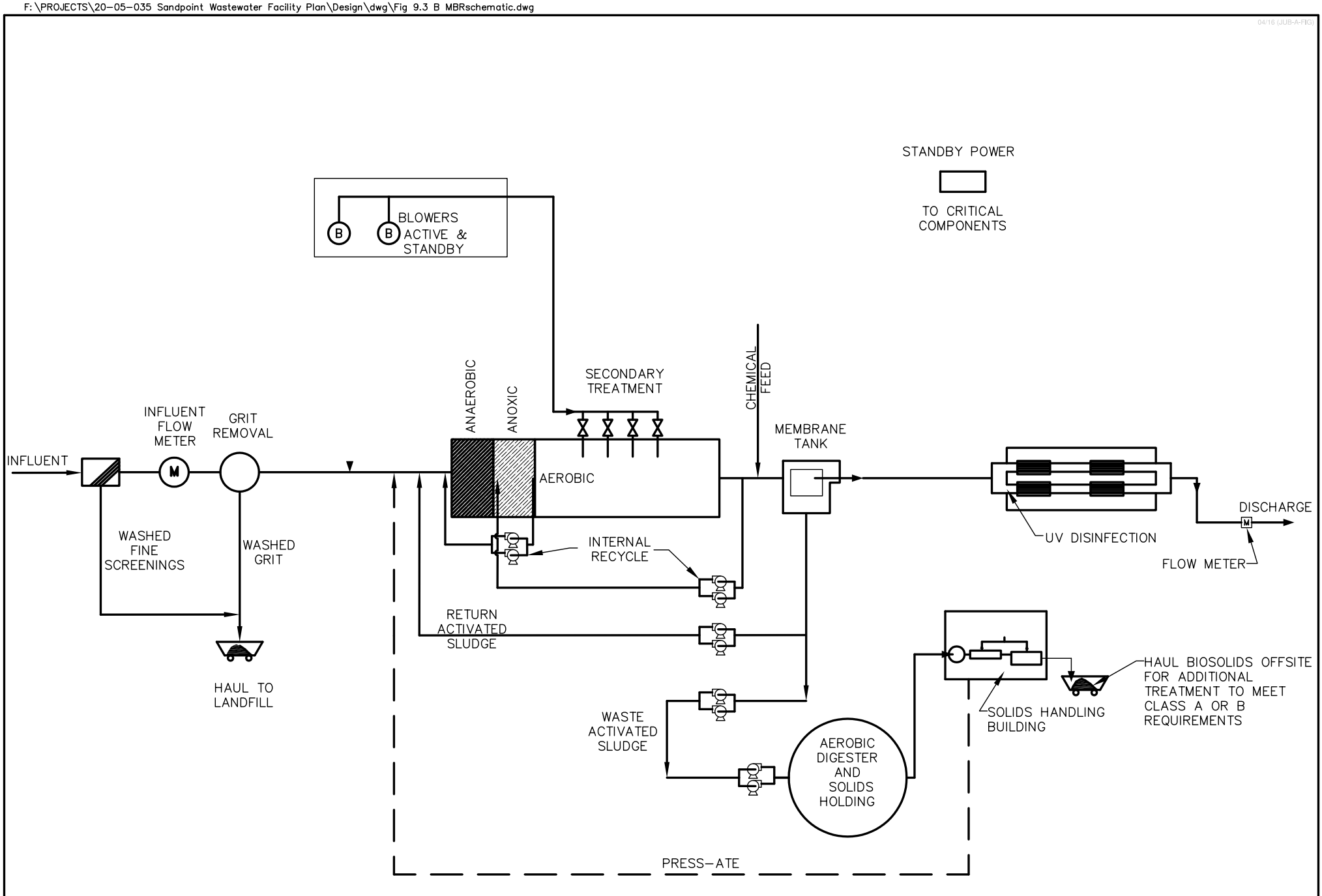


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CAD FILE: Fig 9.3 B MBRschematic

# CITY OF SANDPOINT
# WASTEWATER FACILITY MASTER PLAN

## MBR TREATMENT PROCESS SCHEMATIC
## FIGURE 9.3

TECHNICAL MEMORANDUM NO. 10

## City of Sandpoint Wastewater Facility Plan

# Interim Treatment Plant Actions and Capital Improvement Plan

March 2007

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Appendix A Detailed Opinion of Probable Cost

# 1 Introduction

Based on a review of the existing wastewater treatment plant site and required size of future treatment components, the size of the existing site is not adequate to fit the required treatment components. However, approximately 5 to 15 years will be required to identify a new treatment site, obtain funding, and construct new facilities. Therefore, some improvements must be completed in the interim to maintain plant functionality and effluent quality.

Assuming a 10-year planning period, the plant will need to meet the design criteria summarized in Table 1-1:

TABLE 1-1
Projected Design Conditions at 2015 for Sandpoint Build-Out Alternative
*March 2007*

| Design Criteria | Year-Round |
|---|---|
| **Flow (mgd)** | |
| Base Domestic | 1.4 |
| Average. Dry Weather | 2.83 |
| Average. Monthly | 3.62 |
| Maximum Month | 6.09 |
| Maximum Day | 14.97 |
| **Biochemical Oxygen Demand (#/day)** | |
| Average Annual | 5,050 |
| Maximum Month | 6,870 |
| Maximum Day | 16,680 |
| **Total Suspended Solids (#/day)** | |
| Average Annual | 3,900 |
| Maximum Month | 5,920 |
| Maximum Day | 18,710 |
| **Total Kjeldahl Nitrogen (#/day)** | |
| Average Annual | 329 |
| Maximum Month | 447 |
| Maximum Day | 1,085 |
| **Total Phosphorus (#/day)** | |
| Average Annual | 97 |
| Maximum Month | 131 |
| Maximum Day | 318 |

Based on these design criteria, estimated unit capacities, and known deficiencies (Technical Memorandum No. 7), the recommended interim upgrades to the existing WWTP are summarized next.

# 2 Primary and Secondary Treatment

## 2.1 Introduction

The City's existing permit is not projected to change dramatically in the next 10 years. As a result, the interim improvements are focused on providing improved operation of the existing primary and secondary processes.

## 2.2 Recommended Improvements

### 2.2.1 Headworks

Proposed improvements to the existing plant headworks include:

- Replacement of the existing influent grinder with influent screening using an automatic 6 mm screen to reduce maintenance throughout the plant. The screen will be sized to handle 6 mgd (95 percentile flow). The screen will be housed in a new building to protect it from the weather and to better control odors.
- Replacement of the existing grit washer to improve grit separation and decrease odors.
- Improvements to the ventilation/odor control system to minimize release of malodorous compounds.
- Measuring/recording overflows to the stormwater clarifier.
- Operation and Maintenance Considerations: Removing the material that can be screened out of the influent is a new unit process in the treatment train and will require additional operation and maintenance. The washed screened material will have to be disposed of similar to the grit (e.g., landfill disposal). The grit washer will improve removal of putrescible material to help comply with solid waste handling restrictions.

### 2.2.2 Secondary Pump Station

Proposed improvements to the existing secondary pumps include:

- Installation of in-line magnetic flow meters on the discharge line for better process tracking

### 2.2.3 Aeration Basins

Proposed improvements to the existing aeration basins include:

- Replacement of the existing coarse bubble diffuser system with fine bubble diffusers to increase aeration efficiency. (This item is eligible for grant support from AVISTA Utilities.) Design capacity is 4.3 mgd with an allowance for nitrification.
- Installation of variable frequency drives on the blower motors to increase aeration efficiency
- Automatic blower control based on dissolved oxygen levels in the aeration basins with timer backups (This item is eligible for grant support from AVISTA Utilities.)
- Operation and Maintenance Considerations: The aeration basin improvements will decrease energy consumption by increasing aeration efficiency through higher oxygen transfer rates and demand-specific oxygen delivery via variable frequency drives (VFD). Demand-specific oxygen delivery requires additional control equipment

(dissolved oxygen probes and VFD drives), which will require operator attention for process control and equipment calibration.

#### 2.2.4 Secondary Clarifiers

Proposed improvements to the existing secondary clarifiers include:

- Installation of Stamford-type baffles to maximize solids capture during peak hydraulic loads and to minimize short-circuiting
- Covering or coating of the existing effluent launders to minimize algae growth
- Hydraulic balancing of influent through the use of weirs
- Operation and Maintenance Considerations: Stamford baffles will not increase maintenance. The baffles will improve plant hydraulic performance and may increase capacity. Covering the launders will decrease maintenance and will not affect performance. The use of weirs will not increase maintenance and will improve plant performance. These improvements will not require any additional process control.

#### 2.2.5 Return Activated Sludge (RAS) Pumping

Proposed improvements to the existing RAS system include:

- Addition of in-line flow meters on each RAS Pump
- Operation and Maintenance Considerations: The RAS flow meters will require very little increased maintenance activity. The meters will be used to aid plant process control and will not increase control requirements.

# 3 Disinfection/Discharge

## 3.1 Recommended Improvements

### 3.1.1 Chlorination System

Proposed improvements to the existing chlorination system include:

- In-line chlorine measurement for improved chlorine residual control
- Dechlorination of the effluent using either sulfur dioxide gas or sodium bisulfite liquid
- Operation and Maintenance Considerations: The chlorine meter and dechlorination equipment will increase overall plant operation/maintenance and require process control. Residual chlorine detection by in-line meters has historically been maintenance intensive. As an alternative, the chlorination and dechlorination systems should be flow paced, relying less on chlorine residual measurements. This may require slight overdosing of both chlorine and the dechlorination agent. The increase in maintenance is necessary to decrease plant permit violations.

Dechlorination chemicals and feed system would be housed in the existing chlorine building. The dechlorinating agent would be added immediately following the chlorine contact basin. These improvements are recommended as the most cost effective way to improve disinfection system control. These improvements may not provide adequate chlorine contact time during peak events (>8 mgd). It is recommended that the City aggressively pursue peak flow reduction and monitor chlorine doses required to provide adequate disinfection during these events.

#### 3.1.2 Outfall

Proposed improvements to the existing outfall include:

- Repairs to the joint between the original outfall and the outfall extension

These repairs would require addition of a transition collar placed at the damaged joint.

# 4 Solids Handling

## 4.1 Recommended Improvements

### 4.1.1 Primary Sludge Pumping

Proposed improvements to the existing primary sludge pumping system include:

- Replacement of the existing sludge pumps with new primary sludge pumps capable of pumping 4 percent solids (These pumps would likely be air operated or mechanical diaphragm pumps.)
- Installation of piping improvements from the primary clarifiers to the new pumps to reduce plugging
- Installation of improved control and flow measurement to allow better sludge blanket control
- Operation and Maintenance Considerations: New sludge pumps will reduce O&M requirements and improve plant operational control. Optimizing the performance of the primary tanks will increase the solids processing capacity of the plant by sending thicker solids to the digester, increasing solids detention time in the digester.

### 4.1.2 Waste Activated Sludge (WAS) pumps

Proposed improvements to the existing WAS pumping system include:

- Addition of flow meters to the discharge pipe of each WAS pump
- Addition of sludge wasting control through:
    - Variable Frequency Drives or
    - Run/off timers
- Operation and Maintenance Considerations: Plant process control will be improved by accurately controlling the sludge wasting rate. These improvements will slightly increase plant O&M due to flow meter maintenance and additional sludge wasting control.

### 4.1.3 Sludge Thickening

Proposed improvements to the existing sludge thickening system include:

- Installing a new gravity belt thickener or centrifuge to thicken waste activated sludge. Waste activated sludge would be thickened to one to three percent and then blended with primary sludge prior to digestion. The thickener would be located adjacent to the existing belt filter press in a new addition to the building. The existing gravity thickener would either be decommissioned or reused as a temporary WAS holding tank or primary sludge thickener. Additional storage would be required to provide additional WAS storage to permit “batch” thickening rather than continuous thickening. Based on projected WAS wasting rates, 50,000 gallons of storage would be

required per day of storage desired (i.e., 150,000 gallons for three days). This is not currently budgeted as an interim upgrade but could be added in the future as needed.

- Operation and Maintenance Considerations: These improvements would increase the solids processing capacity of the plant by sending thicker waste activated sludge to the digester. Because this is a new unit process, O&M and process control requirements will increase.

#### 4.1.4 Digester System

Proposed improvements to the existing digester system include:

- Digester cleaning to remove accumulated grit and rags
- Replace faulty valves and add valving to allow additional isolation of piping for maintenance and/or repair work
- Replacement of the existing heat exchanger and replacement of electrical components
- Relocation of the existing boilers to a new building addition to the digester control building to reduce heat loss
- Installation of a gas scrubbing unit to allow use of digester gas in the digester boilers (This item is eligible for grant support from AVISTA Utilities.)
- Operation and Maintenance Considerations: Digester cleaning will recover existing capacity and will not increase O&M or process control requirements. The heat exchanger replacement will decrease O&M requirements because the existing heat exchanger is old and requires frequent repairs. The heat exchanger will not increase process control requirements. The gas scrubbing unit will add additional maintenance since the scrubber must be regenerated. Operational costs will be decreased since digester gas will replace some natural gas usage.

# 5 Miscellaneous

## 5.1 Recommended Improvements

### 5.1.1 Potable Water Piping

Proposed improvements to the existing potable water system include:

- New piping throughout the plant to minimize maintenance costs and improve plant flows
- Backflow prevention and a suitable air gat to meet cross connection control requirements

### 5.1.2 Laboratory

Proposed improvements to the existing laboratory include:

- Improved HVAC facilities for better climate control and improved venting

Laboratory expansion is needed, but City engineering and operations staff have determined that this is not required as an interim upgrade.

### 5.1.3 Electrical/Control System

The existing electrical and controls systems are antiquated and difficult to get parts for. However, City staff feels they are able to keep them running during this interim period. Any new unit processes, however, will get updated power and controls systems.

# 6 Probable Costs

The probable costs of these upgrades were developed based on historical construction costs and are presented in Appendix A. These costs have an accuracy of -50 percent to +30 percent and should be updated prior to developing a final financing plan. The costs are summarized in the following table.

