FLATHEAD COUNTY

DNRC CONTRACT NO. RRG-10-1440

SEWAGE TREATMENT IN THE FLATHEAD BASIN

FOR THE

FLATHEAD REGIONAL WASTEWATER MANAGEMENT GROUP (FRWMG)

BY

CARVER ENGINEERING

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INTRODUCTION

Flathead County received a Renewable Resources Grant from the Montana Department of Natural Resources and Conservation (DNRC) to fund the efforts of the Flathead Regional Wastewater Management Group (FRWMG). The FRWMG advertised for a Statement of Qualifications from consulting engineers and through this process, Carver Engineering was selected as the County's Consultant.

In general, the services provided to the Group have included the preparation of this report and GIS mapping that covers the Flathead Lake and Stillwater River watersheds (See Figure IN-1 at the end of this section) and identifies existing public wastewater collection and treatment systems and existing on-site septic systems within the watersheds. The following report and mapping efforts prepared by Carver Engineering will fulfill the requirements of the DNRC Renewable Resources grant.

The specific scope of services agreed upon by Carver Engineering and the FRWMG included the following services for this report and GIS mapping:

- Review existing studies, plans, reports and maps written or obtained by FRWMG and/or produced by others relating to wastewater collection, treatment and disposal capacity and planning of the existing public wastewater facilities in the study area.
- Contact the owners/operators of the existing major wastewater facilities within the watershed to obtain collection system drawings, determine capacities and limitations of the collection and treatment systems, determine existing and projected wastewater flows, influent and effluent quality and obtain, where available, facility planning studies for the wastewater systems.
- Using available information, analyze the conveyance and treatment capacities of existing major wastewater facilities in the study area and compare with existing and projected flows from the service area to determine if sufficient excess capacity is available to serve additional areas outside of the current service area.
- Identify unsewered areas outside of the current established service areas of the existing major wastewater facilities that could be served by public wastewater systems.
- Develop estimates of general costs of collection system improvements into currently unsewered areas including gravity sewer main extensions, public sewage pumping stations, individual grinder pump stations, pressure mains, and sewer service lines.
- Prepare a map of the sewer service areas of the existing major wastewater facilities in the watershed.
- Prepare a map showing location of existing on-site septic systems within the watershed and classify the age of these existing systems. (Hours allotted are based upon using GIS information already entered into existing mapping systems of Flathead and Lake Counties. Time is not allotted for developing database for any existing septic systems not presently entered in mapping systems.)

- Prepare a map showing location of property in the watershed used for septage disposal by septic tank pumpers.
- Co-ordinate with Flathead County GIS Department to insure that all maps are compatible with the existing GIS mapping system of Flathead County.
- Prepare a written report that summarizes findings of works items listed above, summarizes the results of work performed by the FRWMG and presents any conclusions and / or recommendation developed by FRWMG.
- Attend FRWMG meetings as necessary during the course of this project.

Carver Engineering has completed the above scope of services and this report details those efforts. Collaboration was necessary with the Flathead City-County Health Department to fulfill some of the above-listed work items as the FRWMG has had numerous meetings prior to Carver Engineering's involvement in this project.

A large part of Carver Engineering's work on this project focused on GIS mapping of all of the stakeholder's public sewer systems, and the Figures and Exhibits (drawings) in this report provide a snapshot of the work completed. These drawings, for the most part, depict each City/District's public sewer system along with adjoining properties that are outside City/District limits and are served by on-site septic sewer systems. In this report, Carver Engineering has identified large or dense areas of septic systems within the vicinity of public sewer and then tried to determine if the public sewer system has the capacity to accept these septic systems.

As a part of the GIS mapping effort, Carver Engineering created a DVD with GIS shape files and associated attribute files common to all stakeholders. On this disk, a file folder labeled "Flathead County" contains files with information depicting On-site Septic Systems, Neighborhood Plans, Zoning Districts, Roads, City Limits, Water & Sewer Districts, Parcel Ownership, Tract ID and Section, Township and Range. Lake County's file folder contains files depicting On-site Septic Systems, Parcel Ownership, Zoning Districts and Roads. In addition to these "County" files there are other common GIS files such as Floodplain, Septage Application Sites, Soil Types, Watershed Boundaries and Wetlands. Each stakeholder will also have a file with just their own sewer system components for their use only. This system specific information will be available to only the individual stakeholder and will not be accessible to other stakeholders.

Each one of the above files can be loaded into a computer and stakeholders will be able to open each layer with their sewer system components in the background. For those stakeholders who are unfamiliar with the GIS mapping platform, Carver Engineering will provide, along with the DVD, detailed written instructions on how to download a free GIS program called ArcGIS Explorer that will allow them to use and view the information on the files described above.

We wish to thank all of the operators and system managers that assisted us in providing the data and reports necessary to complete this project. A few of the system managers and operators were concerned that widespread broadcast of their sewer

system data could diminish sewer system security. These concerns were addressed when the Flathead County Commissioners adopted Resolution No. 2321, a "Resolution regarding sharing of information obtained through the activities *(sic)* the Flathead Regional Wastewater Management Group" to deal with the sensitive nature of this information. A copy of the Resolution No. 2321 is provided in Figure IN-2 at the end of this section. With the exception of the Somers County Water & Sewer District, pertinent information on public wastewater systems was provided from all of the stakeholders.

All stakeholders will receive a copy of this report, with all stakeholder's sewer systems, in paper copy only. The above-referenced DVD will have common shape files for all stakeholders to use and each DVD will be customized with only the sewer system of the recipient stakeholder loaded on it. Additionally, the Flathead County GIS department will receive all of the shape files created for this project but will not place individual sewer system files within the public domain and will only distribute said files in accordance with Resolution No. 2321.

The following sections, presented in alphabetical order, describe the public wastewater collection and treatment systems for each municipality and each water & sewer district within the study area. The wastewater system information presented was, for the most part, obtained from existing Facility Plans, Facility Plan Updates or Preliminary Engineering Reports (PERs). Interviews with sewer system managers and operators were necessary due to the fact that most of the Facility Plans and PERs were written between 2004 and 2008 and some of the written information was outdated or needed further clarification. Due to the economic downturn and stagnant growth within the study area, recent actual population and wastewater flow growth is well below the estimates published in the Plans and Reports. Trying to project future populations and wastewater flows in 15 or 20 years was difficult and very likely inaccurate.

When interviewing system managers and operators, the information Carver Engineering generally requested was as follows:

- sewer system layout (maps)
- current population or EDUs served
- per capita wastewater flow used for projections
- treatment plant capacity and current average daily and peak daily flow data
- lift station information – name or ID number, location, type of station, number of pumps, pump horsepower and capacity, number, size & type of force mains
- existing or projected capacity problems with lift stations, gravity mains or sewer force mains
- any problems with infiltration and inflow (I&I)
- system improvements completed/planned since the writing of their Facility Plan
- the ability and/or willingness to accept septage at their treatment facility
- willingness and capacity to provide sewer service outside of existing service area

Again, we would like to thank all of those individuals who assisted us with this project.

In addition to the interviews, facility plans, plan updates and PERs, most of the information presented in the report on the sewer systems owned and operated by the Evergreen Water & Sewer District, the Meadow Lake Water & Sewer District and the Big Mountain Sewer District was obtained from Carver Engineering's long time experience with these wastewater collection systems. Carver Engineering has provided engineering services for each of these three districts for more than 25 years and was able to utilize drawings, information and knowledge we have acquired to complete these sections of the report.

A significant portion of the information presented on the City of Kalispell and City of Whitefish wastewater systems was obtained from the numerous projects Carver Engineering has done for these cities including the Kalispell Advanced Wastewater Treatment and Biological Nutrient Removal Facility, the Whitefish Phosphorus Removal Facility and numerous lift station, force main and gravity sewer main projects in both cities.

In the following report sections, Carver Engineering has identified clusters of on-site septic systems that are relatively close to public sewer and in very general terms, discussed how public sewer could be extended to pick up these septic systems. A more detailed examination of each particular area identified would need to be completed to come up with a legitimate construction cost estimate. Accordingly, Carver Engineering is providing a list of sewer components (See Figure IN-3 at the end of this section) along with an Opinion of Probable Cost for each item to give the stakeholders a general idea of the costs associated with extending their sewer system.

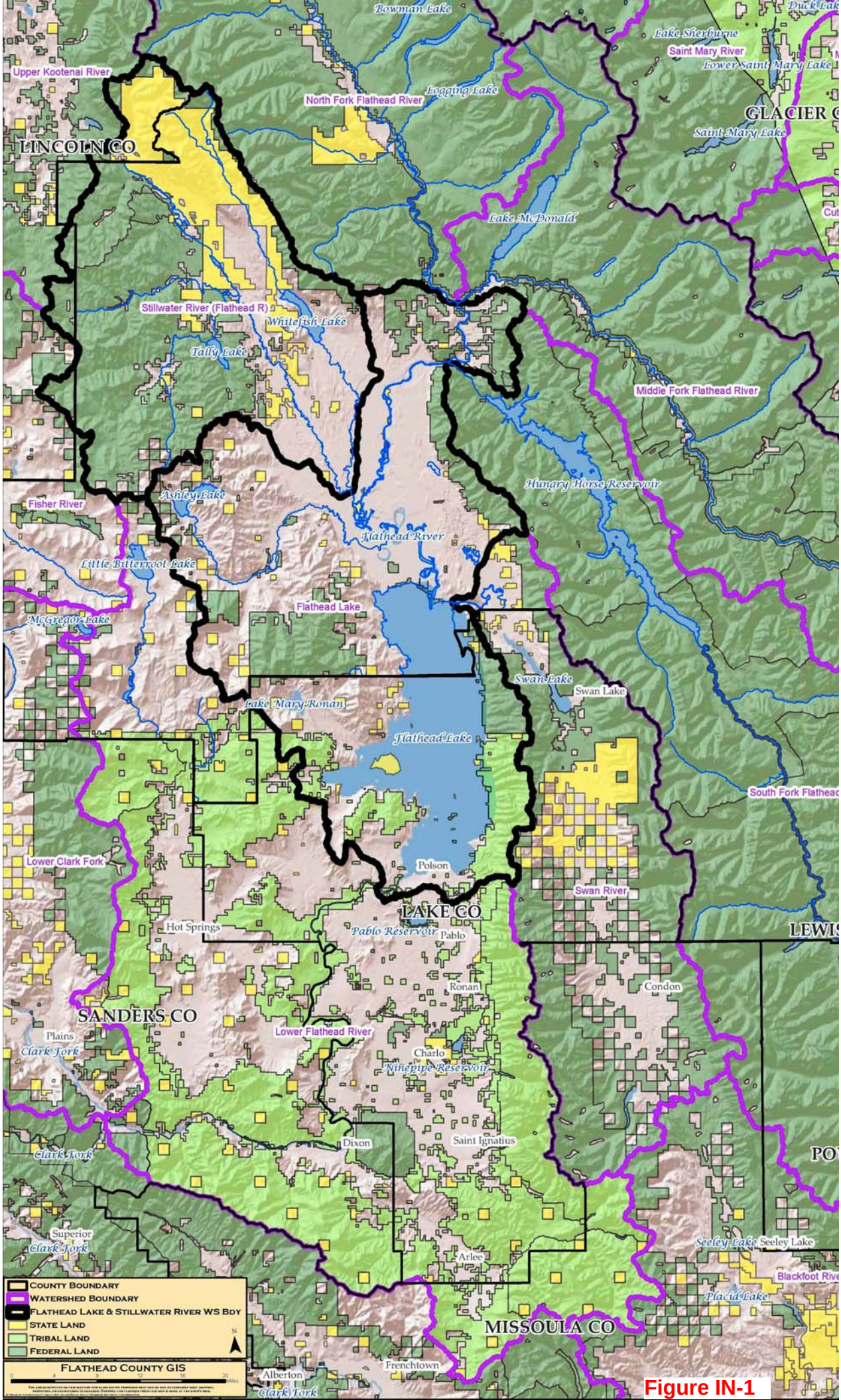

Bowman Lake
Lake Sherburne
Saint Mary River
Lower Saint Mary Lake
Upper Kootenai River
Logging Lake
North Fork Flathead River
GLACIER C
Saint Mary Lake
LINCOLN CO
Lake McDonald
Stillwater River (Flathead R)
Whitefish Lake
Tally Lake
Middle Fork Flathead River
Hungry Horse Reservoir
Ashley Lake
Fisher River
Flathead River
Little Bitterroot Lake
Flathead Lake
McGregor Lake
Swan Lake
Swan Lake
Lake Mary Ronan
Flathead Lake
South Fork Flathead
Lower Clark Fork
Polson
Swan River
LAKE CO
Hot Springs
Pablo Reservoir
Pablo
LEWIS
Ronan
Condon
SANDERS CO
Plains
Clark Fork
Lower Flathead River
Charlo
Ninepipe Reservoir
Dixon
Saint Ignatius
Clark Fork
PO
Superior
Clark Fork
Seeley Lake
Seeley Lake
Arlee
Blackfoot Rive
Placid Lake
MISSOULA CO
Frenchtown
Alberton
Clark Fork
COUNTY BOUNDARY
WATERSHED BOUNDARY
FLATHEAD LAKE & STILLWATER RIVER WS BDY
STATE LAND
TRIBAL LAND
FEDERAL LAND
FLATHEAD COUNTY GIS

Figure IN-1

Resolution No. 2321

Resolution regarding sharing of information obtained through the activities the Flathead Regional Wastewater Management Group.

Whereas, Flathead County is the recipient of a Renewable Resource Grant provided by the Montana Department of Natural Resources and Conservation hereinafter referred to as RRG-10-1440,

Whereas, a portion of the RRG-10-1440 is funding the "Flathead Regional Wastewater Management Study" (hereinafter "Study") characterizing wastewater facilities in Flathead and Lake Counties,

Whereas, some participating agencies that are public wastewater utilities have raised concerns about placing certain portions of their facilities on physical and electronic maps as they fear that it may put their public infrastructure at risk,

Whereas, Flathead County desires to collect this data so that a complete record of wastewater facilities is provided for the study, and

Whereas, certain records and materials are protected from public disclosure if such disclosure may interfere with individual or public safety, such as those described in Section 2-6-102, Montana Code Annotated.

Therefore, it is the intent of Flathead County to protect these wastewater facility records to the same extent that the participating facilities protect their information. Title 2, Chapter 2, Section 102 of the Montana Codes Annotated allows for certain records and materials to be protected from disclosure for matters of public safety.

Wastewater information will be compiled for the study and utilized by the contracted engineering firm to provide relevant information requested for the Study. Any physical maps generated for the report will not provide the level of detail that would compromise public safety. At the end of the Study, all electronic maps will be provided to the Flathead County and stored in a secure location. All requests for electronic information will be made in writing and only information that Flathead County and the public wastewater utility deem allowable will be released.

Flathead County will cite this law and not provide specific wastewater information that is considered by the public wastewater utility to be a matter of public safety, unless otherwise required by statute or a court of competent jurisdiction.

Dated this 18th day of January, 2012.

SEAL OF FLATHEAD COUNTY
CLERK & RECORDER
STATE OF MT.

BOARD OF COMMISSIONERS
Flathead County, Montana

By: _____
Dale W. Laaman, Chairman

By: _____
James R. Dupont, Member

By: _____
Pamela J. Holmquist, Member

ATTEST:
Paula Robinson, Clerk

By: _____
Deputy

Figure IN-2

Opinion of Probable Costs For Sewer Components - 2012		
Item Description	**Unit of Measure**	**Unit Price**
8" PVC Gravity Sewer	L.F.	$ 30.00
10" PVC Gravity Sewer	L.F.	$ 37.00
12" PVC Gravity Sewer	L.F.	$ 45.00
Imported Type A Trench Backfill	C.Y.	$ 20.00
Sewer Force Main:		
2" HDPE	L.F.	$ 22.00
3" HDPE	L.F.	$ 27.00
4" HDPE	L.F.	$ 32.00
6" HDPE	L.F.	$ 38.00
4' Diameter Manhole w/ Ring & Cover (5 - 7 ft. Depth)	Each	$ 2,400.00
4' Diameter Force Main Cleanout Manhole w/ Ring & Cover	Each	$ 7,200.00
4" PVC Gravity Service	Each	$ 900.00
1 1/4" HDPE Pressure Sewer Service	Each	$ 1,250.00
Individual Grinder Pump Station (Environment One)	Each	$ 5,400.00
Horizontal Directional Drilling (Force Main Crossings):		
2" & 3" HDPE	L.F.	$ 35.00
4" HDPE	L.F.	$ 45.00
6" HDPE	L.F.	$ 70.00
8" HDPE	L.F.	$ 100.00
Jack and Bore (Flatter Grade Gravity Sewer Crossings):		
16" Steel Casing	L.F.	$ 200.00
18" Steel Casing	L.F.	$ 230.00
20" Steel Casing	L.F.	$ 260.00
Duplex Submersible Lift Station w/ Generator:		
50 to 100 GPM	Lump Sum	$ 80,000.00
100(+) to 200 GPM	Lump Sum	$ 100,000.00
200(+) to 300 GPM	Lump Sum	$ 125,000.00
300(+) to 400 GPM	Lump Sum	$ 170,000.00
Septic Tank Pumping & Abandonment (Break & Fill)	Each	$ 1,000.00
Gravel Road Replacement	S.F.	$ 3.50
Asphalt Pavement Replacement	S.F.	$ 5.00
Vegetated Ground Restoration	S.F.	$ 2.50

Figure IN-3

BIG MOUNTAIN SEWER DISTRICT

DESCRIPTION:

The Big Mountain Sewer District was created in the 1974 to own, operate and maintain a public wastewater collection and treatment system to provide sewer service to commercial and residential development at the Big Mountain Ski Resort. At that time, the wastewater system consisted of a gravity collection system, a 3-cell lagoon system with 2 aerated cells and a storage cell, and a spray irrigation system located below (south of) the lagoon system.

In March 1983, the District entered into an agreement with the City of Whitefish to discharge treated wastewater to the City's wastewater system. A new sewer main was installed from the District's lagoon system to a manhole located at the intersection of Big Mountain Road and East Lakeshore Drive. The 1983 Agreement consisted of the following items: restricted the flow rate, set a time period when peak flows could be discharged and when more moderate flow rates would be allowed, set limits on wastewater quality; and required the District to pay for an upgrade in the capacity of the Viking Lift Station.

In December 2002, the Agreement between the City of Whitefish and the Big Mountain Sewer District was rewritten to allow the conveyance of raw untreated wastewater to the City's system. This 2002 Agreement required the District to fund a portion of design and construction of the new Viking Lift Station and it set the maximum number of equivalent dwelling units (EDUs) within the District at 2,000. For the purpose of this Agreement, a single dwelling unit was defined as, "…any structure rated for the use of a 3/4" or smaller size (water) meter". The most recent edition of the American Water Works Association (AWWA) Meter Size Manual was to be the accepted means of determining meter size. See Table BM-1 below to determine the number of EDUs for structures requiring a water meter larger than 3/4".

Table BM-1 – Water Meters & EDUs

Meter Size (inch diameter)	Equivalent Dwelling Units
3/4" or less	1.00
1"	1.79
1-1/2"	4.00
2"	7.14
2-1/2"	11.16
3"	16.00
4"	28.57
5"	44.64
6" or greater	64.29

In 2003, additional manholes were added to the existing sewer main running from the District's lagoons down to East Lakeshore Drive. New manholes and a 12-inch bypass sewer main were installed around the existing lagoon system, and new metering manholes were installed on the new main at Lagoon Cell #1 and just prior to connection to the City's manhole at East Lakeshore Drive. With these improvements, and the recently constructed new Viking Lift Station, the City granted permission to the District to abandon its lagoon system and discharge raw untreated wastewater to the City's sewer system. The 2002 Agreement between the District and City is still in effect today.

DEVELOPMENT WITHIN DISTRICT – CURRENT AND FUTURE:

The District tracks the number of EDUs within its service area very closely and, in May 2011, the District asked Carver Engineering to evaluate the total number of EDUs that are connected to the sewer system and the number that has been approved to connect to the system. In addition, the number of future EDUs was also to be counted. The District then wanted Carver Engineering to determine current and future peak wastewater flows. Table BM-2 shows a summary of EDUs and wastewater flows.

Table BM-2 – EDUs & Wastewater Flows

	EDUs	Wastewater Flow gal/day (gal/min)	Peak Flow (gal/min)
Platted Developed	503.45	125,863 (87.4)	326.3
Platted Undeveloped	412.30	103,075 (71.6)	271.7
Future	746.37	186,592 (129.6)	476.7
Remaining	337.88	84,470 (58.7)	225.8
TOTAL	2,000.00	500,000 (347.2)	1,126.70

The flows above were calculated using a wastewater flow of 250 gpd/EDU which is based on 2.5 persons per EDU and 100 gallons per capita per day (gpcd). In accordance with MDEQ Circular DEQ 2, peak flow was determined using "peaking factors" derived by the equation $(18 + P^{0.5})/(4 + P^{0.5})$ where population "P" is in thousands.

"Platted Developed" EDUs are those existing developed structures that are connected to the District wastewater collection system, situated on lots and tracts on file at the Flathead County Clerk & Recorder's Office. They include commercial and resort development, single-family houses, townhouses and condominiums. The "Platted Undeveloped" EDUs are those units that have been approved by the District to connect to the system but have not yet been constructed.

The “Future” EDUs can be debated as there have been a number of master plans for the Village area as well as a number of development plans for other undeveloped land within or adjacent to District boundaries. It was not realistic to include planned or future units as there are factors, other than the total number of allowable EDUs in the Agreement or the capacity of the District’s wastewater conveyance system, that would limit development within the District.

At the forefront of those limiting factors would be parking. Planned or future EDUs did include Elk Highlands, Phase 3 (Wapiti Woods), the most recent Village Area Neighborhood Plan, and The Glades, Phases 2 – 13. It should be noted that some of the units approved with the preliminary plat of The Glades, Phases 2 – 13 will likely never be developed as they are located in wetland or recently dedicated conservation areas. As indicated in the table above, the total combined number of EDUs (Platted + Future) is 1,662.12. This would leave a balance of 337.88 EDUs from the 2000 allotted in the Agreement.

WASTEWATER COLLECTION SYSTEM CAPACITY:

A. Lift Stations:

There are two (2) lift stations within the District service area and each of these lift stations serves only a small number of EDUs. The vast amount of wastewater is collected and conveyed to the City’s sewer system by gravity flow. See Table BM-3 for a summary of District lift stations.

Table BM-3 – Big Mountain Sewer District Lift Stations

Lift Station Name	Type	Capacity (gpm)	EDUs Current Approved	EDUs Future
Glades	Duplex - Submersible Flygt C-3140 - 15 Hp	120 gpm Each Pump	50	173
Base Lodge	Duplex - Submersible Flygt C-3140 - 15 Hp	282 gpm Each Pump	109	237

As wastewater from the Glades Lift Station is pumped to the Base Lodge Lift Station, the currently approved and future EDUs for the Base Lodge station in Table BM-3 above includes those EDUs generating flow to the Glades station. Wastewater from the Base Lodge station is pumped to a manhole on a 10” gravity main in Moose Run, Phase 1. Both of these lift stations are located in the southeasterly portion of the Whitefish Mountain Resort.

Although the pumps in each lift station are the same type and have the same sized impellers and motor horsepower, the pumps in the Glades Lift Station pump against 110 feet of total dynamic head (TDH) whereas the TDH for the Base Lodge Lift Station pumps is 96 feet. The pump curve is fairly steep. Both lift stations have 4" force mains – a HDPE force main for the Glades Lift Station and a PVC force main for the Base Lodge force main.

B. Gravity Sewer Mains:

The gravity sewer mains throughout the District consist of 8", 10" and 12" PVC pipe installed at grades in excess of respective minimum grades as specified in MDEQ's Circular DEQ-2. Within the District boundaries, the flattest section of 10" sewer main that could be considered a "trunk" or "interceptor" line is at 0.66%, and the capacity of this section of sewer main is approximately 800 gpm. The flattest section of 12" sewer main is at 1.03%, and the capacity of this section of sewer main is approximately 1,620 gpm. Neither of these mains convey all of the wastewater flow from the District. The 10" section referred to carries about 60% of the flow and the 12" section carries about 95% of the flow at this time.

From the District boundaries, down the mountain to the East Lakeshore Drive connection, sewer main sizes are also 8", 10" and 12". Based on a 2006 study done by Thomas, Dean & Hoskins for the City of Whitefish, titled "*Big Mountain Road Sewer Main Analysis*", they concluded that one section of existing 8" sewer main was unable to carry the projected full build-out peak flows from Big Mountain and from the development they were proposing – Lookout Ridge. Actually there were eight (8) sections that could not handle their projected flow of 1,498.6 gpm, but the other seven (7) sections were borderline and the one section between Manholes 31 and 31A was determined to be the controlling or limiting section with a capacity of only about 900 gpm. The other borderline sections were in a range of 1,233 to 1,402 gpm.

In 2009, the District replaced the section of 8" sewer main between Manholes 31 and 31A with a new 12" main, and they also replaced another problematic section between Manholes 28 and 29 with a new 12" main. The capacity of the new 12" main from Manhole 31 to 31A is now 1,870 gpm and the capacity of the new main from Manhole 28 to 29 is now 2,214 gpm. Both new sewer mains replaced existing mains with sections that actually had adverse grades, as evidenced by the camera going under water during a TV inspection. The existing District sewer main that conveys wastewater from the District to the City's manhole at East Lakeshore Drive now has more that sufficient capacity to carry current, proposed and future flows from the District.

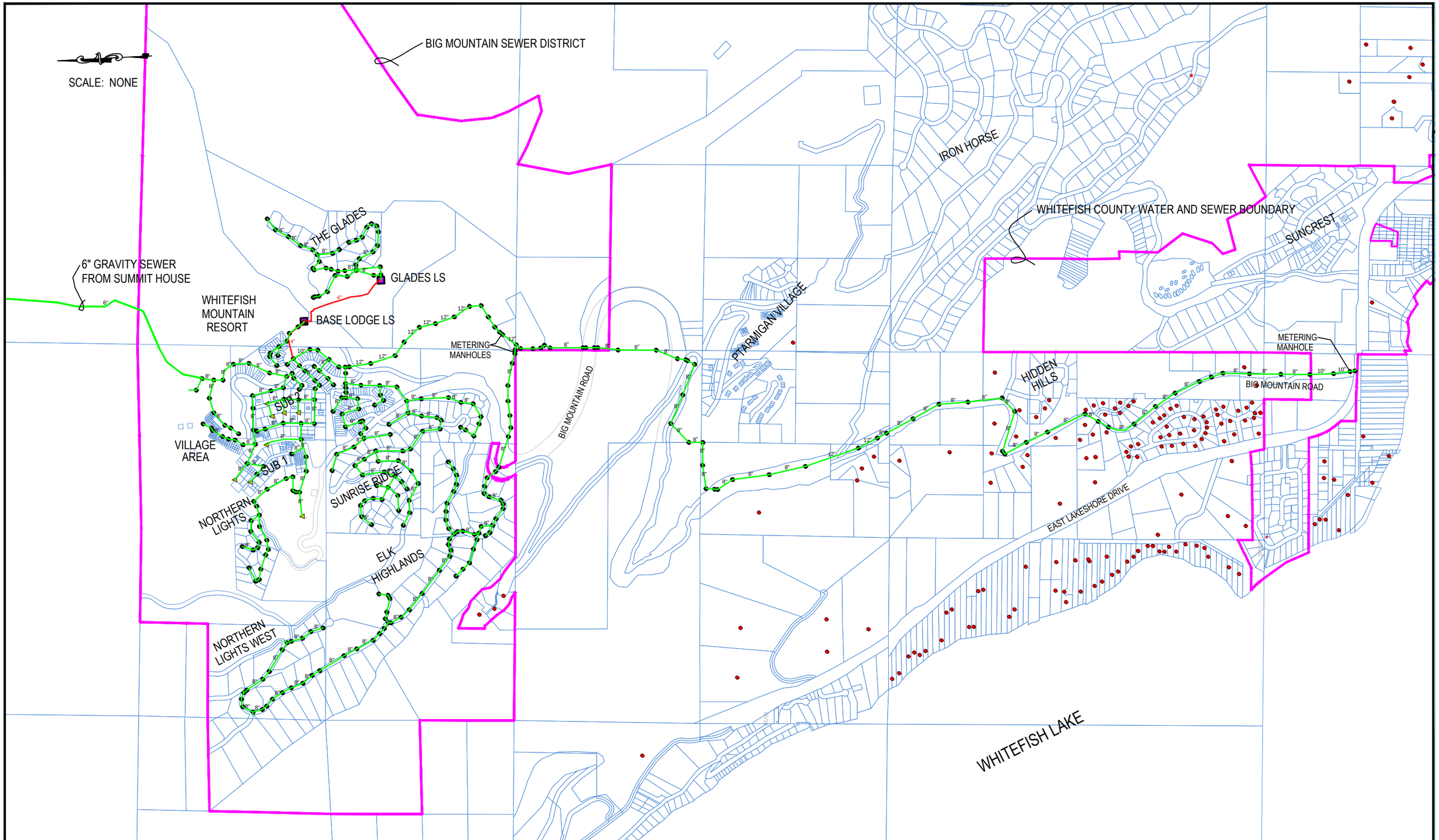
DEVELOPMENT OUTSIDE OF DISTRICT:

There have been numerous requests and inquiries over the years about existing and proposed development connecting to the District's sewer main running down Big Mountain to East Lakeshore Drive. The District has refused to allow any of these connections for several reasons.

The Agreement between the District and the City of Whitefish limits the total number of EDUs to 2,000, and although the District is currently not near that total, giving away allotted wastewater capacity could possibly jeopardize future growth within the District. Wastewater flow from the District is currently metered at three (3) locations – one on the 12" interceptor line near the old inlet to abandoned Lagoon Cell #1; one on the Elk Highlands' 8" main prior to its connection with the 12" interceptor line, also near abandoned Cell #1; and one at the bottom of the mountain just before connection to the City's manhole at East Lakeshore Drive. Any connection to the District's sewer main would also have to be metered requiring the District to first annex the new service area and then requiring the District to bill and collect fees from the new users.

Lastly, in accordance with the Agreement, no other party outside of the District's boundaries may connect to the District's collection system without the express prior written consent of the City and the District. The District is currently content with its Agreement with the City and is reluctant to do anything that may expose that Agreement to possible revisions that could adversely affect future development within the District or subject the District to additional operation and maintenance costs.

Figure BM-1 at the end of this section of the report shows the District boundaries, the District's wastewater collection system and properties with on-site septic systems in the general vicinity of the Whitefish Mountain Resort and the gravity conveyance line down the mountain to East Lakeshore Drive. Also see Exhibit BM-1 at the end of this report for a 24" x 36" plan sheet showing the same but at a much more readable scale.



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BIG MOUNTAIN SEWER DISTRICT

PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

LEGEND

SYMBOLS	DESCRIPTION
	Sewer Main
	Force Main
	Manhole
	Lift Station
	CleanOut
	Flathead County Septic Systems
	Water & Sewer Dist
	Flathead County Parcel

FIGURE NUMBER
BM-1

MARCH 15, 2012

BIGFORK WATER & SEWER DISTRICT

DESCRIPTION:

The Bigfork Water & Sewer District was created to provide public water and sewer service to an unincorporated community along the northeast shore of Flathead Lake where the Swan River drains into the lake. The Bigfork community is generally a summer-time recreational area which experiences rather significant increases in population during the summer months from both tourists and seasonal residents. There are a considerable number of second or vacation homes and condominiums. In the 2010 Census, it indicates there are a total of 3,243 housing units in the Bigfork area of which 1,083 were listed as being for seasonal, recreational or occasional use. It should be noted that not all of these housing units are within the Bigfork Water & Sewer District service area. The visitor component of the population fluctuation, combined with the seasonal residential component, causes highly varied demands on the District's water and sewer systems.

Some of the information presented in this Bigfork section, pertinent to the population within the District and wastewater treatment system flows, was obtained from Preliminary Engineering Report (PER) Updates prepared for the District by Morrison Maierle, Inc. The original 2006 PER was written for the District's proposed wastewater treatment facility, and updates were written in 2008 and 2012 to address changes in population projections, wastewater flows and various aspects of the proposed wastewater treatment process. The PER's describe in detail the differences in summer-time (June – September) and winter-time (December – April) populations and wastewater treatment plant flows; however, as this FRWMG report is more oriented toward collection and conveyance system capacities, only the summer-time data will be used and presented.

POPULATION ESTIMATES:

In the 2012 PER update, the total projected summer population within the District is broken into residential population, resident population in the Lake View Care Center and summer tourist population. The growth rate for the residential population to year 2030 is estimated to be 5.0% per year, and the growth rate for the Lake View Care Center and for summer tourists is estimated to be 2.0% per year. Even though there has been a noticeable decrease in the residential growth rate since 2008, the District decided to use the 5.0% growth rate per year through year 2030 to be "proactive" in their estimates of growth and subsequent wastewater flows to the treatment plant. They wanted to make sure they had sufficient treatment system capacity through year 2030. Table BF-1 on the following page shows the 2012 PER Update information on summer population within the District.

Table BF-1 – Summer Population Projections [1]

Population Component	2005/2006	2030
Residential Population	2,225	7,079
Lake View Care Center Population	66	100
Tourist Population	624	946
TOTAL POPULATION	**2,915**	**8,125**

[1] Information from Bigfork Water & Sewer District 2012 PER Update prepared by Morrison-Maierle, Inc.