TABLE 6-1
Interim Improvement Costs
*March 2007*

| Item | Cost | Priority | Phasing |
|---|---|---|---|
| **Primary/Secondary** | | | |
| Headworks | $865,000 | High | 2007-2008 |
| Secondary Pumps (flow measurement) | $64,000 | Low | |
| Aeration Basins | $425,000 | High | 2006-2007 |
| Secondary Clarifiers | $94,000 | Low | |
| RAS Pumping | $89,000 | Low | |
| **Disinfection/Discharge** | | | |
| In-line Chlorine Meter | $26,000 | High | 2006-2007 |
| Dechlorination System | $215,000 | High | |
| Outfall | $26,500 | Moderate | |
| **Solids Handling** | | | |
| Primary Sludge Pumping | $195,000 | Moderate | |
| WAS Pump Replacement | $35,000 | Moderate | |
| WAS Pump Controls | $108,000 | High | |
| Sludge Thickening | $1,080,000 | High | 2007-2008 |
| Digester Odor Control | $80,000 | Moderate | |
| Digester Improvements | $377,500 | High | 2006-2007 |
| Energy Recovery | $135,000 | High | 2006-2007 |
| Heat Exchanger | $177,500 | High | |
| **Miscellaneous** | | | |
| Potable Water Piping/Pumping | $220,000 | Low | |
| Laboratory Upgrades | $23,500 | High | |
| **Total** | **$4,236,000** | | |

Note: Costs are based on 2006 dollars.

Based on conversations with City staff, only the high priority items will be programmed at this time. The total cost of these upgrades is $2.98 million. With projected revenues of $230,000 to $500,000 from new connections per year, the upgrades will need to be funded through bonds or by borrowing from other utility funds to meet the projected phasing schedule.

# 7 Design Criteria

Design criteria were established during the evaluation of options for the interim upgrades and through the development of budgetary cost opinions. Table 7-1 includes a summary of the design criteria that should be used for the recommended high priority upgrades. When available, equipment that was evaluated during the budgeting process has been included for reference.

TABLE 7-1
Interim Improvements Recommended Design Criteria for High Priority Items
*March 2007*

| ITEM | # of units | Type of Work | Capacity | Comments / Equipment Evaluated[1] |
|---|---|---|---|---|
| **Headworks** | | | | |
| Fine Screen | 1 + bypass channel | New fine screen | 6 mgd with 6 mm perforations | Rotamat |
| Grit Washer and Compactor | 1 | Replace existing unit | 45 cf/hr Minimum | Huber |
| **Secondary Treatment** | | | | |
| Aeration Basins | 2 | Retrofit existing basins | 2 @ 2.5 mgd ea | Conversion to Fine Bubble Diffusers |
| Blowers | 3 | Retrofit existing blowers | 2 @ 100 hp<br>1 @ 50 hp | VFD controls, on-line dissolved oxygen monitoring |
| **Disinfection** | | | | |
| Chlorine Control | 1 | | 14.97 mgd | Chlorine residual monitoring equipment and flow pacing, manual backup |
| Dechlorination | 1 + bypass | New dechlorination system | 14.97 mgd | Chemical feed equipment, residual monitors |
| **Solids Handling** | | | | |
| Energy Recovery | 1 | New gas scrubber | 50,000 cf/day | Varec iron sponge. Install adjacent to boiler. |
| Heat Exchanger | 1 | Replace existing | 455,000 BTU/day | Alfa-Laval, oversize |
| Sludge Thickening | 1 | New gravity belt thickener | 1-meter, 200 gpm | Andritz GBT, install in existing truck parking bay, construct new building to park truck in, re-coat sludge holding tank |
| Digester Improvements | 1 | Repair existing | --- | Clean digester, repair prv, new recirculation pump, new valving |
| WAS Pump Controls | 2 | Control Value Modifications | --- | Timer-controlled wasting and/or VFD control of wasting pumps |

1. Equipment that has been named was used for developing budgetary cost opinions related to required capacity. Specific equipment models, conformance with existing equipment, and detailed sizing have not been verified.

The impact of these changes to the capacity of each unit process is presented in Figures 10-1 and 10-2.

Figure 10-1 – 2015 Liquid Stream Capacity Summary (with Interim Upgrades)

Figure 10-2 – 2015 Solids Handling Capacity Summary (with Interim Upgrades)

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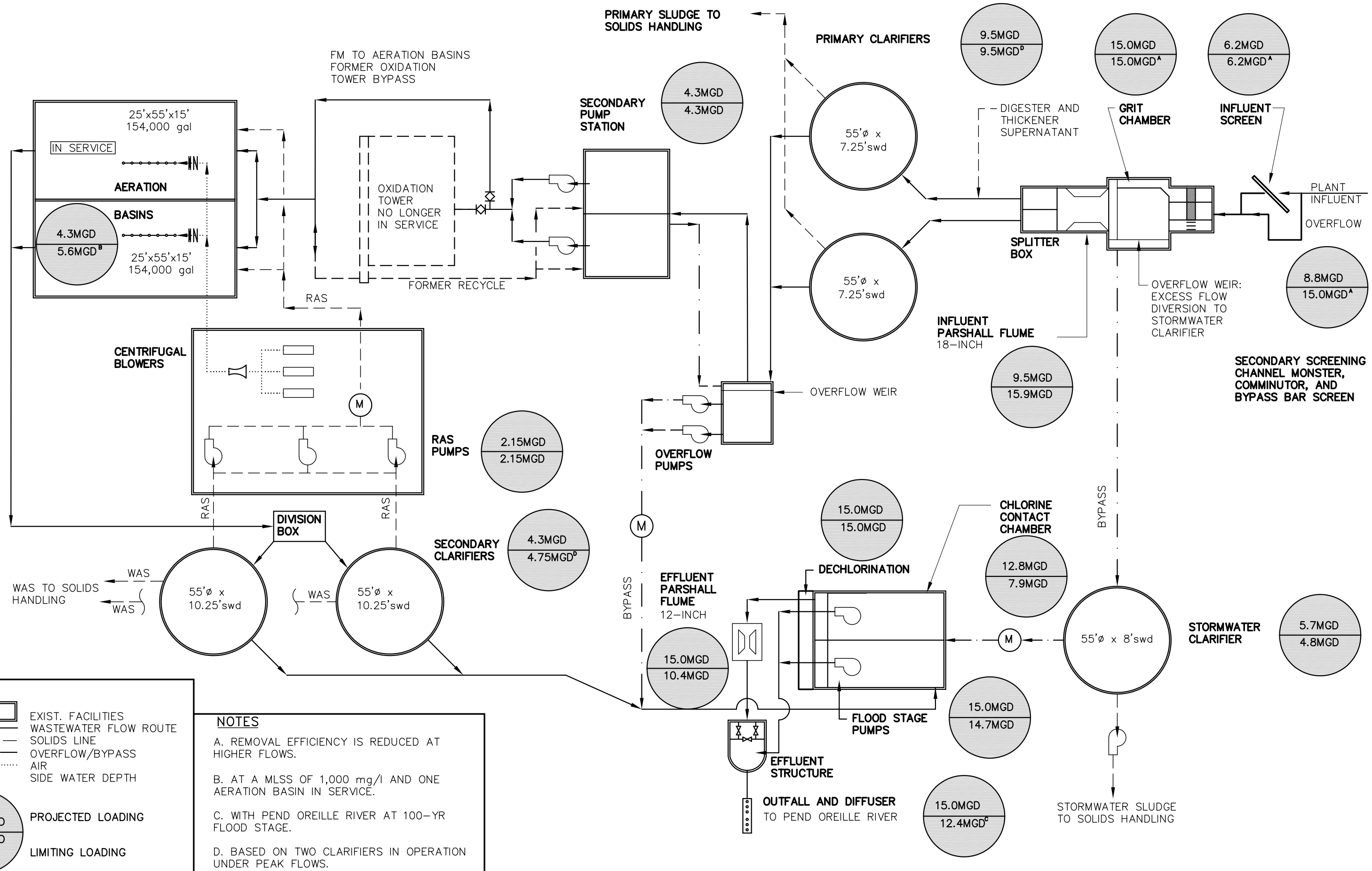


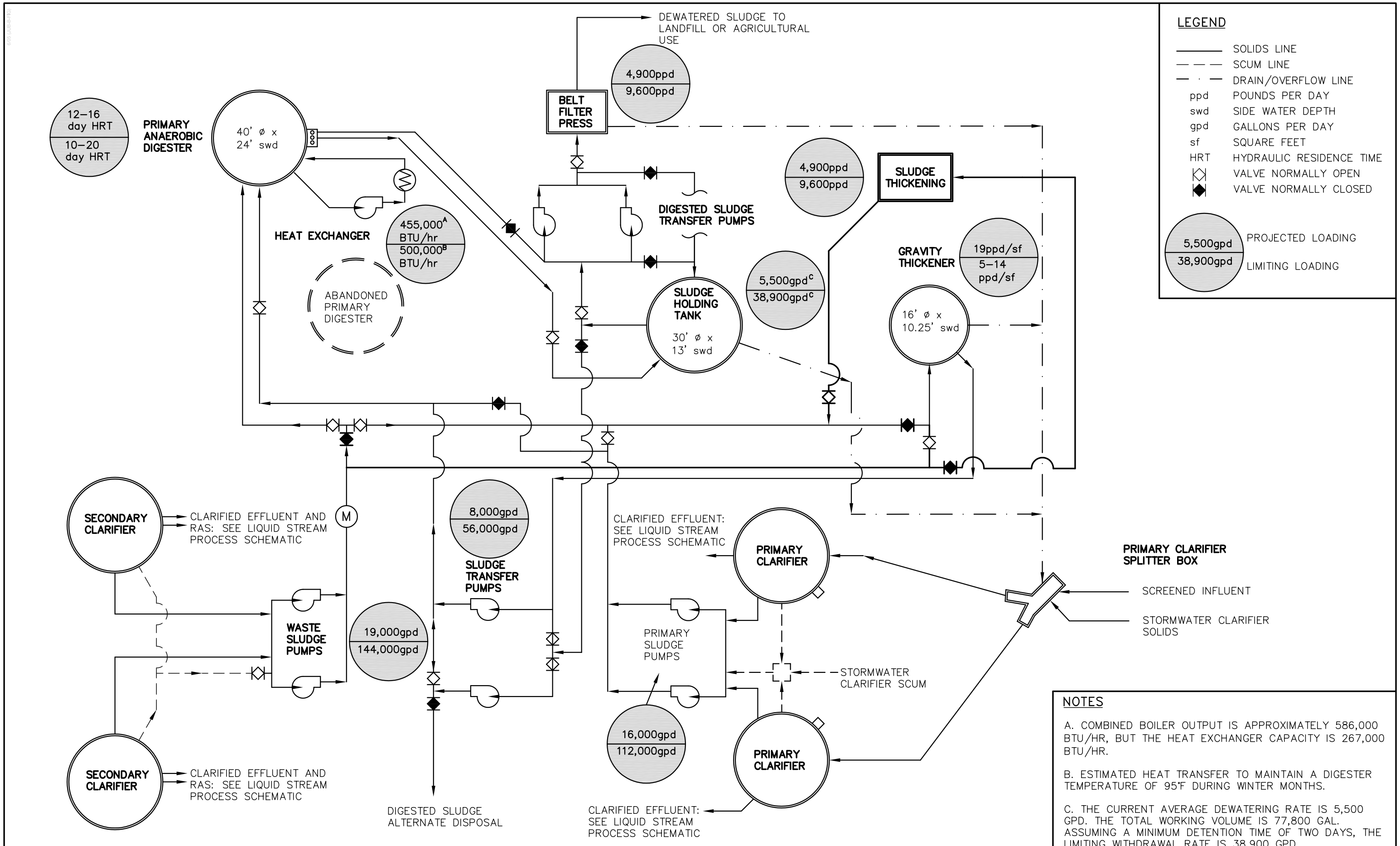

ESVELT ENVIRONMENTAL ENGINEERING
7605 East Hodin Drive., Spokane, WA 99212

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 10-1
2015 LIQUID STREAM CAPACITY SUMMARY (WITH INTERIM UPGRADES)

CAD FILE: SCHEMATIC

\\Cdafiles\Public\Projects\20-05-035 Sandpoint Wastewater Facility Plan\Design\dwg\SCHEMATIC.dwg, FIGURE 10-2, 3/21/2007 2:58:23 PM, wholder, J-U-B CDA




## NOTES

A. COMBINED BOILER OUTPUT IS APPROXIMATELY 586,000 BTU/HR, BUT THE HEAT EXCHANGER CAPACITY IS 267,000 BTU/HR.

B. ESTIMATED HEAT TRANSFER TO MAINTAIN A DIGESTER TEMPERATURE OF 95°F DURING WINTER MONTHS.

C. THE CURRENT AVERAGE DEWATERING RATE IS 5,500 GPD. THE TOTAL WORKING VOLUME IS 77,800 GAL. ASSUMING A MINIMUM DETENTION TIME OF TWO DAYS, THE LIMITING WITHDRAWAL RATE IS 38,900 GPD.