It should be pointed out that the Residential Population component in the 2012 PER Update was actually further broken down into – Residential/Commercial Single Unit Sewered Connections and Projected Residential Population in Condominiums. For the single unit residential/commercial connections, they listed a total of 947 connections and then based the population on 2.08 residents per connection. In the 2010 Census data for Bigfork, they list the average household size at 2.19 persons/household. The data further lists the average household size of owner-occupied units at 2.22 persons per unit and the average household size of renter-occupied units at 2.11 persons per unit. As previously mentioned, the 2010 Census data was for the Bigfork Area in general and not specifically for the Bigfork Water & Sewer District.

WASTEWATER TREATMENT SYSTEM:

A new wastewater treatment facility (WWTF) is presently being constructed for the Bigfork Water & Sewer District and will likely be completed by March 2012. The existing secondary and tertiary components of the wastewater facility will be decommissioned and will be replaced by a new Membrane Bioreactor (MBR) system with UV disinfection of the final effluent. Only the headworks component of the existing system will remain as the headworks was upgraded in 2008 and is capable of adequately pretreating influent wastewater before being sent to the MBR. According to the 2010 PER Update, the MBR system was selected "…due to the low effluent limits (especially for nutrients) anticipated in future permits, the fact that MBRs provide the most treatment capacity per unit area compared to other technologies, and the MBR option was the most cost effective solution for Bigfork."

The new MBR facility has been designed to handle year 2030 projected annual average wastewater flow of 0.69 mgd with a maximum daily flow of 1.26 mgd and a peak hourly flow of 1.38 mgd. It should be noted that the 1.38 mgd peak hourly design flow is based on flow equalization being provided in the headworks and is not plant influent flow. According to the population projections, the year 2030 peak hourly plant influent flow will be 2.10 mgd. The current annual average flow is 0.23 mgd with a maximum daily flow of 0.53 mgd. The design flows were based on year 2030

population projections shown in Table BF-1 and using an annual average per capita flow of 85 gpcd and an average per capita summer flow of 100 gpcd.

With the new and larger capacity WWTF, the District will not only be able to produce a high quality effluent that meets or exceeds existing and future DEQ permit conditions, but it will be able to take on wastewater from previously unsewered areas with high densities of septic tank and drainfield systems. The most critical of these areas is the Woods Bay area in Lake County where there is a high density of septic systems most of which are in soils consisting of very coarse and highly permeable sand and gravel and which are thought by many to be a significant source of contamination and nutrients in Flathead Lake. The Greater Woods Bay Planning Area is currently in the process of looking for funding sources to help pay for the costs of installing infrastructure to collect and convey wastewater to the Bigfork Water & Sewer District's WWTF.

WASTEWATER COLLECTION AND CONVEYANCE:

The wastewater collection and conveyance system serving Bigfork consists of 8", 10" and 12" gravity sewer mains and a total of 16 "major" lift stations with 4", 6" and 8" force mains. There are a number of individual or privately owned grinder pump systems but they generally serve only one or two residences or commercial structures and are not considered a part of the public sewer system. There are also several low pressure grinder pump systems scattered around the District that were designed to serve a small number of residences in specific areas that could not be served by gravity sewer. These systems, located in Mayport Harbor (McDowell Drive), Eagle Bend, Eagle Rock and Bear Hollow, were designed to serve a specific area and were not intended for expansion to serve a broader area.

A. Gravity Collection System:

As mentioned, the gravity sewer system consists of 8", 10" and 12" mains with the vast majority being 8". The only 10" gravity sewer runs north of the wastewater treatment facility (WWTF) along Montana Highway 35 and is not a continuous run as it is interspersed with several sections of 8" gravity sewer. The only 12" gravity sewer was recently installed west of the WWTF along Harbor Hts. Boulevard to Beach Road.

Morrison Maierle conducted a study of "trunk" sewer lines within the District and there are several sections of existing 8" sewer main reported to be "flat", less than minimum grade. Some mains are significantly less than minimum grade. This results in a reduced conveyance capacity, slower velocities and more maintenance by the District. In fact, the District indicated that they have to flush and clean a section of sewer main along Bigfork Bay that runs through Marina Cay at least once each year.

Trunk sewer mains reported at having less than minimum grade or identified by the District as having a low conveyance capacity are:

- The above-mentioned sewer main that runs from Bigfork Bay through Marina Cay with a reported average grade of 0.26%;
- A main running southeast of the WWTF along Montana Highway 35 with sections at an average of 0.24%. This line is identified in Morrison Maierle's study as being the South Trunk Sewer. The District indicates this entire length of 8" sewer main, including the bridge crossing, will have to be upsized should wastewater from the Greater Woods Bay Sewer District ever be conveyed to the Bigfork WWTF;
- The West Trunk Sewer that runs from Eagle Bend to the WWTP, with the exception of the recently installed 12" sewer main along Harbor Hts. Blvd. from Beach Road to the WWTP. The existing 8" sewer main, over a mile in length, has sections that are reported to be slightly under to slightly over the minimum grade of 0.40% for 8" gravity sewer. The District indicates the West Trunk Line has a low conveyance capacity. The West Trunk Line receives wastewater from the Eagle Bend North Lift Station (180 gpm) and from the Eagle Bend South Lift Station (150 gpm) as well as other gravity connections along the way.

Table BF-2 below shows the capacities of 8", 10" and 12" PVC sewer mains at their respective minimum allowable grades, using a roughness coefficient (Manning "n") of 0.013 as required by MDEQ. It should be noted that PVC pipe manufacturers normally recommend using a Manning "n" of 0.010 which would significantly increase flow capacity.

Table BF-2 – Gravity Sewer Main Capacities

GRAVITY PIPE FLOW							
Pipe Size (in.)	Pipe Area (ft2)	Manning "n"	Hydraulic Radius (ft)	Slope (%)	Velocity (fps)	Flow (gpm)	Flow (cfs)
8	0.349	**0.013**	0.167	**0.40**	2.19	343	0.8
10	0.545	**0.013**	0.208	**0.28**	2.12	520	1.2
12	0.785	**0.013**	0.250	**0.22**	2.13	749	1.7

With potential flows of 330(+) gpm in the West Trunk Sewer, and a conveyance capacity of 343 gpm in 8" sewer mains installed at the minimum grade of 0.40%, it can easily be seen why the District believes this trunk line is at or very near capacity.

B. Lift Stations:

As mentioned there are a total of 16 “major” lift stations located throughout the District and a list of these lift stations can be seen in Table BF-3.

Table BF-3 – Bigfork Water & Sewer District Lift Stations

Bigfork LS #	Station Name	Type	Hp - Each Pump	Capacity (gpm)	Max. Number EDUs Served	Max. Pop. Served
1	Bay	Duplex - Submersible Gorman Rupp	2	80	126	280
2	Sunset	Duplex - Submersible Gorman Rupp	5	265	453	1,006
3	Beach	Duplex - Submersible	1	100	160	356
4	Lodge	Duplex - Self-Prime Hydronix	7.5	180	299	664
5	Jones	Duplex - Self-Prime Hydronix	3	80	126	280
6	Harbor Village #1	Duplex - Self-Prime Gorman Rupp	3	155	254	564
7	Harbor Village #2	Duplex - Self-Prime Gorman Rupp	5	130	212	470
8	Harbor Village #3	Duplex - Self-Prime Gorman Rupp	5	155	254	564
9	Lake Pointe	Duplex - Self-Prime Gorman Rupp	5	141	230	510
10	Bear Hollow	Duplex - Self-Prime Gorman Rupp	5	145	238	528
11	Eagle Bend North	5 Pumps - Submersible Myers	7.5	180	299	664
12	Eagle Bend South	Triplex - Submersible Myers	5	150	247	548
13	North Sewer	Duplex - Self-Prime Gorman Rupp	10	155	254	564
14	Saddlehorn	Duplex - Self-Prime Gorman Rupp	15	200	335	744
15	Mayport	Duplex - Submersible Gorman Rupp	2.7	80	126	280
16	**WWTF**	**Triplex - Flooded Suction Cornell**	**10**	**1,000**	**2,216**	**4,920**

The lift station capacities in Table BF-3 represent the capacity of the respective lift stations with the largest pump out of service. Assuming the lift station capacity must be capable of meeting the peak flow from the service area, the maximum number of equivalent dwelling units (EDUs) and the maximum population were calculated using a wastewater flow of 100 gallons per capita per day, 2.22 persons per EDU based on 2010 census data, and a peaking factor (ratio of peak hourly flow to design average flow) based on the MDEQ Circular DEQ 2 equation $(18 + P^{0.5})/(4 + P^{0.5})$ where population "P" is in thousands. Rather than calculating peak flow from a known population as is most commonly done, the maximum population was calculated based on the known peak flow or the known capacities of the various lift stations.

C. Force Mains:

The size, type and length of a sewer force main can limit the pumping capacity of a lift station or cause larger horsepower pumps to be installed to increase capacity and to overcome the increased total dynamic loss due to friction. An undersized force main can lead to a very inefficient pumping system.

Force mains, from "major" lift stations within the District range from 4" to 8" in size. The only 8" force main is from the WWTF Lift Station to the actual treatment facility headworks. There are also several low pressure grinder pump systems with small diameter force mains – 1 1/2" and 2" in size; however, these force mains only serve a small number of residences and are not intended for expansion to serve a broader area.

Of the force mains that convey wastewater from major lift stations, only the force main from the Sunset Lift Station would seem to be undersized. At a station capacity of 265 gpm, a 6", rather than a 4" force main, would appear to be hydraulically a better fit. However, this force main is very short in length and the additional loss in total dynamic head (TDH) does not significantly affect station capacity.

CAPACITY TO SERVE AREAS OUTSIDE OF EXISTING SERVICE AREA:

With the soon to be completed construction of the new WWTF, the Bigfork Water & Sewer District will have adequate capacity to treat wastewater from areas outside of the existing service area. The District's lift stations and force mains appear to have sufficient capacities to handle the existing developed lots and undeveloped lots within their respective service areas and sufficient reserve capacity to handle a moderate amount of existing or proposed development outside of their respective service areas. Figure BF-1 shows the current Bigfork Water & Sewer District service area and the locations of existing septic systems adjacent to the District. A larger (24" x 36") drawing of the Bigfork service area (Exhibit BF-1) is included at the end of this report.

What does restrict the conveyance of wastewater to the WWTF, from specific areas in and around the District boundaries, is the gravity collection system. This was

discussed earlier in this report and improvements will have to be made to increase conveyance capacities of the West Trunk Line, which serves areas west and northwest of the WWTF, and to the South Trunk Line, which serves areas south-southeast of the WWTF. An increase in conveyance capacity will also be needed for the trunk line that serves the downtown area of Bigfork from the Bay Lift Station to the WWTF. The increase in conveyance capacity of this section of gravity sewer is not necessarily needed to facilitate existing or proposed development outside of the current District boundaries, but it is needed to improve sewer service and reduce District maintenance costs within the District boundaries. There is very little potential for the addition of new sewer system users in this area of the District.

The conveyance capacity of the North Trunk Line, as well as the existing lift stations and force mains serving this area is very good and there is substantial reserve capacity to serve infill development and areas currently outside of the District. There are still several sections of 8" sewer main along the North Trunk Line, however, each of these sections are reported to have slopes greater than 1.0% which greatly increases conveyance capacity.

Northwest of District: The greatest concentrations of existing septic systems in the northwest portion of the Bigfork Water & Sewer District, and outside of the District boundaries in this general area, are in the Mayport Harbor area, the northwest corner of Holt Drive and along Pine Needle Lane. There is already public sewer available to the Mayport Harbor area; however, the District reports that very few of the existing residences have connected to the sewer system. There is no public sewer available to the northwest corner of Holt Drive or along Pine Needle Lane. Both of these areas would have to annex to the District and install sewer extensions to serve these areas. The northwest corner of Holt Drive could be served by a low pressure grinder pump system or by a gravity collection system with a lift station and force main. A gravity sewer main extension could be installed along Pine Needle Lane to serve existing and future residences.

Due a lack of conveyance capacity in the West Trunk Line, as previously discussed, the District is reluctant to annex any additional users in this general area. There are already a significant number of undeveloped lots within this portion of the service area that will generate additional flow to the West Trunk Line and until the capacity of these gravity collection mains are addressed, the annexation of additional users is unlikely.

South-Southeast of District: The greatest concentrations of existing septic systems south-southeast of the District are in the Ranch Subdivision, along MT Hwy. 35 to Woods Bay and along the east lakeshore to Woods Bay. It should be noted that a significant number of these existing systems along Hwy. 35 and the east lakeshore are in Lake County.

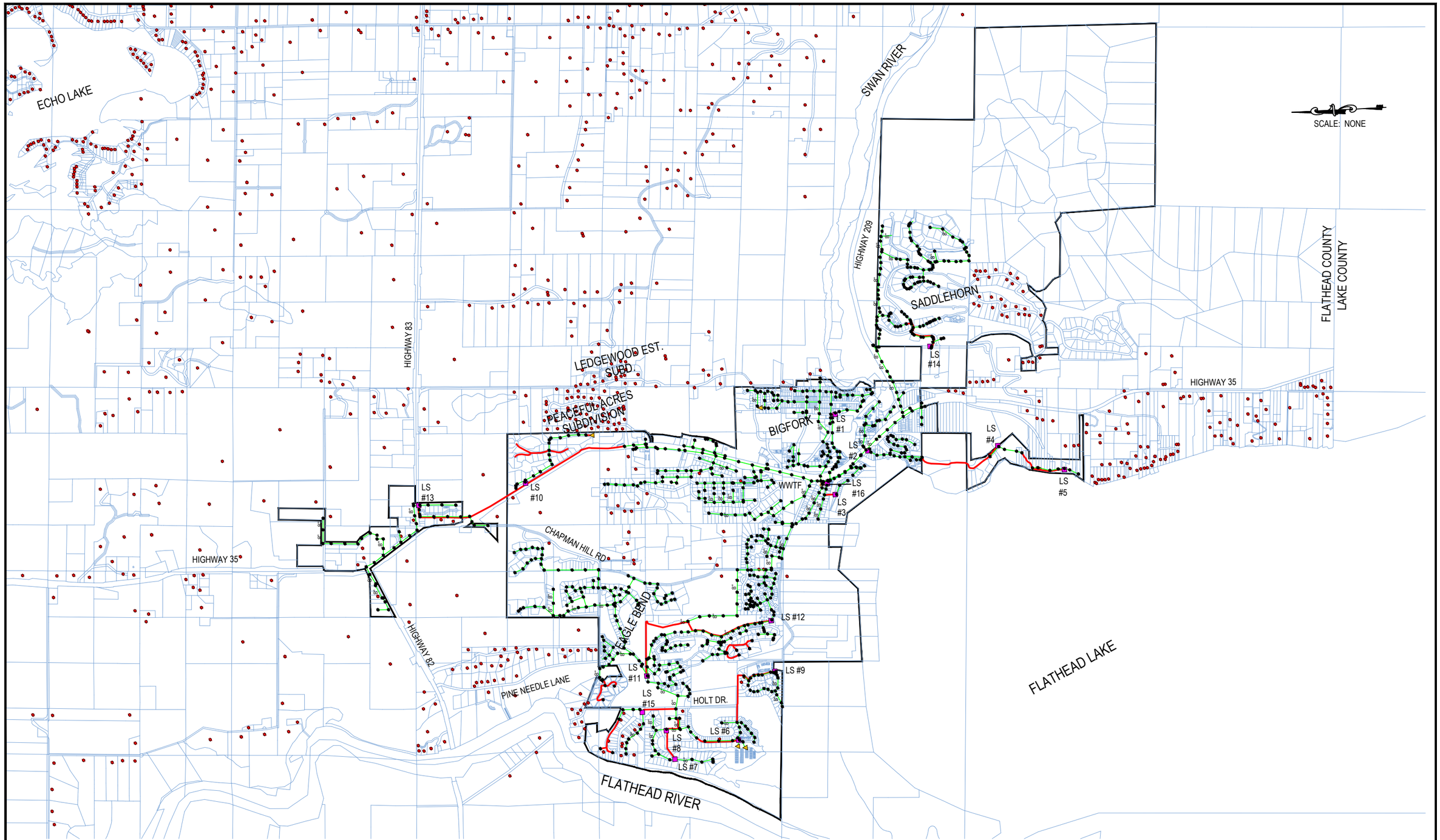
The Bigfork Water & Sewer District is working closely with existing water and/or sewer districts in Lake County to provide wastewater treatment system capacity to all or a large portion of these currently unsewered areas. A Memorandum of Understanding (MOU) was signed in 2008 by the Bigfork Water & Sewer District, the Greater Woods

Bay Sewer District, the Woods Bay Homesites Water & Sewer District and the Sheavers Creek Water & Sewer District to cooperate in the treatment of wastewater from the three (3) Districts at the Bigfork WWTF. The three (3) existing Districts abut one another and cover all privately owned property from the Flathead/Lake County Line to Mausey Creek south of Woods Bay.

The three (3) Districts are now a part of the Greater Woods Bay Planning Area (GWBPA) and a Preliminary Engineering Report (PER) was prepared by Morrison-Maierle, Inc. in 2008 for wastewater collection alternatives. The 2008 PER indicates there are 1,150 persons in the GWBPA (2008 figures) with a projected "low" year 2030 population of 1,825 persons and an "upper" year 2030 population of 3,200. Under a subsection titled "Project Need" the 2008 PER states, "The current poor condition of existing on-site septic systems and the increasing awareness of the environmental effects of failing or inadequate septic systems prompted the community to evaluate alternatives to minimize and reverse groundwater and surface water deterioration. In many cases, untreated or inadequately treated wastewater is being discharged, migrating down gradient and contaminating wells and Flathead Lake, both domestic drinking water sources. Evidence of the occurrence is demonstrated most seriously by two issues:

- The increasing levels of nitrates detected in drinking water supplies in the Woods Bay area, and
- The documented contribution of nutrients to Flathead Lake by near-shore septic systems.

It is reported that preliminary design plans have been prepared to provide sewer service to the GWBPA and the community is currently seeking funding to assist in the costs of constructing the proposed wastewater collection and conveyance systems. Providing public sewer service to this area, with treatment at the Bigfork Water & Sewer District WWTF, would have a huge impact on improving the quality of ground and surface waters.



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BIGFORK WATER & SEWER DISTRICT
PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	Manhole
	Lift Station
	CleanOut
	WWTF

- Sewer Main
- Force Main
- Flathead County Septic Systems
- Flathead County Parcel

FIGURE NUMBER
BF-1

March 15, 2012

CITY OF COLUMBIA FALLS

DESCRIPTION:

The City of Columbia Falls, located northeast of Kalispell and east of Whitefish, in Flathead County, is sewered by a gravity collection system consisting of approximately 20 miles of gravity sewer mains, 425 manholes, 9 sewage lift stations and roughly 2.4 miles of force main. Treatment is provided at the City's biological treatment facility which has a permitted discharge to the Flathead River. Much of the system was constructed beginning in the early 1970s.

Columbia Falls had a Wastewater Utility Plan completed by HDR Engineers in March of 2006. Information from this report, along with interviews with Columbia Falls Public Works Director, Lorin Lowry, will be utilized herein to help describe and evaluate the Columbia Falls' wastewater system. This report does not attempt to update or amend the 2006 Utility Plan but instead, it generally discusses the improvements made to the system as a result of the 2006 Utility Plan recommendations and it looks at existing capacities of system components relative to their capabilities of serving additional users currently on septic systems.

POPULATION ESTIMATES:

Census data for 2000 and 2010 show populations for the City of Columbia Falls to be at 3,645 and 4,688 people, respectively. The 2006 Utility Plan used a population of 4,204 for the year 2005. The overall growth rate from 2005 to 2010 was 2.3%. Most of this growth likely occurred from 2005 to 2007. Growth has slowed down due to the economic downturn that started in 2007-2008 and to this day, growth remains stagnant. The report uses a growth rate of 3% per year to the year 2025.

According to the 2006 Utility Plan, population estimates were completed for an overall sewer study area. This study area was then evaluated by HDR and Columbia Falls staff on criterion such as Public Health Protection, Groundwater Quality Protection, Surface Water Quality Protection, Land Use Planning and Growth Management, Cost of Service and Geophysical Characteristics.

Figure CF-1 (located at the end of this section) shows the above-mentioned study area as well as Columbia Falls' finalized potential wastewater service area (See Exhibit CF-1 at the back of this report for a 24" x 36" plan sheet). Densities were developed for undeveloped land and existing dwellings were counted within the potential service areas. Populations were then calculated using 2.2 people per connection. It was assumed that by the year 2025 all existing structures with septic systems within the potential service area would be connected to City sewer. It was also assumed that 10% of the population living in the potential service area would connect to

City sewer by 2015. In the 2006 Utility Plan, the 2025 Connected Population was used to evaluate and size Columbia Fall's wastewater treatment facility.

Table CF-1 - Predicted Service Area Population*

	2005	2015	2025
Potential Wastewater Service Area Population	6,578	10,143	13,314
Potential Wastewater Service Area Connected Population	4,204	8,006	13,314

* Information from 2006 Wastewater Utility Plan by HDR Engineers.

WASTEWATER TREATMENT SYSTEM:

The City's existing wastewater treatment facility is an activated sludge, biological system with tertiary treatment. The facility removes both nitrogen and phosphorus through biological means by way of an aeration basin. Additional phosphorus removal can be achieved with the use of alum. Sludge is land applied. The treatment facility is permitted to discharge to the Flathead River. The hydraulic capacity of the wastewater treatment facility is 0.550 mgd and the average daily flow in 2011 was 0.406 mgd.

Phase 1 upgrades to the treatment facility, those recommended in the 2006 Wastewater Utility Plan, have been completed and Phase 2 improvements are planned in 2015. Phase 1 improvements were designed for a capacity and service life of 2025 or later, with exception to a new aeration basin which was designed for a 2015 capacity. Phase 2 improvements will expand the aeration basin to 2025 capacities. According to Lorin Lowry, Phase 1 improvements are complete and it appears that Phase 2 improvements can be delayed beyond the 2015 "planned" timeline due to the economy and slower growth rates. The treatment facility currently has the capacity to take on additional sewage flows.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM CAPACITIES:

Columbia Falls' wastewater collection system consists of 8" to 18" collection mains, lift stations and force mains. There are nine lift stations that are owned and operated by the City. A tenth lift station, located south of the Meadow Lake Resort, is owned and operated by the Meadow Lake Water & Sewer District. Below is a listing of all lift stations with their capacities.

According to HDR's report, a majority of the lift stations have adequate capacity to handle wastewater flows with their respective service areas especially since most of the service areas are built-out or the lift station was constructed for a specific number of lots in a subdivision. In discussions with Lorin Lowry, he reiterated what the report said but added that several lifts stations will need to be upgraded to be able to take on

additional future flows from the Potential Wastewater Utility Service Area. In particular, Lift Stations Nos. 2 & 4 have the potential to receive additional flows in the future and would need to be evaluated further when this occurs.

Table CF-2 - City of Columbia Falls Sewage Lift Stations*

Lift Station	Pump Type	Pump Manufacturer	Year Constructed	Capacity (gpm)
Lift Station # 1 - Cresent Drive	Suction Lift	Gorman-Rupp	1996	110
Lift Station # 2 - Mosquito Flats	Flooded Suction	PACO	1972	180
Lift Station # 3 - 4th Ave. West	Suction Lift	Gorman-Rupp	1972	550
Lift Station # 4 - Talbot Road	Suction Lift	Gorman-Rupp	1972	1,000
Lift Station # 5 - Scenic View	Submersible	Flygt	1978	525
Lift Station # 6 - Truck Route	Suction Lift	Gorman-Rupp	1996	180
Lift Station # 7 - Riparian Drive	Submersible	Flygt	2004	100
Lift Station # 8 - Cedar Pointe	Submersible	Flygt	2005	105
Lift Station # 9 - Riverbend Est.	Submersible	Flygt	2007	100
Meadow Lake - Meadow Lake Drive	Submersible	Hydromatic	1986	265

* Information from 2006 Wastewater Utility Plan by HDR Engineers.

The Meadow Lake lift station is a private lift station located in the City's wastewater utility service area. This lift station is not currently pumping at its capacity, however, all of its capacity has been allocated for future phases within Meadow Lake. The force main from the Meadow Lake lift station is owned by the City and in 2007, the City hired Morrison-Maierle, Inc. (MMI) to determine if there was any excess capacity in the force main. MMI, with the help of the City, determined future growth areas along Meadow Lake Drive and came up with possibly 300 additional sewer connections. With that data, MMI modeled the existing force main and determined that the force main would have the capacity to serve these 300 service connections.

CAPACITY TO SERVE AREAS OUTSIDE OF EXISTING SERVICE AREA:

Discussions with Lorin Lowry have focused on the willingness of the City and the capacity of the City's wastewater system to serve existing development with septic systems in relative close proximity to the public sewer system. In general, Lorin was agreeable to the idea of removing septic systems and putting them on City sewer, but he said individuals would have to obtain City approval first. Additionally, he said it is City policy that these individuals then should hook up to City water and that City standards should also apply to roads, sidewalks, etc. To obtain City sewer service, these properties would have to annex into the City or, at a minimum, sign a statement waiving their right to protest annexation.

Additional discussions were held concerning the capacities of the City's sewer conveyance system and treatment facility. As previously mentioned, HDR completed a Wastewater Utility Plan in 2006 and, for the most part, this Utility Plan addressed Columbia Falls' Potential Wastewater Utility Service Area with the purpose of determining the wastewater service population in the year 2025 and sizing the treatment plant accordingly to handle these flows.

HDR's report did not provide any modeling of the existing sewage conveyance system and lift stations to determine component capacities. HDR did make several recommendations on the lift stations but only based them on the age of equipment or operational problems with the stations, as reported to them by City personnel. The City has been completing some of these recommendations in-house as their annual budget allows. To date they have replaced both pumps at Lift Station #2 and one pump each at Lift Station Nos. 4 & 6. Pumps that have been replaced were replaced with the same pump model and capacity with no upsizing. Additionally, it was stated that any new sewer flows to Lift Station #2 would require an upgrade in wet well size.

Although flows have not been modeled for the sewer conveyance system, it is the City's opinion that some of the sewer lines and lift stations may be approaching capacity, however, they have not had any problems with sewer surcharges. Accordingly, future extensions of sewer mains will require sewer flow modeling to determine if the capacity exists to convey additional sewage to the treatment facility.

Parts of the City's wastewater treatment facility have been upgraded to year 2025 projected flows as part of the Phase 1 improvements discussed earlier. Phase 2 improvements were to take place in 2015, in part due to higher growth rates that were occurring from 2000 – 2006 when the report was written. The growth rate has slowed since this time period and, according to Lorin, there is now no big push to complete Phase 2 improvements. Taking on new users with existing septic systems may be an attractive alternative to the City to help make up for revenue lost due to stagnant growth and to help pay off the bonds used to finance Phase 1 improvements.

With that in mind, areas with high densities of septic systems, as shown on Figure CF-1 and Exhibit CF-1, were evaluated to see if any of the areas could be served by the City's public sewage collection system. A discussion of these areas follows:

"Mosquito Flats" - This area has existing sewer mains located nearby and there are a number of existing septic systems located next to the Flathead River. "Mosquito Flats" is located in the Columbia Falls' Potential Wastewater Utility Service Area. All septic systems located in this area are expected to be hooked up to the City's sewer by 2025, according to the 2006 Wastewater Utility Plan. Sewer main and lift station capacities would have to be modeled, as previously discussed, to determine if additional improvements to the downstream conveyance system would be necessary.

To serve this area, an existing gravity sewer main located at Highway 2 and 3rd Ave. E., could be extended east to Park Ave. Service to the area could then be provided with the installation of a new sewage lift station at the corner of River Ave., near the Flathead River. Sewage would then be pumped through a force main to a new manhole at Park Ave. and Highway 2. Most, if not all, of existing development on the north side of the Highway would then be able to gravity flow to the new sewage lift station.

Removing existing septic systems and putting the residences on City sewer is a little more problematic for properties on the south side of the Highway 2. Existing gravity sewer is located in 16th St. E. and it could be extended north to the Highway and east to 2nd Ave. E., however, going further east would require easements through private property. The likely scenario to sewer this area would be with low-pressure grinder pump system with a small diameter force main connected to a new gravity sewer main that is extended to Park Avenue.

"Aluminum City" - This area is located northeast of the existing City Limits and is in the Columbia Falls' Potential Wastewater Utility Service Area. The area has a concentrated density of existing septic systems with many of the residences also served by individual drilled wells. All existing septic systems are expected to be hooked up to the City's sewer by 2025, according to the 2006 Wastewater Utility Plan.

There is an existing 8" gravity sewer line is located in Vans Ave. at a depth of just over 11 feet. This gravity sewer could be extended to the North Fork Frontage Road by horizontally boring under the railroad tracks. Gravity sewer could then be extended north, at minimum grade, along the Frontage Road to just south of 12th Street E.N. Gravity sewer running the opposite direction could then be constructed north to a new sewage lift station constructed generally in the area of the North Fork Rd. and Aluminum Dr. Gravity sewer could be constructed within the interior of "Aluminum City" with all sewage gravity flowing (north and west) to the new lift station. A force main would run south to the last gravity sewer manhole south of 12th St. E.N.

Downstream sewer main and lift station capacities would have to be modeled, as previously discussed, to determine if additional improvements to the conveyance system would be needed.

East of Flathead River Bridge along Highway 2 - The Potential Wastewater Utility Service Area extends east of the Flathead River approximately three-quarters of a mile. There is very little existing development along the highway corridor until Columbia Heights. Columbia Heights is not currently in the Columbia Falls' Potential Service

Area. There are a number of existing septic systems in Columbia Heights that could potentially be served by City sewer, however, the costs to extend sewer out to serve the Columbia Heights area would very high.

When the highway corridor does develop and City sewer is extended across the Flathead River and closer to Columbia Heights, providing public sewer service to the Columbia Heights area could possibly be revisited. The soils in the Columbia Heights area are very gravelly and the area sits above the Flathead River. According to Lorin Lowry, any development east of the bridge will require improvements to Lift Station #2, which would include but not be limited to increasing the wet well capacity and sewer flow modeling would also be necessary.

Northeast (Northfork) - The Potential Wastewater Utility Service Area shows the northern border of this area ending at Cedar Creek Road. With the exception of the "Aluminum City" area (described above), existing septic systems are sparse and, at this time, extending sewer beyond "Aluminum City" would not be practical.

North Central (Vetville) - There are a number of existing septic systems located in an area commonly referred to as Vetville, north of the railroad tracks and just north of Plum Creek. Providing sewer to this area is possible but it would be expensive for the following reasons:

- Existing 8" gravity sewer in Railroad Street is 10 feet deep which would allow for the extension of gravity sewer at minimum grades, however, the deeper depths and potential shallow groundwater would drive up the costs.
- A "jack-and-bore" installation of a sleeve and sewer main under the train tracks would have to be completed to extend gravity sewer north of the tracks.
- The new gravity sewer extended to Vetville would probably start at an existing manhole located between 3rd Ave. and 2nd Ave. N. on Railroad St. The distance from this manhole to the corner of 1st St. WN and 9th Ave. WN (southeast corner of "Vetville") is approximately 1,700 linear feet.

North Central (Vetville) Columbia Falls is not in the City's Potential Wastewater Utility Service Area.

Northwest (West of Meadow Lake Drive) - As previously discussed, the City had a study completed to determine the capacity of the Meadow Lake force main located within Meadow Lake Boulevard and it was determined that an additional 300 homes could be connected to this force main.

The only large density of existing septic systems, north of Highway 2 and west of Meadow Lake Boulevard is an older subdivision, called Hilltop Terrace, off of North Hilltop Road. A new sewage lift station could be constructed near North Hilltop Road, north of Dawn Drive, and sewer service could then be provided to existing and proposed residences in the area by gravity sewer. The force main from this new lift station must connect directly to the existing Meadow Lake force main and there is no existing public right-away between North Hilltop Road and Meadow Lake Boulevard.

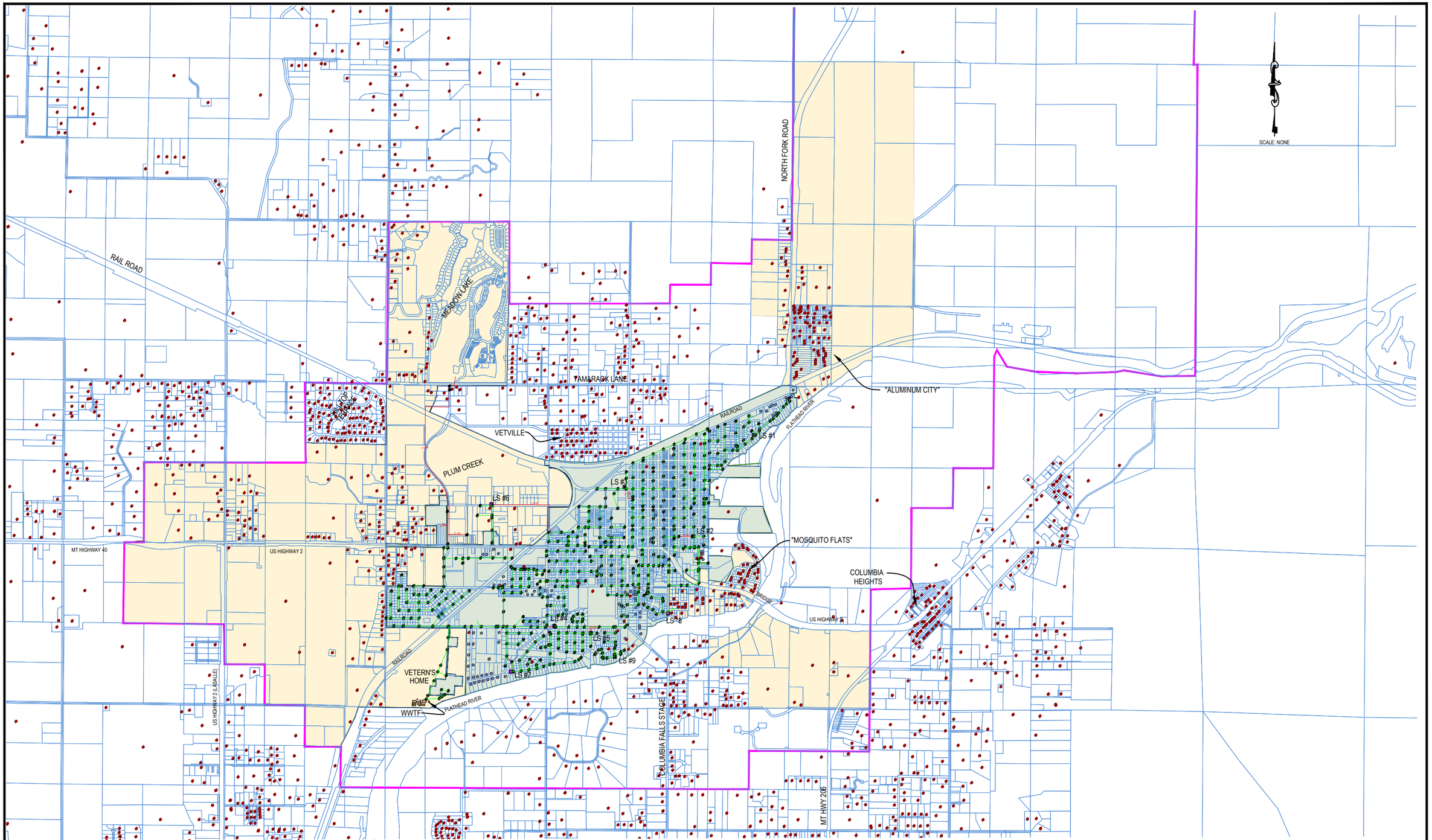
There is a large privately owned parcel between North Hilltop Road and Meadow Lake Boulevard that is owned by Jon Lemburg. If an easement could be obtained from Mr. Lemburg, it might be possible to have a somewhat centralized lift station that could

serve the existing Hilltop Terrace subdivision, as well as new development on Mr. Lemburg's property. This possible easement would run west to east along a common property boundary between Plum Creek property and the north boundary of Mr. Lemburg's parcel. Connection to the existing Meadow Lake force main would be almost directly west of the Meadow Lake Boulevard railroad bridge, approximately 700 feet from the bridge.

For some reason, the Hilltop Terrace subdivision was not included in the City's Potential Wastewater Utility Service Area presumably because it is already served by existing septic systems. Mr. Lemburg's property, as well as property owned by Plum Creek, is within the City's potential service area.

West/Southwest - South of Highway 2 Corridor – Development is limited and existing septic systems are sparse throughout this area. Most parcels are agricultural land. As indicated by the outline of the City's Potential Wastewater Utility Service Area on Figure CF-1 and Exhibit CF-1, it is apparent that this area is one of the City's largest planned growth areas. The future sewer service area extends past Highway 2 and south of Highway 40 (past the Blue Moon and Town Pump). Extending sewer service into this area at this time would not be practical and more than likely will be driven by future private development.

South - There are some small developments south of the Flathead River, but for the most part, septic systems are sporadic and most properties are larger in size. Extending public sewer across the river to this area would be very expensive and would not be practical at this time.



CARVER ENGINEERING
Consulting Engineers

CITY OF COLUMBIA FALLS

PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

LEGEND	
SYMBOL	DESCRIPTION
	Columbia Falls Sewer Mains
	Columbia Falls Manholes
	Columbia Falls Lift Stations
	Columbia Falls Force Mains
	Columbia Falls Septic
	Flathead Septic Systems
	Columbia Falls City Limits Boundary
	ColumbiaFalls Treatment Facility
	Flathead County Parcel
	Columbia Falls Project Study Area
	Columbia Falls City Area
	Columbia Falls Potential WW Service Area

FIGURE NUMBER
CF-1

March 15, 2012

ELMO

DESCRIPTION:

Elmo is a community located on the west side of Flathead Lake, in Lake County and on the Flathead Indian Reservation. The Elmo public sewer system consists of 8" gravity sewer mains, two sewage lift stations, 4" force mains and a treatment facility with aerated and storage lagoons and a land application discharge using spray irrigation.

Elmo's treatment facility and main lift station were reconstructed in 2004. At the treatment facility, the existing unlined facultative lagoons were replaced with a new lined aerated lagoons. Work was completed through a USDA Rural Development grant to the Confederated Salish & Kootenai Tribes of the Flathead Reservation.

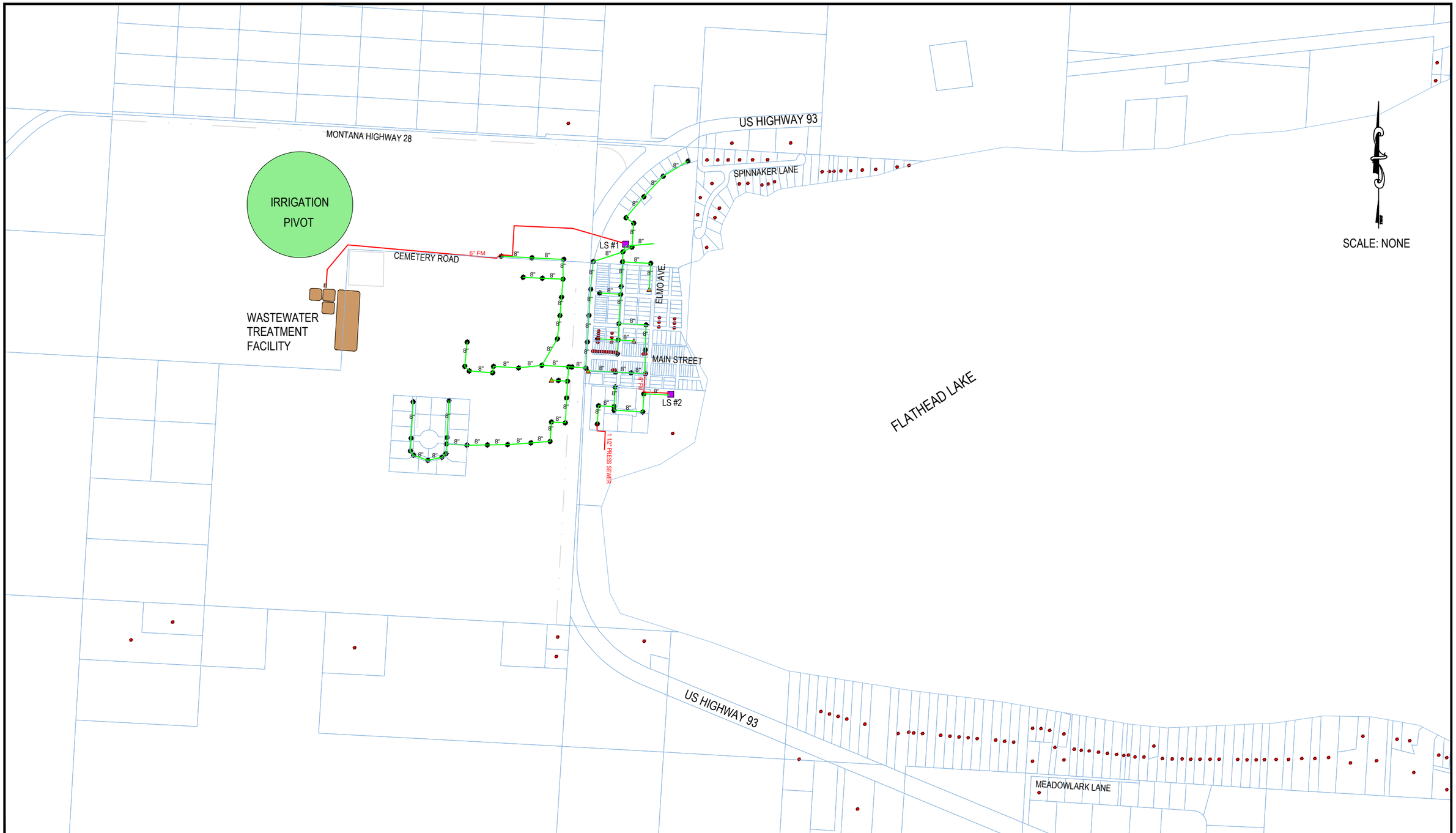
Information used in this report, in part, was obtained from a Final Basis of Design Report prepared by Morrison-Maierle, Inc. in July of 2003, and additional references therein, from a Preliminary Engineering Report (PER) prepared by DJ&A Engineers in 2001. According to these reports, sewage flows were unknown, however, water usage was metered at the well sites. Based on year 2000 water use data, DJ&A Engineers estimated 3.0 persons per household and used wastewater flows of 350 gpcd per connection, in their 2001 PER. This equated to approximately 117 gallons per capita per day (gpcd). An additional 10.2 gpcd was added for infiltration and inflow (I&I) for an overall total of 127 gpcd.

With the above per capita flows projected, the new wastewater treatment facility was designed for a year 2021 population of 450 people for the Elmo area with an annual average daily flow of 57,150 gallons per day (gpd). The peak hourly flow rate to the treatment facility was estimated to be 229,000 gpd or 159 gpm. The peak hourly flow was used to size the new sewage lift station, which serves the entire service area, and an associated 4" force main that runs directly to the wastewater treatment facility.

The population of Elmo in the 2000 census was 143 persons. The 2010 census indicated a population of 180 persons which equates to a growth rate of 2.6% per year. At this growth rate, the 2012 population of Elmo should be approximately 189 persons. Therefore, the treatment facility and associated lift station are at about 42% of their respective design capacities or, to put another way, the system is capable of serving 261 additional people.

CAPACITY TO SERVE OUTSIDE OF EXISTING SERVICE AREA:

Elmo's existing wastewater collection and treatment systems have excess capacity to serve existing properties with on-site septic systems. Figure EL-1 shows only one area with any appreciable density of septic systems that is close to existing gravity sewer mains. (See Exhibit EL-1 for full size plan sheet) This area, in the northwest part of Elmo, is accessed by Spinnaker Lane and there is an existing 8" sewer main less than 200 feet away.



CARVER ENGINEERING
Consulting Engineers

ELMO SEWER SYSTEM

PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

LEGEND

SYMBOLS	DECRIPTION
	Lake County Parcel
	Lake County Septics
	Waste Water Treatment Facility
	Elmo Land Application
	Force Main
	SewerMain
	Manhole
	LiftStation
	CleanOut

FIGURE NUMBER
EL-1

March 15, 2012

EVERGREEN - FLATHEAD COUNTY WATER & SEWER DISTRICT #1

DESCRIPTION:

Evergreen is an unincorporated community in Flathead County located directly adjacent to and north and east of the City of Kalispell. The Evergreen area is situated in the low lying floodplain that borders the west side of the Flathead River just east of Kalispell. The Stillwater and Whitefish Rivers flow through Evergreen. Soils are mostly coarse grained sands and gravels. Topography is generally flat. Groundwater is quite shallow.

Public water supply and wastewater collection services are provided to property within the area by Flathead County Water & Sewer District #1 (Evergreen). The District was formed after the 1964 flood of the Flathead River, which contaminated most of the shallow wells in the area. The public water supply system was installed in the late 1960s to provide a safer source of potable water for the residents of the community. Due to the highly permeable gravelly soils, shallow groundwater, use of onsite wastewater treatment & disposal systems, and relatively high population density of the area, studies in the 1980s showed that significant amounts of nutrients were entering the Flathead watershed from Evergreen.

The public sewage collection system in Evergreen was installed during the early 1990s to eliminate the use of septic systems. The Evergreen sewer service area is confined to the lower ground in Evergreen. The Evergreen water service area also includes the “Bluff” area along Whitefish Stage Road south of Reserve Drive and consequently is about twice as large as the Evergreen sewer service area.

The Evergreen sewage collection system was funded in part with funds from the EPA sewage construction grant program, which encouraged the use of innovative and alternative (I & A) technology. In Evergreen, the I & A technology that was utilized was septic tank effluent (or small diameter) gravity mains instead of conventional gravity sewer mains. In a septic tank effluent system, each sewer service has a septic tank in the sewer outlet piping directly outside of the structure. The purpose of the septic tank in the small diameter sewage collection system is to remove solids, oils and grease from the wastewater. Consequently, the collection mains can be smaller in diameter and installed at a lesser slope since the wastewater is a relatively “clarified” liquid (grey water) that does not contain solids or other materials that require higher velocities to transport. The lesser slopes mean that a greater horizontal distance can be attained for a given vertical drop. Limiting the depth of the sewer mains in Evergreen was critical due to the shallow groundwater and because it would be difficult to excavate the gravel for pipeline installation.

The Evergreen sewage collection system contains a mix of conventional sewage collection mains and septic tank effluent collection mains. The conventional gravity

mains were located in the commercial areas along the two major highways that pass through Evergreen. The septic tank effluent mains serve the bulk of the residential areas located away from the highway corridors.

The area served by the Evergreen sewage collection system totals 2,199 acres. During the original construction project of the sewer system, a total of 590 conventional services and 1,149 septic tank effluent services were installed. The split between conventional and septic tank effluent was roughly 1 to 2. This split has remained fairly constant throughout the life of the system. As of March 2012, there were approximately 2,520 homes and businesses connected to the system. Over 1,600 of these sewer customers are served by septic tanks.

The Evergreen Water & Sewer District does not own its own wastewater treatment facility. Instead, Evergreen conveys the wastewater it collects to the City of Kalispell Wastewater Treatment Plant (WWTP) for treatment and disposal. In June 1990, Evergreen and Kalispell entered into an Interlocal Agreement that defined the conditions under which Kalispell would receive and treat sewage from Evergreen. Among other things, this agreement established a sewer service area for Evergreen, the sewer treatment rate to be paid by Evergreen to Kalispell, and the maximum daily flow that Evergreen could send to Kalispell. Property outside of the established sewer service area could not connect to the Evergreen sewage collection system without explicit approval of the City of Kalispell.

The term of this agreement is 25 years and it will expire in June of 2015. Evergreen and Kalispell are presently negotiating a new agreement to replace the 1990 Interlocal Agreement and extend the relationship where Evergreen will collect and convey sewage to Kalispell for treatment and disposal. Since Evergreen does not own or operate a wastewater treatment facility, the remainder of this section will pertain to the Evergreen Sewage Collection and Conveyance System only.

POPULATION AND FLOWS:

Data from the United States Census Bureau from the past three censuses indicates that the Evergreen area has grown steadily during the past two decades. Those census results are tabulated as follows:

Table EG1 - Evergreen Census Data – 1990 - 2010

Year	Population	10 year Change, %	Annual Change, %
1990	4,109	-	-
2000	6,215	51%	4.2%
2010	7,616	23%	2.1%

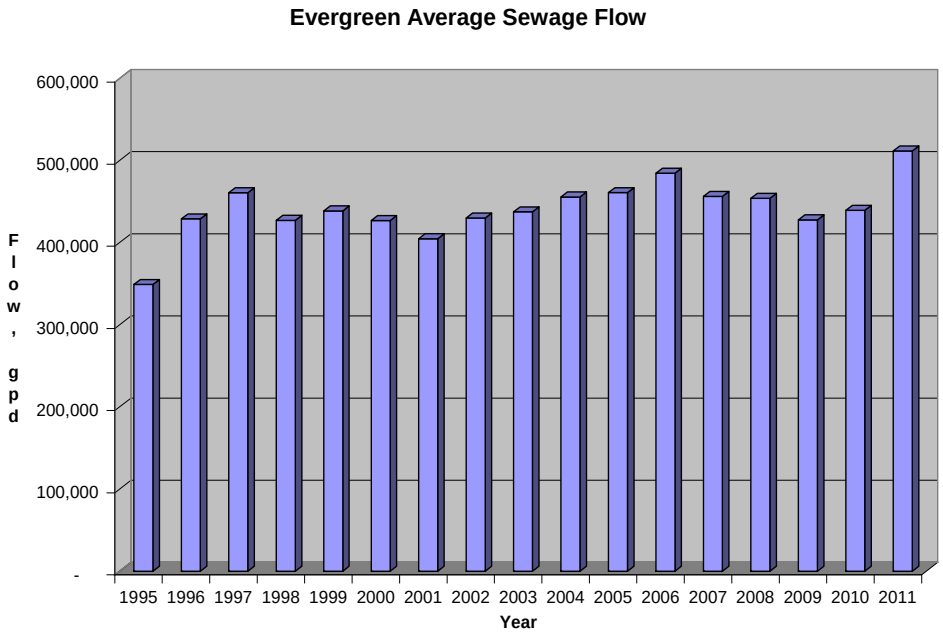
The population data presented in Table EG-1 is for an area designated by the US Census Bureau as “Evergreen”. The area designated by the Census Bureau changes from census to census as settlement patterns change. The area designated by the Census Bureau does not coincide with the Evergreen sewer area. The population data tabulated above is presented to show what happened in Evergreen after the sewer system was installed. Immediately following completion of construction of the sewage collection system in 1995, development in Evergreen increased dramatically as many commercial establishments moved in, including Shopko, McDonalds, Wendy’s, Wal-Mart, Applebee’s, Town Pump, and other banks, retailers, car washes and gas stations. Mobile home court expansions and new residential subdivisions also were undertaken.

The advent of public sewer service to the area allowed development to occur on vacant ground that had previously been undevelopable due to septic system and economic limitations. The census data shows an annual growth rate in Evergreen of 4.2% from 1990 to 2000 and an annual growth rate of half that, 2.1%, from 2000 to 2010. The decline in the growth rate in Evergreen during the last decade is attributed to both the lack of vacant property in Evergreen and the general worsening of the economy during the latter part of the decade.

Flows in the Evergreen sewage collection system have been relatively stable from the beginning of its operation. Recorded sewage flows have not increased at the same rate as the measured population for Evergreen has. Historical flows for the Evergreen sewage volume from 1996 to 2011 are tabulated and charted as follows:

Table EG-2 - Evergreen Annual Average Daily Sewage Flows by Year

Year	Average Daily Flow, gpd
1995	348,877
1996	428,841
1997	460,668
1998	427,018
1999	438,441
2000	426,685
2001	404,713
2002	429,885
2003	437,335
2004	455,535
2005	460,737
2006	484,400
2007	456,134
2008	453,814
2009	427,637
2010	439,242
2011	511,522



Average daily sewage flow for the 16-year period from 1996 to 2011 has been 446,400 gallons per day. Peak flows are influenced significantly by inflow and infiltration during times of wet weather and high groundwater in the shallow Evergreen water table aquifer. During years with considerable runoff, flows increase during spring runoff. The three highest daily flows of 1,195,400 gpd; 999,900 gpd and 730,932 gpd were observed during 2011; 1997 and 2006, respectively. There was some limited flooding from the Whitefish and Stillwater Rivers in Evergreen during these years and the flow in the Flathead River remained high for an extended period of time.

Some additional future growth in Evergreen is possible on the remaining vacant property or on currently underutilized parcels, but the potential for additional population and increased sewage flows is not great when compared to the amount of developed land that already exists within the sewer service area. The number of vacant parcels within the District was counted in 2010 during a periodic review of sewer capacity allocation. A total of 254 vacant parcels were noted. Projected flow from these parcels, assuming 1 dwelling per parcel, is 47,752 gpd. At the unit population density used for the design of the sewer system, 2.806 persons per dwelling, these vacant parcels would have 713 additional persons living on them at full build out. However, these projections are at the lower end of the range of possibility since many of the vacant parcels are large enough to support more than one dwelling. Actual flows will likely be higher.

According to the Supplemental 201 Facilities Plan for the Kalispell Vicinity, which was written in 1989 by Stahly Engineering & Consultants, the Evergreen sewage collection system was designed for a 2010 population of 6,473. Population and flow projections for the Evergreen collection system related are tabulated as follows:

Table EG-3 - Evergreen Population and Flow Projections from 1989 Facilities Plan

Year	Equivalent Population	Ave Daily Flow		Peaking Factor	Peak Hourly Flow	
		MGD	GPM		MGD	GPM
1990	6,018	0.4032	280	3.17	1.278	888
2010	6,473	0.4337	301	3.14	1.361	946
Ultimate	10,179	0.6820	474	2.95	2.010	1,396

Unit residential flow used to generate the numbers in the above table is 67 gpcd, which was taken from the Evergreen sewer system design criteria developed in 1992.

The average daily flow for the two years 2009 and 2010 is 433,425 gpd, which is eerily close to the 2010 flow predicted for the system back in 1990 (433,700 gpd). The 2010 population predicted for Evergreen in the facility plan (6,473) is not so close to the 2010 population reported by the census (7,616). The discrepancy probably is due to the difference between the census boundary for Evergreen and the boundary of the Evergreen sewer service area.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM:

Evergreen's collection and conveyance system consists of 14.5 miles of "conventional" gravity sewer mains, 25 miles of "septic tank effluent" gravity mains, 25 wastewater lift stations, 4 pressurized septic tank effluent collection mains, over 100 individual septic tank effluent pump (STEP) systems and approximately 10 miles of force mains ranging in size from 2" to 14". (See Figures EG-1 & EG-2 at the end of this section for the sewer system layout; Exhibits EG-1 & EG-2 are full size plan sheets located at the end of this report.)

Groundwater depths throughout Evergreen were monitored during the design period. The collection system was laid out to keep the collection mains above the high seasonal groundwater level wherever possible. The reason for this limitation was two fold: (1) to reduce initial installation cost and (2) to minimize extent of infiltration of groundwater into the collection mains during the life of the system. The exterior surfaces of manholes and lift station wet wells were treated with a cementious waterproofing agent to further limit entry of groundwater into the system. In floodplain areas, manholes with water tight bolt down lids were provided.

A. Conventional Gravity Collection System:

Evergreen's conventional gravity collection system consists of pipe ranging from 8" diameter up to 21" diameter with a total length of 77,342 lineal feet (14.65 miles). The various lengths of and sizes of gravity sewer mains are listed in the following table.

Table EG-4 - Evergreen Conventional Gravity Sewer Main Sizes & Lengths

Pipe Diameter	Total Length (Ft)	Total Length (mi.)	% of Total Conventional
8"	49,684	9.41	64.2%
10"	9,588	1.82	12.4%
12"	14,242	2.70	18.4%
15"	22	0.004	0.03%
18"	1,070	0.20	1.4%
21"	2,736	0.52	3.5%
TOTAL	77,342	14.65	

All of the conventional gravity sewer mains up to 15" in diameter within the Evergreen collection are made of ASTM D3034 PVC sewer pipe. Mains 18" and larger are made of ASTM F-679 PVC. Wall thicknesses for both PVC material types are according to SDR 35. The typical laying length for these mains is 13 feet. Joints are push-on bell and spigot with rubber gaskets.

B. Septic Tank Effluent Gravity Collection System:

Evergreen's septic tank effluent gravity collection system consists of pipe ranging from 6" diameter up to 10" diameter with a total length of 132,166 lineal feet (25.03 miles). The various lengths of and sizes of gravity sewer mains are listed in the following table.

Table EG-5 - Evergreen Septic Tank Effluent Gravity Sewer Main Sizes & Lengths

Pipe Diameter	Total Length (Ft)	Total Length (mi.)	% of Total Conventional
6"	112,199	21.25	84.6%
8"	14,383	2.72	10.9%
10"	5,584	1.06	4.2%
TOTAL	132,166	25.03	

All of the septic tank effluent gravity sewer mains within the Evergreen collection are made of ASTM D3034 SDR 35 PVC sewer pipe. The typical laying length for these mains is 13 feet. Joints are push-on bell and spigot with rubber gaskets.

C. Lift Stations:

The Evergreen sewage collection system has a total of 25 lift stations – 24 duplex "area" stations and one "main" tri-plex lift station, described below.

Area stations: All the area stations are the same basic configuration and are equipped with duplex submersible sewage pumps located in pre-cast concrete wet wells. A pre-cast concrete valve vault is situated adjacent to the wet well. Separate discharge pipes from each pump enter the valve vault. There are check valves in each separate pump discharge pipe. None of the 24 area stations have flow meters. Pump run times are tracked individually for each pump.

All 18 of the mid-sized and larger lift stations have backup electrical power generators to provide electricity to run the pumps in the event of an electrical utility power outage. The 6 smaller pump stations, defined as those with over 24 hours of storage volume within the collection mains serving it, have a receptacle for connection to a mobile trailer-mounted generator that can be taken to an afflicted station during an outage. The only above ground features at the area stations are the control panel and appurtenances, vent chimney, generator, if present, and fencing. A carbon canister is provided within the vent piping from the wet well for odor control.

The area stations were designed to handle projected peak flows from the service area with a single pump running. Peak flow projections were made during design by counting the number of existing homes and businesses and also the number of vacant lots. Whenever possible, the pump capacity selected was at least 50% greater than

projected flows to account for uncertainties in amount of development that might occur in the service area.

Main station: The main pump station of Evergreen, Lift Station No. 19, is located south of Snappy's Sport Center and east of the Shopko parking lot. The configuration of this pump station is unique in Evergreen. The station contains three end suction centrifugal pumps located in a below ground dry well. A large wet well sits beside the dry well. A building sits above the dry well at ground level and houses the controls, odor control system, air injection system, and flow meter. The output from the flowmeter is transmitted via radio to the Evergreen District office and by telephone to the Kalispell wastewater treatment plant. Both Evergreen and Kalispell track the flows from Lift Station #19 on a daily basis. The meter reading is used by Kalispell to prepare a bill for treatment, which the City sends to Evergreen each month.

The main station pumps are Model 6NHTA-VM-1800 manufactured by Cornell Pump Company of Portland, Oregon. Impeller diameter is 12.75". Motors are 60 HP, 480 volt 3 phase. Design capacity is 1,400 gpm with one pump running and 1,800 gpm with two pumps running simultaneously.

Originally, each pump in the main station was controlled by a variable frequency drive, which sped up or slowed down the pump in proportion to the liquid level in the wet well. The original control has been replaced and the present control logic does not vary the speed of the pumps but rather operates the pumps at a constant speed during every pump cycle. At maximum speed, the output of each of the three pumps is greater than projected peak flows at ultimate build out in Evergreen. The average flow rate of a single pump at its present speed setting is around 1,250 gpm over a pump cycle.

Septic Tank Effluent Pump (STEP) Systems: In addition to the area stations and main lift station, there are also numerous individual septic tank effluent pump (STEP) scattered throughout the collection system. Most of these pumping units were necessary on lots where the plumbing outlet from an existing structure was too low to achieve gravity flow to the adjacent gravity public main. There are four isolated pockets within the collection system where pressure mains were installed and all homes within the area had to use pump systems. These STEP system/pressure main areas are along West Evergreen Drive west of Spruce Drive; at the east end of Poplar Drive, a tiny area on the east side of Maple Drive, and the Spruce Park Campground. In general, Evergreen is responsible for maintenance of all STEP systems that were installed as part of the original construction project or later if the owner installed a STEP system that conformed to District standards. Some owners have ignored District standards and installed non-compliant pump systems. These systems are not maintained by the District and are the responsibility of the owner to maintain.

Table EG-6 below, presents basic data on the major lift stations within Evergreen.

Table EG-6 - Evergreen Lift Station Data

#	Name	Location	Type & Pump	Capacity (gpm)	Max. No. EDUs that could be served	No. of existing EDUs served	No. of additional EDUs possible
1	Conrad Drive	@ Southwest corner of Meadow Manor	Duplex Submersible - ABS AF13-4W-3" 1.75 HP	130	256	142	114
2	East Cottonwood	Near East Cottonwood Drive and Park Drive	Duplex Submersible - ABS AF60-4EX–6" 8 HP	1,018	2,513	1,085	1,427
3	Mountain View Drive	East side of Mountain View Drive	Duplex Submersible - ABS AF60-4EX–4" 8 HP	337	721	381	340
4	Solberg Drive	North end of Edgewood Drive on west side	Duplex Submersible - ABS AF13-4W-3" 1.75 HP	205	419	263	155
5	Harmony Road	@ Northeast corner of Harmony & Parliament Drives	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	115	225	74	150
6	Forest Drive	On Forest Drive at outside of southerly 90° bend	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	79	151	41	109
7	Bernard Road	South end of Bernard along north side of Highway 35	Duplex Submersible - ABS AF30-4-4" - 4.0 HP	380	823	276	547
8	Helena Flats Road	South end of Helena Flats Road along Highway 35	Duplex Submersible - ABS AF13-4W-3" - 1.75 HP	194	394	157	237
9	River Road	Outside of easterly "S" curve on River Road	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	228	469	254	215
10	Kings Way	Just north of West Evergreen Drive on west side	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	163	326	127	200
11	Cheery Lynn	South end of Cheery Lynn where roadway is blocked	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	135	267	62	205
12	Scenic Drive	West side of Scenic Drive	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	113	221	35	185
13	Montclair Drive	East end of Montclair along west bank of Stillwater River	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	226	465	223	242
14	Lake Park Drive	Along east leg of Lake Park Drive on west side of road	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	118	231	37	194

#	Name	Location	Type & Pump	Capacity (gpm)	Max. No. of EDUs that could be served	No. of Existing EDUs served	No. of additional EDUs possible
15	K-Mart	Near southwest corner of parking lot	Duplex Submersible - ABS AF60-4EX – 4" - 8 HP	672	1,561	663	898
16	Terry Road	North side of Terry Road in FEC near Judith Road	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	201	410	305	105
17	The Preacher	Off west side of US 2 just north of Brieske's Collision Repair	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	130	256	53	203
18	Plum Creek	West edge of Ridgewood Terrace Mobile Home Park	Duplex Submersible - ABS AF28-4W-4" - 3.75 HP	276	578	219	359
19	Main Station	South of Snappy's Sport Center; East of Shopko	Triplex Dry Pit – Cornell 6NHTA-VM – 60 HP	1,400	3,640	2,528	1,112
20	Greenwood Trailer Court	North side of US 2, east side of RR Tracks by Aquarium Shop	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	174	350	45	305
21	Shady Lane	East side of Shady Lane by White Birch Storage	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	136	269	30	238
22	Glacier Pines	In Swan Mountain Village along south leg of Swan Mountain Dr.	Duplex Submersible - ABS AF15-4EX-3" - 2.6 HP	177	357	14	343
23	Rainbow Bar	South edge of parking lot of Rainbow Bar	Duplex Submersible - ABS AF18-4W-3" - 2.5 HP	142	282	9	272
24	Meadow Manor 2	Within Meadow Manor Mobile Home Court, Phase 2	Duplex Submersible - ABS AFP 0841 M28/4-3" – 3.7 HP	100	194	7	187
25	Trumbull Creek Crossing	In homeowners park of Trumbull Creek Crossing	Duplex submersible - ABS AFP 0841M22/4-3"-3 HP	105	193	51	142

The tabulated lift station capacities represent the capacity of the respective lift stations with only one pump running. The maximum number of equivalent dwelling units (EDUs) and the maximum population were calculated using a wastewater flow of 67 gallons per capita per day, 2.81 persons per EDU based on Evergreen sewer system design criteria, and a peaking factor (ratio of peak hourly flow to design average flow) based on the MDEQ Circular DEQ 2 equation $(18 + P^{0.5})/(4 + P^{0.5})$ where population "P" is in thousands. Rather than calculating peak flow from a known population as is most commonly done, the maximum population was calculated using the known capacities of the various lift stations and the assumption that the projected population would generate a peak flow equal to pumping capacity of a given station.

The number of existing EDUs served was calculated using the previously stated unit flows from the Evergreen sewer design criteria and the average monthly sewage volumes pumped by each station during 2010 and 2011. The number of additional EDUs possible was calculated by subtracting the number of existing lots served from maximum number of lots a station could serve. No allowances were made for possible inflow or infiltration or for any vacant lots presently within the service area. Actual capacity available for future connections outside the sewer service area will be less than shown in the table.

D. 14" Force Main between Main Pump Station and Kalispell WWTP:

All wastewater from Evergreen is pumped to the Kalispell WWTP by Lift Station #19, the "Main Station", through approximately 24,000 lineal feet of 14" PVC force main that runs westward in Conrad Drive, then southward in Willow Glen Drive to Twin Acres Drive, and finally westward across Highway 93, along the City airport to the Kalispell WWTP. There is a short section of 12" ductile iron pipe in the force main where the pipeline is attached to the Conrad Drive Bridge at the Stillwater River crossing.

The 14" force was constructed primarily to convey sewage from Evergreen to the Kalispell WWTP. The force main passes through an unsewered area that is outside the sewer service areas of both Evergreen and Kalispell. During construction, an 8" tee was installed in the force main at the intersection of Willow Glen Drive and Concord Lane for a future connection of a discharge pipeline from a sewage pump station that would serve the North Willow Glen (Days Acres) area. A capacity of 200 gpm has been reserved in the force main for this connection. The City of Kalispell reimbursed Evergreen for the additional construction costs related to providing this connection and the increased conveyance capacity in the force main. As of 2012 this connection remains unused. Kalispell has requested and Evergreen has consented that the reserve of the 200 gpm flow be documented in the new Interlocal Agreement that is presently being negotiated.

CAPACITY TO SERVE AREAS OUTSIDE OF EXISTING SERVICE AREA:

North of Evergreen: The potential growth area for the Evergreen sewer system is limited primarily to that property that lies north or northeast of the present service area. The land west of the present sewer service area is either already served by the public sewer system of the City of Kalispell or else is closer to and better able to connect to Kalispell's sewer system. The Flathead River, Stillwater River and their adjacent floodplains are physical constraints that exist along the District's eastern and southern boundaries and preclude any serious development potential in those directions. Practically speaking, the only large area that could connect to the Evergreen sewer system is that property north of Evergreen that is situated between the Whitefish River on the west and the Flathead River on the east. This area is outside of the original Evergreen Sewer Rural Special Improvement District (RSID), and City of Kalispell consent is required for connection to the Evergreen sewer system.