ESVELT ENVIRONMENTAL ENGINEERING
7605 East Hodin Drive., Spokane, WA 99212

SANDPOINT WASTEWATER FACILITY PLAN

FIGURE 10-2
2015 SOLIDS HANDLING CAPACITY SUMMARY (WITH INTERIM UPGRADE)

CAD FILE: SCHEMATIC

# Appendix A

# Detailed Opinion of Probable Costs

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Headworks Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Vertical fine screen, 6 mm perforations (partial flow) | 1 | LS | $ 225,000 | $ 225,000 |
| 2 | Grit washer and compactor | 1 | LS | $ 80,000 | $ 80,000 |
| 3 | installation and contractor mark-up | | | 40% | $ 32,000 |
| 4 | Electrical modifications | | | 27% | $ 21,600 |
| 5 | Structural modifications | 1 | LS | $ 25,000 | $ 25,000 |
| 6 | Building | | | | |
| 7 | 20 x 30 | 600 | SF | $ 110 | $ 66,000 |
| 8 | odor control (biofilter) | 1 | LS | $ 40,000 | $ 40,000 |
| 9 | misc. site work | 1 | LS | $ 25,000 | $ 25,000 |
| | **SUBTOTAL** | | | | **$ 514,600** |
| | **mobilization, bonding, administration** | | | 10% | $ 51,460 |
| | **contingency** | | | 30% | $ 154,380 |
| | **engineering, administration** | | | | $ 144,088 |
| | **TOTAL** | | | | **$ 864,500** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Secondary Pumping Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Flow metering | 2 | EA | $ 10,000 | $ 20,000 |
| 2 | installation and contractor mark-up | | | 30% | $ 6,000 |
| 3 | Electrical modifications | | | 25% | $ 5,000 |
| 4 | Controls improvements | 1 | LS | $ 10,000 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 41,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 4,100 |
| | **contingency** | | | 20% | $ 8,200 |
| | **engineering, administration** | | | 20% | $ 10,700 |
| | **TOTAL** | | | | **$ 64,000** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Aeration Basin and Blower**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Fine Bubble Diffusers | 1 | LS | $ 75,000 | $ 75,000 |
| 2 | Piping | 1 | LS | $ 50,000 | $ 50,000 |
| 3 | Equipment Installation | 1 | LS | 40% | $ 53,000 |
| 4 | Electrical | 1 | LS | 30% | $ 17,250 |
| 5 | 100 Hp Blower VFD | 2 | EA | $ 20,000 | $ 40,000 |
| 6 | 50 Hp Blower VFD | 1 | EA | $ 10,000 | $ 10,000 |
| 7 | Dissolved oxygen probe | 1 | LS | $ 7,500 | $ 7,500 |
| | **SUBTOTAL** | | | | **$ 252,750** |
| | **mobilization, bonding, administration** | | | 10% | $ 25,275 |
| | **contingency** | | | 30% | $ 75,825 |
| | **engineering, administration** | | | | $ 70,770 |
| | **TOTAL (Year 2005)** | | | | **$ 424,600** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Secondary Clarifier Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Stamford baffles | 2 | EA | $ 25,000 | $ 50,000 |
| 2 | Effluent launder coating/covering | 400 | LF | $ 25 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 60,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 6,000 |
| | **contingency** | | | 20% | $ 12,000 |
| | **engineering, administration** | | | 20% | $ 15,600 |
| | **TOTAL** | | | | **$ 93,600** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: RAS Pumping Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Flow metering | 3 | EA | $ 10,000 | $ 30,000 |
| 2 | installation and contractor mark-up | | | 30% | $ 9,000 |
| 3 | Electrical modifications | | | 25% | $ 7,500 |
| 4 | Controls improvements | 1 | LS | $ 10,000 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 57,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 5,700 |
| | **contingency** | | | 20% | $ 11,400 |
| | **engineering, administration** | | | 20% | $ 14,800 |
| | **TOTAL** | | | | **$ 88,900** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Chlorination System Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | In-line chlorine sampler | 1 | EA | $ 10,000 | $ 10,000 |
| 2 | installation and contractor mark-up | | | 30% | $ 3,000 |
| 3 | Electrical modifications | | | 25% | $ 2,500 |
| 4 | Dechlorination system | 1 | LS | $ 50,000 | $ 50,000 |
| 5 | installation and contractor mark-up | | | 30% | $ 15,000 |
| 6 | Electrical modifications | | | 25% | $ 12,500 |
| 7 | Sample manhole | 1 | LS | $ 25,000 | $ 25,000 |
| 8 | Chemical piping | 500 | LF | $ 50 | $ 25,000 |
| | **SUBTOTAL** | | | | **$ 143,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 14,300 |
| | **contingency** | | | 30% | $ 42,900 |
| | **engineering, administration** | | | | $ 40,000 |
| | **TOTAL** | | | | **$ 240,200** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Outfall Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Outfall repair | 1 | LS | $ 10,000 | $ 10,000 |
| 2 | Divers | 8 | HR | $ 250 | $ 2,000 |
| 3 | Permitting | 1 | LS | $ 5,000 | $ 5,000 |
| | **SUBTOTAL** | | | | **$ 17,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 1,700 |
| | **contingency** | | | 20% | $ 3,400 |
| | **engineering, administration** | | | 20% | $ 4,400 |
| | **TOTAL** | | | | **$ 26,500** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Primary Clarifiers Solids Pumps and piping**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Diaphragm Pumps | 2 | EA | $ 25,000 | $ 50,000 |
| 2 | Piping | 1 | LS | $ 25,000 | $ 25,000 |
| 3 | Installation | 1 | LS | $ 22,500 | $ 22,500 |
| 4 | Electrical | 1 | LS | $ 18,750 | $ 18,750 |
| | **SUBTOTAL** | | | | **$ 116,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 11,600 |
| | **contingency** | | | 30% | $ 34,800 |
| | **engineering, administration** | | | 20% | $ 32,500 |
| | **TOTAL (Year 2005)** | | | | **$ 194,900** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: WAS Pumping

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Pump replacement | 1 | EA | $ 15,000 | $ 15,000 |
| 2 | installation and contractor mark-up | | | 30% | $ 4,500 |
| 3 | Electrical modifications | | | 25% | $ 3,750 |
| 4 | Variable frequency drives | 2 | EA | $ 10,000 | $ 20,000 |
| 5 | Flow metering and valving | 1 | LS | $ 20,000 | $ 20,000 |
| 6 | installation and contractor mark-up | | | 30% | $ 12,000 |
| 7 | Electrical modifications | | | 25% | $ 10,000 |
| 8 | Controls improvements | 1 | LS | $ 10,000 | $ 10,000 |
| | **SUBTOTAL** | | | | **$ 95,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 9,500 |
| | **contingency** | | | 20% | $ 19,000 |
| | **engineering, administration** | | | 20% | $ 24,700 |
| | **TOTAL** | | | | **$ 148,200** |

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## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Solids Thickening**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Gravity Belt Press | | | | |
| 2 | Gravity Belt Press and equipment | 1 | LS | $ 150,000 | $ 150,000 |
| 3 | walkway and stairs | 1 | LS | $ 10,000 | $ 10,000 |
| 4 | Polymer System | 1 | EA | $ 10,000 | $ 10,000 |
| 5 | 1-1/2" poly piping | 100 | LF | $ 10 | $ 1,000 |
| 6 | installation and mark-up | | | 27% | $ 46,170 |
| 7 | Conveyor extension | 1 | LS | $ 50,000 | $ 50,000 |
| 8 | Mechanical piping | 1 | LS | $ 75,000 | $ 75,000 |
| 9 | Building | 800 | SF | $ 125 | $ 100,000 |
| 10 | HVAC | 1 | LS | $ 25,000 | $ 25,000 |
| 11 | Odor Control | 1 | LS | $ 50,000 | $ 50,000 |
| 12 | Electrical | 1 | LS | $ 75,000 | $ 75,000 |
| 13 | Recoat sludge holding tank | 1 | LS | $ 25,000 | $ 25,000 |
| 14 | Yard piping | 500 | LF | $ 75 | $ 37,500 |
| 15 | Transfer pumps | 2 | EA | $ 20,000 | $ 40,000 |
| | **SUBTOTAL** | | | | **$ 694,670** |
| | **mobilization, bonding, administration** | | | 10% | $ 69,467 |
| | **contingency** | | | 20% | $ 138,934 |
| | **engineering, administration** | | | | $ 180,614 |
| | **TOTAL (Year 2006)** | | | | **$ 1,083,700** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Digester odor control - new biofilter

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Biofilter including | 1 | LS | $ 30,000 | $ 30,000 |
| 2 | shell | | | | |
| 3 | media | | | | |
| 4 | Tank flashing | 94 | LF | $ 20 | $ 1,885 |
| 5 | Ducting (temporary above ground) | 250 | LF | $ 15 | $ 3,750 |
| 6 | Electrical including | 1 | LS | $ 12,500 | $ 12,500 |
| 7 | fan | | | | |
| 8 | additional electrical capacity | | | | |
| 9 | Repair PRV on digester | 1 | LS | $ 7,500 | $ 7,500 |
| | **SUBTOTAL** | | | | **$ 56,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 5,600 |
| | **contingency** | | | 20% | $ 11,200 |
| | **engineering, administration** | | | 20% | $ 14,600 |
| | **TOTAL** | | | | **$ 87,400** |

**J-U-B ENGINEERS, Inc.** 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: Digester Cleaning and Piping / Valving Upgrades

OWNER PROJ. NO.:

J-U-B PROJ. NO.: 20-05-035

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Digester Cleaning, including | 1 | LS | $ 150,000 | $ 150,000 |
| 2 | mobilization | | | | |
| 3 | pumps and screening equipment | | | | |
| 4 | screenings disposal (landfill) | | | | |
| 5 | additional belt filter press | | | | |
| 6 | Digester Biosolids Disposal (Class B) assuming | 475 | TON | $ 10 | $ 4,750 |
| 7 | solids content of 4% | | | | |
| 8 | 112,500 gal total in storage | | | | |
| 9 | land application by Woods | | | | |
| 10 | Digester Biosolids Disposal, assuming | 475 | TON | $ 50 | $ 23,750 |
| 11 | solids content of 4% | | | | |
| 12 | 112,500 gal total in storage | | | | |
| 13 | composting or landfilling | | | | |
| 14 | Ongoing Waste Generation Disposal, assuming | 112 | TON | $ 50 | $ 5,600 |
| 15 | solids generation of 4,000 ppd | | | | |
| 16 | composting or landfilling | | | | |
| 17 | no digestion 2 weeks prior to cleaning | | | | |
| 18 | no digestion for 2 weeks during cleaning | | | | |
| 19 | 25 to 35 days of storage while filling | | | | |
| 20 | 4 add'l weeks to meet Class B biosolids | | | | |
| 21 | Recirculation System Modifications | | | | |
| 22 | 12-in plug valves | 5 | EA | $ 2,500 | $ 12,500 |
| 23 | provide tee for future recirculation pump | 1 | LS | $ 10,000 | $ 10,000 |
| | relocate boiler feed | 1 | LS | $ 15,000 | $ 15,000 |
| 24 | replace recirculation pump | 1 | LS | $ 20,000 | $ 20,000 |
| | **SUBTOTAL** | | | | **$ 242,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 24,200 |
| | **contingency** | | | 20% | $ 48,400 |
| | **engineering, administration** | | | 20% | $ 62,900 |
| | **TOTAL** | | | | **$ 377,500** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Energy Recovery**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Scrubber | 1 | LS | $ 50,000 | $ 50,000 |
| 2 | Piping | 1 | LS | $ 2,500 | $ 2,500 |
| 3 | Concrete pad | 3 | YD | $ 850 | $ 2,550 |
| 4 | Installation | 1 | LS | 30% | $ 16,515 |
| 5 | Electrical | 1 | LS | 25% | $ 13,763 |
| | **SUBTOTAL** | | | | **$ 85,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 8,500 |
| | **contingency** | | | 20% | $ 17,000 |
| | **engineering, administration** | | | | $ 22,100 |
| | **TOTAL (Year 2006)** | | | | **$ 132,600** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Heat Exchanger**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Heat Exchanger | 1 | EA | $ 40,000 | $ 40,000 |
| 2 | Demolition | 1 | LS | $ 5,000 | $ 5,000 |
| 3 | Relocate Boilers | 1 | LS | $ 10,000 | $ 10,000 |
| 4 | Plumbing improvements | 1 | LS | $ 2,500 | $ 2,500 |
| 5 | Piping | 1 | LS | $ 15,000 | $ 15,000 |
| 6 | Installation | 1 | LS | 30% | $ 21,750 |
| 7 | Electrical | 1 | LS | 27% | $ 19,575 |
| | **SUBTOTAL** | | | | **$ 113,825** |
| | **mobilization, bonding, administration** | | | 10% | $ 11,383 |
| | **contingency** | | | 20% | $ 22,765 |
| | **engineering, administration** | | | | $ 29,595 |
| | **TOTAL (Year 2006)** | | | | **$ 177,600** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Potable Water Piping**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | 2" Water Piping | 750 | LF | $ 50 | $ 37,500 |
| 2 | Hose reels | 3 | EA | $ 1,000 | $ 3,000 |
| 3 | Misc. Hose bibs | 10 | EA | $ 250 | $ 2,500 |
| 4 | Lake pump | 1 | LS | $ 25,000 | $ 25,000 |
| 5 | Parallel irrigation lines | 100 | LF | $ 50 | $ 5,000 |
| | **SUBTOTAL** | | | | **$ 73,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 7,300 |
| | **contingency** | | | 20% | $ 14,600 |
| | **engineering, administration** | | | 20% | $ 19,000 |
| | **TOTAL (Year 2006)** | | | | **$ 113,900** |

**J-U-B ENGINEERS, Inc.** Suite A, 7825 Meadowlark Way, Coeur d'Alene, ID 83815 (208) 762-8787

## ENGINEERS OPINION OF PROBABLE COST

DATE: 2-Apr-07

PROJECT: City of Sandpoint Facility Plan
Interim Treatment Plant Improvements

PROJECT DESCRIPTION: **Laboratory HVAC**

TO:

OWNER PROJ. NO.: J-U-B PROJ. NO.: 20-04-128

| ITEM NO. | DESCRIPTION | SCHEDULE OF VALUES QUANTITY | UNIT | UNIT PRICE | TOTAL EST. COST |
|---|---|---|---|---|---|
| 1 | Air conditioning | 1 | EA | $ 7,500 | $ 7,500 |
| 2 | Vent Hood | 1 | EA | $ 5,000 | $ 5,000 |
| 3 | Misc. ducting | 1 | LS | $ 2,500 | $ 2,500 |
| | **SUBTOTAL** | | | | **$ 15,000** |
| | **mobilization, bonding, administration** | | | 10% | $ 1,500 |
| | **contingency** | | | 20% | $ 3,000 |
| | **engineering, administration** | | | 20% | $ 3,900 |
| | **TOTAL (Year 2006)** | | | | **$ 23,400** |

TECHNICAL MEMORANDUM NO. 11

## City of Sandpoint Wastewater Facility Plan

# Long-Term Treatment Plant Actions and Capital Improvement Plan

March 2007

# Contents

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Table 11-2 Design Criteria for 2025 Interim Conditions
Table 11-3 Design Criteria for Build-out Conditions for Sandpoint
Table 11-4 Wastewater Treatment Facilities for Sandpoint, Projected 20-year (2025) Flow and Loading
Table 11-5 Wastewater Treatment Facilities for Sandpoint, Build-out Flow and Loading
Table 11-6 Construction Phasing
Table 11-7 20-Year Capital Improvement Plan
Table 11-8 Projected User Rates (in future dollars)

# 1 Introduction

As discussed previously, the existing WWTP site is expected to be inadequate to contain the components required for the build-out treatment plant. Therefore, long-term wastewater treatment will likely be provided by a new facility located elsewhere, on a larger parcel of land[1]. The required facilities are discussed in Technical Memorandum No. 9.