As mentioned previously, Evergreen and Kalispell are currently negotiating a new Interlocal Agreement regarding wastewater collection and treatment. Based upon Kalispell's recently adopted annexation policy, it is possible that the new Interlocal Agreement will allow for future connections to the Evergreen sewer system in the area east of the Whitefish River and north of Evergreen's present sewer service area by a process that is simpler and less restrictive than the current method required in the original Interlocal Agreement. Negotiations are continuing and the goal for completion of the new agreement is July 2012.

The ground surface in Evergreen generally slopes downhill to the south at a slope of roughly 5 feet vertically per mile horizontally. The sewage collection system "starts" at the north, east and west fringes of Evergreen and flows downhill towards the Main Station, which is located near the east-west midpoint of the system and in the southern edge of the sewer service area. To get from any fringe area to the Main Station, sewage must be pumped at least twice and as many as four times along any given route. The trunk lines, pump stations and force mains are small at the far ends of the system. Gravity mains are minimum pipe size (6" for septic tank effluent and 8" for conventional mains) along the fringes of the system. Moving closer to the Main Station, trunk line size, wet well volume, pumping capacity and force main diameter all increase as sewage flows become successively greater through each pump station. Trunk lines expand to a final size of 21". Wet well diameters are 6 feet for most area stations but increase to 8 feet for the two largest area stations, #2 – East Cottonwood & #15 – K-Mart. Force main diameter ranges from 3" for Area Station #12 - Scenic to 10" for Area Station #2 - East Cottonwood.

When the Evergreen sewage collection system was designed, EPA grant conditions explicitly prohibited oversizing the facilities to serve future growth in areas outside the Evergreen District unless Evergreen paid for the cost difference with their own funds. There was no support among current property owners within the District to pay for improvements to serve future development on property outside of the District. Consequently, the collection mains and pump stations were sized without regard for providing additional capacity for adjacent property outside the District.

The result is ironic. The property near Evergreen that now is most likely to grow and need sewer service is next to that part of the Evergreen collection system that has the least amount of excess capacity available.

Before the bursting of the housing bubble, developers were actively talking with Evergreen about two major projects that were contiguous to but just north of the District sewer service area. One proposed development, Riverbend Village, on the west side of Highway 2, would have contained over 750 EDUs, according to preliminary plans. The other proposed development, Trumbull Creek Crossing, Phase 2+, on the east side of Highway 2, would have contained over 600 EDUs plus a 30 acre industrial complex, according to preliminary plans. Both developments were located north of Reserve Drive, south of Rose Crossing, and between Spring Creek and the Whitefish River.

During consideration of those two projects, preliminary analysis of the Evergreen sewage collection system indicated that Area Station #16 had capacity for 105 living units after existing development and vacant lots within the District were considered, and the West Trunk line along LaSalle Road had capacity for 138 lots due to bottlenecks in the 12" diameter line downstream of Area Station #16 - Terry.

By policy, the Evergreen District does not allow new developments to create new septic tank effluent services if conventional sewer mains are “reasonably” available. Conventional sewer mains exist along Highway 2, but do not extend very far away from the highway corridor. In the north part of the District, the residential areas that lie both east and west of the Highway 2 are served by septic tank effluent mains. Most septic tank effluent mains are 6” diameter mains laid at a slope of 0.20%. Capacity of a pipe of this size and slope is limited to a maximum of 202 EDUs, using Evergreen design criteria for flow.

The 6” septic tank effluent main located in Mountain View Drive that could serve additional development north of Reserve Drive was designed to serve a total of 95 EDUs (sum of existing dwellings and vacant lots). The Mountain View main would therefore have excess capacity for an additional 107 EDUs if septic tank effluent services were allowed. As shown in Table EG-6, Area Station #3 - Mountain View, has capacity for 340 EDUs, so capacity in this area is limited by the conveyance system, not the pump station.

Area Station #3 – Mountain View discharges into the East Trunk line, which starts along the east side of Highway 2 at the Highway 2 – Spring Creek Drive intersection by Les Schwab Tires. The East Trunk line is 10” diameter conventional sewer main at a nominal slope of 0.20% from Spring Creek Drive to Evergreen Drive. From Evergreen Drive to Area Station #2 in East Cottonwood Drive, the East Trunk line is a 12” diameter conventional sewer at a nominal slope of 0.16%. Capacity analysis of the East Trunk line was not performed by Evergreen for the proposed developments north of Evergreen because its north end is located too far south to be of any benefit.

The 6” septic tank effluent main located in Scenic Drive that could serve additional property north of Reserve Drive was designed to serve a total of 24 EDUs (sum of existing dwellings and vacant lots) and according to Table EG-6 presently serves 35 EDUs. The Scenic Drive main would therefore have excess capacity for an additional 167 EDUs if septic tank effluent services were allowed. Also, as shown in Table EG-6, Area Station #12 - Scenic, has capacity for 185 EDUs, so again capacity in this area is limited by the conveyance system, not the pump station.

The combined “excess” capacity of the three flow paths just described is 412 additional EDUs (107 EDUs for LS #3 - Mountain View; 167 EDUs for LS #12 - Scenic; and 138 EDUs for the West Trunk/ LS #16 - Terry). This total is less than the number of lots contemplated for either the Riverbend Village or Trumbull Creek Crossing developments. This conclusion underlines the reality of the weakness of the collection system along its north fringe. Before large numbers of new or existing homes or businesses can connect to the Evergreen sewer system in the area north of Evergreen, major new interceptor sewer mains are necessary because the existing sewer mains do not have adequate capacity.

Camelot Estates: Located along the north side of East Reserve Drive just east of Spring Creek, this 42-acre subdivision containing 58 residential lots was approved by the Flathead County Commissioners in 1981 with the condition that “dry sewer” mains be installed within the roadways of the subdivision and connected to a public sewer system at an unspecified later date.

The subdivision was constructed in two phases. The construction of the first phase took place in 1994 and the second phase was completed in 2001. 6" diameter septic tank effluent collection mains were installed in the roadways during construction. There are two mains running downhill to the south, in Rock Drive and in Pebble Drive, that end at East Reserve Drive. To serve the 5 lots that front Alpine Drive, another main, located along the west side of Alpine Drive and running downhill to the north, was installed from the midpoint of Lot 54 to Stone Street. This main could also serve the adjoining 6 existing lots on the east side of Alpine Drive.

By 2011, homes had been constructed on 57 of the 58 lots. Only Lot 3 is vacant on the 2011 Flathead County NAIP imagery. All homes presently use individual septic systems for wastewater treatment and disposal.

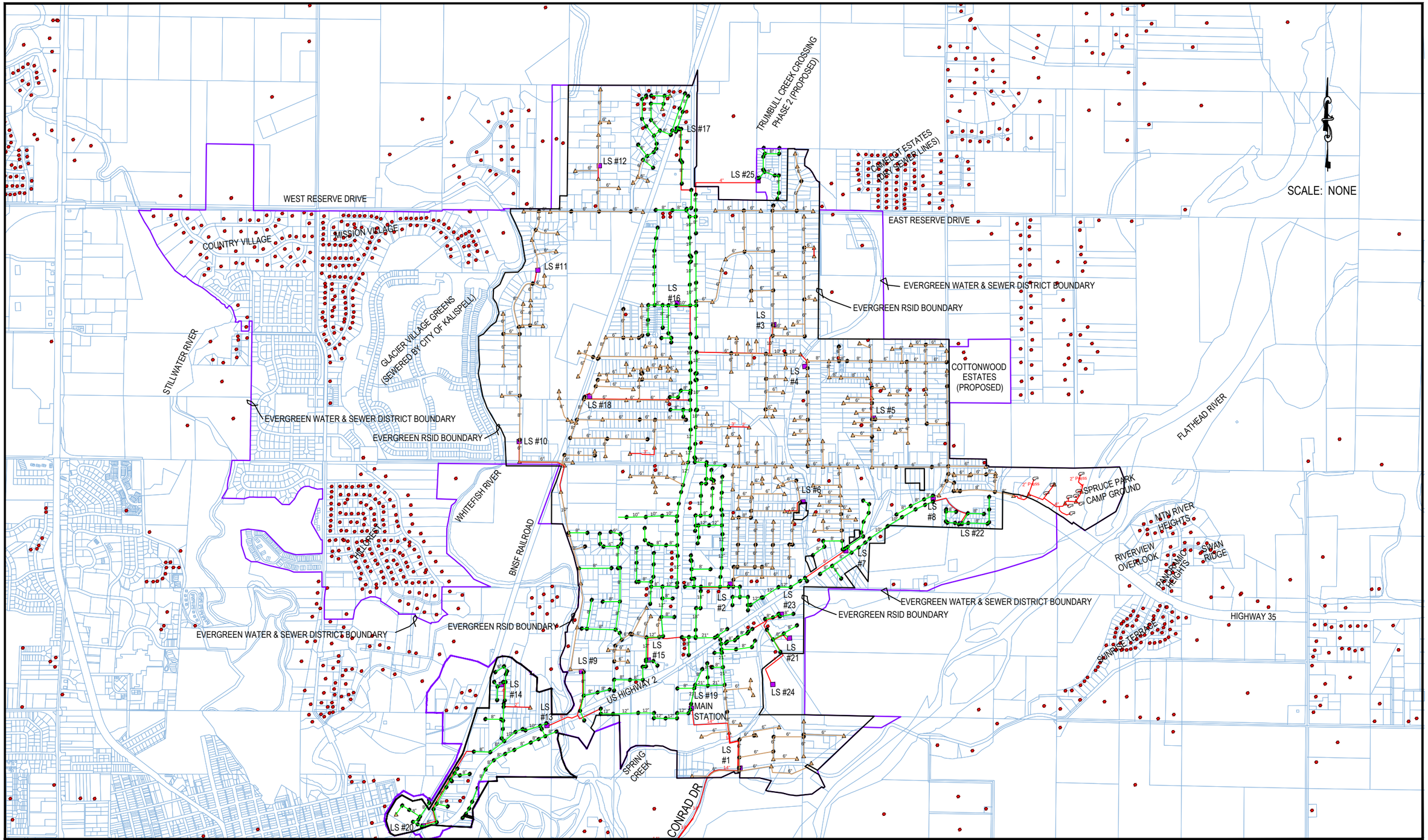
In addition to completion of the gravity mains in East Reserve Drive, a sewage pump station and force main that includes a stream crossing would be necessary to convey wastewater from Camelot Estates across Spring Creek to the existing 6" diameter septic tank effluent main located in East Reserve Drive about 1,000 feet west of Spring Creek. There is adequate capacity in both the gravity main to Area Station #3 and the pumps of Area Station #3 to serve Camelot Estates without overloading.

Sunrise Terrace, Panoramic Heights, Mountain River Heights, Swan Ridge and Riverview Overlook: Located on the east side of the Flathead River just over the Highway 35 bridge from Evergreen, these 5 subdivisions contain a total of 115 lots. All existing houses are on individual septic tank and drainfield systems. The soils in the area are very gravelly as evidenced by the JTL & Flathead County gravel pits located between Sunrise Terrace and the river.

The Evergreen sewer system has both conventional sewer mains and septic tank effluent mains located along the west side of the Flathead River. The conventional sewer mains are located on the south side of Highway 35 in the Glacier Pines RV Park/ Swan Mountain Village. Area Station #23 - Glacier Pines serves the RV Park & manufactured home park and has adequate capacity for the 115 lots of Sunrise Terrace et al subdivisions.

The septic tank effluent system located on the north side of Highway 35 in Spruce Park RV Park & manufactured home park is a series of pressure sewer mains and does not have adequate capacity to serve Sunrise Terrace et al. To reach the Evergreen sewer collections, collection mains, one or more pump stations and a force main crossing the Flathead River would be required.

North Willow Glen / Day's Acres Area: As mentioned previously, an 8" tee was installed in Evergreen's 14" main at the intersection of Willow Glen Drive and Concord Lane and a flow of 200 gpm is reserved in Evergreen's force main from this intersection to the Kalispell WWTP for the City of Kalispell. At Evergreen's unit wastewater flow for residences of 188 gpd, this capacity could serve a total of 407 homes, using the peaking factor defined in DEQ2, Figure 1, Chapter 10. There are perhaps 200 existing residences served by on-site sewer systems in the general area, which is presently unincorporated and not involved with the City of Kalispell. The flow reserved for Kalispell within the Evergreen force main is adequate to handle these existing homes. Shallow groundwater and floodplain concerns have limited development of the area. A network of collection sewer mains and one or more pump stations would be required to bring public sewer service to the area.



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Consulting Engineers

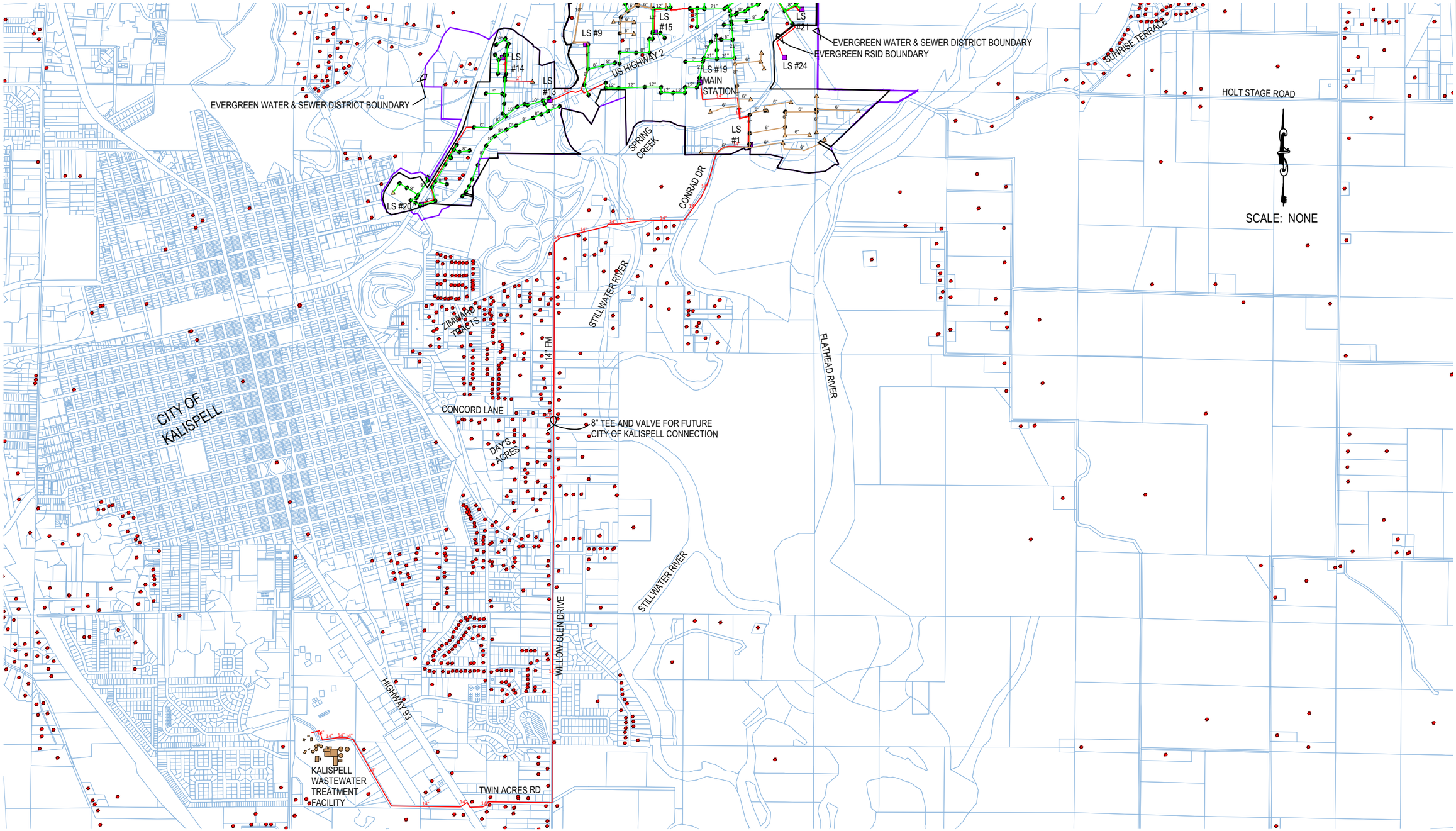
EVERGREEN WATER & SEWER DISTRICT
PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS - NORTH

Legend

Symbols	Description
	STEP Systems
	Sewer Small Diameter Mains
	Sewer Gravity Mains
	Manhole
	Lift Station
	Force Main
	Clean Out
	Flathead County Parcel
	Flathead County Septic Systems
	Flathead County Water & Sewer District

FIGURE NUMBER
EG-1

March 15, 2012



CARVER ENGINEERING
Consulting Engineers

EVERGREEN WATER & SEWER DISTRICT
PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS - SOUTH

Legend

Symbols	Description
	STEP Systems
	Sewer Small Diameter Mains
	Sewer Gravity Mains
	Manhole
	Lift Station
	Force Main
	Clean Out
	Flathead County Parcel
	Flathead County Septic Systems
	Flathead County Water & Sewer District

FIGURE NUMBER
EG-2

March 15, 2012

CITY OF KALISPELL

DESCRIPTION:

The City of Kalispell, located north of Flathead Lake and south of Whitefish, in Flathead County, is sewered by a central gravity collection system consisting of approximately 100 miles of gravity sewer mains, 2,444 manholes, 38 public sewage lift stations with their associated force mains and a biological nutrient removal treatment facility that has a permitted discharge to Ashley Creek.

Kalispell completed a Wastewater Facility Plan Update in March 2008. This facility plan update was prepared by HDR Engineers, Inc. of Missoula. Information from this report, along with information from and interviews with Kalispell Public Works staff and design reports for some recent subdivisions, is also utilized herein to help describe and evaluate the Kalispell wastewater system.

POPULATION ESTIMATES:

Census data for 2000 and 2010 show populations for the City of Kalispell to be 14,223 and 19,927 people, respectively. The 2008 Utility Plan used a population of 18,480 for the year 2005. The overall growth rate from 2005 to 2010 was 7.8% during the period for an annual growth rate of 1.5% per year. Most of this growth probably occurred from 2005 to 2007. Growth has slowed down due to the recession that started in 2007-2008 and to this day, growth remains stagnant.

The 2008 Kalispell Facility Plan Update uses a growth rate of 3% per year, to the year 2050.

According to the 2008 Kalispell Facility Plan Update, population estimates were prepared for an overall sewer study area, excluding the Evergreen Water District. The study area included the existing developed area in and around the City of Kalispell, and extended southward to Montana Highway 82, eastward to the Flathead River, westward to the base of the hills bordering the Flathead Valley in the south or Farm to Market Road in the north, and northward to a mile north of Church Drive in the West Valley area and north of the Glacier International Airport along US Highway 2. These estimates were used for utility system analysis and capital improvements planning. Population projections for the sewer service area are shown in Table KA-1.

Table KA-1 - Estimated Sewer Study Area Population*

Year	Sewer Study Area Population
2005	39,282
2025	70,948
2035	95,348
2050	148,549

* Information from 2008 Wastewater Facility Plan Update by HDR Engineers.

WASTEWATER FLOW ESTIMATES:

Using the population estimates just presented, the 2008 Kalispell Facility Plan Update developed flow estimates for the sewer study area by assigning a flow value of 106 gallons per day per capita and a per household population of 2.5 persons. Actual yearly average flow for fiscal year 2011 and wastewater flow projections for 2025 and 2050 for the sewer service area are shown in Table KA-2.

Table KA-2 - Estimated Wastewater Flows for Sewer Study Area *

Year	Yearly Average, MGD	Design Maximum Day, MGD
FY2011	3.09(1)	-
2025	7.52	17.22
2050	15.75	36.07

* Information from 2008 Wastewater Facility Plan Update by HDR Engineers.

(1) Actual yearly average flow for fiscal year 2011 - July 1, 2010 through June 30, 2011 – from Kalispell WWTP meter data.

WASTEWATER TREATMENT SYSTEM:

The City's existing wastewater treatment facility is an advanced treatment facility utilizing biological nutrient removal (BNR) system with tertiary treatment. The plant is located near the south edge of Kalispell on the east side of Airport Road and the north side of Ashley Creek. The plant site was until recently located further south than most, if not all, of the area served by the Kalispell sewer collection system. Development within only the past ten years or so has started to push significantly southward past the plant.

In August 2009, the City completed a two year plant expansion project to accommodate rapid growth in the Kalispell area. Plant capacity was increased from 3.1 to 5.4 million gallons per day. The biological nutrient removal process was changed from the modified University of Cape Town to the modified Johannesburg process. Improvements also included a biological state-of-the-art odor control system.

Influent wastewater enters the plant at the headworks, flows through primary clarifiers, to the bioreactor with its anoxic, anaerobic and aerobic zones to maximize nutrient removal, and then to secondary clarifiers and sand filters. The filtered effluent flows through an ultraviolet disinfection system and is reaerated before discharge into Ashley Creek.

Primary sludge is pumped to a fermenter. Supernatant from the fermenter is piped to the bioreactor to provide volatile fatty acids for the nutrient removal process. Fermenter solids pass through a gravity thickener and then to a primary digester and two secondary digesters. Disgested primary sludge is dewatered in belt filter presses. Secondary sludge is pumped to the bioreactors as return activated sludge. Waste activated sludge is pumped through dissolved air floatation (DAF) units. DAF filtrate is

returned to the bioreactors and DAF sludge is mixed with primary sludge just before the belt filter presses. The belt press cake is trucked either to a composting facility (Glacier Gold in Olney) or the Flathead County Landfill. Filtrate from the belt presses is returned to the headworks.

Recent upgrades to the treatment facility included Phases 1, 2 and 4 improvements identified in a March 2004 Wastewater Facilities Plan prepared by HDR, Stantec, and Morrison-Maierle for Kalispell. The goal of the upgrade was to provide additional treatment capacity and to implement greater odor control. Project elements deferred to later phases were related to sludge thickening and dewatering. Capacity of these unit processes can be increased through additional operational hours and increased operating costs.

According to the Facility Plan Update, the liquid treatment capacity of the Kalispell WWTP is significantly greater now that the recent upgrades have been completed. Table KA-3, a reprint of Table 4-2 from the Facility Plan Update, summarizes the present approximate unit process capacity at the Kalispell WWTP.

Table KA-3 – Summary of Unit Process Capacity After 2007 Expansion

Unit Process	Design Capacity Rating Factor	Estimated Year to Exceed Capacity[1]
Headworks	22 mgd +/- Peak Hour Flow	2025 or later
Influent Pump Station	15 mgd +/- Peak Hour Flow (firm)	2014
Primary Clarifiers	4.6 mgd Average Wet Weather Flow	2014
Flow Equalization Basin	N/A[2]	2014
Secondary Treatment	5.4 mgd Average Daily Flow	2016
Effluent Filtration	8.6 mgd Peak Hour Flow	2015
Ultraviolet Disinfection	16.6 Peak Day Flow	2025
Dissolved Air Flotation Thickening (WAS)	N/A	2015-2025[3]
Primary Sludge Fermentation System	7.3 mgd Average Daily Flow	2025
Anaerobic Digestion System	5.4 mgd Average Daily Flow	2016
(Belt Press) Dewatering System	N/A	2015-2025[3]

1 Based on straight-line extrapolation of flow and load projections as presented in Chapter 1, Table 1.9 and 1.10.

2 Design development for the Phase 1 expansion suggests that when the primary clarifiers require expansion that additional flow equalization be added.

3 Solids thickening and dewatering capacity is variable due to batch operations and ability to extend operating hours. Additional discussion regarding expansion and equipment replacement in Chapter 6.

Actual "year to exceed capacity" could occur in a year later than the year listed in Table KA-3 since predicted 3% annual growth rate may not materialize.

WASTEWATER TREATMENT PLANT EXCESS CAPACITY:

Annual average flow for Fiscal Year 2010-2011 at the Kalispell WWTP was 3.09 MGD. Present plant capacity is 5.4 MGD considering average daily flow of the secondary treatment train and anaerobic digesters as the limiting factors (See Table KA-3 above for design capacities of the various unit processes at the plant). The Facility Plan Update established flow criteria as 106 gpd per person and 2.5 persons per household. Using these values, the plant presently has an excess capacity of 2.31 MGD, which can serve 8,717 additional dwelling units or 21,792 more people.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM CAPACITIES:

The collection and conveyance system of Kalispell was analyzed in detail by HDR as part of the 2008 Facility Plan Update. Chapter 5 of that update is the source of much of the following discussion of collection system capacity.

A. Gravity Collection System:

Kalispell's wastewater collection system consists of roughly 100 miles of gravity collection mains ranging in size from 6" to 36". Pipe materials consist of vitrified clay, cast iron, reinforced concrete, asbestos cement and PVC. The original collection system was installed in 1911. Parts of the collection system are over a century old. Additions and improvements to the collection system have occurred over the life of the system as growth, development, repair and maintenance have required. (See Figures KA-1 & KA-2 at the end of this section for the sewer system layout; Exhibits KA-1 & KA-2 are full size plan sheets located at the end of this report.)

In the Facility Plan Update, there are descriptions of five main gravity interceptor sewers that collect wastewater from the Kalispell service area and convey it to the Kalispell WWTP.

Line A: Line A serves the west side of Kalispell and the Highway 93 corridor north of the Meridian Road-Highway 93 intersection. The designated low point (and end point) for Line A is at the Kalispell WWTP. From the plant, past the City Airport to the City Shops, Line A is a 36" diameter reinforced concrete pipeline. From the City Shops, through Legends Field, to the intersection of 2nd Avenue West and 11th Street West Line A is a 30" diameter reinforced concrete pipeline. Line B connects to Line A at the intersection of 2nd Avenue West and 11th Street West. Line A continues as a 30" diameter reinforced concrete pipeline north and west, zigging and zagging to the intersection of 5th Avenue West and 9th Street West., where Line E, a 24" pipe, connects to Line A. At this point, the size of Line A reduces to 18" diameter pipe and pipe material changes to clay. Line A

continues west and north to Meridian Road and Center Street, and then north in Meridian Road to Two Mile Drive, where the pipe size decreases to 15". This 1968 vintage 15" clay pipe continues north in Meridian Road to Liberty Street, where the trunk line turns west and decreases in size to 12" diameter clay pipe, heading west to Hawthorne Avenue, where the 12" clay line turns north. Line A runs north in Hawthorne Avenue to Three Mile Drive, jogs one block west to Northern Lights Boulevard, and continues northward in Northern Lights Boulevard to Sherry Lane, where the pipe changes again to 8" clay before following a circuitous route along Northern Lights Boulevard, Wedgewood Lane, Crestview Road and Northridge Drive to Highway 93, crossing the highway and ending at a manhole to which the force main from Lift Station 3 – Grandview Drive connects.

In 2009, in response to concerns by MT DEQ that development in north Kalispell was outstripping available sewer capacity, Kalispell undertook improvement projects to increase the capacity of Line A by installing larger pumps in Lift Station 3 - Grandview Drive; increasing size of the force main from Lift Station 3 from 6" to 10" HDPE by pipe bursting; replacing the existing 8" diameter sewer main in Parkway Drive from Northridge Drive to Meridian Road with new 15" diameter main, and modifying the manhole at the Northridge Drive-Parkway Drive intersection to act as a splitter manhole where flow from Lift Station 3 is diverted partially into the Parkway Drive main and the remainder into the Northridge Drive main. These improvements increased capacity of Lift Station 3 to 860 gpm, which was estimated to be adequate to serve 1,089 additional dwelling units in the area north of Four Mile Drive / Grandview Drive.

Even with these improvements, the excess capacity in Line A at its north end was barely greater than the number of lots that had been proposed in the area upstream of Lift Station 3 – Grandview Drive by developers and had received preliminary approval from the City of Kalispell. A count provided to MT DEQ by Paul Burnham, then Assistant City Engineer, in September 2008 estimated that only 67 gpm of the total pump station capacity (enough for 175 lots) remained unallocated after present users and future commitments were taken into account. The conclusion drawn by the Facility Plan Update was that Line A's existing piping up and over Buffalo Hill does not and will never contain sufficient capacity to serve potential growth envisioned in the areas north and west of Kalispell, and consequently a new West Side Sewer Interceptor is necessary to meet sanitary sewer demands for full build out of the planning areas west and north of Kalispell. Estimated cost of the project was between $12 million and $15 million. With the collapse of the real estate market, many of the "committed" projects have at least

been put on hold or else have been abandoned completely, and excess capacity will be adequate to satisfy short terms needs of the area.

The sewer collection system north / upstream of Lift Station #3 – Grandview was not modeled by HDR.

The first few segments extending northward from Lift Station #3 – Grandview were installed in 1990 to serve the original phase of the then “new” Flathead Valley Community College campus. These segments are 8” sewer main. In the early to mid-2000s, the area adjacent to Highway 93 from Grandview Drive / Four Mile Drive to Reserve Drive rapidly developed and now includes the Kids Sports Complex, Wal-Mart, Costco, Home Deport, Lowes, and a multitude of additional commercial development. Further west, Glacier High School, the West View Estates subdivision and various smaller developments have also extended or connected to the sewer collection system. 12” sewer trunk lines and 8” collection mains were connected to the college’s 8” mains and were extended northward and westward to serve the area.

In 2008, City of Kalispell sewer was extended 2 ¼ miles along Highway 93 north from West Reserve Drive to the Silverbrook subdivision. A pair of force mains – an 8” pipe presently in service and a 12” pipe for future service – run east and south from Lift Station #39 in Silverbrook to the intersection of Ponderosa Lane and Highway 93. From this point, an 18” gravity trunk line runs southward along the east side of Highway 93 to just north of the Stillwater River, where the sewer main crosses Highway 93 to the west side and ultimately ends at Lift Station #36. Roughly 700 feet of 10” HDPE force main leaves Lift Station #36, crosses the Stillwater River, transitions to 8” HDPE force main, and then runs approximately 1,700 feet further to a point on the east side of Highway 93 just south of West Reserve Drive which is the northern terminus of the 12” gravity sewer that drains to Lift Station #3 – Grandview. About 600 feet of 16” HDPE pipe was placed parallel to the 10” force main across the Stillwater River for future use when flows increase. This larger force main is not complete – it must be connected to Lift Station #36 at its north end and must be extended to the receiving gravity sewer network on the south side of the river.

The design of Lift Station #36 contained provisions for future expansion to handle larger flows. These features include connections in the incoming gravity pipe for a future second wet well and valve pit, piping stubbed out of the present wet well to tie into the future wet well, another future tie-in branch in the force main, and the larger force main across the river.

Minimum grade in the 18" gravity sewer main between Silverbrook and Lift Station #36 is 0.20%. This reach of sewer main has a capacity of 1,653 gpm when flowing 2/3rds full. This capacity could serve 2,906 dwelling units at Kalispell's unit residential flow rate of 106 gpd per person and 2.5 persons per household and using the peaking factor established by Figure 1, of DEQ Circular 2.

Current capacity of Lift Station #36 is 815 gpm. According to the "Municipal Utility Extension Engineering Report" prepared for Silverbrook by CTA Civil Engineering in 2008, the force main presently leaving Lift Station #36 was sized to handle 960 gpm, which was the predicted peak flow from Silverbrook (2,200 persons/880 lots) and the then proposed OWL development (1,250 persons/500 lots), which is located on the west side of Highway 93 south of Silverbrook and north of the Big Mountain (formerly Northern Pines) Golf Course. Since that time, the pace of development has slowed. Only the initial two phases (Phase 1 and Phase 1A) of Silverbrook, containing 286 lots/715 persons, have been platted. The OWL development property was annexed into the City of Kalispell, but has not moved forward and is currently dormant.

Line A downstream of the Silverbrook improvements does not have sufficient capacity to handle peak flows that could be generated from Lift Station #36. Initial approvals of Silverbrook by MT DEQ contained explicit prohibitions of any additional connections to the "Highway 93 North" improvements until "physical upgrades have been made to the downstream wastewater collection system and additional capacity is illustrated to be available". The present poor economic outlook, glut of vacant residential lots and lack of growth in the area have relieved the pressure on Kalispell to resolve the sewer capacity bottlenecks in Line A for the short term. The West Side Interceptor has been identified as the long term solution and will be necessary if and when significant growth north and west of Buffalo Hill is to occur.

Further downstream of Lift Station #3 - Grandview, the Facility Plan Update estimated that Line A had excess capacity of 0.60 MGD at the Two Mile Drive and Meridian Road intersection, which would be adequate to serve 742 additional dwelling units. The Facility Plan Upgrade also estimated that Line A had excess capacity of 2.0 MGD at two places: 1) the intersection of 5th Avenue West and 9th Street West, and 2) the intersection of 1st Avenue West and 18th Street West. Downstream of each of these locations, Line A would be capable of handling flows from an additional 2,747 dwelling units.

Line B: Line B serves the southeast side of "older" Kalispell. Line B is located in 11th Street; begins near 9th Alley East as an 8" main and runs downhill to the west, ending in 2nd Avenue West as a 15" pipe, where it connects to Line A. Line B serves an area that is almost completely developed and has little additional growth potential. The Facility Plan Upgrade estimated that Line B has an excess capacity of 0.20 MGD, which is enough to serve an additional 247 dwelling units. Growth in the area is not expected to exceed this available excess capacity.