Constructing a new facility will require several years and may be affected by the following:

- Sites suitable for the new treatment facility
- Potential Regionalization and the entities that choose to be involved
- Pumping and piping requirements to convey sewage to the new facility
- Interim phasing to transition between existing and new facilities
- Discharge permit
- Funding acquisition
- Rate and density of population growth

# 2 Potential Sites

Wastewater treatment facilities similar in size to those required by Sandpoint's build-out population are situated on parcels ranging from 10 to 20 acres. The plants sited on smaller parcels have higher odor and noise mitigation expenses and generally have more "good neighbor" concerns. The plants sited on larger parcels have larger buffer areas between the process facilities and neighbors and therefore can be made to look more "park-like" rather than industrial. Additionally, the green space surrounding the treatment plant provides opportunities for public education and can be irrigated with re-use water to serve as a demonstration site for water re-use.

The City should seek a parcel of land between 20 to 30 acres and budget accordingly in the CIP. The logistics of determining a specific site for the treatment plant is beyond the scope of this memorandum and will likely involve a study involving City staff and residents. However, due to available land and potential service areas, the area west of the railroad tracks and north of Pine Street was chosen for planning purposes because some of the City's existing collection system could gravity flow to that location.

As the City begins to look for future plant sites, consideration should be made to identify low-lying sites that are easily served by gravity and that have public support. The public involvement process should continue throughout the siting and construction process. Site acquisition planning should begin in the next 2 years.

# 3 Pumping and Piping Requirements

A new main pump station is required at the existing treatment plant to intercept the raw wastewater from the existing collection system and pump it to the new facility. A portion of the existing Lincoln Street sewer can be diverted near Pine Street to flow by gravity to the new plant. Future collection system development will be required to gravity drain to the new plant, if possible. Following treatment, the effluent would be routed back to the existing outfall. Therefore, an effluent line would be required from the new facility to the existing outfall. The effluent line would most likely parallel the new force main.

[1] New technology may offer alternatives that are not available today.

# 4 Construction Phasing

The build-out plant will serve the build-out population of approximately 37,200 residences and have a design flow of about 7.5 million gallons per day (mgd). To reduce the initial cost of construction, the build-out plant will be constructed in phases. To further reduce the cost of the initial construction, the existing treatment plant will continue to provide service until sufficient capacity is built at the new plant. The first phase will be more costly than following phases because flow routing facilities (pumping plants and force mains) have to be constructed to convey water to and from the new plant.

The design criteria for each phase are presented in Table 11-1 through Table 11-3.

TABLE 11-1
Design Criteria for 2015 Conditions
*March 2007*

| Design Criteria | Units | 2015 | 2015 50% I/I Reduction |
|---|---|---|---|
| Base Flow | mgd | 1.4 | 1.4 |
| Avg. Dry Weather Flow | mgd | 2.8 | 2.2 |
| Avg. Monthly Flow | mgd | 3.6 | 2.6 |
| Maximum Month Flow | mgd | 6.1 | 3.9 |
| Maximum Day Flow | mgd | 15.0 | 8.4 |
| Average Annual BOD | #/day | 5,050 | 5,050 |
| Maximum Month BOD | #/day | 6,870 | 6,870 |
| Maximum Day BOD | #/day | 16,680 | 16,680 |
| Average Annual TSS | #/day | 3,900 | 3,900 |
| Maximum Month TSS | #/day | 5,920 | 5,920 |
| Maximum Day TSS | #/day | 18,710 | 18,710 |
| Average Annual TKN | #/day | 329 | 329 |
| Maximum Month TKN | #/day | 447 | 447 |
| Maximum Day TKN | #/day | 1,085 | 1,085 |
| Average Annual TP | #/day | 97 | 97 |
| Maximum Month TP | #/day | 131 | 131 |
| Maximum Day TP | #/day | 318 | 318 |

TABLE 11-2
Design Criteria for 2025 Interim Conditions
*March 2007*

| Design Criteria | Units | 2025 | 2025 50% I/I Reduction |
|---|---|---|---|
| Base Flow | mgd | 2.07 | |
| Avg. Dry Weather Flow | mgd | 3.7 | 2.9 |
| Avg. Monthly Flow | mgd | 4.5 | 3.3 |
| Maximum Month Flow | mgd | 7.2 | 4.6 |
| Maximum Day Flow | mgd | 16.00 | 9.1 |
| Average Annual BOD | #/day | 6,820 | 6,820 |
| Maximum Month BOD | #/day | 9,270 | 9,270 |
| Maximum Day BOD | #/day | 22,490 | 22,490 |
| Average Annual TSS | #/day | 5,770 | 5,770 |
| Maximum Month TSS | #/day | 8,770 | 8,770 |
| Maximum Day TSS | #/day | 27,690 | 27,690 |
| Average Annual TKN | #/day | 467 | 487 |
| Maximum Month TKN | #/day | 661 | 661 |
| Maximum Day TKN | #/day | 1,605 | 1,605 |
| Average Annual TP | #/day | 144 | 144 |
| Maximum Month TP | #/day | 194 | 194 |
| Maximum Day TP | #/day | 472 | 472 |

TABLE 11-3
Design Criteria for Build-out Conditions for Sandpoint
*November 2003*

| Design Criteria | Units | Sandpoint | 50% I/I Reduction |
|---|---|---|---|
| Base Flow | mgd | 4.3 | |
| Avg. Dry Weather Flow | mgd | 6.8 | |
| Avg. Monthly Flow | mgd | 7.6 | 5.5 |
| Maximum Month Flow | mgd | 10.7 | 6.2 |
| Maximum Day Flow | mgd | 19.6 | 10.3 |
| Average Annual BOD | #/day | 12,000 | 12,000 |
| Maximum Month BOD | #/day | 16,300 | 16,300 |
| Maximum Day BOD | #/day | 39,600 | 39,600 |
| Average Annual TSS | #/day | 11,900 | 11,900 |
| Maximum Month TSS | #/day | 18,100 | 18,100 |
| Maximum Day TSS | #/day | 57,100 | 57,100 |
| Average Annual TKN | #/day | 2,400 | 2,400 |
| Maximum Month TKN | #/day | 3,260 | 3,260 |
| Maximum Day TKN | #/day | 7,920 | 7,920 |
| Average Annual TP | #/day | 480 | 480 |
| Maximum Month TP | #/day | 650 | 650 |
| Maximum Day TP | #/day | 1,580 | 1,580 |

To facilitate project phasing, the new plant will initially be constructed with a capacity of 1.25 mgd to serve new growth. Subsequent upgrades will be constructed in 1.25-mgd increments. Each 1.25-mgd increment is able to treat the flow from approximately 6,200 residents to the expected build-out population of 37,200 residents.

Based on these flow and loading criteria, preliminary plant sizing is presented for the 20-year planning period in Tables 11-4 and full build-out in Table 11-5.

TABLE 11-4

Wastewater Treatment Facilities for Sandpoint, Projected 20-year (2025) Flow and Loading

*March 2007*

| | | | | | |
|---|---|---|---|---|---|
| **BIOLOGICAL TREATMENT - SEASONAL P REMOVAL, NITRIFICATION-DENITRIFICATION** | | | | | |
| **HEADWORKS - Peak Year Round Flow** | | | | | |
| Fine screens | 2 | 63" x 1/4" | + Reliability | | Rotomat #63 |
| Grit Chamber | 1 | 16'Φ | + Bypass | | Pista Grit #20 |
| **BIOLOGICAL TREATMENT - SECONDARY TREATMENT YEAR ROUND, BNR SEASONAL - May - October** | | | | | |
| Anaerobic Basins | 4 | 0.85 MG | Total | 4 @ 0.22 MG | Seasonal MMF, Φ = 2 hr |
| Anaerobic Mixers | 4 | 15 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Basins | 3 | 1.5 MG | Total | 3 @ 0.5 MG | Seasonal MMF, Φ = 1.1 hr |
| Anoxic Mixers | 3 | 25 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Recycle | | 24 mgd | Total | Pumps | Seasonal Recycle ~ 7:1 for NO3-N = 8 mg/l |
| Aeration Basins | 3 | 2.64 MG | Total | 3 @ 0.8 mgd | MM SRT = 11 days, MLSS = 4,000 mg/l |
| Aeration Horsepower | | 900 | + Reliability | Fine Bubble Aeration OR | Slow Speed Surface Turbines |
| **SECONDARY CLARIFIERS** | **3** | **80' Φ** | **16' swd** | **1 Redundant for Reliability** | **Circular, Suction Sludge Removal** |
| RAS Pumping | | 5,000 gpm | + Reliability | | Max @ MMF, 8,000 mg/l |
| WAS Pumping | | 320 gpm | + Reliability | | Max 6 hr/day wasting |
| **DISINFECTION** | | | | | |
| UV Disinfection | 2 | 55'x3' channels | + Reliability | 8 Modules of 40 lamps | Low pressure, high intensity dose = 50,000 NW•S/cm$^2$ |
| **EXCESS FLOW TREATMENT - Flow in Excess of Annual MMF or Seasonal MDF** | | | | | |
| Rapid Mix Basins | 2 | 18,000 Gal Ea | 2,000 CF | | HRT = 2 Min |
| Flocculation Basin | 1 | 92,000 Gal | 12,000 CF | | HRT = 10 Min |
| Clarifier | 1 | 42' Φ | 16' swd | 920 SF Settling Tubes | OR = 10 gpm/SF for Settling Tube Area |
| **SLUDGE THICKENING - Secondary Sludge (No Primary Clarifiers) - For Sludge Digestion** | | | | | |
| Gravity Belt Thickeners (GBT) | 1 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **SLUDGE DIGESTION** | | | | | |
| Aerobic Digesters | 3 | 1.9 MG Ea | 125'Φ x 20'd | Coarse Bubble Diffusers | 30 day SRT/HRT @ 4% DS, Max Mo Sludge |
| **LIQUID SLUDGE STORAGE - Short Term** | | | | | |
| Sludge Storage Tanks | 3 | 0.9 MG Ea | 90'Φ x 20'd | Coarse Bubble Diffusers | 7 day HRT |
| **SLUDGE DEWATERING - Digested Sludge or Stored Sludge w/o Digestion** | | | | | |
| Belt Filter Presses | 2 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **DEWATERED SLUDGE STORAGE & LAND APPLICATION** | | | | | |
| Covered Storage Area | | 3,300 CY | 17,500 SF | 6 Months Storage - 5' deep | Paved, Covered, Contained |
| Land Application Area | | 440 Acres | | 200 #N/Acre-Year | Managed, Tested Annually |

TABLE 11-5
Wastewater Treatment Facilities for Sandpoint Build-out Flow and Loading
*March 2007*

| | | | | | |
|---|---|---|---|---|---|
| **BUILD-OUT TREATMENT FACILITIES - BIOLOGICAL TREATMENT - SEASONAL P REMOVAL, NITRIFICATION-DENITRIFICATION** | | | | | |
| **HEADWORKS - Peak Year Round Flow** | | | | | |
| Fine screens | 2 | 63" x 1/4" | + Reliability | | Rotomat #63 |
| Grit Chamber | 1 | 16'Φ | + Bypass | | Pista Grit #20 |
| **BIOLOGICAL TREATMENT - SECONDARY TREATMENT YEAR ROUND, BNR SEASONAL - May - October** | | | | | |
| Anaerobic Basins | 4 | 1.44 MG | Total | 4 @ 0.36 MG | Seasonal MMF, Φ = 2 hr |
| Anaerobic Mixers | 8 | 10 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Basins | 4 | 3.0 MG | Total | 4 @ 0.75 MG | Seasonal MMF, Φ = 1.1 hr |
| Anoxic Mixers | 4 | 40 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Recycle | | 48 mgd | Total | Pumps | Seasonal Recycle ~ 7:1 for NO3-N = 8 mg/l |
| Aeration Basins | 4 | 5.6 MG | Total | 4 @ 1.4 mgd | MM SRT = 11 days, MLSS = 4,000 mg/l |
| Aeration Horsepower | | 1,600 HP | + Reliability | Fine Bubble Aeration OR | Slow Speed Surface Turbines |
| **SECONDARY CLARIFIERS** | **4** | **80' Φ** | **16' swd** | **1 Redundant for Reliability** | **Circular, Suction Sludge Removal** |
| RAS Pumping | | 7,500 gpm | + Reliability | | Max @ MMF, 8,000 mg/l |
| WAS Pumping | | 400 gpm | + Reliability | | Max 12 hr/day wasting |
| **EXCESS FLOW TREATMENT - Flow in Excess of Annual MMF or Seasonal MDF** | | | | | |
| Rapid Mix Basins | 2 | 15,000 Gal Ea | 2,000 CF | | HRT = 2 Min |
| Flocculation Basin | 1 | 75,000 Gal | 10,000 CF | | HRT = 10 Min |
| Clarifier | 1 | 36' Φ | 16' swd | 680 SF Settling Tubes | OR = 10 gpm/SF for Settling Tube Area |
| **SLUDGE THICKENING - Secondary Sludge (No Primary Clarifiers) - For Sludge Digestion** | | | | | |
| Gravity Belt Thickeners (GBT) | 2 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **SLUDGE DIGESTION** | | | | | |
| Aerobic Digesters | 4 | 3 MG Ea | 160'Φ x 20'd | Coarse Bubble Diffusers | 30 day SRT/HRT @ 4% DS, Max Mo Sludge |
| **LIQUID SLUDGE STORAGE - Short Term** | | | | | |
| Sludge Storage Tanks | 4 | 1.3 MG Ea | 100'Φ x 20'd | Coarse Bubble Diffusers | 7 day HRT |
| **SLUDGE DEWATERING - Digested Sludge or Stored Sludge w/o Digestion** | | | | | |
| Belt Filter Presses | 4 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **DEWATERED SLUDGE STORAGE & LAND APPLICATION** | | | | | |
| Covered Storage Area | | 6,700 CY | 40,000 SF | 6 Months Storage - 5' deep | Paved, Covered, Contained |
| Land Application Area | | 900 Acres | | 200 #N/Acre-Year | Managed, Tested Annually |
| **DISINFECTION** | | | | | |
| UV Disinfection | 3 | 55'x3' channels | | 12 Modules of 40 lamps | Low pressure, high intensity dose = 50,000 NW•S/cm$^2$ 60% transmissivity |

The interim upgrades for the existing treatment plant will be designed to provide ten years of additional life with a gradual transition to the new facility. A preliminary construction sequence is shown in Table 11-6.