Line C: Line C serves the east side of Kalispell north of Line B. The upstream end of Line C is located in 2nd Street East just west of Woodland Avenue. The force main from Lift Station 7 – Woodland Park discharges into Line C at this point. Line C is 15" in diameter and runs downhill to the west in 2nd Street East to 1st Alley East, where it turns south and runs downhill in the alley to 11th Street East, where it connects to Line B. The gravity portion of Line C serves an older part of Kalispell that is fully built out and has little additional growth potential. The Facility Plan Upgrade estimated that Line C has an excess capacity of 0.90 MGD, which is enough to serve an additional 1,113 dwelling units. Growth in the older part of Kalispell that receives gravity sewer service from Line C is not expected to exceed this available excess capacity. The area that could exert appreciable additional future growth and wastewater loading on Line C is the currently unsewered area east of Woodland Park and along Conrad Drive, namely the Phillips Addition and the Zimwald Tracts. There are roughly 200 lots in the area, and Line C has adequate capacity if all of those lots were to connect to public sewer.

Line D: Line D serves the area in northeast Kalispell along Whitefish Stage Road. Line D collects and conveys wastewater from the Buffalo Stage, Riverview Greens, Fairway Boulevard Townhomes, Glacier Commons, Stillwater Bluffs and Glacier Village Greens subdivisions and some other small developments. This area is within the Evergreen Water & Sewer District and receives potable water service from the Evergreen water system. Also in the this area are three large older subdivisions (Mission Village, Hillcrest Estates, and Country Village) plus a handful of other smaller developments that are presently served by on-site septic systems that could be served by Line D if and when they connect to public sewer. South of Reserve Drive there are roughly 350-400 existing residences adjacent to or near Whitefish Stage that might eventually connect to Line D. According to the Facility Plan Update, Line D has excess capacity of 0.35 MGD, which could serve 433 dwelling units. This capacity would be enough to serve the existing developments just mentioned, but if these

developments did connect to Line D, there would be very little excess capacity left for any significant future projects located north of Reserve Drive.

Line D conveys wastewater to Lift Station 9 – Fairway, which pumps the sewage through a recently upsized force main (now 10" in diameter) that crosses the Stillwater River, passes through Lawrence Park and discharges into the upper end of Line E. The Facility Plan Update states that the excess capacity of Lift Station 9 – Fairway could be increased to 0.70 MGD if the existing pumps were replaced with larger equipment. The Facility Plan Update also identified another possible improvement to Line D that would eliminate a bottleneck near West Evergreen Drive and Whitefish Stage Road, which is replacing a 12" section of Line D with new 15" pipe. With this upsizing, excess capacity in Line D would increase to 0.70 MGD, matching potential excess capacity of Lift Station 9 – Fairway. An excess capacity of 0.70 MGD could serve 866 dwelling units, which would be enough to serve the unsewered developments already in existence south of Reserve Drive along Whitefish Stage Road plus some future development further north of Reserve Drive or in or near Glacier Village Greens.

Line E: Line E serves the western central core area of "old" Kalispell, the Kalispell Mall area, and both the East North & West North areas. Line E receives all the sewage that is collected by Line D at its upper end in North Main Street. Line E is a 24" pipe throughout most of its lower length, but pipe size decreases to 12" north of Montana Street. Further north, there is a segment three blocks long between Washington Street and Nevada Street in 1st Alley East where the size of Line E drops to 8". North of this restriction, size of Line E increases back to 12" for the remainder of its length to its north end where the force main from Lift Station 9 – Fairway connects. Line E has no excess capacity north of Washington Street due to the 8" bottleneck.

There is very little growth potential within the gravity service area of Line E since this part of the City was developed long ago and is almost fully built out. Potential increased flows in Line E would come from additional connections made to Line D (Whitefish Stage Road service area) just described. The Facility Plan Update concluded that excess capacity in Line E could be increased to 0.70 MGD, enough to serve 866 dwelling units, if the 8" bottleneck in 1st Alley East was replaced with 12" sewer pipe. This increased excess capacity in Line E would then match the excess capacity that could also be achieved with the previously mentioned improvements to Line D and Lift Station 9 – Fairway.

One major trunk line not mentioned in the 2008 Facility Plan Update is the interceptor located south of Kalispell running along Highway 93 from Old School Station to the Kalispell WWTP. This conveyance route is made up of 12" & 15" gravity mains flowing to Lift Station #34 – Ashley Creek, twin force mains crossing the creek - a 6" force main in operation now and a 12" force main installed in the same trench for future use when flows increase – that discharge into 15" gravity mains that flow north to Lift Station #22 – Cemetery Road, which then pumps through another set of twin force mains – 6" (present) and 8" (future) – that discharge into 12" gravity mains that flow to the Kalispell WWTP. Lift station #22 – Cemetery Road and associated piping were installed as part of the Highway 93 South reconstruction project in 2004 and the Old School Station improvements were installed in 2006. The area served is not densely developed presently and Lift Stations #22 & #34 are lightly loaded at this time. Lift Station #22 – Cemetery Road ran an average of 4.2 hours per week and a maximum of 10.1 hours for one week in 2011 and Lift Station #34 – Ashley Creek ran an average of 3.2 hours per week and a maximum of 17.9 hours for one week in 2011. Maximum run times are most likely due to wet weather and I & I, not high wastewater flow loading from customers. This south trunk line has considerable excess capacity to serve existing and future developments in the area.

B. Lift Stations:

There are thirty eight public sanitary sewer lift stations within the Kalispell sewer collection & conveyance system that are owned and operated by the City. The Main Station of Evergreen also pumps to the Kalispell WWTP, but it pumps directly to the plant through an independent force main and is not connected to the Kalispell Sewer collection system. Kalispell also owns & operates storm water pumping stations and an individual wastewater pumping station for City Hall, but these stations are not considered in this report. Basic information for the sewer lift stations is presented in Table KA-4.

Table KA-4 - City of Kalispell Sewage Lift Stations*

Sta. #	Location	Pump Station Arrangement	Motor HP (ea)	Ave. Pump Rate (gpm)	2011 Ave. Weekly Run Time (hrs)
2	18th St. E. - Between Hwy 93 and Airport Road	Wetwell/Drywell Packaged System	10	490	55.0
3	SE Corner of Hwy 93 and Grandview	Wetwell/Drywell Packaged System	20	460	35.4
4	South of Liberty Street in El Dorita Addition 3	Vertical Column Pumps	3	165	13.1

Sta. #	Location	Pump Station Arrangement	Motor HP (ea)	Ave. Pump Rate (gpm)	2011 Ave. Weekly Run Time (hrs)
5	Kelly Road and Eagle Drive	Self Priming Packaged System	10	355	33.7
5A	End of Eagle Drive	Submersible Packaged System	1	UK	13.9
6	Cooper Lane — 2 Mile Vista Apts.	Submersible Packaged System	5	260	10.2
7	Woodland Park	Self Priming Packaged System	10	180	10.4
8	Sunnyside Drive and 7th Ave. West	Self Priming Packaged System	5	85	59.3
9	West of Fairway Blvd.	Wetwell/ Drywell	10	253	74.4
10	W. Nicklaus Ave. in Gla.Village Greens	Wetwell /Drywell Packaged System	30	360	25.4
11	E. Nicklaus Ave. in Gla. Village Greens	Self Priming Packaged System	5	170	15.6
12	Buffalo Stage South of Bruyer Way	Self Priming Packaged System	5	165	23.7
13	Juniper Bend	Self Priming Packaged System	10	105	7.4
14	Parkway & Summit Ridge Drives	Submersible Packaged System	3/4	25	2.7
15	Belmar North of Bluestone	Submersible Packaged System	1	210	4.1
16	274 Buttercup Loop	Self Priming Packaged System	5	185	20.4
17	Home Depot	Self Priming Packaged System	7.5	140	14.4
18	2271 Pintail Court	Submersible Packaged System	5	140	10.5
19	91 Blue Crest Drive	Self Priming Packaged System	7.5	220	7.6
20	188 Palmer Drive	Submersible Packaged System	2.7	98	2.3
21	830 12th Avenue West	Submersible Packaged System	2	43	10.1

Sta. #	Location	Pump Station Arrangement	Motor HP (ea)	Ave. Pump Rate (gpm)	2011 Ave. Weekly Run Time (hrs)
22	106 Cemetery Road	Self Priming Packaged System	40	485	4.2
23	1994 Teal Drive	Submersible Packaged System	3	144	11.6
24	179 Empire Loop	Self Priming Packaged System	75	250	19.4
25	Willow Glen & Russell Drive	Submersible Packaged System	2	44	3.9
27	Highway 93 & Four Mile Drive	Submersible Packaged System	2	21	3.4
28	134 Auric Drive	Submersible Packaged System	3	53	16.0
29	135 Triple Creek Drive	Submersible Packaged System	50	544	9.6
30	122 Moes Run	Submersible Packaged System	3	80	3.3
31	FVCC - O.T. Building	Submersible Packaged System	3	60	7.8
32	FVCC - A &T Building	Submersible Packaged System	3	70	0.4
33	351 Lupine Drive	Self Priming Packaged System	10	225	2.0
34	3391 U.S. Highway 93 South	Submersible Packaged System	60	250	3.2
35	Meadows - 310 Four Mile Drive	Self Priming Packaged System	14	180	1.6
36	2686 Hwy 93 North (by Stillwater River)	Duplex submersible packaged system	40	815	2.2
38	Spring Creek Estates – 180 Westland Dr.	Duplex submersible grinder system	3	35	4.9
39	Silverbrook – 177 West Swift Creek Way	Submersible Packaged System	18	370	1.5
40	Ashley Heights – 334 Bismark Street	Duplex submersible grinder system	2	20	7.4

* Information from 2008 Facility Plan Update by HDR Engineers and flow run times from Kalispell Sewer Department.

According to HDR's Facility Plan Update, a majority of the lift stations are capable of servicing their service area especially since most of the service areas are built-out or the lift station was constructed for a specific subdivision.

The most heavily used pump stations are #9 – Fairway; #8 – Sunnyside; #2 – Elks; #3 – Grandview; and #5 – Greenacres.

Pump station #9 - Fairway is part of the Line D interceptor and has already had its force main upsized and pumping equipment replacement was identified in the Facility Plan Update to further increase capacity. Pump station #3 – Grandview is contained in Line A and both the pumping equipment and force main were recently upsized to increase capacity. These two pump stations are located along the northern edge of Kalispell where considerable future development could potentially occur. These existing stations, even with any remaining improvements already identified, will likely not have adequate capacity to satisfy loads from all the potential developments that could occur further north. The limitations of these stations reinforce the need for the City of Kalispell to ultimately build the West Side Interceptor if it plans on connecting extensive areas north of Kalispell to its sewer collection system.

Pump station #3 - Elks serves the existing commercial area along Highway 93 roughly from 13th Street south to Kelly Road. This service area is mostly fully built out. There is little potential for future significant development within the service area and no likelihood of connections from areas outside the service area. Its capacity is adequate for existing customers and any reasonably likely future projects.

Pump stations #8 – Sunnyside and #5 – Greenacres serve existing residential areas in the southwest and southeast parts of Kalispell, respectively. These service areas are mostly fully built out, but not all existing homes in the service areas are presently connected to Kalispell sewer. The number of homes currently using septic systems in the Sunnyside area is relatively small and Pump Station #8 has adequate capacity to handle these homes if and when they connect to public sewer. The number of homes currently using septic systems in the Greenacres area is much higher. Pump Station #5 suffers from high seasonal non-wastewater loading thanks to the shallow groundwater of the Greenacres area and common use of sump pumps connected to the sanitary sewer in houses of the area. Peak week run times in 2011 approached 67% of the time during the first week of April. Pump station #5 has adequate capacity to handle wastewater loads from the homes in the area if they were to connect to public sewer, but a separate storm water system to relieve non-wastewater loading on the station is warranted before wholesale connection of these properties is undertaken.

CAPACITY TO SERVE AREAS OUTSIDE OF EXISTING SERVICE AREA:

There are some densely developed areas presently utilizing existing on-site septic systems for wastewater treatment and disposal within or close to the Kalispell sewer collection system that could connect to the public sewer system if sufficient excess capacity was available. However, ample capacity does not always exist in the City system.

Ponderosa & Northern Pines Subdivisions – These two developments are located on opposite sides of Highway 93, north of the Stillwater River and south of the Silverbrook subdivision. Collectively these two developments contain just over 100 existing residences. These subdivisions could connect to the 18" gravity sewer main that runs from the Silverbrook subdivision downhill to the south to Lift Station #36. To reach the 18" gravity main located on the east side of Highway 93, it may be necessary to install pump stations in both subdivisions. There is sufficient excess capacity in the 18" gravity sewer main and Lift Station #36 to serve these developments but the capacity of the Line A south of Reserve Drive is limited. Connection of these two subdivisions to Kalispell sewer may have to wait until after the future West Side Interceptor has been constructed.

Stillwater Estates / Country Estates / Country View Estates / Royal Reserve Condominiums / Mountain Villa Apartments – On the 280 acres north and west of the West Reserve Drive – Highway 93 intersection, there are over 420 dwelling units utilizing septic systems for wastewater treatment and disposal. Kalispell sewer has been extended to the east, south and west sides of the area. If the existing residences in this area did connect to Kalispell sewer, wastewater would flow to Lift Station #3 – Grandview, which does not have enough excess capacity to serve all the formerly proposed future homes and existing septic system homes in this area. Connection of this area to Kalispell sewer may have to wait until after the future West Side Interceptor has been constructed.

North Haven / Meadowland – These two subdivisions are located in the northwest quadrant of Kalispell and are totally surrounded by property that is within Kalispell, but both subdivisions are rural developments located outside of the Kalispell City Limits. Collectively these two developments contain 78 lots. The 32 lots of the North Haven subdivision could gravity flow to Lift Station #3 – Grandview while the 46 lots of Meadowland would connect to Kalispell's Line A downstream of Lift Station #3 – Grandview. Excess capacity exists presently in Kalispell's collection system to serve these two subdivisions. Timing of the connections is important. Capacity of Lift Station #3 – Grandview is not a problem currently but could become an issue for North Haven later if growth picks up again and many of the previous developments that have been mothballed are resurrected. Timing is not so critical for Meadowland as adequate excess will likely remain in Line A for the foreseeable future. If the West Side Interceptor is constructed, sewer loading on Lift Station #3 – Grandview and Line A will be greatly lessened and excess capacity to serve both developments should be available.

Two Mile Drive / Highway 2 West / West Spring Creek Drive Area – There are over 250 existing residences in the area west of Kalispell along the loop created by Two Mile Drive, West Spring Creek Drive and US Highway 2 West. In this area are the Big Sky Homesites, Hillcrest Terrace, Two Mile Tracts, Aspen Knoll and Meadow Hills subdivisions and other smaller subdivisions plus many homes on individual tracts. The area is roughly one mile north to south and almost two miles east to west. Extensive new collection mains and pumping stations would be necessary to collect and convey sewage to the Kalispell system. The 2008 Facility Plan Update estimated that an excess capacity of 0.60 MGD exists at the Two Mile Drive and Meridian Road intersection, which would be adequate to serve 742 additional dwelling units. There would be sufficient capacity for this area to connect to Kalispell sewer.

Whitefish Stage Road Area – There are roughly 350-400 existing residences in the area along Whitefish Stage Road south of West Reserve Drive. There are three large older subdivisions, Mission Village, Hillcrest Estates, and Country Village, some other smaller developments and many additional homes on individual tracts that are presently served by on-site septic systems. These homes would connect to Line D. According to the Facility Plan Update, Line D has excess capacity of 0.35 MGD, which could serve 433 dwelling units. This capacity would be enough to serve the existing developments just mentioned. However, Line D flows into Line E and, according to the 2008 Facility Plan Update, there is no excess capacity in Line E due to the presence of three blocks of 8" sewer main in 1st Alley EN from between Washington Street and Nevada Street. If this small sewer main was replaced with 12" pipe, the Facility Plan Update estimated that excess capacity would increase to 0.70 MGD, enough to serve 866 dwelling units. This improvement to Line E would be necessary before the existing unsewered homes in the Whitefish Stage Road area could connect to the Kalispell sewer.

East of Woodland Park – Phillips Addition / Zimwald Tracts – There are roughly 200 existing lots in the area east of Woodland Park along Conrad Drive. The area is low lying flood prone ground with gravelly soils and shallow groundwater. There are two large older subdivisions, the Phillips Addition and Zimwald Tracts, and some additional homes on individual tracts that are presently served by on-site septic systems. These homes would connect to Line C. According to the Facility Plan Update, Line C has excess capacity of 0.90 MGD, which is enough to serve an additional 1,113 dwelling units. This capacity would be enough to serve the existing developments just mentioned. A small portion of this area could gravity flow to Lift Station #7 – Woodland Park. To serve the bulk of the area, at least one pump station would be required.

North Willow Glen Road – Day's Acres – There are roughly 100 existing lots in the area further east of the Zimwald Tracts along the north end of Willow Glen Drive. Like the area just described, this area is also low lying flood prone ground with gravelly soils and shallow groundwater. There is one large older subdivision in the area, Day's Acres, and many homes or other uses on individual tracts that are presently served by on-site septic systems. These homes would connect to the 14" Evergreen force main located in Willow Glen Road. As described in the Evergreen Sewer System section, an 8" tee was installed in Evergreen's 14" main at the intersection of Willow Glen Drive and Concord Lane and a flow of 200 gpm in the 14" Evergreen force main is reserved for the City of Kalispell. This capacity could serve 279 dwelling units at Kalispell's unit residential flow rate of 106 gpd per person and 2.5 persons per household and the peaking factor established by Figure 1 of DEQ Circular 2. This capacity would be

enough to serve the existing developments just mentioned. A network of collection sewer mains and one or more pump stations would be required to bring public sewer service to the area.

South Woodland Drive – Greenacres, Knoll's Addition, etc. – There are roughly 150 existing lots in the area along the southern end of Woodland Avenue and along South Woodland Drive. There are many smaller older subdivisions clustered around Woodland Avenue at the north end of South Woodland drive. These subdivisions include the Knoll's Addition, Leduc Addition, French and Greendale subdivisions. Further south, along South Woodland Drive is the Greenacres subdivision, parts of which have already connected to Kalispell sewer and other parts of which are still using septic systems.

In general this area has fairly tight, slow draining soils with relatively shallow groundwater. Kalispell sewer already runs through the area. Lift Station #5 – Greenacres would serve most if not all of the area. As mentioned previously, Lift Station #5 – Greenacres is one of the most heavily loaded pump stations in the Kalispell system due to the shallow ground water and widespread use of sump pumps connected to the sewer system in the area. Lift Station #5 – Greenacres has sufficient capacity for present and additional wastewater loads of the area, but stormwater and inflow/infiltration loads are significant at times and come close to overloading the station. A separate storm water collection system would help divert groundwater and sump pump discharges from sanitary sewer system.

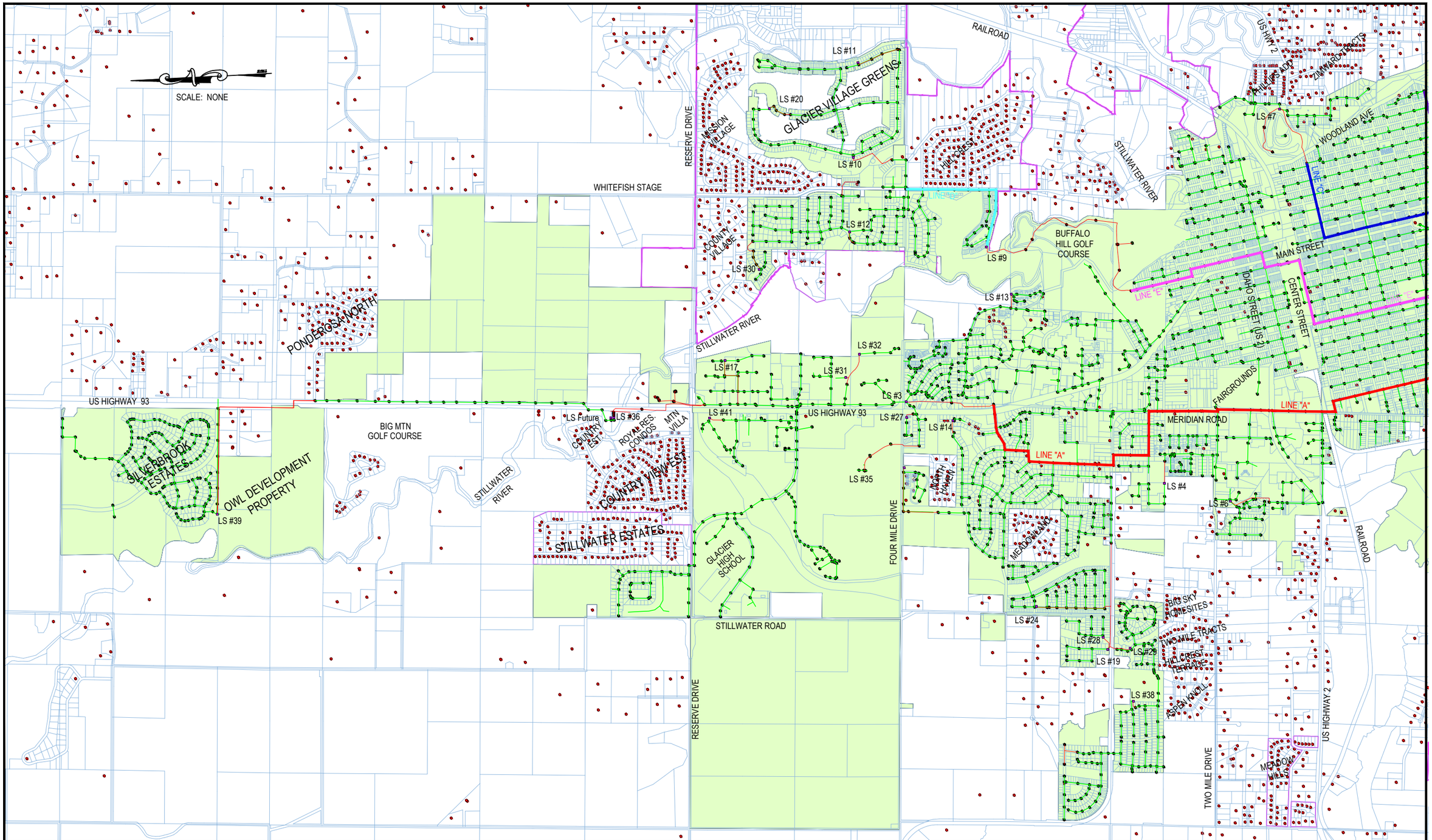
Green Tree Meadows – Green Tree Meadows is a 95 lot subdivision located on Lower Valley Road about ¾ mile east of the Four Corners intersection on Highway 93. Soils of the area are fine grained silt and clay loams underlain by more sandy material. The subdivision sits just south of the Stillwater River just upstream of its confluence with the Flathead River. Collection mains, a pump station and force main would be required to collect the wastewater from the subdivision and convey it to the interceptor running along Highway 93 in south Kalispell to the Kalispell WWTP. A new pump station in Green Tree Meadows could pump to either Lift Station #22 – Cemetery Road or the force main from the same pump station. Presently either connection point has sufficient excess capacity to handle the load from Green Tree Meadows.

Highway 93 Corridor South of Kalispell – The sewer collection system installed during the Highway 93 South reconstruction project of 2004 and the 2007 improvement to serve Old School Station extended public sewer almost three miles south of the previous limits of sewer service. There are some developed commercial parcels fronting the highway scattered throughout the area, but the region is not densely developed. There are a few pockets of denser residential developments that are adjacent to or close to the sewer mains, specifically at the northwest quadrant of the Four Corners intersection and across the highway from Old School Station. Collectively there might be 100 developed tracts utilizing septic systems along this three mile stretch of highway. The existing Kalispell sewer system could handle the increased load if all these parcels were to connect to public sewer.

Foys Lake Road / Whalebone Drive Corridor South and West of Kalispell – There are perhaps a few hundred existing residences along Foys Lake Road and close in on Whalebone Drive in the vicinity of Kalispell. The distance between these residences and the existing Kalispell sewer collection system is considerable. The closest Kalispell sewer system to this area is weak – the sewer system that was extended to the Lone Pine Trail subdivision located near the east end of Foys Lake Road has only a 6" HDPE force main (from Lift Station #33) connecting to the 8" gravity piping network of Kalispell's Line A on the opposite side of Ashley Creek. This force main and receiving gravity sewer would have limited capacity to serve additional users in the area.

Depending upon how the excess capacity in Line A is allocated, there may or may not be excess capacity available to serve the Foys Lake Road area when the time comes for it to connect to the Kalispell sewer system. The 2008 Facility Plan Update estimated that there was 0.60 MGD excess capacity in the 18" clay portion of Line A downstream of the Two Mile Drive and Meridian Road intersection, which would be adequate to serve 742 additional dwelling units. The Facility Plan Upgrade also estimated that Line A had excess capacity of 2.0 MGD at the intersection of 5th Avenue West and 9th Street West where pipe diameter increased to 30", which would be capable of handling flows from an additional 2,747 dwelling units.

To serve the Foys Lake Road / Whalebone area, a connection to Trunk Line A or the future West Side Interceptor would be necessary. In general, this area is high and the ground slopes downward to the east, in the direction of the City of Kalispell. With this favorable slope, gravity flow to one main pump station might be possible. Ideally, a master plan for the whole area could be prepared and the major elements of a collection and conveyance system could be intelligently located and designed to efficiently serve the area.



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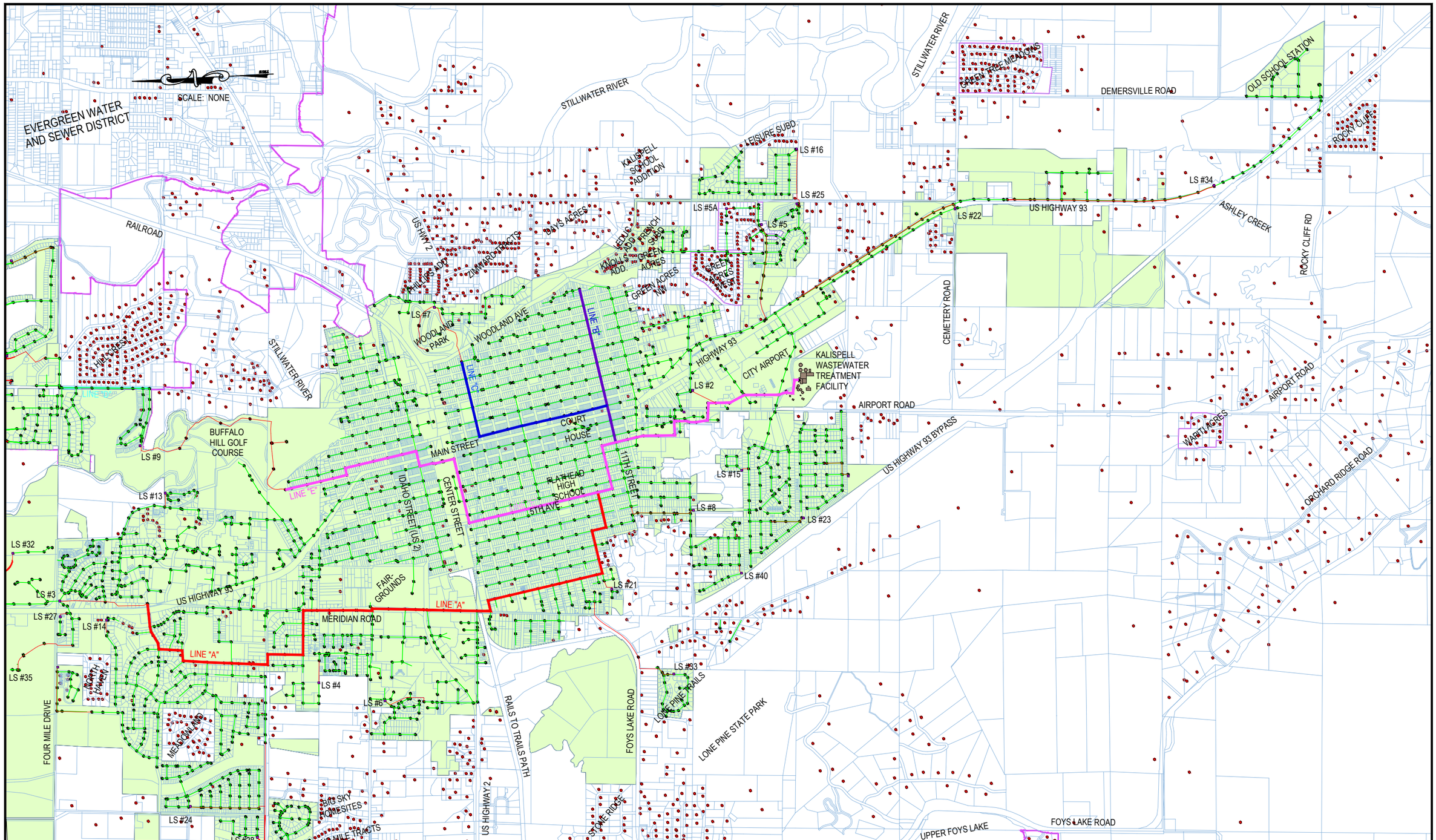
CITY OF KALISPELL
PUBLIC SEWER SYSTEM AND
AREA SEPTIC SYSTEMS - NORTH

Legend

Symbols	Description
	Lift Station
	Force Main
	Sewer Main
	Sewer Manhole
	Flathead County Parcel
	WasterWater Treatment Facility
	Flathead County Septic Systems
	Kalispell City Limit
	Water Sewer Districts

FIGURE NUMBER
KA-1

March 15, 2012



CARVER ENGINEERING
Consulting Engineers

CITY OF KALISPELL PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS - SOUTH

Legend

Symbols	Description
	Lift Station
	Force Main
	Sewer Main
	Sewer Manhole
	Flathead County Parcel
	WasterWater Treatment Facility
	Flathead County Septic Systems
	Kalispell City Limit
	Water Sewer Districts

FIGURE NUMBER
KA-2

March 15, 2012

LAKESIDE WATER & SEWER DISTRICT

DESCRIPTION:

Lakeside is an unincorporated community located on the west shore of Flathead Lake approximately 5 miles from the north end of the lake. The Lakeside County Water & Sewer District (LCWSD) was created and a sewer system constructed in 1988 to provide sewer service to the residents of Lakeside. The LCWSD also treats sewage generated by users in the Somers County Water & Sewer District (SCWSD). Since the creation of the original LCWSD boundaries, numerous areas around the Lakeside community and along the lakeshore between Lakeside and Somers, have annexed to the District to take advantage of the Lakeside public wastewater collection and treatment system. Although this did facilitate new development, the District's public wastewater system eliminated hundreds of existing on-site septic systems, some in close proximity to Flathead Lake or creeks flowing to Flathead Lake, and it unquestionably reduced nutrient loading on the lake.

Lakeside's collection and conveyance system consists of over 12 miles of 8", 10" and 12" PVC gravity sewer mains, 20 sewage lift stations and approximately 8.7 miles of 3", 4", 6" and 10" force main. What is commonly referred to as Lakeside's conveyance system, that portion of the system between Lakeside community and the wastewater treatment facility, is almost seven miles long and consists of 33,200 feet of 10" force main, 2,800 feet of 12" gravity main and five lift stations all of which were included in the previously mentioned numbers. The conveyance system starts at the north end of Lakeside at Lift Station #5, runs along Highway 93 through Somers and then north to the treatment facility, which is about 0.8 mile north of Highway 82 and one mile east of Highway 93.

The treatment facility consists of two aerated lagoons, each with approximately 2.35 acres of surface area, with two additional storage ponds for winter storage of treated effluent. One storage pond, referred to as the Lakeside Pond, has a capacity of approximately 47.0 million gallons (MG). The other pond, referred to as the Somers Pond, has a capacity of about 24.0 MG. Treated effluent is land-applied by way of spray-irrigation using a center irrigation pivot on a 160-acre parcel west and north of the treatment facility. The crop irrigated is usually alfalfa. The pivot covers approximately 135 acres.

In 2007, the LCWSD had a Wastewater System Preliminary Engineering Report (PER) completed by Robert Peccia & Associates (RPA). Development up to 2007 was booming in the Flathead Valley and LCWSD was requested to provide water and sewer service to several new and very large developments, both within and outside of the District's boundaries. The LCWSD made commitments to these proposed

developments, up to the limits of their treatment facility capacity, and then decided to create a moratorium on any further commitments for wastewater treatment.

The above-referenced report was completed with the purpose of identifying the overall planning area for the LCWSD and for the purposes of evaluating the wastewater system with the primary focus of identifying and making recommendations to increase the treatment facility capacity so the District could ease or eliminate the moratorium. Figure LS-1, at the end of this Lakeside section of the report, shows the overall planning area.

Information from this PER, along with interviews with Rodney Olson, General Manager for the LCWSD, will be utilized to help describe and evaluate Lakeside's wastewater system. This report does not attempt to update or amend the 2007 PER but instead looks at current capacities of system components to determine whether or not they can serve additional customers, primarily existing development with on-site septic systems.

POPULATION ESTIMATES:

Table LS-1 shows populations for the Lakeside CDP (Census Designated Place) and the Somers CDP based on 2000 and 2010 Census data.

Table LS-1 - Planning Area Population Projection

Area	2000 Census Population	2010 Census Population	*2007 PER Estimated Population	*2007 PER Projected 2027 Population
Lakeside CDP	1,679	2,669	2,000	8,200
Somers CDP	556	1,109	680	1,230
*Remaining Land within Planning Area (est.)	500	669	610	2,500
Total	**2,735**	**4,447**	**3,290**	**11,930**

* LCWSD Wastewater System PER, RPA, 2007

As stated earlier, prior to 2007, the LCWSD was requested to provide sewer service to some rather large new developments, both within their service area, as well as outside of District boundaries. The Bear Meadows Development, above Bierney Creek Road, planned on approximately 400 new residences and the Eagle Crest Subdivision, south of Lakeside, planned on 800 residences at full build-out. Two other proposed major subdivisions outside the District's boundaries, both along Highway 82, are the Cooper Farms development in which 800 new residences were proposed, and the North Shore development in which 390 new residences were initially proposed. The total number of new residences or equivalent dwelling units (EDUs) in these proposed

developments was 2,390 EDUs. Using an average household size of 2.35 persons from the 2010 Census data, the 2,390 equivalent dwelling units (EDUs) equates to 5,616 additional residents. The 2027 population estimate in Table LS-1 reflects the large population increase expected from these proposed developments.