TABLE 11-6
Construction Phasing
*March 2007*

| Phase | ER | Maximum Month Capacity Required mgd [1] | Peak Day Capacity Required [2] mgd | Estimated Year Complete | Existing Plant Capacity mgd | New Plant Capacity mgd | New Plant Peak Capacity mgd [3] | Peak Day Flow Handling mgd [4] |
|---|---|---|---|---|---|---|---|---|
| 1 | 10,000 | 3.6 | 11.8 | 2015 | 2.4 | 1.25 | 2.50 | 9.3 |
| 2 | 11,500 | 4.0 | 12.3 | 2020 | 2.4 | 2.5 | 5.0 | 4.8 |
| 3 | 13,530 | 4.5 | 12.9 | 2025 | --- | 5.0 | 10.0 | 2.9 |
| 4 | 18,650 | 5.7 | 12.9 | 2037 | --- | 6.25 | 12.5 | 0.4 |
| 5 | 23,775 | 6.9 | 13.1 | 2043 | --- | 7.5 | 15.0 | --- |

1. Base domestic flow plus base I/I contribution.
2. Assuming I/I reduction goals are eventually met and per capita is approximately 202± gallons per day.
3. Assuming the new plant can handle a peak day flow of twice the design flow.
4. Peak flow handling required is difference between peak flow and combined capacity of new plant and existing plant (2.5 mgd) - existing plant or facilities at new plant site.

Actual construction phasing will be based on treatment plant flow and equivalent connections. As a result, the assumptions used to project population, per capita contributions, and I/I reduction will have to be reevaluated periodically to maintain an accurate capital improvement program.

The projected project phasing is presented in the following table.

TABLE 11-7
20-Year Capital Improvement Plan
*March 2007*

| | 2014 | 2016 | 2020 | 2025 |
|---|---|---|---|---|
| New plant (1.25 mgd capacity) | $15.0 million | | | |
| Full nitrification/P removal (1.25 mgd) | | $5.0 million | | |
| Plant upgrade to 2.5 mgd | | | $20.0 million | |
| Plant upgrade to 5.0 mgd | | | | $21.6 million |
| Outfall + peak flow handling | $6.3 million | | | |
| **TOTALS** | **$21.3 million** | **$5.0 million** | **$20.0 million** | **$21.6 million** |

This table includes peak flow handling (primary clarification) at the new facility assuming I/I cannot be reduced. If peak flows continue to be treated at the existing plant site, the overall costs can be significantly reduced.

## 5 Infiltration and Inflow Reduction

Treatment plant capital costs are directly related to treatment capacity. To minimize capital costs, extraneous flow should be eliminated to the extent possible. As discussed in Technical Memorandum No. 6, the existing system receives extensive extraneous flow in the form of I/I. Sandpoint has an aggressive program to remove 50 percent of the existing I/I from the influent and to maintain very low rates of I/I from new development. If the I/I reduction goal is not met, the phasing schedule may have to be shortened, the capacity of the build-out plant increased, and/or additional peak flow handling facilities included in the overall design of the new facilities.

## 6 Discharge Permit

New discharge requirements are expected to be phased in over the next 20 years. Ongoing conversations with the regulatory agencies should be maintained throughout the process. The ultimate project phasing includes future tertiary treatment units.

## 7 Funding

It is assumed that funding the new treatment facility will require substantial grant support. However, if the project is funded strictly by user rates, the following will be required.

TABLE 11-8
Projected User Rates (in future dollars)
*March 2007*

| Period | ERU | Pre-Payment Cost [1] | Monthly User Cost [2] |
|---|---|---|---|
| 2014-2015 | 10,030 | $2,200 | $17 [3] |
| 2016-2019 | 10,850 | $500 | $5 |
| 2020-2024 | 11,500 | $1,750 | $20 |
| 2025-2030 | 13,530 | $1,600 | $28 |

1. Based on 2006 costs.
2. Costs based on 2006 costs escalated by 5% per year to time of construction.
3. Costs do not include peak flow handling. Add $975 pre-payment and $5/month.

To ensure that growth pays its fair share of the required capacity improvements, the City should re-visit its current new user facility fees (NUFFs) within the next two years. The City also will need to begin planning to borrow money to build the proposed new treatment plant. All funding should be in place by 2011 to allow completion of construction by 2014.

TECHNICAL MEMORANDUM NO. 12

## City of Sandpoint Wastewater Facility Plan

# Regional Considerations

March 2007

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Table 12-2 Approximate Wastewater Loads
Table 12-3 Design Criteria for Regional Build-Out Alternative
Table 12-4 Biological Treatment
Table 12-5 Regional Treatment Options
Table 12-6 Regional Cost Comparison

# 1 Regionalization Background

Wastewater collection and treatment services in the North Lake Pend Oreille Urban Area are currently provided independently by five different entities—the cities of Sandpoint and Dover, the Kootenai-Ponderay and Southside Sewer Districts, and Schweitzer Mountain Utilities. All five entities have aging facilities that are either at or near capacity and have determined that each of their existing wastewater treatment facilities will need to be extensively modified to continue to provide service and protect the environment. As part of this master planning project, the City of Sandpoint (the largest municipality in the urban area) investigated wastewater treatment regionalization to provide service to the North Lake Urban Area.

# 2 Citizen Advisory Committee

To bring the regional stakeholders together, the City of Sandpoint sponsored the creation of a Citizen Advisory Committee to provide input regarding future wastewater treatment facilities beginning in September 2005. The committee was made up of 18 individual residents, business leaders, and civic leaders representing the cities of Dover, Ponderay, Kootenai, and Sandpoint as well as the Kootenai-Ponderay Sewer District, the Southside Water and Sewer District, and the Mountain Utility Company. This Citizen Advisory Committee reached a unanimous agreement that a regional solution should be pursued and that the facility should focus on maximum protection of the Pend Oreille River.

Additionally, the committee recommended that a Feasibility Study be prepared to investigate the potential of Sandpoint's relocated facility also serving as a regional facility. The regional wastewater treatment plant could provide service to the North Lake Urban Area, including Dover, Kootenai, Ponderay, Sandpoint, Schweitzer Mountain, and parts of the County in the Sagle and Kootenai area, thereby eliminating four other wastewater treatment plants and allowing the removal of numerous septic tanks from service.

# 3 Design Criteria

To estimate the size of the potential regional facility, the wastewater flows and loads from each entity were estimated based on current Wastewater Facility Plans for Sandpoint, Southside Water and Sewer District (SWSD), and Kootenai-Ponderay Sewer District (KPSD). Flows and loads from Dover were estimated assuming a 3 percent growth rate. Flows and loads from Schweitzer were estimated using standard engineering assumptions based on the expected number of dwelling units at build-out as provided by Mountain Utilities Corporation. The estimated wastewater flows and loads are shown in Table 12-1 and Table 12-2, respectively.

TABLE 12-1
Approximate Wastewater Flows
*March 2007*

| Entity | Flow (mgd) | | ERUs |
|---|---|---|---|
| | Average | Peak | |
| SWSD [1] | 0.11 | 0.2 | 600 |
| Schweitzer [1] | 0.49 | 1.33 | 2,100 |
| KPSD [2] | 1.43 | 3.789 | 8,350 |
| Dover [3] | 0.47 | 1.27 | 2,000 |
| Sandpoint [1] | 7.5 | 19.61 | 23,775[4] |
| **Total** | **10.0** | **26.2** | **36,825** |

Notes:
SWSD = Southside Water and Sewer District
KPSD = Kootenai-Ponderay Sewer District

1. Approximate flow at build-out of existing boundary
2. Approximate flow at build-out of expanded boundary
3. Approximate flow in 40 years (not build-out flow)
4. ERU based on 37,171 residents at 2.29 res/ERU plus non-residential contribution of 7,543 ERU based on non-residential load of 3,771 lbs of $BOD_5$ at an equivalent load of 0.5# BOD/ERU

TABLE 12-2
Approximate Wastewater Loads
*March 2007*

| Entity | Average Load (pounds/day) | |
|---|---|---|
| | $BOD_5$ | TSS |
| SWSD | 202 | 202 |
| Schweitzer | 905 | 905 |
| KPSD | 2,766 | 1,579 |
| Dover | 862 | 862 |
| Sandpoint | 12,000 | 11,900 |
| **Total** | **16,740** | **15,450** |

Based on these data, the design criteria are presented in Table 12-3.

TABLE 12-3
Design Criteria for Regional Build-out Alternative (including 50 percent Sandpoint reduction)
*March 2007*

| Design Criteria | | Regional | May-October Seasonal |
|---|---|---|---|
| Average Dry Weather Flow | mgd | 6.3 | |
| Average Monthly Flow | mgd | 8.0 | 7.2 |
| Maximum Month Flow | mgd | 11.3 | 8.2 |
| Maximum Day Flow | mgd | 18.5 | 13.7 |
| Average Annual BOD | #/day | 16,740 | 16,740 |
| Maximum Month BOD | #/day | 22,740 | 22,740 |
| Maximum Day BOD | #/day | 55,240 | 55,240 |
| Average Annual TSS | #/day | 15,450 | 15,450 |
| Maximum Month TSS | #/day | 23,500 | 23,500 |
| Maximum Day TSS | #/day | 74,130 | 74,130 |
| Average Annual TKN | #/day | 3,350 | 3,350 |
| Maximum Month TKN | #/day | 4,550 | 4,550 |
| Maximum Day TKN | #/day | 11,060 | 11,060 |
| Average Annual TP | #/day | 670 | 670 |
| Maximum Month TP | #/day | 910 | 910 |
| Maximum Day TP | #/day | 2,210 | 2,210 |

These projected flows and loads were used for preliminary sizing of a regional wastewater treatment facility.

TABLE 12-4
Biological Treatment
*March 2007*

| SEASONAL P REMOVAL, NITRIFICATION-DENITRIFICATION | | | | | |
|---|---|---|---|---|---|
| **HEADWORKS - Peak Year Round Flow** | | | | | |
| Fine screens | 3 | 63" x 1/4" | + Reliability | | Rotomat #63 |
| Grit Chamber | 1 | 18'Φ | + Bypass | | Pista Grit #30 |
| **BIOLOGICAL TREATMENT - SECONDARY TREATMENT YEAR ROUND, BNR SEASONAL - May - October** | | | | | |
| Anaerobic Basins | 6 | 1.88 MG | Total | 6 @ 0.32 MG | Seasonal MMF, Φ = 2 hr |
| Anaerobic Mixers | 6 | 20 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Basins | 6 | 4.10 MG | Total | 6 @ 0.68 MG | Seasonal MMF, Φ = 1.1 hr |
| Anoxic Mixers | 6 | 40 HP Ea | VFD Drive | Downflow Turbine | 50 HP/MG |
| Anoxic Recycle | | 68 MGD | Total | Pumps | Seasonal Recycle ~ 7:1 for NO3-N = 8 mg/l |
| Aeration Basins | 6 | 7.44 MG | Total | 6 @ 1.24 MGD | MM SRT = 11 days, MLSS = 4,000 mg/l |
| Aeration Horsepower | | 2,500 HP | + Reliability | Fine Bubble Aeration OR | Slow Speed Surface Turbines |
| **SECONDARY CLARIFIERS** | **6** | **90' Φ** | **16' swd** | **1 Redundant for Reliability** | **Circular, Suction Sludge Removal** |
| RAS Pumping | | 10,000 gpm | + Reliability | | Max @ MMF, 8,000 mg/l |
| WAS Pumping | | 450 gpm | + Reliability | | Max 12 hr/day wasting |
| **DISINFECTION** | | | | | |
| UV Disinfection | 4 | 55'x3' channels | | 16 Modules of 40 lamps | Low pressure, high intensity dose = 50,000 NW•S/cm$^2$ |
| **EXCESS FLOW TREATMENT - Flow in Excess of Annual MMF or Seasonal MDF** | | | | | |
| Rapid Mix Basins | 2 | 23,000 Gal Ea | 3,000 CF | | HRT = 2 Min |
| Flocculation Basin | 1 | 115,000 Gal | 15,400 CF | | HRT = 10 Min |
| Clarifier | 1 | 48' Φ | 16' swd | 680 SF Settling Tubes | OR = 10 gpm/SF for Settling Tube Area |
| **SLUDGE THICKENING - Secondary Sludge (No Primary Clarifiers) - For Sludge Digestion** | | | | | |
| Gravity Belt Thickeners (GBT) | 2 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **SLUDGE DIGESTION** | | | | | |
| Aerobic Digesters | 6 | 2.6 MG Ea | 150'Φ x 20'd | Coarse Bubble Diffusers | 30 day SRT/HRT @ 4% DS, Max Mo Sludge |
| **LIQUID SLUDGE STORAGE - Short Term** | | | | | |
| Sludge Storage Tanks | 6 | 1.22 MG Ea | 102'Φ x 20'd | Coarse Bubble Diffusers | 7 day HRT |
| **SLUDGE DEWATERING - Digested Sludge or Stored Sludge w/o Digestion** | | | | | |
| Belt Filter Presses | 5 | 2 meter | | | 30 - 40 Hr/Wk Operation |
| **DEWATERED SLUDGE STORAGE & LAND APPLICATION** | | | | | |
| Covered Storage Area | | 9,200 CY | 50,000 SF | 6 Months Storage - 5' deep | Paved, Covered, Contained |
| Land Application Area | | 1,200 Acres | | 200 #N/Acre-Year | Managed, Tested Annually |

# 4 Preliminary Regionalization Cost Estimate

The same alternatives evaluated previously for Sandpoint's Master Plan were evaluated for regional treatment options. The estimated costs are presented in Table 12-4. The costs per connection are based on 36,825 equivalent connections.

TABLE 12-5
Regional Treatment Options
*March 2007*

| Option | Cost | Cost/ERU |
|---|---|---|
| 1. Basic Secondary Treatment | $101,500,000 | $2,700 |
| 2. Highest Quality River Discharge | $127,100,000 | $3,500 |
| 3. Basic Secondary Treatment with Seasonal Land Application | $167,500,000 | $4,400 |
| 4. Full Water Reuse | $330,500,000 | $9,000 |

The projected costs per ERU for the Sandpoint treatment facilities and a regional facility are compared to costs for other systems in Table 12-5.