As of this date, the only development that has received final plat approval and has actually installed some improvements, is the Eagle Crest subdivision, with only 15 lots platted thus far. Development for the past 3 to 4 years has virtually been at a standstill due to the current economic downturn. Three of the four proposed developments paid the District to reserve sewer capacity for a period of 15 years at which point the unused capacity is taken back by the District and the developer loses any remaining money already paid.

Bear Meadows, Eagle Crest and Cooper Farms all have approximately eight years left to keep their capacity secure. North Shore Ranch has not yet paid for sewer capacity but has an agreement in place, good for three more years, that stipulates when a sewer design is submitted to the District, the District will then receive payment. It could be many years before any significant development occurs in Flathead County, and it is quite possible that the above-mentioned developments will relinquish their reserved sewer capacities. With exception to the Eagle Crest subdivision, none of the above proposed subdivisions have even progressed to the final plat stage.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM CAPACITIES:

A. Conventional Gravity Collection System:

As previously mentioned, Lakeside's collection and conveyance system consists of over 12 miles of 8", 10" and 12" PVC gravity sewer mains, 20 sewage lift stations and approximately 8.7 miles of 3", 4", 6" and 10" force main.

Due to the large developments being proposed to the LCWSD, RPA evaluated the capacities of the LCWSD's collection and conveyance system in the 2007 PER to determine if there would be any "bottlenecks" in the system. There were two sections of gravity sewer piping that needed to be evaluated if the Bear Meadows and Eagle Crest developments materialized.

The first section of 8" gravity sewer is in Bierney Creek Road and is the receiving sewer line for the proposed Bear Meadows development. The minimum slope in this segment of sewer is 1.12%, which would equate to a capacity of 730 gpm. In the 2007 report, RPA assumed average daily flows of 200 gpd per equivalent dwelling unit (EDU) and applied a peaking factor of 3.8 for peak hourly flows to determine that the above segment of gravity sewer has the capacity to accept flows from approximately 1,400 EDUs. The Bear Meadows development would add approximately 600 residences (EDUs) to the collection system and the existing 8" gravity sewer currently has the capacity to take on additional flows along Bierney Creek Road.

The other sections of gravity sewer main are along Highway 93, north of Adams Street, to Lift Station #5 (LS #5). Within these sections of gravity sewer are both 8" and 10" mains installed at minimum grades. The 8" pipe, just north of Adams Street, will receive the flows from the proposed 800 residences in the Eagle Crest subdivision. Using the same flow factors as before, an 8" gravity sewer at minimum grade conveys flows up to 436 gpm which equates to wastewater flow from approximately 825 EDUs. This section of gravity sewer will have to be upsized prior to the full build-out of Eagle Crest.

The 10" sewer line, installed at minimum grade, is located just south of LS #5 and currently receives almost all of the flows generated in the Lakeside area, including flows from the new Eagle Crest subdivision and flows from the proposed Bear Meadows development. Again, according to the 2007 PER, a 10" gravity sewer main at minimum grade can convey flows up to 660 gpm which equate to flows from approximately 1,250 EDUs. This segment of pipe will need to be monitored as development occurs and will need to be upsized in the future.

B. Conveyance System:

The 2007 PER also evaluated the LCWSD's conveyance system, which consists of 33,200 feet of 10" force main, 2,800 feet of 12" gravity main and five lift stations (Lift Station Nos. 1A – 5). According to the report, the lowest capacity segment of 12" gravity sewer is 700 gpm and is located upstream of LS #3. To determine the capacity of the 10" force main, the report assumed that the lift stations could be upgraded in the future to pump more volume through the existing force main at an assumed maximum velocity of 6 feet per second (fps). Based on this assumption, and also assuming the 10" force main is SDR11 HDPE, the maximum capacity of the 10" force main is 1,106 gpm.

Therefore, the current capacity of the conveyance system is 700 gpm upstream of LS #3, and from LS # 3 to the treatment facility, the capacity is 1,106 gpm. From the report, the projected peak hour wastewater flow for the entire system in year 2027 is estimated to be 1,400 gpm. It should be noted that both the Cooper Farms development and North Shore Ranch development, each off Highway 82, would be required to run their own force main directly to the treatment facility. Nonetheless, segments of existing 12" gravity sewer will have to be upsized in the future when it becomes necessary to increase the pumping capacities of the conveyance system lift stations. It will also become necessary to upsize the existing 10" force main to keep flow velocities at or below 6 fps.

C. Lift Stations:

Lift Stations #1A - #5: There are five lift stations used to convey sewage from the north end of Lakeside to the treatment facility. LS #5, located in the northerly part of Lakeside, is at the beginning of the conveyance system. LS #4 is located approximately 1,700 feet downstream of LS # 5, and LS #3 is another 8,800 feet downstream of LS #4. LS #1 and LS #2 have been "sidelined" or have been taken off the main conveyance system. LS #1 receives all of the wastewater collected in the Somers Water & Sewer District and pumps it into the 10" conveyance force main. LS #1A was constructed to replace Lift Station #1, and it pumps all sewage from the LCWSD, with exception of the sewage from the White Oak and Southside Townhouses Lift Stations, to the treatment facility.

According to the 2007 PER, Lift Stations #1A - 5 are in good shape and are well-maintained and monitored, however, the District has made commitments to the previously mentioned developments that will necessitate the monitoring of flow rates and pump run times with eventual upsizing of pumps and wet wells as conditions warrant. In general, Lift Stations #1A - 5 have capacities of 460 - 600 gpm in simplex mode and 460 - 800 gpm in duplex mode.

The lift station capacities in Table LS-2 represent the capacity of the respective lift stations with the largest pump out of service. The MDEQ requires this as part of the sizing requirements for sewage lift stations. Assuming the lift station capacity must be capable of meeting peak flow from the service area, the maximum number of EDU's and the maximum population were calculated using a wastewater flow of 85 gallons per capita per day and 2.35 persons per EDU, based on 2010 census data. The peaking factor (ratio of peak hourly flow to design average flow) was determined using the MDEQ Circular DEQ-2 equation $(18 + P^{0.5})/(4 + P^{0.5})$ where population "P" is in thousands. Rather than calculating peak flow from a known population, as is most commonly done, the maximum population was calculated based on the known peak flow or the known capacities of the various lift stations.

Lift Station #6 & #7: These two lift stations serve existing developments - Carolina Point, Cherry Hill Yacht Club and Mission View Terrace - and for the most part, each of these developments are built-out.

Lift Station #8 & #9: These two lift stations serve a limited area along the lake. They currently serve properties along Conrad Point Road, which ends with a cul-de-sac. The physical characteristics of the property to the south would make an extension of this force main unlikely.

Table LS-2 - Lakeside County Water & Sewer District Sewage Lift Stations

Lakeside LS #	Station Name	Type	HP - Each Pump	Capacity (gpm)	Max. Number EDUs Served	Max. Pop. Served
1	Somers	Duplex - Submersible Flygt CP-3127/204	10	390	795	1,828
1A	-	Duplex - Self-Prime Gorman Rupp T6A3-B	20	600	1,254	2,948
2	-	Duplex - Submersible Flygt 3152/432	10	476	969	2,276
3	-	Duplex - Submersible Flygt CP-3152	20	510	1,047	2,460
4	-	Duplex - Submersible Flygt CP-3152	20	469	953	2,240
5	-	Duplex - Submersible Flygt	50	507	1,040	2,444
6	-	Duplex - Submersible ABS AF60-4EX-4	8	105	190	446
7	-	Duplex - Submersible ABS AF15-EX-4	15	150	276	648
8	-	Duplex - Submersible ABS PIRANHA 3	3	61	106	250
9	-	Duplex - Submersible ABS PIRANHA 3	3	73	130	305
10	-	Duplex - Submersible ABS AF15-EX-4	15	109	197	464
11	-	Duplex - Submersible ABS 22-4EX-4	3	210	396	930
12	-	Duplex - Submersible ABS M35/2-11.60	4.7	79	140	330
13	-	Duplex - Submersible ABS PIRANHA 3	3	47	82	192
14MB	Marco Bay	Duplex - Submersible Gorman Rupp JSV3G60-X6.2	6.2	80	142	334
15FH	Fish Hatchery	Duplex - Submersible Hydromatic SPGH750M4-2	7.5	52	91	214
16TSB	Terraces at Somers Bay	Duplex - Submersible Gorman Rupp JSV4E60-X17	17	230	437	1,028
17BVE	Best View Estates	Duplex - Self-Prime Gorman Rupp T3A3-B	10	175	327	768
18CH	Cherry Hill	Duplex - Submersible	4	132	242	568
19SSTH	Southside Townhouses	Duplex - Submersible Myers	1	28	49	114
WO	White Oak	Duplex - Submersible Hydromatic	2	46	80	188

Lift Station #10 & #11: LS #10 receives wastewater from the LS #9 and LS #8 service areas, as well as wastewater from lake front properties south of LS #10 to Peaceful Bay. A majority of these lakefront properties are built-out. Wastewater from the Eagle Crest development gravity flows across Highway 93 and then to LS #10. It is known that LS #10 and LS #11, the next downstream lift station are undersized for the Eagle Crest Subdivision. According to the LCWSD, the District's acceptance of the Eagle Crest development was conditioned on an Agreement with the Eagle Crest developers to increase the capacity of Lift Station Nos. 10 and 11 when flows dictated.

Lift Station #12: This is a small lift station that serves the Youth With A Mission Complex and has gravity sewer extended to Blacktail Road for possible future extensions. The capacity of this lift station is limited.

Lift Station #13: This is small lift station serving just a handful of lakefront properties southwest of Carolina Point. This area is built out.

Lift Stations #14 through #19; the White Oak Lift Station and the Southside Townhouses Lift Station: These lift stations serve specific areas, businesses or subdivisions and where sized for site-specific flows. Some excess capacity may exist in these lift stations.

D. Wastewater Treatment System:

The District's existing wastewater treatment facility is an aerated treatment lagoon system with disposal of the effluent by land application (spray irrigation), generally occurring between May 15th to October 15th. The two treatment ponds have a capacity of 5.18 MG each. There are also two storage ponds used for winter-time storage of treated effluent. The storage ponds have capacities of approximately 47.0 MG (Lakeside) and 24.0 MG (Somers).

Flows to the treatment facility were 86.6 MG in 2011. The lowest average flows occurred in the month of October at about 205,000 gpd and the highest average flows occurred in the month of February at around 281,000 gpd. To determine the current remaining EDUs available before system capacities are reached, the same rationale will be used, as in the 2007 PER, to evaluate the capacity of the LCWSD wastewater treatment system, where each component of the treatment process was evaluated: land disposal (spray irrigation), treatment cells and storage ponds.

Irrigation Capacity - The District irrigates on 135 acres with a crop nutrient uptake requirement of 1.9 MG/acre. This equates to a maximum hydraulic capacity of 256 MG/year according to the 2007 PER. The District's 2011 wastewater flows were 86.6 MG/year, leaving an additional irrigation capacity of 169.4 MG/year. Using 200 gallons/EDU, this equates to a total of 2,320 EDUs available (169.4 MG/year ÷ 365 days/year ÷ 200 gpd/EDU).

Treatment Cell Capacity - The maximum annual capacity of the treatment cells is 238 MG (2007 PER). The District's current wastewater flows are 86.6 MG/year, leaving 151.4 MG/year as available capacity. Again using 200 gallons/EDU, this equates to a capacity capable of serving an additional 2,074 EDUs.

Storage Pond Capacity - The maximum capacity of the existing storage ponds, both Lakeside's and Somers', is 119 MG/year (2007 PER). With the District's current flow of 86.6 MG/year, the remaining or reserve storage pond capacity is 32.4 MG/year. This equates to 444 EDUs before the storage pond capacity is reached. The storage ponds have the least amount of reserve capacity and therefore are the limiting factor for any future growth within the LCWSD.

In 2011, wastewater flows from the Somers Water & Sewer District averaged 1.18 MG per month or 39,333 gpd. The Somers contractual limit with the LCWSD is 45,000 gpd. Of the 444 EDUs remaining in treatment system storage capacity, 28 of those EDUs belong to Somers, leaving LCWSD a total of 416 EDUs for future growth.

The 2007 PER addressed the above-mentioned limiting factors and made recommendations to the Lakeside Water & Sewer District for improvements that would increase the capacity of each of the treatment facility components as follows:

- Install a new irrigation system on a 90-acre parcel the District owns. This would increase the capacity to serve an additional 4,100 EDUs.
- Construct a new 5.18 MG aerated treatment pond. This would increase the capacity to serve an additional 4,100 EDUs.
- Construct a new 119.5 MG storage pond. This would increase the capacity to serve an additional 3,500 EDUs.

None of these recommended improvements have been completed to date.

CAPACITY TO SERVE OUTSIDE OF DISTRICT:

Figures LS-2, LS-3 and LS-4, at the end of this Lakeside section of the report, show several subdivisions outside of the LCWSD's current sewer service area with large clusters of septic systems. They are the Tamarack Woods Subdivision, Lakeview Park Estates and Hillside Homes Subdivision. The District currently has reserve storage capacity to accept wastewater flows from 416 EDUs and could accept these areas into their system. Also see Exhibits LS-2, LS-3 and LS-4 at the end of this report for 24" x 36" sheets showing the District's wastewater system and surrounding properties with septic systems.

Rodney Olson, of the LCWSD, also confirmed they currently have some capacity available, but he indicated the District does have a good portion of this capacity reserved for developments for which commitments have been made. However, he acknowledged that some of these developments may never materialize. He also indicated that even if the economy was to recover, it probably would be over a number of years, and with the District's plant investment fees that have to be paid with each sewer hookup, he felt that when the time comes to increase the capacity of the sewer system, the District will have the money to do so. He also indicated that the District's Board would be "very receptive" to allowing the connection of existing homes, currently on septic systems, to the District's sewer system.

The areas outside of the LCWSD's current sewer service area with large clusters of septic systems are as follows:

Tamarack Woods: Tamarack Woods Subdivision is located south of Blacktail Road on the west side of Highway 93. The closest connection point to the District's sewer is approximately 550 feet away where an 8" gravity sewer main is located at the intersection of Blacktail Road and Ben Williams Lane. The 8" gravity sewer main could be extended from this point along Blacktail Road to the subdivision and then along Tamarack Woods Drive to the top of the subdivision. This subdivision has 78 platted lots and is close to being built-out.

Lakeview Park Estates: This subdivision is located north of Lakeside, on the west side of Highway 93, above Carolina Point. It is an existing subdivision with 61 platted lots and is approximately two-thirds built-out. It appears the subdivision could be served with gravity sewer mains installed in Lakeview Drive. Gravity sewer would have to run down to a new sewage pump station located at the intersection of Lakeview Drive and Highway 93 with the station's force main crossing the highway and tying into the existing 10" force main. The highway crossing would have to be approved by the Montana Department of Transportation (MDT) and would almost certainly have to be installed by horizontal directional drilling.

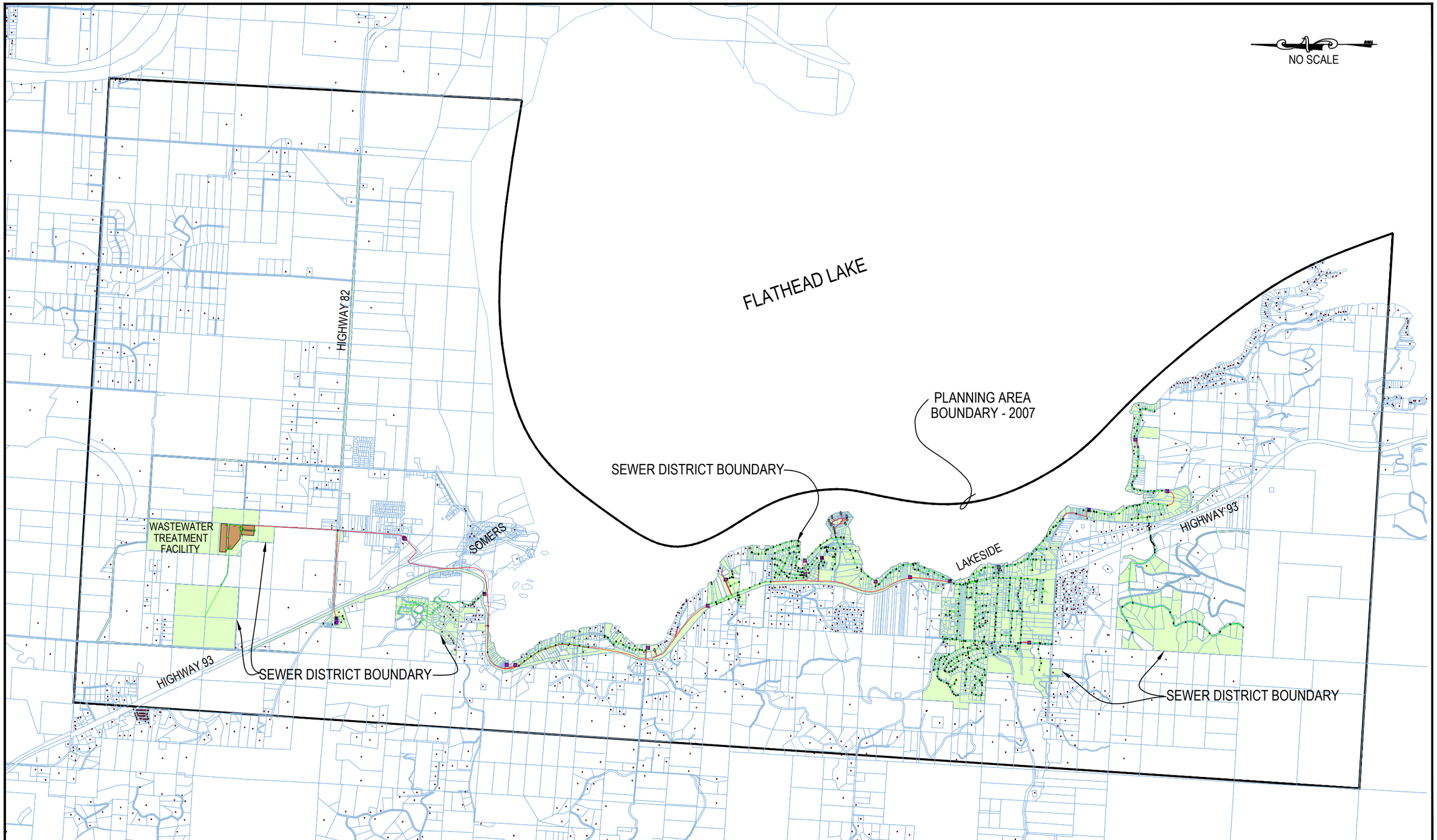
Hillside Homes: This subdivision, north of Lakeview Park Estates, is a smaller subdivision but could possibly be served by the District's sewer. Two possible solutions exist to bring gravity sewer to this subdivision. Gravity sewer currently exists on the west side of the highway at Deer Creek Road. This gravity sewer could be extended south, approximately 1,500 feet in the highway right-of-way (ROW), and then into the subdivision along Rimini Road.

The other option, which is probably less expensive, would require a highway crossing. An existing gravity sewer manhole is located on the east side of the highway, almost directly across from Rimini Road. A new 8" gravity sewer could be extended from this point, to Rimini Road, to serve the subdivision. As previously mentioned, horizontal directional drilling would be required at the highway crossing.

Lakefront Properties: There are also a few smaller areas of existing septic systems that are located along the lake that could be served by the District's public sewer system. Although there are only a few lakefront properties on existing septic systems in the Marco Bay area near LS #14MB, this station has significant reserve capacity and could be used to serve these properties.

There are existing 1-1/2" and 2" force mains in South Juniper Bay Road and the 2" force main could be extended to serve several existing properties with on-site septic systems. Each new or existing residence would have to install a individual grinder pump system with individual 1-1/4" or 1-1/2" service lines that connect to the extended 2" force main.

There are other existing residences along the lake with septic systems that could connect to the District's system and each would have to be evaluated on an individual, or possibly a small group, basis to determine the best way to connect to the District's public sewer system. As the number of these unsewered properties is not extensive, there should be available capacity on the system to serve virtually all of these properties.



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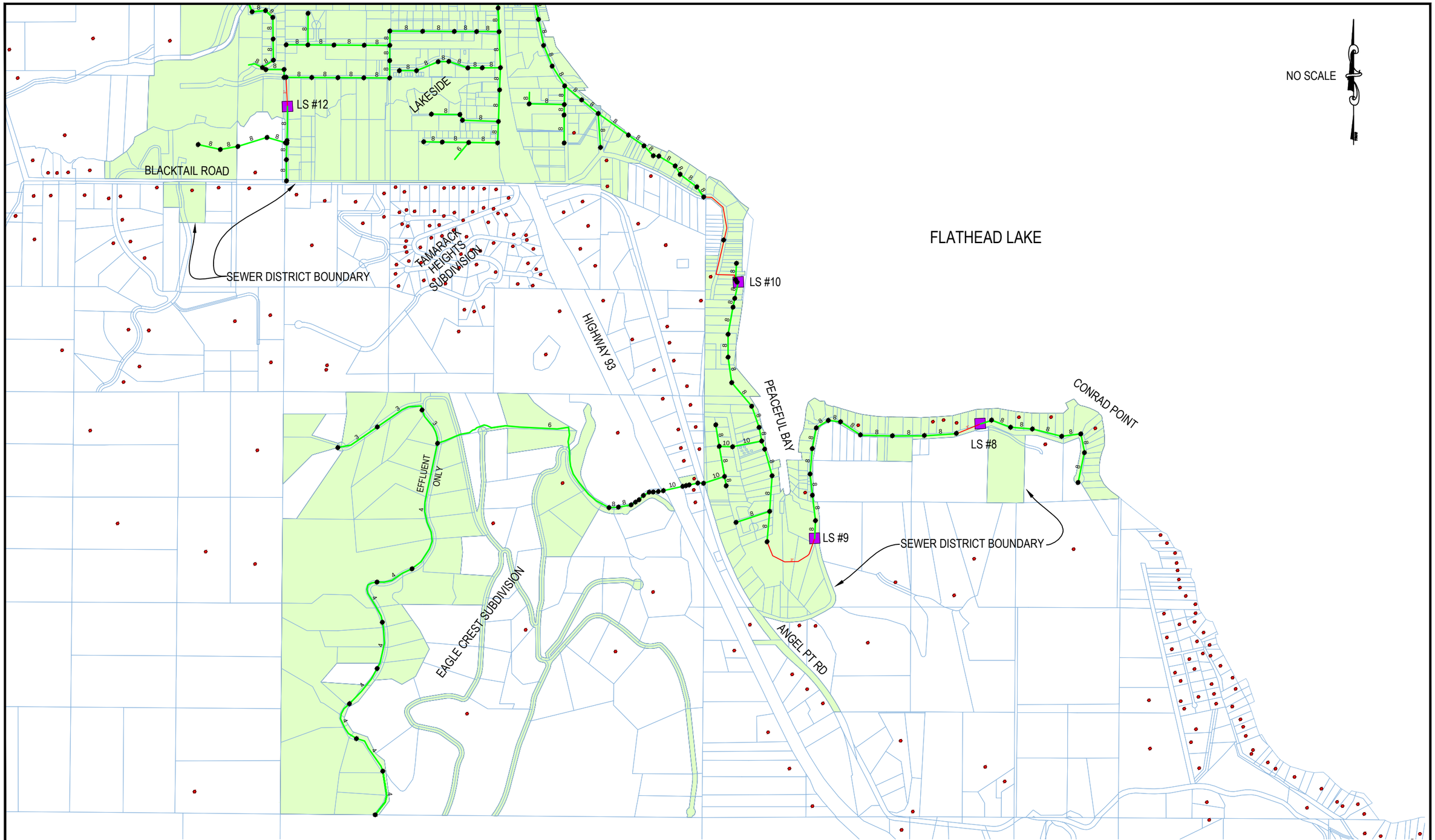
Consulting Engineers

LAKESIDE COUNTY WATER AND SEWER DISTRICT
2007 PER PLANNING AREA

FIGURE NUMBER
LS-1

March 15, 2012



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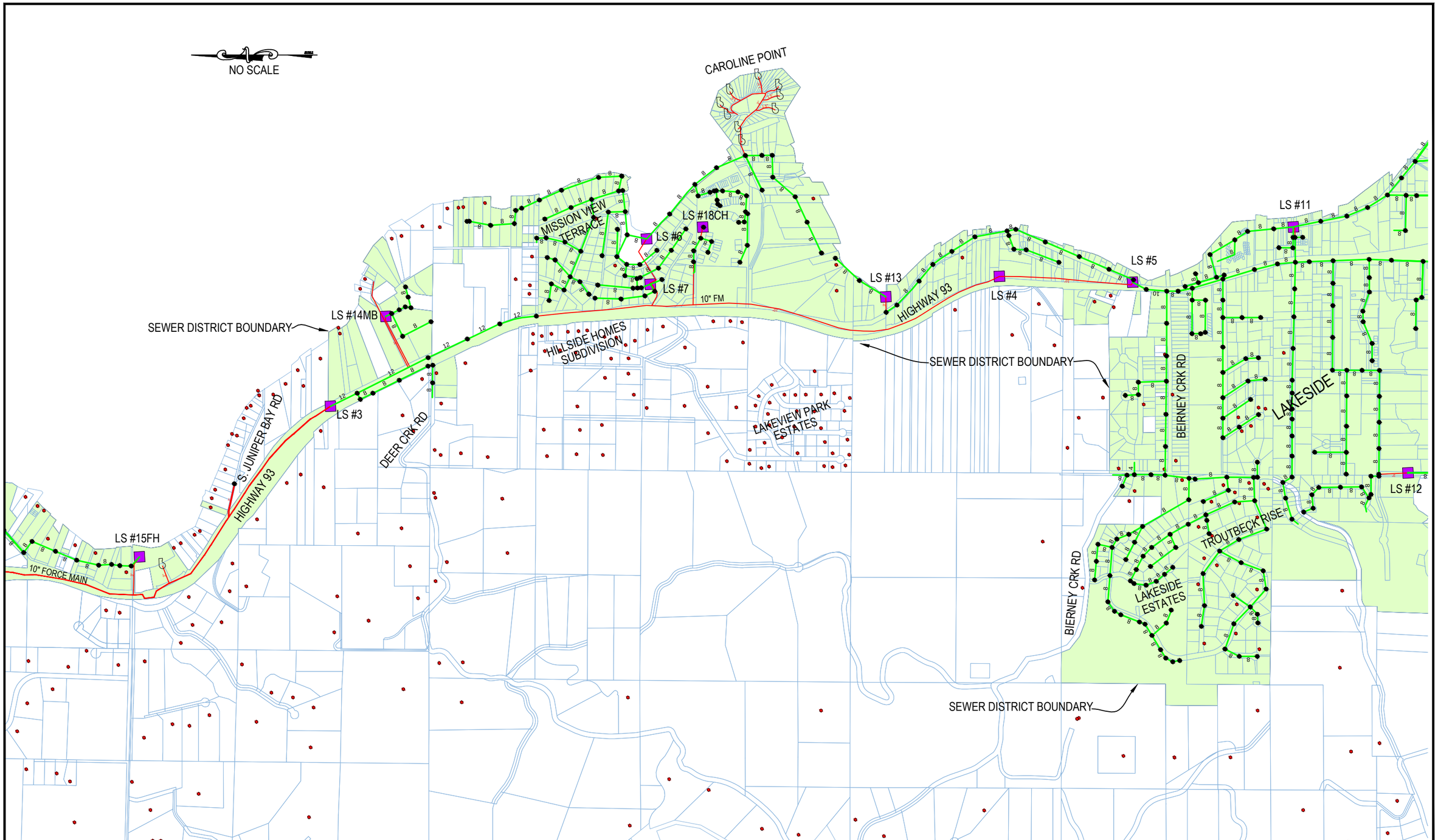
LAKESIDE COUNTY WATER AND SEWER DISTRICT
SOUTH END PUBLIC SEWER SYSTEM
AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	Lakeside Sewer Manholes
	Lakeside Sewer Grinder Pumps
	Lakeside Sewer Lines
	Lakeside Sewer Force Mains
	Lakeside Lift Stations
	Lakeside WWTF
	Flathead Septic Systems
	Flathead County Parcel
	Lakeside Water Sewer District

FIGURE NUMBER
LS-2

March 15, 2012



CARVER ENGINEERING
Consulting Engineers

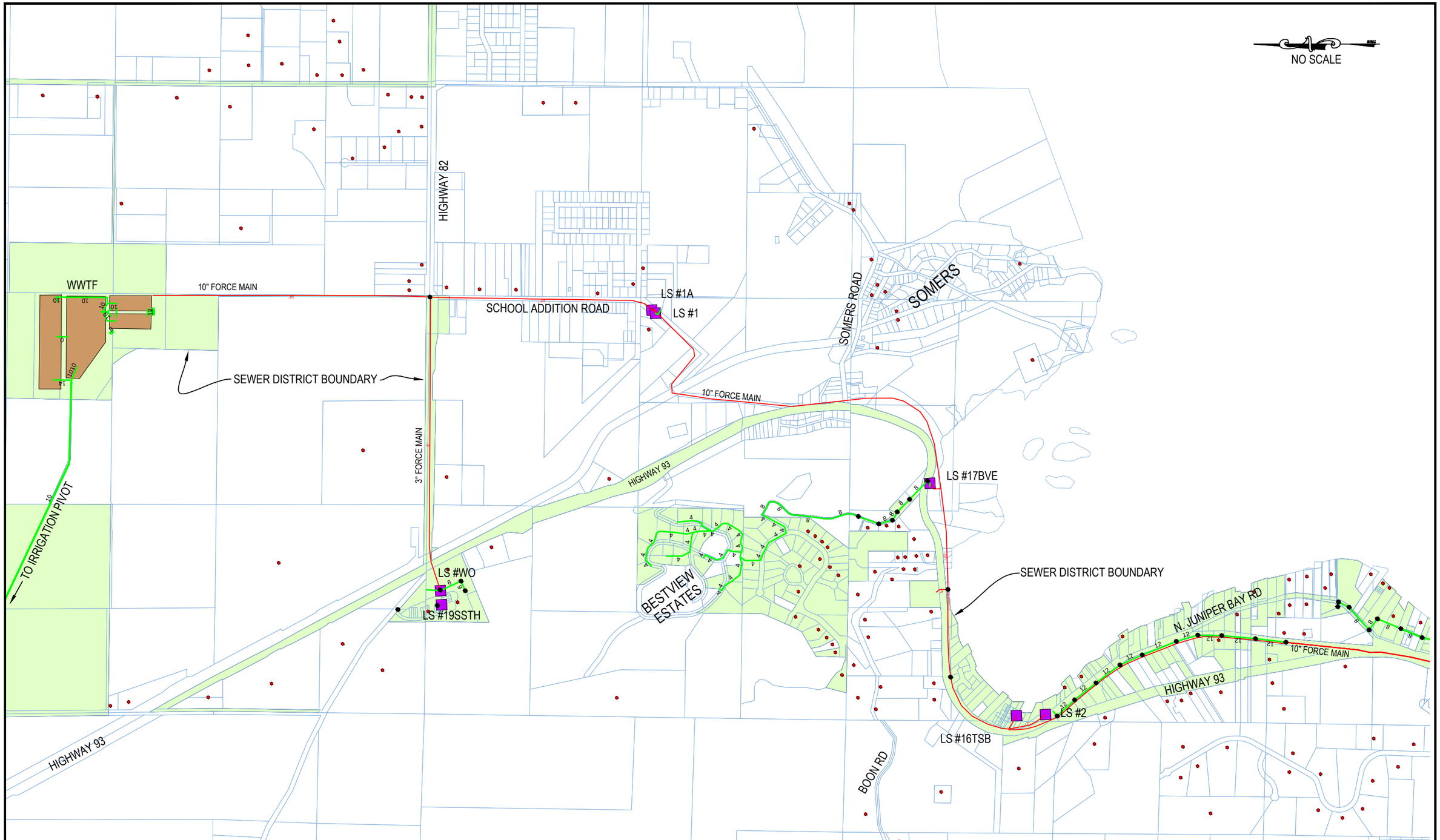
LAKESIDE COUNTY WATER AND SEWER DISTRICT CENTER AREA PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	Lakeside Sewer Manholes
	Lakeside Sewer Grinder Pumps
	Lakeside Sewer Lines
	Lakeside Sewer Force Mains
	Lakeside Lift Stations
	Lakeside WWTF
	Flathead Septic Systems
	Flathead County Parcel
	Lakeside Water Sewer District

FIGURE NUMBER
LS-3

March 15, 2012



CARVER ENGINEERING
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LAKESIDE COUNTY WATER AND SEWER DISTRICT NORTH END PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	Lakeside Sewer Manholes
	Lakeside Sewer Grinder Pumps
	Lakeside Sewer Lines
	Lakeside Sewer Force Mains
	Lakeside Lift Stations
	Lakeside WWTF
	Flahead Septic Systems
	Flathead County Parcel
	Lakeside Water Sewer District

FIGURE NUMBER
LS-4

March 15, 2012

MEADOW LAKE WATER & SEWER DISTRICT

DESCRIPTION:

The Meadow Lake Water & Sewer District (MLWSD) was created in 1983 to provide water and sewer service to residential and commercial development generally located around the Meadow Lake Golf Course. An existing residential subdivision just west of the golf course (Meadow Lake Estates, a.k.a. Meadow Lake West) was added to the District in 1987 and the proposed Tamarack Heights development, northwest of the Meadow Lake Golf Resort, was annexed to the District in 2005. The District is located northwest of the City of Columbia Falls, north and east of Tamarack Lane.