TABLE 12-6
Regional Cost Comparison
*March 2007*

| | ERU | Project Cost | Cost/ERU |
|---|---|---|---|
| Southside Water and Sewer District | 600 | $4.1 Million | $6,800 |
| Kootenai Ponderay Sewer District (Current Boundary) | 4,100 | $9.8 Million | $2,400 |
| Schweitzer | | N/A | |
| Dover | | N/A | |
| Sandpoint Only – I/I Removal | 23,775 | $96,600,000 | $4,100 |
| Regional – I/I Removal | 36,825 | $127,100,000 | $3,500 |

# 5 Conclusions and Additional Study

Technical data gathered during Sandpoint's investigation found that a regional facility appears to be a viable, cost-effective approach and showed that a regional approach would improve environmental protection and reduce the costs per connection in the North Lake Urban Area. The preliminary evaluation was designed to determine if a detailed study of regionalization would be beneficial. Because the benefits appear significant, regionalization should be evaluated in more detail.

The timing is good to consider wastewater regionalization because the entire urban area has recently experienced a rapid increase in population, which has significantly reduced available wastewater treatment plant capacity. As a result, all five wastewater treatment providers must determine how to provide additional capacity, which could involve significant capital expenditures.

The entities have joined together and are currently seeking funding to study the specifics of wastewater regionalization with respect to all of the entities. The project would build on the work to date to more precisely determine costs for an overall regional system versus independent systems. Additionally, the project could review land use projections, investigate potential governance structures, review the legal aspects of forming a regional entity, determine project phasing, and create implementation plans for the entities. A critical aspect of this work would be public involvement and outreach since public acceptance is critical for its long-term success.

# Sandpoint Wastewater Treatment Plant Facilities Plan

## Public Involvement Summary
## May 2005 to January 2006

## Prepared by:
## The Langdon Group Inc.

## March 2, 2006

**Key Person Interviews**

**Summary:** May 11-12, 2005 Dan Adams of the Langdon Group and Brett Converse of J-U-B ENGINEERS conducted a series of interviews with stakeholders in the Sandpoint, Idaho area who were identified by the City of Sandpoint as being possible working group members as well as individuals representing the various communities, agencies, and demographics of the community.

Parties interviewed:

- Ray Delay - Ponderay Development Corporation
- Kootenai Ponderay Sewer District Office Staff
- Tim Closson - Kootenai Ponderay Sewer District
- Mary Mitchell – Rock Creek Alliance
- Verna Brady – Litehouse Corporation
- Wally Schmidt – Economic Development Corporation of Sandpoint (Bonner Business Center)
- William Herrington – City of Sandpoint, City Attorney
- Mark Williams – Bonner County Economic Development Corporation
- Karl Dye – Bonner County Commissioner
- Diane Williams and Ruth Watkins – Tri-State Water Quality Council
- Jim Quinn - Downtown Sandpoint Business Association
- Jim Janish – Dover City Council

*For a complete list of comments, see Appendix A*

**Background and Information Newsletter**

**Summary:** Draft and distribution of a project background and information newsletter. This letter serves a multipurpose role:

- Educate the public
- Clarify project purpose and need

- Invitation for public participation in the project
- Reduce uncertainty and clarify project roles
- Invitation to the open house
- Provide project contact information

The project background and information newsletter was distributed to the public through direct mail, email, and at distribution sites throughout the community. Distribution began June 20, 2005.

**Database**

**Summary:** The Langdon Group developed a project database that was populated with key stakeholders identified by the City of Sandpoint as well as parties recommended through key person interviews, the open house, and other activities throughout the project.

**Website**

**Summary:** Project website created by subsidiary of J-U-B Engineers and is located at www.jubprojects.com/sandpointwwtp Website not only provides up to date project information but also provides an outlet for the general public to post general comments and questions.

**Open House**

**Summary:** The Open House was held at the Sandpoint Community Hall on Monday, June 27th, 2005.
The public was invited to come and participate anytime between 4:00 and 8:00 pm and meet the project team, discuss alternatives with City personnel, and view informative displays.

The City of Sandpoint asked area residents and businesses to work together to successfully identify alternatives that will provide the most balanced solution for the wastewater needs of the community. Approximately 32 area residents attended the open house. *See Appendix B for list of attendees.*

**A. Advertise**

1. Newspaper Paid Advertising. Ads were ran in the Bonner County Daily Bee starting two weeks before the open house and the day of the event.
2. Press Release.
3. Radio: Public Service Announcements and Paid Advertising. Radio was identified as a primary source of news for many area residents. Due to the large potential project area radio ads were also placed.
4. 11x17 Posters. Posters were distributed throughout Sandpoint informing people of the open house (date, time, topics, invitation for involvement, etc.). Display sites included:
    - Library

- Senior Center
- City Hall
- County Offices
- Grocery Stores
- Bonner County Economic Development Corporation
- Downtown Sandpoint Business Association
- Kootenai Ponderay Sewer District
- Lighthouse
- Rock Creek Alliance
- Tri-State Water Council
- Coffee Shops

5. Personal Invitations by Email and Phone.

B. **Presentation** – Open House Format
   1. Display Boards. Display boards were drafted by the Langdon Group and covered such topics as: Frequently Asked Questions, project purpose and need, history, definition of master planning, potential options, project goals, and project schedule.
   2. Food. Food was provided by the City of Sandpoint.

C. **Comment Sheets.** Comment sheets were also distributed to participants with specific questions as well as the opportunity to express general comments and questions. Space was also made available for stakeholders to express interest in participation in the Citizen Advisory Committee (CAC). *For complete list of comments, see Appendix C.*

**Continuous Public Involvement**

**Summary:** The Langdon Group and J-U-B Engineers functioned throughout the project as a resource for public inquiries concerning the project. Phone calls, emails, and office visits were common place with involvement recorded into the project database.

A. **Press Relations.** An ongoing effort throughout the project and more especially at the time of the Citizen Advisory Committee selection of a preferred alternative, the Langdon Group worked with the various news agencies in the area. Press releases were distributed January 13, 17, and 30 as well as February 2, 2005.

   Press outlets were Bonner County Daily Bee, Sandpoint River Journal, 953 KPND (Radio), Sandpoint Reader, Spokesman Review (CDA), and The Inlander.

B. Elected Officials. Many elected officials were members of the CAC and thus had immediate involvement with the planning process. The Langdon Group maintained communication and provided updates with state elected officals including:
   - Eric Anderson – State Representative

- Joyce Broadsword – State Senator
- George Eskridge – State Representative
- Shawn Keough – State Senator

**<u>Citizen Advisory Committee</u> (CAC)**

**Summary:** A citizen advisory committee was formed from those interviewed in key person interviews as well as others that were identified by stakeholders and the city. The purpose of the advisory committee was to provide a depth and breadth of knowledge and input from the community in aiding the consultant team in the planning process. The advisory committee was not formed to make a final decision but to make a recommendation of preferred alternatives to the city.

A. **Identify Advisory Committee Members.** Advisory committee members were selected from each of the communities surrounding the City of Sandpoint and included plant operators, business, special interest, and regulatory agencies. Advisory Committee Members are:

- Brett M. Converse – J-U-B ENGINEERS, Inc.
- Carrie Logan – City of Ponderay
- Cindy Elliott – City of Sandpoint City Council
- Cindy Gooch – J-U-B ENGINEERS, Inc.
- Dan Adams – Langdon Group Inc.
- Diane Williams – Tri State Water Council
- Gary Westcott – Southside Water District
- Helen Newton – City of Sandpoint
- Jeanne Jackson-Heim – Selkirk Association of Realtors
- Jim Quinn - Sandpoint Business
- John Corn – Area Resident
- John Monks – Hydro-Geoscience
- John Tindall – Idaho Department of Environmental Quality
- Karl Dye – Bonner County Commissioner
- Kody Van Dyk – City of Sandpoint
- Maggie Becker – City of Dover
- Mark Williams – DCEDC
- Nancy Piatt – City of Ponderay
- Neal Hewitt – City of Dover
- Owen Marcus – Area Resident
- Randy Curless – City of Dover Mayor
- Ray Miller – City of Sandpoint Mayor
- Rosemary Shoong – Area Resident
- Ruth Watkins – Tri State Water Council
- Ryan Luttman – Bonner County Engineering
- Steve James – J-U-B ENGINEERS, Inc.
- Tim Closson – Kootenai Ponderay Sewer District

- Tom Trulock - Schweitzer
- Verna Brady – Litehouse

B. **Kick Off Meeting** – September 12, 2005.
**Summary:** The process began with the development of a partnering agreement which was then drafted as a team charter and signed by each member of the CAC. *See Appendix D.*

The purpose of the first CAC meeting was to help all members of the CAC to be on an even playing field by providing critical information about wastewater treatment facilities, project background and history, and context for the project. This task was accomplished by expert testimony from the consultant team, a field trip to the existing City of Sandpoint Wastewater Treatment Facility, and PowerPoint presentation.

C. **Second CAC Meeting** – October 18, 2005.
**Summary:** The purpose of the second CAC meeting was to learn about funding. An overview was presented by Cindy Gooch of J-U-B Engineers. The second task was to provide a summary of progress to date followed by a presentation reviewing other area wastewater facilities in the region.

Steve James led a discussion regarding the conditions of the existing facility and defined a regional plant and how other jointly managed facilities are run. The final discussion was over plant relocation options.

D. **Third CAC Meeting** – December 20, 2005.
**Summary:** Process began with Steve James of J-U-B Engineers providing an update on the consultant services. This included the review of the latest technical memos which had also been distributed to the committee prior to the meeting and were also posted to the project website.

The essence of the third CAC meeting was a review of a prior distribution of an alternative matrix. The matrix was a source of frustration for several people. Causes for frustration were a desire to make a decision now, lack of knowledge of alternatives and evaluation criteria, etc. While the process was a challenge for the group, the outcome was very effective for the consultant team.

After the review of the matrix scores, a facilitated discussion took place where each alternative and criteria were discussed and concerns, comments, and questions were all recorded. This invaluable information was then used as a narrowing tool to help the consultant team prepare for the fourth and final meeting where clear defined alternatives and proper criteria were used by the committee to select preferred alternatives and guidance to the city and the wastewater treatment facilities plan.

E. **Fourth CAC Meeting** – January 24, 2006.

**Summary**: Meeting purpose was to review treatment plant options, facility location, selection of a preferred alternative, and identification of next steps.

Treatment plant options were shared through a matrix and then the group asked clarifying questions. The group then discussed the details of where the preferred treatment plant should be located.

This all lead to the selection of preferred treatment plant process and location which was decided by a ballot vote. After the vote was tallied, the group reconvened and reviewed the decision. Upon review, it was decided that the vote process was correct and that all parties agreed with the results. The results were as follows:

- Voted 18 to 0 in favor of Regional Only Facility.
- Voted 16 to 0 in favor of locating the facility outside the City of Sandpoint. *Two committee members did not vote pending more knowledge of where the plant could be located outside of the City of Sandpoint.*
- Of the four options, the average score per option was:
  - Option 1 = 3.27
  - Option 2 = 1.27
  - Option 3 = 2.94
  - Option 4 = 3.05

*This was based on the ranking of the alternatives from 1 (most preferred) to 4 (least preferred).*

**Option 2** (the preferred alternative) was defined by having the highest water quality and could be river discharged. It would require 10 to 20 acres of land whether regional or kept in Sandpoint. Water quality would be treated to Class A and energy consumption is lower. Maximum flexibility is achieved with this quality of treated water and would allow for land application as well. Cost per ERU if kept in Sandpoint only is approximately $2,880 and if moved to regional would be approximately $2,560.

*For complete definition of alternatives and the evaluation matrix, see Appendix E.*

*For complete summary of the final CAC as well as the preferred alternatives, see Appendix F.*

Appendix A

**Sandpoint Wastewater Treatment Plant Master Plan**
**Key Person Interview Notes**
**Conducted May 11-12, 2005**

May 11-12, 2005 Dan Adams of the Langdon Group and Brett Converse of J-U-B ENGINEERS conducted a series of interviews with stakeholders in the Sandpoint, Idaho area who were identified by the City of Sandpoint as being possible working group members as well as individuals representing the various communities, agencies, and demographics of the community.

The following notes are grouped according to the person interviewed and common themes that appeared during the interviews. Under FAQ, the questions were asked by the person being interviewed and the responses were from Brett Converse of J-U-B.

This draft is most likely not appropriate for distribution to the public so as to protect individuals from judgment based on their comments. It is critical that we continue to provide a safe atmosphere for key individuals and their organizations throughout this process. A public version would be presented by theme, not by individual contributions.

## Key Person Interviews

### Ray Delay - Ponderay Development Corporation

The Community/Culture

- Have always considered the collection of cities in the region as one community.
- Would like to see the barriers that have been created between the communities brought down.
- In the future everything will be ranchettes. The older demographic that is moving to the area often wants this type of real estate. There are very few farmers that are under 50 years of age.
- Cultural considerations are: resort atmosphere, over 50, ranchettes, mix of old and new population (mix of people based on how long they have lived in the area).
- Floyd McGee of Ponderay has a great degree of influence and usually gets what he wants for the city.

Economics

- Ponderay has less than 600 population but generates the most money in Bonner County. Hardly any of the money comes back to Ponderay after going to Boise.
- The farmers Coop has to grow or it dies. The Coop prefers to have growth.
- Average age of Coop customers that attend the Coop annual meetings are 75 – 80 years old.

Regional Facility

- Have the new facility where it will not impact scenic views.

Existing Facility

- Ray lives down wind and does not smell the facility.
- If the existing facility stays, it will prohibit regionalization.

FAQ

- Question: Where would the new location for the regional facility be?
  Answer: Nothing has been identified at this time. Dover is the lowest elevation point but is the furthest away. Ralph is looking at moving the Dover facility further south.
- Question: Is regionalization part of a series of wastewater treatment plants?
- Question: How big of a geographical area would the new regional facility encompass? How far outside the community of Sandpoint?
- Question: Our local soil types, how do they handle growth?
- Question: How deep to the aquifer?

**Kootenai Ponderay Sewer District Office Staff**

The Community/Culture

- People need to be told that they Kootenai Ponderay Sewer facility is 30 years old.
- Sandpoint does not have any more capacity at the existing wastewater treatment facility.
- Challenge as to what happens during wet and dry years and how the water is used from the WWTP.
- Sandpoint Water is not adding to its existing boundary
- Sandpoint has everyone pay the same sewer rate but charges new customers a hook up fee. Adding pipe should be paid for by new development.

Economics

- The Kootenai Ponderay Sewer District board does not want to charge existing customers for new people to come on to the system.

FAQ

- Question: If we regionalize, will rates go up?
- Question: What happens in a scenario if say Sandpoint serves (whom serves) Northside water, suddenly quits selling Northside water?
- Question: Is Sandpoint looking to the Kootenai Ponderay Sewer District to help with their sewer problem?
- Question: What would happen to the Kootenai Ponderay Sewer District if there was a regional facility?
  Answer: It won't be a Sandpoint treatment facility; it will be a regional facility.

**Tim Closson - Kootenai Ponderay Sewer District**

General Comments

- There are two options:
  1. Us and Them

2. One regional plant. Will require proper management representing all of the communities.

- J-U-B Engineers is creating the master plan for the Kootenai Ponderay Sewer District. Once this is completed in July, this will give the district the data they needed to help make their comments.
- In doing the public involvement, please also contact the mayors of Kootenai and of Ponderay.

The Community/Culture

- Do public involvement early!
- Many people in the community have lived here for a long time.
- Many resident are older in age.

Economics

- Believe that the first question for the public will be about the economics of a regional facility. How much will it cost?

Regional Facility

- Has to have proper management in order to be able to work. PNCWA has some good examples for proper regional management.
- Sara Vigors is working with Boise State University on regional management plans
    - Has a short list of regional management examples
- Mechanics of a plant are easy. Sorting out the politics is the hard part.
- Regional plant board should be made up of people that are one step removed.
- Money is another key issue for a regional facility.
- Perception in communities of loosing control can also be a problem.
- Ability or lack of ability to annex into the sewer district will be a challenge.
- Make sure existing rate payers don't pay for extra improvements.

Existing Facility

- If the facility is to stay, will have to overcome past prejudices regarding increased rate because of Sandpoint.

**Mary Mitchell – Rock Creek Alliance**

General Comments

- Asked that we interview Marsha Phillips.
- Food and beverage have really helped the Rock Creek Alliance to get people out to their public meetings.

The Community/Culture

- Given the growth, people need to start thinking about planning!
- People in the community are familiar with the NEPA process.
- People in the community are united in their care for the lake. It might be a good idea to tie this project to the lake somehow to build community support.

Regional Facility
- Appreciate moving the existing facility.
- It makes sense for the communities to work together.
- Regional facility makes sense but doesn't know much about what a regional facility would entail.

Existing Facility
- Has been in the park near the existing facility and has smelled the sewer.
- The existing facility is not an eye sore. You can hardly see it.

FAQ
- Question: Will there be an effort to get the non-sewer district residents on the new proposed regional system?

**Verna Brady – Litehouse Corporation**
General Comments
- Have a new pretreatment operation at their manufacturing/packaging facility

The Community/Culture
- Give the community a chance to share their comments and questions. Some can get long winded so have a time limit for when comments can be received.

Existing Facility
- There are a lot of venues at Memorial Park. Sometimes the existing facility smells.
- The current WWTP site would be better used for other community options such as an amphitheatre, etc.
- If the facility stays where it is currently, keep it hidden, don't increase the smell, and don't put bad stuff into the stream.

FAQ
- Question: There is not much land at the existing Sandpoint WWTP. What will be done if more land is needed at this facility? Would Sandpoint take land away from the museum?
- Question: Where would we move the facility to for a regional plant?
- Question: Where would we get the money to redo the pipe (infrastructure) if facility moved?

**Wally Schmidt – Economic Development Corporation of Sandpoint (Bonner Business Center)**
General Comments
- The Montana mining waste is a consideration coming down steam to the Sandpoint community.

The Community/Culture
- People in Sandpoint don't play well with neighbors. Almost rivals.

- Wonders where the rivalry came from!

Regional Facility
- A regional facility does not bother him.
- Charge cities that are part of a regional facility according to usage. This is defensible.

Existing Facility
- Output is going to Sandpoint's lake. People are going to complain about this. Complaints already exist about Dover Bay dumping their waste into the river.

FAQ
- Question: How do we monitor where waste water comes from?
- Question: How are solids from the WWTP used currently?
  Answer: Liquid waste is treated to a level that it can be better than drinking water.

**William Herrington – City of Sandpoint, City Attorney**
General Comments
- The WWTP is a monumental problem

The Community/Culture
- Need an outside person to facilitate all of the greater community working together.
- City of Sandpoint is seen as being dictatorial.
- In the recent regional transportation plan, a problem was with equal voting rights. Population size some felt warranted Sandpoint getting more votes.

Regional Facility
- Moving locations will be a problem.
- Moving to a new location will most likely involve condemnation.
- Having a regional facility at Dover or beyond Dover is most likely the best option. There is a wetland there that could be part of the solution.

Existing Facility
- Would be in awe if the public wanted to keep the existing WWTP.
- We are limited in the lake front park.

**Mark Williams – Bonner County Economic Development Corporation**
General Comments
- Would like to see all of the current public involvement projects work under the same umbrella. Kootenai has "Kootenai Perspectives" which is a consensus group that works together for community problems.
- Likes the idea of there being a central office for these public involvement activities. This office probably should not be in Sandpoint because of Sandpoint perception by other cities.
- Eric Darstad might be a good person to also interview.
- The Sandpoint WWTP problem is a county wide problem, not just Sandpoints.

The Community/Culture

- Need a county manager that can balance the various city fiefdoms.
- People are shifting their responsibility and accountability to Sandpoint if they do nothing.
- The "no growth" people in the community will oppose a new regional facility.

Economics

- The current infrastructure situation in the community is a deterrent to attracting outside businesses.
- With a regional facility, need to be able to show the community how pocketbooks will be impacted long term.

Regional Facility

- Pro having a regional facility.
- Don't suboptimalize!
- Avoid using the name of one community to name a new regional facility.
- Old smelter site is a possible location for a new regional facility.

Existing Facility

- If we were to draw a circle on a map, how much would it cost based on distance from the existing facility?

FAQ

- Question: What would be the cost?

**Karl Dye – Bonner County Commissioner**

General Comments

- Use The Langdon Group to take political boundaries out of the process.
- Information for the public is the key to this project.
- The City of Sandpoint is looking at annexing part of Segle.
- Need to include DEQ and EPA. They need to help lead the charge.
- Sandpoint is part of the "3rd Coast"
- Need to promote awareness of the aquifer.
- Look at the "Rocky Mountain Foundation" based out of the University of Montana.
- County happy to provide a link to this project website through their home page.

The Community/Culture

- Avoid having the small communities feel that the county is telling them what to do.

Economics

- The only way the community can grow is with planning.

Regional Facility

- Regionalization is the only way!

- Helps to have a variety of lot sizes.
- Helps to have jobs that allow for residential growth that makes diversity (especially age) of residents in the community.

**Diane Williams and Ruth Watkins – Tri-State Water Quality Council**

General Comments

- There was a grant to look into much the same thing as is proposed in this project. This grant was awarded 16 years ago but the process failed because people from the community could not get together. Sandpoint was seen as the "bully" and people were afraid their communities would be annexed by Sandpoint.
- Create an email list for regular updates.
- Keep the public involvement process open!
- Dover and Sandpoint discharge so close together that it is difficult to tell who is discharging. This is a problem.
- In 2007 the current wastewater permits will expire.
- Dover did not use a public process before in dealing with their WWTP.
- Tri-State Water Council has monitored the river the past 2 years. Problems were found in the Priest River.
- Would like to see the Ponderay River listed for nutrients (TMDL)
- Dissolved gas is a problem. It currently exceeds EPA standards. It comes from dams.
- Look at the TMDL process!
- Recommended getting some long term residents involved. *When asked for names of long term residents that were trusted in the community, Ruth and Diane struggled to come up with a recommendation. This was experienced with virtually everyone we interviewed.*
- Recommended speaking with a representative of the Wood family. They have been in the area for a very long time. Cattle, timber, and gravel industry family businesses. They (Ruth and Diane) will ask the mother (matriarch) of the Wood family for a representative for this project.
- Thompson family has also been in the area for a long time. Do not know of an individual to ask.

The Community/Culture

- The community of Hope and East Hope are really struggling with their WWTP and growth.
- Keys to success with this project will be to have a wide array of people involved early. Each meeting ask who else should be involved.
- Since Dover is growing and expanding, wastewater will also have to expand there.
- Challenges to working with the public will be associated with Sunbirds migrating south. They commonly leave Sandpoint the first part of October. Can tell a difference in local traffic the day after Labor Day.
- People in the community understand water quality. The want it and it is a reason they live in the community. This applies to older and younger people and how long people have lived in the community does not matter.

Economics
- Land is so expensive.

Regional Facility
- Finding land will be the key challenge.
- Maybe a land owner will donate land for a new regional facility site.
- Both are in favor of a regional facility.
- For a regional facility to work, it has to be equally represented by all of the cities.
- Where a regional facility will discharge is critical.
- People that own property along the Ponderay River will probably have push back about discharge.

Existing Facility
- Resale of homes is a challenge due to the smell of the existing facility.
- At the 2004 Festival of Sandpoint, the facility really smelled. Many people came from out of town and this was not a good thing for visitors to experience.
- Current discharge is not seen as a problem.

FAQ
- Question: Before building the regional facility, will we have to expand the existing facility first to get by?
- Question: Is there enough land to use the existing as a regional facility?
- Question: Would it be a regional facility and then be a number of cell facilities around it?
- Question: Can the existing facility pre treat and then end the existing or new regional facility?
- Question: Would the facility have to be on the river?
- Question: Could the point source discharge go into the lake?
- Question: If the plant were at Sully Road, could we add communities to the east? Answer: Economics would be the key consideration in this alternative.
- Question: Where will the new regional facility discharge?

**Jim Quinn - Downtown Sandpoint Business Association**
General Comments
- The Byway has done a good job with public involvement. Repeat this effort to do regionalization.

The Community/Culture
- There are pitfalls of to much growth. Need to have balance.
- Perception is that big business runs everything.
- People live here because they do not want to be bothered.
- People here are fearful of change.
- Community needs to be a unique destination.

Economics

- There are strong economic reasons for a regional facility. Growth of industry and housing is limited if there is not infrastructure.
- County doesn't want to incur the infrastructure costs. This adds credence to regionalization.

Regional Facility

- Regionalizing makes sense but the challenge will be the divisions amongst the communities.
- Don't treat the facility as a "Sandpoint Wastewater Treatment Facility", make it a regional facility.

**Jim Janish – Dover City Council**

The Community/Culture

- Old baggage of the communities is the problem.
- Dover was incorporated in the late 1980's as a response to not being annexed into Sandpoint.
- The existing city council in Dover was all in the city at the time of incorporation.
- City of Dover is very busy at this time.
- Dover city council is the P+Z board and is doing the urban renewal.
- 200 to 400 new homes could be built west of Highway 2 in Dover.

Economics

- Dover has a CMAC grant to pay for paving Pine Street.

Regional Facility

- Long term regionalization makes sense.
- Dover is the logical place for a new regional facility because it is downstream.
- City of Dover has to deal with its growth issues before a regional WWTP can be built there.

FAQ

- Question: Does Dover want to be the site?
- Question: Will Dover still be allowed to have river discharge with a new regional facility?

## Appendix B

**Sandpoint Wastewater Open House**
**June 27, 2005**
**32 Attendees**

| Name | Address | Email | Phone |
|---|---|---|---|
| Maggie Becker | Box 86, Dover, ID 83825 | | 263-4060 |
| Marquerite Burge | Box 114, Dover, ID 83825 | | 263-9089 |
| Jessie DeMers | 180 Emerald Road, Ponderay, ID 83852 | | 263-6190 |
| Tim Closson | PO Box 562, Kootenai, ID 83840 | | 263-0229 |
| Molly O'Reilly | 206 N. 4th, Sandpoint, ID 83864 | | 610-6642 |
| Gretchen Hellar | 401 St. Clair, Sandpoint, ID 83864 | hellar@televar.com | 263-6893 |
| Jim Osman | 85 Knollwood Drive, Sandpoint, ID 83864 | | 265-4513 |
| Ruth Watkins | 307 N. 2nd, Sandpoint, ID 83864 | ruthtristatecouncil@sandpoint.net | 265-9092 |
| Mary Mitchell | 1319 N. Division, Sandpoint, ID 83864 | maryrca@rockcreekalliance.org | 265-8272 |
| Diane Williams | 307 N. Second #12, Sandpoint, ID 83864 | tristatecouncil@sandpoint.net | 265-5468 |
| Nancy Piatt | PO Box 500, Ponderay, ID 83852 | pondciti@bossig.com | 265-5468 |
| Jim Quinn | 550 Oden Bay Road, Sandpoint, ID 83864 | info@timberstand.com | 263-7748 |
| Gary R. Wescott | 50 Harbor View, Sagle, ID 83860 | gandvw@culdrcams.com | 263-2976 |
| Bryan Quayle | 606 S. Olive, Sandpoint, ID 83864 | | 263-4720 |
| Bob Thurston | 640 Whiskey Jack, Sandpoint, ID 83864 | | 263-6937 |
| Jim Haynes | 180 Lakewood Avenue, Sagle, ID 83860 | haynesontheweb@nctv.com | 265-4029 |
| David Broughton | 206 N. 4th Ave, #135, Sandpoint, ID 83864 | dcb@netw.com | 290-6577 |
| John Elsa | 1306 Lake Street, Sandpoint, ID 83864 | | 263-9245 |
| Ted Farmin | 516 N. 6th, Sandpoint, ID 83864 | | 290-1913 |
| Ryan Luttmann | 4100 McGhee Road, Suite C, Sandpoint, ID 83764 | rluttmann@co.bonner.id.us | 255-5681 |
| Helen Newton | 423 S. Huron, Sandpoint, ID 83864 | | 263-4950 |
| Skip Newton | 423 S. Huron, Sandpoint, ID 83864 | | 263-4950 |
| Bruce Vogelsinger | 365 Birch Haven Drive, Sagle, ID 83860 | | 265-5096 |
| Mark Williams | 378 Kaniksu Shores Road, Sandpoint, ID 83864 | | 265-6402 |

| | | | |
|---|---|---|---|
| John Monks | 512 Monroe, Sandpoint, ID 83764 | john@monkshydro.com | 255-7161 |
| Verna Brady | 55 Upper Syringa, Sandpoint, ID 83864 | nbrady@litehouseinc.com | 263-7569 |
| Bill Friedmann | 364 Pinecrest Lane, Sandpoint, ID 83864 | | 265-5178 |
| Dann Hall | PO Box 1311, Sandpoint, ID 83864 | dannhall@sisna.com | 263-4704 |
| Debra Harper | Mt. Utilities Co., Sandpoint, ID 83864 | dharper@schweitzer.com | 255-3042 |
| Karl Dye | 215 S. 1st Avenue, Sandpoint, ID 83864 | kdye@co.bonner.id.us | 265-1435 |
| Denise Dyans | 330 S. Florence, Sandpoint, ID 83864 | | |
| Eric Eldenburg | 600 4th Street West, Newport, WA 99156 | eeldenburg@jasewell.com | 437-2641 |

Appendix C

# Sandpoint Wastewater Open House
# June, 27, 3005
# Comments Received

**Do you have any questions or concerns?**

- Impact fees should be in place to cover evaluation and planning costs. Development and developers should pay for the increased cost associated with the growth.
- A regional system is needed, however, it needs to be controlled by an independent board and not any city.
- Regional wastewater and regional planning should go hand-in-hand. How proposed? Who pays beyond upgrading current plant? If use TIF in City, what additional burden to those outside urban renewal district? Integrate with GEM team surveys?
- You mention Selle as a possible site, providing services to the coast. What about the demand for services to the south? Ponderay's AIC extends to the south side vs Selle.
- Urgent need for a regional plant. More efficient, more cost effective and needed asap.
- Want to be kept up-to-date on time line.