Development within the service area consists of a mix of single-family residences, townhouses, condominiums, apartments, a small hotel, restaurant, golf club pro shop and several recreational facilities. With the Meadow Lake Golf Course being the primary amenity, occupancy within the District is very seasonal. Winter-time occupancy is just a fraction of that experienced during the summer months. In conjunction with occupancy levels, water demands and sewer flows peak during the summer months and fall off significantly in the late fall, winter and early spring months.

Specific to wastewater, the MLWSD owns and operates a public sewage collection system with subsequent treatment taking place at the City of Columbia Falls Wastewater Treatment Facility. There are no wastewater treatment facilities within the District. Through an Agreement between the City and District, wastewater collected within the District is pumped to a manhole on the City's collection system, and from that point, wastewater gravity flows to the City's treatment facility.

Wastewater flow is metered just after leaving District boundaries and the City records wastewater flow on a daily basis. There have been a total of 482 equivalent dwelling units (EDUs) that have been approved to connect to the sewage collection system, although only 283 EDUs have been developed to date. There are also a total of 202 EDUs that have been proposed as a part of future development projects.

The current Agreement between the MLWSD and City, dated December 19, 2006, stipulates that, " … the District shall discharge sewerage at a rate not to exceed 80,000 gpd or a total of 35,000,000 gallons per year into the City sewerage system. This volume shall exclude inflow/infiltration flows."

WASTEWATER COLLECTION SYSTEM CAPACITY:

A. Lift Stations:

The wastewater collection system serving the Meadow Lake Water & Sewer District consist of 8", 10" and 12" PVC gravity sewer mains; three (3) lift stations; and 2", 4" and 6" PVC and HDPE force mains. All wastewater generated within the District flows to a duplex submersible lift station located south of the hotel and just southeast of

the “green” for golf course Hole #18. This lift station is commonly referred to as the “Main Lift Station”. There are currently two (2) remote lift stations both of which serve residential lots in the Meadow Lake Estates subdivision. See Table ML-1 for a summary of District lift stations.

There will also be two (2) additional remote lift stations to serve future phases of the Tamarack Heights development, should that property ever be developed. The original developers of Tamarack Heights no longer own the property and it is uncertain if the remaining phases of the development, with a total of 136 single-family lots planned, will ever go forward as originally proposed in the Preliminary Plat.

Table ML-1 – Meadow Lake Water & Sewer District Lift Stations

Lift Station	Type	Capacity	EDUs Served - Current	EDUs Served - Future
Meadow Lake Drive	Duplex -Submersible Grinder - Myers 2 Hp	30 gpm Each Pump	15 EDUs	18 EDUs
Meadow Lake West	Duplex -Submersible Grinder - Flygt 3 Hp	140 gpm Each Pump	35 EDUs	47 EDUs
Main	Duplex -Submersible Non-Clog Hydromatic 3 Hp	265 gpm Each Pump	283 EDUs	684 EDUs

Meadow Lake Drive Lift Station: This lift station serves an area at the south end of Meadow Lake Drive south of the Golf Course Drive intersection. The lift station is actually located in Meadow Lake Drive. The lift station was constructed in the 1970’s and both submersible grinder pumps were replaced in 2011. A 2” HDPE force main conveys wastewater to a manhole at the intersection of Meadow Lake Drive and Golf Course Drive. From there, wastewater gravity flows to the Meadow Lake West Lift Station. With projected peak wastewater flows of only 16 gpm from 18 future EDUs, this lift station has sufficient capacity to meet existing and future demands. Although there is little, if any, possibility of expanding the service area, with a station capacity of 30 gpm, the lift station could serve up to 34 EDUs.

Meadow Lake West Lift Station: This lift station serves the entire Meadow Lake Estates subdivision presently consisting of 35 EDUs made up of single-family residences and condominiums. At full build-out, the lift station will serve 47 EDUs. The station was constructed in 1989 and wastewater is pumped through a 4” PVC force main across the Driving Range, Garnier Creek, and golf course Hole Nos. 1 and 9, to Meadow Lake Manhole #61A located along the east side of Hole No. 9. From there wastewater gravity flows to the Main Lift Station. With projected peak wastewater flows of only 41 gpm from 47 future EDUs, this lift station has sufficient capacity to meet

existing and future demands. Although there is little, if any, possibility of expanding the service area, with a station capacity of 140 gpm, the lift station could serve up to 168 EDUs.

Main Lift Station: The Main Lift Station serves the entire Meadow Lake Resort development, including the previously mentioned Meadow Lake Estates and Tamarack, Phase 1. There are currently 482 EDUs that have been approved to connect to the Meadow Lake sewage collection system, although only 283 EDUs have been developed to date. There are also a total of 202 EDUs that have been proposed as a part of future development projects. Construction of the Main Lift Station was completed in 1986 and wastewater is pumped via a 6" PVC force main approximately 6,490 feet to a manhole on the Columbia Falls gravity collection system located at the intersection of Meadow Lake Boulevard and U.S. Highway 2. Wastewater then gravity flows to the City's wastewater treatment facility.

As described below, this lift station has limited capacity to meet projected wastewater flows from even the 482 EDUs that have already been approved to connect to the District's collection system, and improvements will have to be made to increase pumping system and wet well capacity if any additional residential or commercial developed is proposed.

Wastewater flow is metered just outside of the District boundaries south of Tamarack Lane, and the City of Columbia Falls records the meter reading each day. Based on wastewater flow records from 2005 to 2011, using only the months of July and August in each year when occupancy throughout the District was at its highest level, it was determined the average daily flow during these high occupancy periods was 208 gpd per EDU. With a current total of 283 EDUs, the average daily flow was therefore 58,864 gpd (40.9 gpm) and based on 3 persons per EDU, the resident population was 849 persons. Using Figure 1 from MDEQ's Circular DEQ-2, the peaking factor should be 3.84 and the peak hourly flow rate to the Main Lift Station would then be 157 gpm. This is still well within the 265 gpm capacity of each Main Lift Station pump. The MDEQ requires that lift station capacity be determined with the largest capacity pump out of service, which in the case of the Main Lift Station with two (2) equally sized pumps, station capacity would be 265 gpm.

With the currently approved 482 EDUs the average daily summer-time flow would be 100,256 gpd (69.6 gpm). The population would be 1,446 persons, the peaking factor would be 3.69, and the peak hourly flow would be 257 gpm or almost equal to the station capacity. It is for this reason that the MDEQ will not approve any new or additional residential or commercial development in the MLWSD service area without improvements to increase the capacity of the Main Lift Station. With a possible future total of 684 EDUs (see Table ML-1), the population would be 2,052, the average daily flow would be 142,272 (98.8 gpm) and the peak hourly flow would be 354 gpm using a peaking factor of 3.58.

This of course only accounts for wastewater flows from District users and does not factor in infiltration and inflow (I & I). Metered wastewater readings from the Main Lift Station indicate flow can increase as much as 44 gpm due to I & I. The District is making a concerted effort to reduce I & I, but any future improvements in Main Lift Station capacity will still have to allow for some amount of I & I. New lift station pumps should each have a capacity of about 400 gpm to account for existing and future residential and commercial development as well as for I & I. That is assuming that District boundaries remain the same as they are today and there are no new areas that are annexed to the District that will generate wastewater flow to the Main Lift Station.

B. Sewer Force Mains:

The existing 2" HDPE force main for the Meadow Lake Drive Lift Station and the existing 4" PVC force main for the Meadow Lake West Lift Station have adequate capacity to serve existing and future development within their respective service areas. The existing 6" PVC force main that conveys wastewater from the Main Lift Station to the City of Columbia Falls does have some limitations, primarily due to its length. Hydraulic calculations on the 6" force main performed by Carver Engineering for the District indicate the force main has sufficient capacity for an upgrade of station capacity to 400(+) gpm to meet future District demands. In addition, an April 2007 study conducted by Morrison-Maierle for the City of Columbia Falls also indicates the 6" force main has sufficient capacity for not only an upgrade to meet future District demands but the possible addition of up to 300 dwelling units along Meadow Lake Boulevard between the golf course and U.S. Highway 2.

C. Gravity Sewer Mains:

The gravity sewer mains throughout the District consist of 8", 10" and 12" PVC pipe installed at no less than minimum grade as required in MDEQ's Circular DEQ-2. In Table ML-2 below, the capacities of 8", 10" and 12" PVC sewer mains are shown at minimum allowable grades and using a roughness coefficient (Manning "n") of 0.013 as required by MDEQ. Pipe manufacturers normally recommend using a Manning "n" of 0.010 which would significantly increase flow capacity.

Table ML-2 – Gravity Sewer Main Capacities

Pipe Size (in.)	Pipe Area (ft2)	Manning "n"	Hydraulic Radius (ft)	Slope (%)	Velocity (fps)	Flow (gpm)	Flow (cfs)
8	0.349	0.013	0.167	0.40	2.19	343	0.8
10	0.545	0.013	0.208	0.28	2.12	520	1.2
12	0.785	0.013	0.250	0.22	2.13	749	1.7

The major “trunk” or “interceptor” lines are 10” and 12” and even at minimum grades each could carry considerably more than the projected future peak flows of 400(+) gpm including infiltration and inflow.

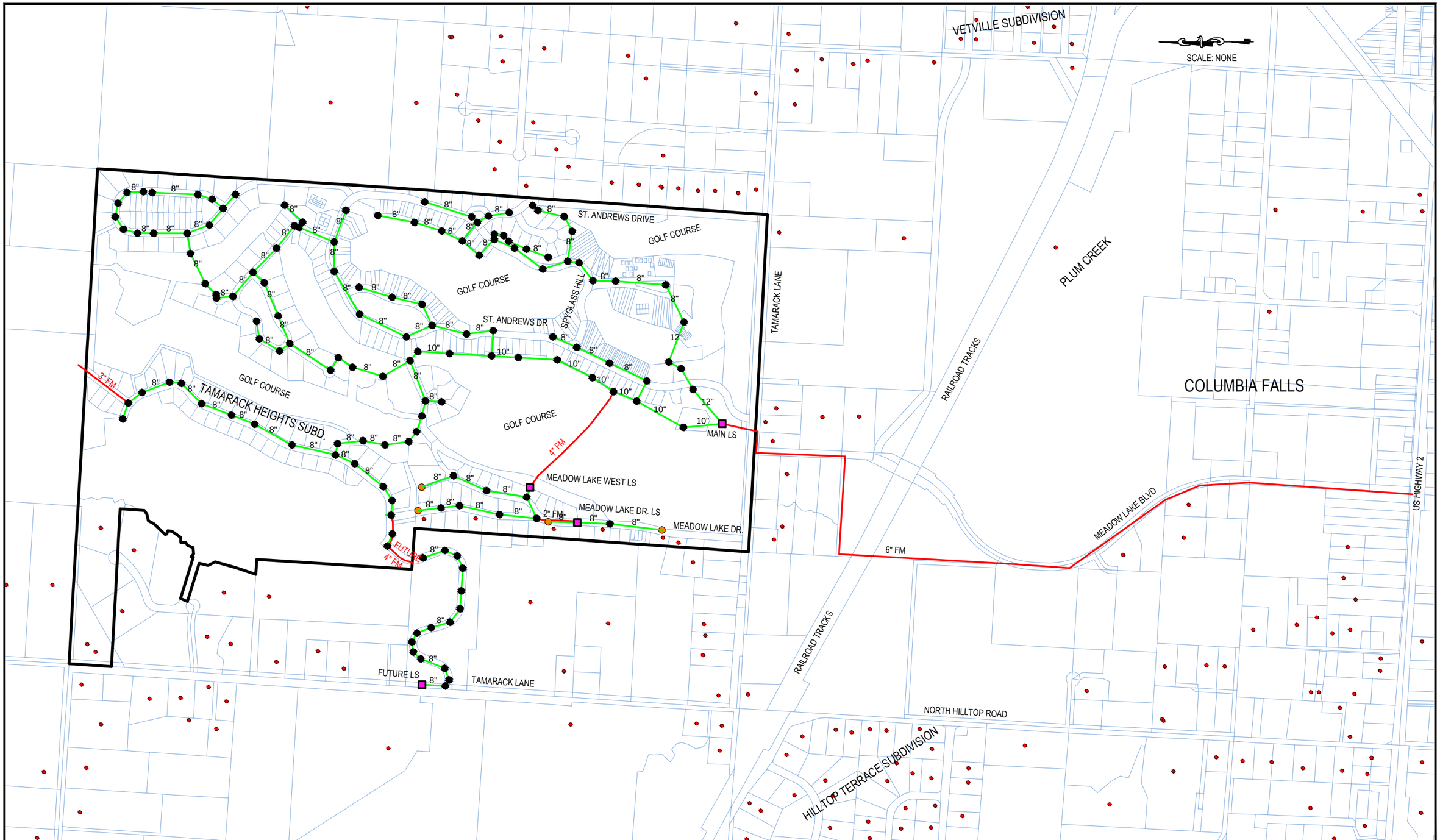
CAPACITY TO SERVE OUTSIDE OF DISTRICT:

In looking at Figure ML-1 (See Exhibit ML-1 at the end of this report for 24” x 36” plan sheet), one can see that the greatest concentrations of existing septic systems are located just east of the MLWSD along Tamarack Ridge, in a mobile home park located about 1/2 mile to the east, in Vetville to the southeast along the north side of the railroad tracks and in Hilltop Terrace to the southwest of the MLWSD on the south side of the railroad tracks. None of these existing developed areas could conveniently connect to the MLWSD public wastewater collection system, and all would have to install very costly gravity sewer mains, lift stations and force mains to convey wastewater to the District’s collection system. Hilltop Terrace and possibly Vetville would most likely connect to the existing 6” force main along Meadow Lake Boulevard, or to some other future gravity collection system and regional lift station as discussed in Morrison-Maierle’s April 2007 report. It may be possible to serve Vetville with gravity sewer to the east as further discussed in the Columbia Falls section in this report

To the west of the MLWSD, if future phases of Tamarack Heights are ever developed with a lift station near the intersection of Turnberry Terrace and Tamarack Lane, some existing development along Tamarack Lane could possibly be served by the District system with a sewer main extension along Tamarack Lane.

To the north, the MLWSD has already given permission for six (6) sewer connections on what was previously referred to as the Brown’s property and now the Siddall property. Otherwise, existing septic systems in this general area are sparse and existing properties are relatively large. Although possible to connect to the District’s sewer system, it would be very costly and likely not practical.

The District’s existing gravity collection system has sufficient capacity to serve areas outside of the current District boundaries, assuming the Main Lift Station is upsized to increase pumping capacity. However, providing sewer service to these outlying areas would require significant out-of-District infrastructure improvements and be very costly and is probably not likely to occur even in the next 20 years.



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MEADOW LAKE WATER & SEWER DISTRICT

PUBLIC SEWER SYSTEM & AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	Meadow Lake Manholes
	Meadow Lake Lift Station
	Meadow Lake Sewer Main
	Meadow Lake CleanOuts
	Meadow Lake Force Main
	Flathead County Septic Systems
	W & S Dist Boundaries
	Flathead County Parcel

FIGURE NUMBER
ML-1

March 15, 2012

CITY OF POLSON

DESCRIPTION:

The City of Polson, located along the south shores of Flathead Lake and Flathead River, in Lake County, is sewered by a central gravity collection system consisting of approximately 23 miles of gravity sewer mains, 11 sewage lift stations, approximately two miles of sewer force mains, and an aerated lagoon treatment system that has a permitted discharge to the Flathead River. The original wastewater treatment system was constructed in the 1950s.

Polson's most recent Facility Plan Update was completed in December of 2004 by Entranco. The 2004 Plan updates the previously completed Wastewater Facility Plan completed in 1998 by MSE-HKM, Inc. Information obtained from these reports will be utilized herein to help describe and evaluate Polson's wastewater system. This report does not attempt to update or amend the 2004 Facility Plan Update but instead addresses the lower population estimates due to the downturn in the economy of the past three years and also discusses the system improvements that have since been made as a result of recommendations made from the 2004 Plan Update and the 1998 Facility Plan.

POPULATION ESTIMATES:

Census data for 2000 and 2010 show populations for the City of Polson to be at 4,041 and 4,488, respectively, for an average annual growth rate of 1.11%. This is about half of the estimated growth rate used in the 2004 Facility Plan Update. Using the above growth rate and applying it to 2012, the estimated current population of Polson should be 4,587. This population estimate will be used in this report.

According to the 2004 Plan Update, Polson has a non-residential user population equivalent to 575 equivalent dwelling units (EDUs). The Plan uses a generally accepted occupancy rate of 2.5 persons per dwelling unit so this equates to an additional non-residential population of 1,438 persons. The total current equivalent population is therefore 6,025 persons. The 2004 Plan Update estimates a 2025 population of 7,099 and a 2025 wastewater system design population of 9,407 (2.28% annual growth rate).

WASTEWATER TREATMENT SYSTEM:

The City's existing wastewater treatment facilities consists of three aeration cells and one polishing cell and is located on the west side of Polson just south of the Flathead River. The system is designed as a tapered multi-cell aerated lagoon system with a discharge line to the Flathead River. Total lagoon capacity is 20.75 million gallons and the hydraulic capacity of the facility is 0.650 mgd with a detention time under, primary aeration, of 23 days.

Average facility wastewater flows for 2011 were 501,900 gpd with a peak flow recorded in January of 799,400 gpd, primarily due to infiltration and inflow (I & I) associated with snowmelt and precipitation events. Based on the current average flow, the per capita day flow (gpcd) calculates to 83 gpcd. For the purposes of this report, 90 gpcd will be used which is also the per capita day flow used in the 2004 Plan Update.

Based on the above per capita flows, an additional 1,645 persons or 658 EDUs could be served without exceeding the hydraulic design capacity of the treatment facility. Additionally, the facility's capacity will be reached when the equivalent population reaches 7,222 persons and this equivalent population should be reached in 2019 based on the 2004 Plan Update annual growth rate of 2.28%. Treatment facility upgrades will be needed in the future but a continued depressed economy could possibly push this date further down the road.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM CAPACITIES:

A. Lift Stations:

Polson's wastewater collection system consists of 6" to 18" collection mains made up of either asbestos cement (AC) pipe, vitrified clay pipe (VCP), cast iron (CI) pipe or polyvinyl chloride (PVC) pipe for gravity mains and ductile iron (DI) pipe and high density polyethylene (HDPE) pipe for force mains. All of Polson's wastewater is pumped via sewage lift stations to the wastewater treatment facility. There are 11 sewage lift stations in Polson (See Table PO-1) and four of them pump directly to the treatment facility. These are the Riverside Park, Seventh Ave. (Stewart's) and DuCharme Park stations with the Riverside Addition lift station pumping into the Riverside Park force main. All other stations pump to gravity mains which then flow to the Riverside Park lift station or the DuCharme Park lift station.

The City of Polson does not monitor flows at the individual lift stations but does record hour meter readings for each of the pumps. Average flows at each of the major lift stations will be estimated using the average run time of each pump and multiplying it by its capacity. The hour meter readings for 2011 were obtained from Polson's Public Works Department. Actual overall sewage flows are measured by a weir structure located at the head of the treatment facility. As previously mentioned, the average daily flow for 2011 was 501,900 gpd and peak daily flow was 799,400 gpd. Table PO-1, on the following page, lists all of the City's lift stations with their capacities and their projected 2025 station capacities based on the 2004 Facility Plan population estimates.

Table PO-1 - City of Polson Sewage Lift Stations*

Lift Station	No. of Pumps	Pump Capacity	Projected Station Capacity Needed
Riverside Park	3 - 30 HP (VFD)	780 gpm (1 pump) 920 gpm (2 pumps) 1050 gpm (3 pumps)	1065 gpm*
Stewart's (7th Ave.)	2 - 20 HP	600 gpm - each	600 gpm
Riverside Add.	2	50 gpm - each	20 gpm
Sacajawea Park	30-gal pneumatic	20 gpm	20 gpm
West Shore	3 - 10 HP	240 gpm - each	645 gpm
DuCharme Park	2 - 42 HP	1050 gpm - each*	1100 gpm
Lake View	2 - 5 HP	165 gpm - each	65 gpm
Golf Course Rd.	2 - 21 HP	625 gpm - each	625 gpm
Boettcher Park	30-gal pneumatic	20 gpm	20 gpm
Wal-Mart	2 - 5 HP	400 gpm - each	400 gpm
Mission Bay	2 - 14 HP	90 gpm - each	90 gpm

* Information from 2004 Facility Plan Update with a few modifications due to lift station improvements after 2004.

Riverside Park Lift Station: This lift station, located just south of the east end of the Highway 93 bridge, is one of two primary lift stations for the City of Polson. It serves as a collection point for gravity sewer flows from the City center and a large portion of residential service area south of the business area. Additionally, it receives wastewater pumped from the West Shore and Sacajawea Park lift stations. The DuCharme Park lift station used to discharge flow to the Riverside Park station but upgrades in 2006 to this lift station, along with the installation of a new dedicated 12” force main to the treatment lagoons, now permits flow from the DuCharme Park station to bypass the Riverside Park lift station.

The Riverside Park lift station pumps directly to the treatment facility lagoons through a 10” AC force main, and with one of the three pumps out of service, the station is capable of pumping 920 gpm. According to the 2004 Facility Plan Update, projected flows to the Riverside Park lift station will be 1065 gpm, after taking out flows from the DuCharme Park lift station - 425 gpm from the West Shore lift station, 20 gpm from the Sacajawea Park lift station and 620 gpm from the gravity service area. So even with flows from the DuCharme Park lift station now bypassing Riverside Park, the Riverside Park lift station will be at its capacity when full build out of each service area occurs. A new and larger force main would increase capacity at this lift station.

It should be noted that in the 2004 Facility Plan, an investigation into sources of I&I were identified and recommendations to correct these inflows were made. According to Public Works, 75% of these recommendations have been completed to date. This will also help increase the capacity of the Riverside Park lift station.

Stewart's (7th Avenue) Lift Station: The 1998 Facility Plan recommended that a new lift station be constructed at this location and one was constructed in 1999. It is located on the west side of Polson and collects gravity sewer flows from the south and west of 1st Street E. The station pumps directly to the treatment facility lagoons via an 8" PVC force main. The station and force main were designed for a 20-year projected demand of 600 gpm.

Riverside Addition (RIO) Lift Station: Located near the Flathead River in the west part of Polson, this lift station serves a small built-out area of about four city blocks. This lift station was a pneumatic pump station that failed back in 2000 and was upgraded at that time. Sewage is pumped to a 6" cast iron force main that is connected to the Riverside Park lift station's 10" force main. Current lift station pump capacity is 50 gpm and the projected station capacity is only 20 gpm . This lift station has excess capacity but there is no growth potential in this area.

Sacajawea Park Lift Station: This pneumatic lift station is located in northwest Polson, adjacent Flathead Lake, and serves a small recreation area. Sewage is pumped, via a 4" force main, to a gravity sewer main which then discharges into the Riverside Park Lift Station. Existing lift station pump capacity is 20 gpm and projected station capacity is also reported to be 20 gpm. There is no growth potential in this area.

West Shore Lift Station: The West Shore lift station is located near the northwest end of the Highway 93 bridge. This lift station serves an area along the west shore of Flathead Lake and small areas on both sides of the City Airport. Sewage is pumped from the lift station through a 6-inch force main that is suspended along the bridge and then flows through gravity mains to the Riverside Park lift station. Lift station pump capacity is 425 gpm and the projected station capacity is 645 gpm. This lift station was designed with the higher station capacity in mind with future flows being increased by changing pump sheaves and belts in the existing lift station.

DuCharme Park Lift Station: This lift station is located in north Polson, near the south shore of Flathead Lake and serves a gravity collection area in central Polson as well as the Lakeview, Golf Course Road, Boettcher Park, Wal-Mart and Mission Bay Preserve lift stations service areas. The 2004 Facility Plan Update recommended that a new lift station be constructed at this location and one was constructed in 2007.

This station is now the second of two major lift stations with all sewage from northeast and southeast Polson flowing to this station. Sewage from this lift station now by-passes the Riverside Park lift station and is directly piped to the treatment facility

lagoons through a 12” force main. According to the 2004 Facility Plan Update, the projected station capacity at this lift station is 1100 gpm (165 gpm from the Lake View lift station, 625 gpm from the Golf Course lift station and 310 gpm from the gravity service area).

Lake View Lift Station: With construction of the Golf Course Road lift station in 2003, demand on the Lake View lift station was reduced significantly. This station now only serves a limited area on the lakeshore between the lift station and the golf course. Wastewater from this station is pumped to gravity sewer lines in Highway 93 that then flow to the DuCharme Park lift station. Lift station pump capacity is 165 gpm and, again according to the 2004 Facility Plan Update, projected station capacity is 65 gpm. This lift station has excess capacity but its service area is limited. It should be noted that the original gravity sewer main coming from the golf course area is still intact and could serve as an overflow gravity line if flows into the Golf Course Road lift station exceed pumping capacity.

Golf Course Road Lift Station: This lift station is located west of the City Golf Course and serves the east side of Polson. A new lift station for this location was recommended in the 1998 Facility Plan and one was constructed in 2003. It pumps sewage through a 10” force main to a gravity sewer main that then flows to the DuCharme Park lift station. Boettcher Park, Wal-Mart and Mission Bay Preserve lift stations all pump to gravity sewer mains that flow to the Golf Course lift station. Lift station pump capacity is 625 gpm and according to the 2004 Facility Plan Update, projected station capacity is 625 gpm (20 gpm from the Boettcher Park, 400 gpm from the Wal-Mart lift station, 90 gpm from the Mission View lift station and 115 gpm from the gravity service area).

Boettcher Park Lift Station: This pneumatic lift station is located northwest of the Polson Golf Course, adjacent Flathead Lake, and serves a small recreation area. Sewage is pumped via a 4” force main to the Golf Course Road Lift Station. Lift station pump capacity is 20 gpm and projected station capacity is 20 gpm. Additional capacity is not available and there is no growth potential in this area.

Wal-Mart Lift Station: This lift station, located in southeastern Polson, serves a business district on the south side of Highway 35. Sewage is pumped to gravity sewer through a 6” force main and then gravity flows to the Golf Course lift station. Lift station pump capacity is 400 gpm and projected station capacity, according to the 2004 Facility Plan Update, is 400 gpm.

Mission Bay Preserve Lift Station: This lift station, located in the Mission Bay Preserve development on the east side of Polson, was designed and constructed for the Mission Bay development. Pumps were sized for the development with an extra wet well installed for possible future expansion. A 4” force main conveys sewage to a gravity

sewer main which then flows to the Golf Course Road lift station. Current lift station capacity is 90 gpm and projected capacity is 90 gpm.

Average daily run times for all of the major sewage lift stations were obtained from the Public Works Department to determine current lift stations capacities and possible reserve capacities for future connections to the City's sewer system. Table PO-2 below, depicts last years' average pump run times along with calculations of sewage flows based on reported pump capacities. From the calculations, it appears there is available capacity for additional wastewater flow to all of Polson's sewage lift stations.

Table PO-2 - 2011 Average (Estimated) Lift Station Flows

Lift Station	Pump Capacity	Total Run Time (hrs/day)	Average Day Flows (gpd)	Daily Capacity Used
(1) Riverside Park	780 gpm	6	280,800	25.0 %
(1) Stewart's (7th Ave.)	600 gpm	2	72,000	8.3 %
(1) DuCharme Park	1050 gpm	2.4	151,200	10.0 %
West Shore	240 gpm	2.5	36,000	10.4 %
Golf Course Rd.	625 gpm	2	75,000	8.3 %
Wal-Mart	400 gpm	1.5	36,000	6.3 %
Mission Bay	90 gpm	1.6	8,640	6.7 %

(1) All of Polson's sewage flows through these three lift stations

B. Sewer Force Mains:

Riverside Park Lift Station: According to the Public Work Department, flows at this lift station have temporarily exceeded station capacity during large storm events due to infiltration and inflow (I & I). Reducing I & I will certainly increase the available capacity of the lift station. As stated earlier, the City has completed 75% of the necessary improvements to reduce I & I. Additionally, if the existing 10" AC force main could be upsized, pump head losses due to friction could be reduced, which would increase lift station pumping capacity. This station's force main is directly routed to the treatment facility lagoons.

Stewart's (7th Avenue) Lift Station: This 8" PVC force main is adequately sized to handle this lift station's projected capacity of 600 gpm. This force main is directly routed to the treatment facility lagoons.

West Shore Lift Station: This 6” force main is adequately sized to handle the lift station’s current capacity of 425 gpm. Projected station capacity is 645 gpm. At this flow, pipe velocities in the 6” force main may exceed 8 feet per second (fps). Modeling of these future flows will need to be completed to determine if this is acceptable. After sewage is pumped across the Highway 93 bridge, it enters a 12” gravity sewer main which then flows to the Riverside Park Lift Station.

DuCharme Park Lift Station: This 12” force main is adequately sized to handle the lift station’s projected capacity of 1100 gpm. This force main is directly routed to the treatment facility lagoons. There are, however, existing 10” and 12” gravity sewer mains in Highway 93, between the DuCharme Park Lift Station and one block west of the Fourth Avenue intersection, that need to be replaced with 15” pipe to accommodate projected flow from the Golf Course Road, Wal-Mart and Mission Bay Preserve lift stations.

Golf Course Road Lift Station: This 10” force main is adequately sized to handle the lift station’s projected capacity of 625 gpm. Sewage is pumped to a gravity sewer main which then flows to the DuCharme Park Lift Station. There are two sections of gravity sewer main, between Seifert Tracts and Golf Course Road, just upstream of the Golf Course Road Lift Station, that would need to be replaced with 12” pipe to accommodate projected flow from the Wal-Mart and Mission Bay Preserve lift stations.

Wal-Mart Lift Station: This 6” force main is adequately sized, although barely, to handle the lift station’s projected capacity of 400 gpm. Sewage is pumped to a gravity sewer main which then flows to the Golf Course Road Lift Station. There are six sections of minimum grade (0.40%) 8” gravity sewer main between Seifert Tracts and Hwy 35 that will need to be replaced with 12” pipe to accommodate projected flows from the Wal-Mart Lift Station.

Mission Bay Preserve Lift Station: This 4” force main is adequately sized to handle the lift station’s projected capacity of 90 gpm. Sewage is pumped to a gravity sewer main which then flows to the Golf Course Road Lift Station.

C. Gravity Sewer Mains:

Polson’s wastewater collection system consists of 6” to 18” gravity collection mains made up of either asbestos cement (AC) pipe, vitrified clay pipe (VCP), cast iron (CI) pipe, or polyvinyl chloride (PVC) pipe.

Numerous gravity sewer mains were recommended for upsizing in the 1998 Facility Plan. A majority of the recommendations were completed in 2004, however, there are still three recommendations made in the 1998 report that have not been completed.

The three recommendations, also reference above, are:

1. On Highway 93, between the DuCharme Park Lift Station and one block west of the Fourth Avenue intersection, replace existing 10” and 12” gravity sewer mains with 15” pipe.
2. Between Seifert Tracts and Golf Course Road, just upstream of the Golf Course Road Lift Station, replace two sections of 8” gravity sewer with 12” pipe.
3. Minimum grade 8” gravity sewer mains (6 sections) between Seifert Tracts and Hwy 35 should be replaced with 12” pipe. These sections are downstream of the Wal-Mart Lift Station.

CAPACITY TO SERVE OUTSIDE OF EXISTING SERVICE AREA:

Figure PO-1, at the end of this section of the report, shows there are not many areas outside of the Polson’s current sewer service area with large clusters of septic systems (See Exhibit PO-1, at the end of this report, for a 24” x 36” plan sheet). There are, however, several areas worth pointing out as possible candidates for system expansion:

South Hills Area: There are several potential areas of properties that could be placed on nearby City sewer that are just on the outskirts of existing City Limits. The area between Woodbine Way and Skyline Drive, in the south hills, is one of those areas, along with the Demers Heights subdivision just south of Skyline Drive. Gravity sewer flows would go to the Stewart’s lift station which currently has excess capacity.

City Infill: There are existing septic systems in the area between 11th & 13th Ave. East and 9th St. East and Hillcrest Lane. This area is surrounded by existing City limits. Sewage from this area would gravity flow to the Riverside Park lift station. Capacity at this lift station could be an issue, but further work on I & I issues and possibly increasing the station’s force main could provide additional capacity.

Lakeview Estates and Overlook Subdivisions: Currently there is no public sewer system in Kerr Dam Road and in all likelihood, if sewer is ever to be placed in Kerr Dam Road, it will be developer driven. If City sewer does get closer to the Lakeview Estates and Overlook subdivisions, it may be feasible to convert these subdivisions from on-site septic systems to City sewer.