**What additional information might help you better understand the project?**

- Please send us a hard copy (and electronic copy, if possible) of boards from open house. Or let us know if it's posted to the website. We're particularly interested in the map.
- Summaries of results of studies completed to date with cost projections.
- I would appreciate knowing what a "regional system" would entail, representation, etc.
- What are legal or political road blocks to regionalization?
- Are the questions you had on the boards answered?

**Additional comments, suggestions and/or ideas:**

- We're glad to participate in the process and provide comments on options throughout. Thanks for organizing the open house.
- Conservation? Cost of installing low-flow toilets in all bathrooms vs. expanding treatment, for example. Cost of diverting extraneous flow vs. treatment?

- Tax dollars will not be used effectively if we continue with separate rinky-dink systems.
- Build new plant in Selle area – dispose of effluent by land application.

Appendix D

**Sandpoint Wastewater Facility Plan**
**Citizen Advisory Committee Partnering Agreement**
September 12, 2005

We the partners of the Citizen Advisory Committee are assisting the City of Sandpoint and the consultant team of J-U-B Engineers to effectively develop a Wastewater Treatment Facility Plan. To accomplish this task, we are committed to learning as much as possible about this process and share our feedback with the City of Sandpoint.

To aid the City of Sandpoint as a Citizen Advisory Committee to achieve the best wastewater treatment facility plan possible, we are committed to the following goals:

1. **Effective Communication**
    - No infighting. Safe and respectful environment to speak and be heard.
    - Use of time limits as needed.
2. **Conflict Resolution**
    - Avoid conflicts before they happen avoiding personal or derogatory comments, listening, respecting.
    - Every idea has value.
3. **Public Outreach and Education**
    - Share the learning of the group with community.
    - Share the comments and questions we hear from the public.
4. **Develop a Plan!**
    - Show outside the box thinking.
    - Implement the plan.
5. **Finalize a Preferred Alternative**
6. **Continual Evaluation of the Planning Process**

Appendix E

| | Treatment Plant Options | | | |
|---|---|---|---|---|
| | **Option 1** | **Option 2** | **Option 3** | **Option 4** |
| | **Basic Secondary Treatment** | **Highest Quality River Discharge** | **Basic Secondary Treatment w/ Land Application** | **Highest Quality Full Water Reuse** |
| **Effluent Uses** | **River discharge** | **River discharge** | **Winter river discharge. Summer land application** | **Winter lagoon storage. Summer Residential lawn irrigation.** |
| **Land Required Sandpoint** | **10-20 acres** | **10-20 acres** | **1,800±** | **4,900±** |
| **Land Required Regional** | **10-20 acres** | **10-20 acres** | **2,400±** | **6,625±** |
| **Effluent Quality** | **Class C** | **Class A** | **Class C** | **Class A** |
| **Energy Consumption** | + | ++ | ++ | ++++ |
| **Flexibility** | **River Discharge Only Unless Purchase Land** | **Could be used if Land is Available** | **River discharge and Orchard irrigation** | **River discharge and lawn irrigation** |
| **Cost Per ERU Sandpoint** | **$2,200** | **$2,880** | **$4,040** | **$8,800** |
| **Cost Per ERU Regional** | **$1,920** | **$2,560** | **$3,560** | **$7,800** |

Appendix F

**Sandpoint Wastewater Facility Plan**
**Citizen Advisory Committee #4**

**January 24, 2006**
*Elks Golf Course*
*30196 Highway 200*
*Sandpoint, ID 83864*

**Attendees**
Tim Closson – Kootenai Ponderay Sewer District
Nancy Piatt – City of Ponderay
Ryan Luttman – Bonner County
Owen Marcus – Area Resident
Gary Wescott – Southside Water and Sewer District
Verna Brady – Litehouse
John Corn – Area Resident
Cindy Elliot – Sandpoint City Council
Karl Dye – Bonner County Commissioner
Carrie Logan – Area Resident
Tom Trulock - Schweitzer
Diane Williams – Tri State Water Council
John Tindall – Idaho Department of Environmental Quality
Jeanne Jackson-Heim – Area Realtor
Maggie Becker – City of Dover
Rosemary Schoong – Area Resident
Kody Van Dyk – City of Sandpoint
Ray Miller – Mayor, City of Sandpoint
Steve James – J-U-B Engineers
Brett Converse – J-U-B Engineers
Jennifer Hartwig – J-U-B Engineers
Dan Adams – Langdon Group

**Welcome and Introductions** – Dan Adams, Langdon Group
Group reviewed the December 20, 2005 Partnering Evaluation. Dan shared insights into thinking of the project in terms of Long and Short Term Needs. The long term solutions are approximately 10 years from taking place. There are short term needs that have to be met during that 10 year period as well as a continuation of dialogue regarding a regional facility, etc.

Dan also shared that the committee needed to listen closely to the discussion of Treatment Plant Options and Where The Plant Should Be Located as the group would be asked to vote on a preferred alternative during the meeting.

**Treatment Plant Options** – Steve James, J-U-B Engineers

Steve shared that there are 4 primary treatment plant options: 1. Basic Secondary Treatment, Highest Quality River Discharge, Basic Secondary Treatment with Land Application, and Highest Quality Full Water Reuse.

General Questions

- Tim Closson: If engineers design a new treatment plant, how long can it be expected to last?
    - Answer: Some of the mechanical equipment could be expected to last between 10 to 25 years. The concrete could last 50 - 100 years with proper care and maintenance.
- Ryan Luttman: Asked if the future WWTP alternatives and phasing being presented by Steve were focused specifically on the City of Sandpoint?
    - Answer: The phasing of the future WWTP and the unit process required to produce different qualities of effluent are the same for both the regional facility and for a Sandpoint only facility.
- Rosemary Schoong: Asked about certain months of discharge into the river (months of land application that are not necessarily the growing season or typical irrigation season).
    - Answer: About 4 months for land application, remainder for river discharge. Typically an agronomic land application effluent disposal operation can apply treated effluent to the land anytime the water demand is greater than the water supplied by the normal hydrogeological cycle (rain, dew, fog) which of course is during the dryer season. Because nutrient restriction are place on receiving water during the shoulder season when the natural water supplied is greater than the water demand, land application systems have to store effluent.
- Gary Westcott: What would be the sense of treating to a high level if you aren't going to use it?
    - To be more protective of the environment, and
    - To provide Class A effluent to potential users for re-use (Golf course, lawn irrigation, Athletic fields, cemeteries, etcetera). The availability of Class A encourages re-use.
- Diane Williams: What do you do with full water reuse in the winter?
    - Answer: Storage in winter then land apply in the growing season.
    - What we mean by growing season is when water demand is greater than the water supplied by natural methods. Technically, that time is called the application season.
- Carrie Logan - How many acres of irrigable land is there?
    - A very difficult question to answer because residential lawns, golf courses, athletic fields could all be irrigated with re-use water if Class A water was available and delivery system was in place. Additionally there are tracts of land that could be irrigated if they could be purchased.
- Rosemary Schoong: In which parts have you incorporated Ozone as opposed to chlorine?
    - Answer: The current goal is to decide if a regional plant if feasible and what quality of effluent to produce in general and broad term. The question regarding what kind of disinfection to use will have to be answered at a later

date. This is more of a general look at options…specific recommendations will be in final facility plan.

- Karl Dye: When cost planning could you focus on short term needs with phased additions to build out? Kind of a modular system? Is phasing is built into cost estimates?
    - Yes, the goal would be to build in increments. The final implementation plan will review phasing options.
- Karl Dye: Is there an opportunity to lease public lands?
    - Gary Westcott commented that land application systems typically require that public access to the land be restricted which is difficult to do because it removes public use.
- Maggie Becker: Will this be a self-sufficient utility?
    - Yes, typically wastewater treatment facilities are paid for by those that use them through user rate fees, connection fees etcetera.
- Tim Closson: Are there permits issued for lower classes of effluent (i.e. Class E)?
    - Answer: John Tindall answered that Class E effluent is the most common land application system effluent.

General Comments

- John Tindall: Estimated costs per ERU for regional facility at about $15 a month. (using DEQ loan rates and 30 year payback period)
- Steve James: Regarding reuse options, the soils are tight so cannot apply too much to land around the City of Sandpoint. Some groundwater recharge might be possible if some more porous soils found – possibly in an old drainage. This would require Class A water.

**Where Should the Plant Be Located** – Steve James, J-U-B Engineers
Steve led a discussion of possible plant location alternatives.

General Questions

- How does forest service feel about land application to their land? (See Gary's comment above)
    - John Tindall noted that the forest service generally requires that the land be purchased, not leased.
- Is a buried drip system possible?
    - Usually not economical on a large scale; however, high quality effluent can be used for residential irrigation where buried distributions systems have been installed.
- Does it make any sense for South Side and Dover to treat what they can with their existing facilities and send excess flow to Sandpoint's existing plant to relieve pressure on those communities until a regional plant can be built?
    - This question has to be answered in the next step of the regionalization process. It may be a good idea, if Sandpoint has sufficient capacity, for them to receive excess flow that cannot be treated by Dover and SWSD to prevent capital expenditures to increase capacity that would not be needed when a regional plant is built. Basically, a regionalization plan would be in effect

without a regional facility but with 5 local facilities that would be optimized to provide treatment where there is capacity until a new facility can be constructed.

- Maggie Becker: Is it possible for all sewer systems in existence right now to undergo study to see what the best option is?
    - Answer: That is exactly what is needed.

**<u>Selection of a Preferred Alternative</u>** – Dan Adams, Langdon Group
The committee voted on a preferred treatment option and voted on location.

Results:

A. Voted 18 to 0 in favor of Regional Only Facility.
B. Voted 16 to 0 in favor of locating the facility outside the City of Sandpoint. *Two committee members did not vote pending more knowledge of where the plant could be located outside of the City of Sandpoint.*
C. Of the four options, the average score per option was:
   - Option 1 = 3.27
   - Option 2 = 1.27
   - Option 3 = 2.94
   - Option 4 = 3.05

   This was based on the ranking of the alternatives from 1 (most preferred) to 4 (least preferred).

Discussion Comments and Questions

- What was the driving reason for the ranking Option 2 as the preferred alternative?
    - Class A
    - More flexible
    - Public Acceptance
    - Cost
    - Acreage required is possible to attain
    - Water Quality
    - Provides so much more of a known since river discharge is readily available and this technology for treatment allows us to meet future permits.
    - Makes most sense when it comes to population growth
- Statistically options 1, 3 and 4 are fairly close. Option 2 is a clear cut favorite.
- Public has to support the cost of the plan.
- If you go with Option 2 you can get to Option 4, if you go with option 4 you may not be able to go to option 2.
- Environmental concerns were more critical than cost when deciding between option 1 and 2.
- Could easily phase from 1 to 2.
- Can we irrigate to Memorial Field?

- Answer: Need to have a lot of political will to do that. We get so much rain there is not a huge driver to do this but the production of Class A effluent encourages re-use.

- Option 2 also fits into future regulations, why plan short now when we don't know what regulations will be in 10-20 years other than getting stricter.
- Why not do it big the first time instead of doing it small 5 times?
- The committee, as a whole, agreed to support to recommend regionalization, and Option 2.
- Maybe someday all of the current districts will not need to exist.

**Identification of Next Steps** – Dan Adams, Langdon Group

1. Continuation of Committee – Tim Closson indicated that the most logical thing to do next is to form a regionalization action committee consisting of members from the 5 entities to apply for grant money to study the feasibility of a regional plant from everyone's perspective. The action-committee-member entities would discuss with their respective Councils and Boards if they were willing to come up with matching money. The existing CAC would continue to exist and be revamped into a regional CAC. The action committee would report to the CAC monthly via emails and/or phone calls to update them on the grant funding. The entire group could meet in September for a face to face update.
2. Need to get commitment from:
    a. City of Kootenai
    b. City of Ponderay
    c. City of Dover
    d. City of Sandpoint
    e. Southside Water and Sewer District
    f. Kootenai-Ponderay Sewer District
    g. Schweitzer, and
    h. Bonner County.

The above entities could have representative on the action committee.

3. Civic Group presentations
    a. Best way to get feedback, or information out to the public. Need to have someone there to endorse, i.e. Engineer, CAC committee member, facilitator.
    b. Create talking points, PowerPoint presentation, FAQ's or an outline to take information to public, other meetings, luncheons etc.
    c. Create a ball park summary on what it would take to continue outreach program from all involved districts.
4. Put together a funding application for the study of regionalization to take to city council/board meetings.
    a. Letters of support from the entities and community.
    b. Mayor Miller agreed that Sandpoint could sponsor the grant
    c. Support letter outline send to CAC

5. Action Committee Face to face meeting to talk about funding? Or a summary. Money for a feasibility study? Have all entities as the name on the applicant?