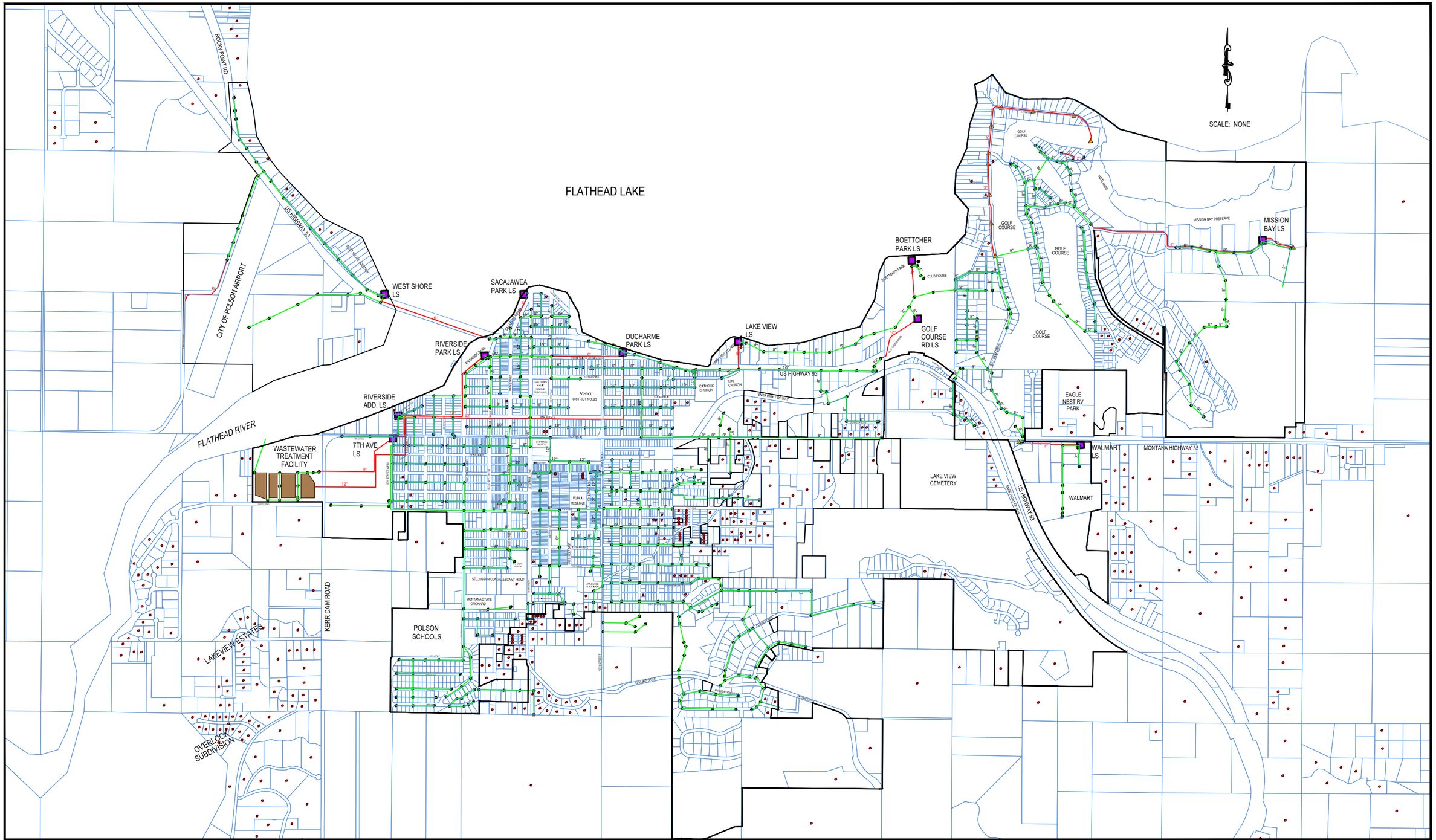
Ideally, sewer in Kerr Dam Road would be a gravity line running down the road directly to the treatment facility, however, if not possible, sewer could be extended along Kerr Dam Road from an existing 8” gravity main adjacent River Terrace Drive and next to Kerr Dam Road, near the treatment facility. This existing gravity sewer main conveys sewage to the Stewart (7th Ave.) lift station, which currently has excess capacity.

Northeast Polson (north of Hwy. 35 & east of Mission Bay Preserve subdivision): Mostly vacant farm land exists east of Mission Bay Preserve and north of Highway 35, with just a handful of existing septics located on these properties. Public sewer is nearby (Mission Hills) but an extension of public sewer service to this area would not be cost effective due to the few septic systems that do exist.

There are a few businesses, including the Eagle Nest RV Park, located on the north side of the Highway that potentially could be served by City sewer. Gravity sewer could possibly be extended south from the golf course (Montana Landing) to this area or possibly a low pressure force main could be installed across the Highway discharging to the Wal-Mart lift station.

Southeast Polson (south Hwy. 35 & east of Hwy. 93): There are a number of existing septic systems in this area but generally, these systems are spread out and lot sizes are larger. Extending sewer service to this area does not appear to be warranted.

Northwest (North of Hwy 93 Bridge): A fairly large number (approx. 100) of existing septic systems located within 1,000 feet of the west shore of Flathead Lake could be eliminated if City sewer service could to be extended along Rocky Point Road for another 1 1/2 miles. This would place City sewer just past the Ferguson Heights Subdivision. This extension would likely be a series of both gravity and pressure sewer mains with lift stations located at strategic locations to serve the greatest number of possible users. The existing 12" gravity sewer main to the West Shore lift station, as well as the West Shore lift station itself, has the capacity to serve this additional area.



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CITY OF POLSON
PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

PolsonSewer	
Symbols	Description
	Lake_County_Septics
	PolsonCityLimits
	LakeCountyParcel
	PolsonTreatmentFacility
	PolsonSewerMain
	PolsonManhole
	PolsonLiftStations
	PolsonForceMains
	PolsonCleanOuts

FIGURE NUMBER
PO-1

March 15, 2012

SOMERS WATER & SEWER DISTRICT

DESCRIPTION:

The Somers Water & Sewer District (SWSD) has decided not to participate is this project because they did not want their sewer system information made public, citing Homeland Security reasons. As stated in the Introduction, we tried to alleviate this concern with Flathead County Resolution No. 2321, "Resolution regarding sharing of information obtained through the activities *(sic)* the Flathead Regional Wastewater Management Group". The wishes of the SWSD will be respected and no Figures or Exhibits will be generated depicting information pertinent to the District's wastewater collection system. Access to a 2003 Preliminary Engineering Report, prepared by TD&H, Inc. for the District, was available and the following general information comes from this report.

The SWSD's sewer system was constructed in 1994 to provide sanitary sewer service to the residents of Somers. The District provides service for sewage collection only, with treatment being provided by the Lakeside Water & Sewer District. The Lakeside and Somers Water & Sewer Districts have an Interlocal Agreement in place allowing Somers to discharge 45,000 gpd of raw sewage to the Lakeside treatment facility. Somers, an unincorporated community, is located along the northwest corner of Flathead Lake, south of MT Highway 82 and mostly east of U.S. Highway 93.

Somers' wastewater collection system generally consists of 17,800 linear feet of 8" and 10" PVC gravity sewer and 2", 4" and 6" force mains. The District also owns and operates three sewage lift stations. All of Somers' sewage flows to a main lift station, near the Somers School, where sewage is then pumped into the Lakeside Sewer District's 10" force main that conveys the sewage to Lakeside Wastewater Treatment Facility. This main lift station is identified as Lift Station (LS) #1 in the Lakeside Water & Sewer District section of this report, and the lift station is operated and maintained by the Lakeside Water & Sewer District. Wastewater flows from the Somers service are measured with magnetic flowmeters.

SWSD wastewater flows for 2011 were obtained from the Lakeside Water & Sewer District (LWSD). Average flows were reported to be 1.18 MG per month or 39,333 gpd in 2011. Their contractual limit with the LCWSD is 45,000 gpd. As described earlier in the Lakeside section of this report, the reserve storage capacity at the LCWSD treatment facility equates to wastewater flow from 444 equivalent dwelling units (EDUs), of which 28 EDUs belong to Somers. Unless the SWSD can negotiate for an increase in their allotted capacity with the Lakeside Water & Sewer District, Somers will not be able to expand their service area. The current Interlocal Agreement is set to expire on February 3, 2013.

CITY OF WHITEFISH

DESCRIPTION:

The City of Whitefish is a resort community with numerous summer and winter recreational amenities. These numerous recreational opportunities result in significant fluctuations in both resident and visitor populations. Fluctuations in the resident population are primarily due to the considerable number of living units that are second or seasonal homes that are not occupied year-round. The visitor component of the population fluctuation, and to some degree the resident population, significantly impacts employment in service related businesses. Combined, these population fluctuations cause highly varied demands on the City's water and sewer systems. It should also be noted that in addition to serving the population within the City Limits of Whitefish, through an Agreement between the City and the Big Mountain Sewer District, the City receives and treats wastewater from the District which includes the Whitefish Mountain Resort and its surrounding residential and commercial development.

Information presented in this section of this report was, in part, obtained from the City of Whitefish Wastewater Utility Plan, dated April 2006, and prepared by Anderson Montgomery, Inc. This Wastewater Utility Plan presents data on 2006 treatment and collection system capacities and, based on year 2025 population projections, the plan points out what improvements will be necessary to the various components of both the wastewater treatment system and the collection and conveyance system to meet the expected increases in hydraulic and organic loading. This FRWMG report does not attempt to update or amend the 2006 Wastewater Utility Plan, it simply tries to point out some lower population estimates caused by the downturn in economic conditions, what improvements have been made to the City's treatment, collection and conveyance systems since 2006 to improve reliability and increase capacity, and to discuss the capability of the City's public wastewater system to serve more densely populated areas outside of the current City Limits that are presently served by septic tank and drainfield systems.

POPULATION ESTIMATES:

In the 2006 Utility Plan, population estimates were based on 1990 and 2000 census data and the *City of Whitefish, Montana, Residential Construction and Land Subdivision and Annexation Report 2004.* The City's population grew at a rate of 1.4% per year from 1990 to 2000 and at a rate of 5% per from 2000 to 2003. For purposes of the Utility Plan, a continued growth rate of 5% per year until 2010 was used and a supposedly more moderate rate of 3% per year was used for years 2015 to 2025. This resulted in the projections for sewer service area population as shown in Table WF-1.

Table WF-1 – Predicted Service Area Population [1]

	2005	2015	2025
Proposed Sewer Service Area Population	8,829	13,109	16,089
Proposed Sewer Service Area Connected Population	6,083	10,638	16,089

[1] Information from City of Whitefish Wastewater Utility Plan, dated April 2006, and prepared by Anderson Montgomery, Inc.

According to the 2000 and 2010 census data, the population of the City of Whitefish was 5,032 in 2000 and 6,357 in 2010. Based on growth projections of 5% per year from 2000 to 2005, the 2005 population was projected to be 6,354 persons or just 3 persons fewer than that reported in the 2010 census data. Although the overall growth rate from 2000 to 2010 was just over 26%, the vast majority, if not all, of that growth likely occurred between 2000 and 2008, or up to the economic downturn when development in the Whitefish area virtually stopped.

WASTEWATER TREATMENT SYSTEM:

The City's existing wastewater treatment facilities generally consists of three (3) partially mixed aerated lagoons with discharge to flocculating clarifiers where alum and polymers are added to precipitate phosphorus. The design capacity of the lagoons is 1.25 million gallons per day (MGD) and the design capacity of the flocculating clarifiers is 1.8 MGD. It should be noted that relatively recent improvements to the lagoon system, which include providing the ability to store wastewater during high flow periods, could actually bring the hydraulic design capacity of the lagoon system close to the 1.8 MGD capacity of the flocculating clarifiers.

Average daily flows to the treatment facility are approximately 0.75 MGD although peak flows of up to 2.2 MGD have been recorded primarily due to infiltration and inflow (I & I) associated with snow melt, precipitation events, groundwater and sump pumps that discharge to the City's wastewater collection system. The City has been very active in removing sump pump connections to the collection system, as well as making repairs to leaking sewer mains and manholes. These efforts have resulted in a marked decrease in flows to the treatment facility during the wet spring months and periods of intense precipitation.

Organic loading is also an important factor in treatment plant capacity, and will be even more critical with the new TMDL's; however, this information is well documented in the 2006 Utility Plan and in the 2011 EPA document titled, *Summary of Permitted Point Sources in the Flathead Lake Basin.* This FRWMG report is more focused on the City's collection and conveyance system capacities.

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM:

According to the 2006 Utility Plan, the City of Whitefish's collection and conveyance system consists of 45.7 miles of "conventional" gravity sewer mains. In addition there are 18 wastewater lift stations, 6 centralized septic tank effluent pump (STEP) systems, 71 individual STEP or grinder pump systems and approximately 13.9 miles of force mains ranging in size from 1-1/2" to 16".

A. Gravity Collection System:

The City's gravity collection system consists of pipe ranging from 4" diameter up to 30" diameter with a total length of 45.7 miles as reported in the 2006 Utility Plan. Since 2006, additional gravity sewer mains have been installed in several subdivision developments throughout the City, but the exact length of these additional gravity sewer mains has not been calculated. The various lengths of and sizes of gravity sewer mains are listed in Table WF-2.

Table WF-2 – Gravity Sewer Main Sizes & Lengths [(1)]

Pipe Diameter	Total Length (Ft)	Total Length (mi.)	% of Total System
4"	185	0.04	0.08%
6"	1,550	0.29	0.64%
8"	181,656	34.40	75.30%
10"	22,674	4.29	9.40%
12"	15,795	2.99	6.55%
15"	4,497	0.85	1.86%
18"	9,029	1.71	3.74%
27"	3,129	0.59	1.30%
30"	2,714	0.51	1.13%
TOTAL	241,229	45.69	100%

(1) City of Whitefish Wastewater Utility Plan, April 2006, Anderson Montgomery, Inc.

There is both a variety of pipe sizes and pipe materials. Clay tile pipe was used during construction of the original collection system and was the common choice for gravity sewer mains until the early 1970's when PVC became widely used along with concrete pipe. There is also reported to be some cast iron and asbestos concrete pipe within the collection system. Table WF-3 lists the types of gravity pipe materials and the associated lengths of each, as reported in the 2006 Utility Plan. Since 2006, gravity sewer mains installed throughout the Whitefish area consisted exclusively of PVC pipe. New sewer force mains are primarily HDPE pipe.

Table WF-3 – Pipe Materials and Lengths [1]

Pipe Material	Total Length (Ft)	Total Length (mi.)	% of Total System
Clay Tile	63,800	12.08	26.43%
Cast Iron	220	0.04	0.09%
Asb. Concrete	1,945	0.37	0.81%
Concrete	2,929	0.55	1.21%
PVC	172,453	32.66	71.45%

[1] City of Whitefish Wastewater Utility Plan, April 2006, by Anderson Montgomery, Inc.

The clay tile pipe was reported to have been installed in 3-foot sections of pipe, including the length of the bell, so the result is a pipe joint every 2.7 ft. Therefore, in an average block with clay tile gravity sewer pipe, there is over 140 pipe joints, with an estimated total of just over 23,600 joints throughout the City. Gasket material used for clay tile pipe joints was typically a wax or petroleum-based material, and although there is some belief that no gasket material was even installed on some of the clay tile pipe to increase infiltration to help dewater wet areas, this gasket material, if used, has very likely deteriorated over time. This has apparently been verified by TV inspections of the mains. With over 23,600 pipe joints, at best with deteriorated gasket material at each joint or at worst no gasket material at all, it is not difficult to understand how a significant amount of infiltration is getting into the collection system.

Infiltration and inflow (I & I) severely limits the available conveyance capacity of gravity sewer mains and lift stations as well as the available capacity of the wastewater treatment facility. It has also caused previous problems with wastewater overflowing manholes and lift stations, some of which have resulted in sanctions being imposed by the MDEQ. In 2005, the City completed a study of gravity collection system I & I, titled *City of Whitefish – Sanitary Sewer Infiltration Mitigation Study.* Rehabilitation of gravity sewer mains using cured-in-place lining and the replacement of some pipe and manholes were some of recommendations of the study. Problem sections of gravity sewer main, with defects identified by either TV inspections or hydraulic analyses, are listed in the 2006 Utility Plan, and the City has been making, and is continuing to make, a significant effort to correct the defective gravity sewer main piping.

Through 2011, the City has used cured-in-place lining to rehabilitate 16,230 lineal feet of existing clay tile sewer main, and a total of 1,615 lineal feet of gravity sewer main was replaced. In addition, approximately 50 manholes were grouted to repair leaks, 2 manholes were sealed with a cured-in-place lining, and 2 lift station wet wells were sealed to eliminate or reduce infiltration. This work will undoubtedly eliminate a significant amount of infiltration into the City's wastewater collection system.

The 2006 Utility Plan also identified several sections of the gravity collection system that had capacity problems. The City has replaced many of these low capacity mains with larger pipe to mitigate problems with overloading and surcharging at manholes. Capacity problems with about 2,500 lineal feet of 10" gravity sewer main along Wisconsin Avenue, which previously received wastewater from the Wisconsin Lift Station (formerly the Viking Lift Station), were eliminated by installing a new 12" HDPE force main from the Wisconsin Lift Station to a manhole at the intersection of Wisconsin Ave. and Skyles Place. This bypassed the low capacity section of 10" sewer main and the main now has more than sufficient capacity to handle the wastewater flows from adjacent commercial and residential units.

B. Lift Stations:

The City of Whitefish has a total of 16 "major" lift stations that it maintains and more than 75,000 lineal feet of force main. There are actually 18 lift stations, but the Bohemian station which presently serves only one dwelling unit is going to be removed and the State Park lift station is owned, operated and maintained by the Montana Fish Wildlife & Parks.

There are also numerous individual septic tank effluent pump (STEP) and grinder pump systems. The STEP systems are primarily located in the Pack Rat Lane area and Whitefish Summer Lake Homes – Rest Haven areas. Because of Federal and State funding, the Rest Haven Area Sewer Project was constructed with individual STEP systems for the lots along Rest Haven Drive and with individual Environment One (E-1) grinder pump systems for those lots along Plaza Road. The grinder pump systems collectively discharge into a large common STEP system that is now referred to as the Rest Haven Lift Station (See Table WF-4 on the following page). The 4" force main from this lift station, which also serves the other individual Rest Haven STEP systems, runs approximately 7,750 feet along East Lakeshore Drive to its discharge point near Mountain Shadows Drive. The Rest Haven force main passes several subdivisions – Deer Run, Lakewood Estates and Whitefish Lake Summer Homes – and for those lots and residences that connect to the City's public sewer system, will have to install STEP systems because the Rest Haven force main, with an in-line non-mechanical aerator, was designed for septic tank effluent only.

Along with the individual E-1 grinder pump systems along Plaza Road, there are a considerable number of E-1 grinder pump systems scattered throughout the City. Some of these are duplex units that serve multiple residential or commercial units.

Table WF-4 on the following page lists the "major" lift stations within the City that the City owns, operates and maintains.

Table WF-4 – City of Whitefish Lift Stations

City ID Number	Station Name (Old Name)	Location	Type	Capacity (gpm)	Max. Number EDUs	Max. Pop. Served
21P	Baker	East of Baker Ave. So. Side of River	Duplex - Submersible KSB - 2.6 Hp	98	105	252
45P	Birch Point	700 Birch Point Dr.	Duplex - Vertical Fairbanks Morse - 5 Hp	160	176	423
47-IP	Boat House	2 Oregon Ave.	Duplex - Submersible KSB - 3 Hp	225	251	606
49-01P	City Beach (Miller)	No. End City Beach off Lakeside Blvd	Duplex - Submersible KSB - 10 Hp	345	398	958
57-0701P	Colorado (Texas-Colo.)	E. of Colorado - 1 Blk. No. of Edgewood	Duplex - Submersible Hydromatic - 1 Hp	170	187	450
12-023P	Dairy Queen	638 Kalispell Ave.	Duplex - Submersible Paco - 3 Hp	40	41	100
92-10P	Houston Point	2303 Houston Pt. Dr.	Duplex - Vertical Hydromatic - 15 Hp	200	222	534
74P	Lacy Lane (Monk's Bay)	End of Lacy Lane	Duplex - Submersible Hydromatic - 5 Hp	100	107	258
49-015P	Lakeside (City Beach)	26 Lakeside Blvd. (City Beach)	Duplex - Submersible E-1 Extreme - 1 Hp	14	15	35
00P	**Main Lift Station**	**Along River At WWTP**	**Triplex - Self Prime Gorman Rupp - 60 Hp**	**3,600**	**5,600**	**13,496**
35-7009P	Mountain Park	825 State Park Rd.	Duplex - Submersible Flygt - 15 Hp	422	495	1,192
95ST	Rest Haven	2667 Rest Haven Dr.	Duplex Turbine - STEP OSI - 1.5 Hp	45	46	112
96P	River Lakes	991 River Lakes Pkwy	Duplex - Submersible KSB - 15 Hp	346	399	962
21-061P	Scott W. 6th	291 W. 6th Street	Duplex - Submersible KSB - 6.5 Hp	350	403	972
86A-409P	Shooting Star	Shooting Star Circle (Iron Horse)	Duplex - Submersible Flygt - 5 Hp	54	56	136
70-011P	Wisconsin (Viking)	Wisconsin Ave. - No. of Colorado Ave.	Duplex - Submersible Fairbanks Morse - 50 Hp	450	530	1,278

The lift station capacities in Table WF-4 represent the capacity of the respective lift stations with the largest pump out of service. Assuming the lift station capacity must be capable of meeting the peak flow from the service area, the maximum number of EDUs and the maximum population were calculated using a wastewater flow of 136 gallons

per capita per day, 2.41 persons per EDU based on 2010 census data, and a peaking factor (ratio of peak hourly flow to design average flow) based on the MDEQ Circular DEQ 2 equation $(18 + P^{0.5})/(4 + P^{0.5})$ where population "P" is in thousands. Rather than calculating peak flow from a known population as is most commonly done, the maximum population was calculated based on the known peak flow or the known capacities of the various lift stations.

With the exception of the wastewater from the River Lakes lift station, which pumps directly to Cell #1 at the City's WWTP, wastewater flow from all other lift stations and gravity sewer mains flows to the Main Lift Station located along the Whitefish River at the City's WWTP. Larger impellers were recently installed in Pumps 1 and 2 at the Main Lift Station and this resulted in an increase in pumping capacity to approximately 2,500 gpm for each pump. Pump 3 still has a smaller impeller and produces about 1,300 gpm, but the City does plan to replace the impeller in Pump 3 with a larger impeller and the capacity is expected to increase to around 2,500 gpm. When that is done, the capacity of the Main Lift Station, with the largest pump out of service, will be approximately 4,500 gpm. This would equate to peak wastewater flow from 7,299 EDUs or a population of 17,590.

CAPACITY TO SERVE AREAS OUTSIDE OF EXISTING SERVICE AREA:

In the 2006 Utility Plan, treatment, collection and conveyance system capacities were evaluated based on projected populations within the year 2025 sewer service area. See Table WF-5 below. Note: Table WF-5 is identical to Table WF-1, but it is included again for ease of use.

Table WF-5 – Predicted Service Area Population [(1)]

	2005	2015	2025
Proposed Sewer Service Area Population	8,829	13,109	16,089
Proposed Sewer Service Area Connected Population	6,083	10,638	16,089

[(1)] Information from City of Whitefish Wastewater Utility Plan, April 2006, by Anderson Montgomery, Inc.

As was discussed earlier in this report, the 2006 population projections were based on growth rates from years 1990 to 2000 and from 2000 to 2005. With the economic downturn that started in 2008, those projected growth rates were not realized, at least up through 2011. The projected City of Whitefish population in 2005 was reported to be 6,354 persons, but in the 2010 census data the 2010 population of Whitefish was 6,357 persons or only 3 more than that reported in 2005. Therefore, the predicted sewer service area populations, as shown in Table WF-1 above, and the

associated wastewater flows, will likely not be accurate for years 2015 or 2025. Because of the economic downturn, some treatment, collection and conveyance system capacities may now be adequate for some period of time beyond what was predicted in the 2006 Utility Plan.

There are areas outside of the current sewer service area, with rather high developed densities, that are presently served by on-site septic tank and drainfield systems. Figures WF-1 and WF-2 show the current City of Whitefish sewer service area and the locations of existing septic systems. Larger (24" x 36") drawings of the Whitefish service area (Exhibits WF-1 and WF-2) are included at the end of this report. High densities of septic systems can be seen in the Lion Mountain area, Whitefish Lake Summer Homes along the east shore of Whitefish Lake, Alpine Village, Northwoods, areas in the southwest part of Whitefish around 6th and 7th Avenues West and Karrow Ave., the Blanchard Lake area, and south of the City in Emerald Heights and along Blanchard Lake Road. Although not on individual septic tank and drainfield systems, Ptarmigan Village has a significant number of residential units with wastewater treated in a packaged aerobic treatment system with effluent flowing to an unlined lagoon. Based on lagoon levels, treated wastewater can also be pumped to percolation ponds located in the northeast corner of Ptarmigan Village. Although not all, most of these areas are within the 2006 Proposed Sewer Service Area.

Whitefish Summer Lake Homes: This area is located along the east shore of Whitefish Lake, generally between Houston Point and Les Mason State Park. The lots are long and narrow and the slopes are generally steep (+25%) near the lake and more gently sloping near the backs of the lots. Some lots in Whitefish Summer Homes are already connected to the Rest Haven force main which runs along the west side of East Lakeshore Drive and then discharges at a manhole near Mountain Shadows Drive. Those lots already connected to public sewer have individual septic tank effluent pump (STEP) systems that convey wastewater in common 2" or 3" force mains to the 4" Rest Haven Force Main. The capacities of these small "community" force mains are normally adequate to serve a group of lots that are usually accessed by a common road or driveway.

In a 2009 study of the Rest Haven force main capacity, it was concluded that the force main was nearing its capacity and if additional connections were allowed, the capacities of some individual and duplex effluent pump systems could be affected. At the time of the 2009 study, there were a total of 74 individual STEP systems and 2 duplex STEP systems either connected to or approved to connect to the Rest Haven force main.

Because State and Federal guidelines, in place at the time the Rest Haven Area Sewer project was designed and constructed, did not allow the upsizing of component parts of a sewer collection system to facilitate future growth, the City had the foresight to install a spare 4" PVC force main along side of the Rest Haven force main. The ends of this spare 4" line could easily be connected to the existing Rest Haven force main which would result in a significant increase in the conveyance capacity of the force main system. Certainly enough capacity to permit connection of all existing lots in Whitefish Summer Lake Homes not presently connected to the public sewer system.

Alpine Village: Located on the east side of East Lakeshore Drive, just across the road from Houston Point and Mountain Shadows Subdivisions, this subdivision consists of 46 single-family lots in Phases 1 and 2, of which 41 have already been developed. All existing houses are on individual septic tank and drainfield systems. The soils in the Alpine Village area are very gravelly and typical surface failures are likely not common. However, there is also known to be a restrictive clay layer underlying the very permeable gravel and that this clay layer can cause water to move laterally toward the lake.

The end of the City's existing gravity collection system is located across East Lakeshore Drive from Alpine Village, between the access roads into Phases 1 and 2. This 10-inch PVC sewer main has sufficient capacity to serve the lots in Alpine Village. Along with recent upgrades to the Wisconsin (Viking) Lift Station and its downstream force main, adequate capacity should not be an issue at this location on the City's sewage collection system.

Ptarmigan Village: The wastewater system for this 150-unit residential condominium development, off Big Mountain Road, was briefly discussed earlier in this report. Although wastewater is not discharged in a subsurface drainfield system, wastewater is treated in a packaged treatment system and discharged to an unlined lagoon and to unlined percolation ponds. Connection to a public sewer main could be provided by extending a gravity sewer main down Lookout Road to an existing 12" gravity main in Big Mountain Road. There is plenty of capacity in the gravity sewer main in Big Mountain Road, but that sewer main is owned and operated by the Big Mountain Sewer District and access to that main may not be allowed by the District.

Another possible option would be to install a force main up Lookout Road from the treatment system to an existing City of Whitefish 8" gravity main in Lookout Lane (Iron Horse). The downstream capacity through Iron Horse is somewhat limited but, in a report prepared by Thomas, Dean & Hoskins for the Lookout Ridge development, it was concluded that there is adequate capacity for both Lookout Ridge and Ptarmigan.

Northwoods: The Northwoods area, located up Reservoir Road beyond (east of) the City's Water Treatment Facility, was not included in the proposed sewer service area in the 2006 Utility Plan; however, there is a rather high density of development in this area all of which are on septic tank and drainfield systems. The topography of this area is steep and undulating with scattered benches and ridges. Soils generally consist of a compact glacial till (cobbly silt loam) and shallow seasonal groundwater is common throughout the area. There is no existing public sewer nearby, the closest being at the intersection of Wisconsin Ave. and Reservoir Road. It might be possible to install a gravity sewer collection system to serve the entire Northwoods development; however, the costs would be very high.

Lion Mountain: The Lion Mountain Subdivision is located off State Park Road, above or west of the railroad tracks, in the northwest part of the Whitefish area. The topography in this area is steep with scattered small benches and ridges. Shallow bedrock is common throughout the area and suitable area on the individual lots for septic tank and drainfield systems is very limited. There are approximately 70 existing individual septic systems in the 6 phases of Lion Mountain plus a community system for 18 lots in Lion Mountain, Phase 6 that consists of individual septic tanks, a 2-zone sand filter and a 4-zone drainfield system.

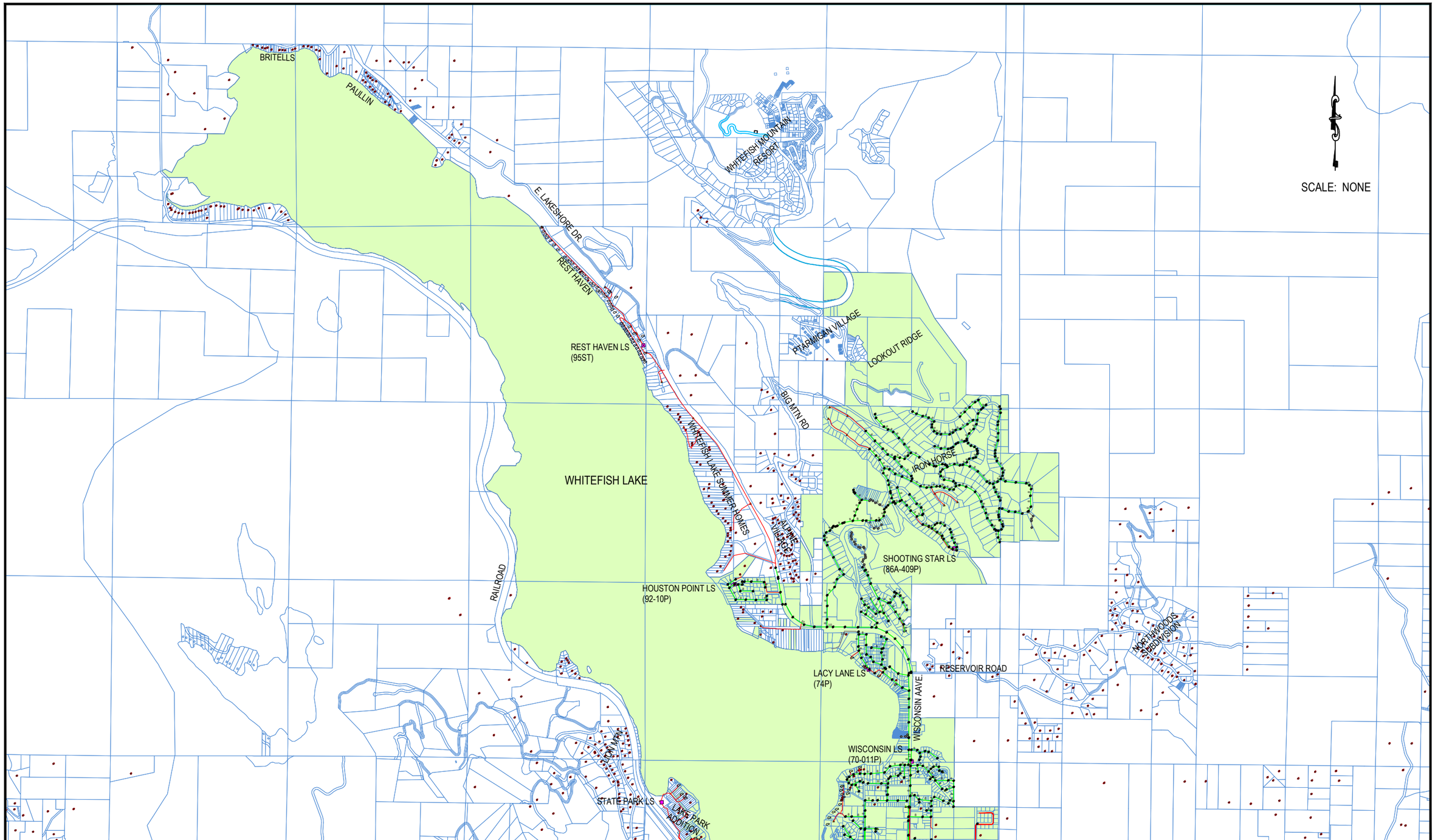
There is an existing lift station in the Whitefish Lake State Park that the entire Lion Mountain area could possibly gravity flow to, but this lift station was designed for use by only the State Park. The Mountain Park lift station along State Park road, approximately 1/4 mile from the access road to Lion Mountain, was designed with sufficient reserve capacity to handle wastewater flow from the entire area north of Lion Mountain Loop Road to and including the Lion Mountain Subdivision area. The collection system would be expensive to install.

Southwest Whitefish: There are significant numbers of existing septic systems in the southwest portion of Whitefish, generally south of 4th Street West to and along 7th Street West. Public sewer is reasonably close and accessible to these areas; however, upgrades to the Scott Avenue lift station would be necessary.

There is also a number of existing septic systems along both sides of Karrow Ave., near Lost Coon Lake and in the Blanchard Lake area, but there is no existing public sewer close proximity to any of these areas so their connection to a public sewer system is not likely in the foreseeable future.

South Whitefish: There are scattered septic systems in the south part of Whitefish with a few pockets with higher density systems, but with the exception of Park Knoll Estates and Emerald Estates, it would be difficult to provide public sewer to the other unsewered areas.

East Whitefish: Areas east of Whitefish, from Edgewood to Highway 40, are generally characterized by flat open fields, larger tracts of land, and predominantly poorly drained soils with shallow seasonal groundwater. Existing septic systems are sparse. There has been interest in developing some of this land, but with the poor soil and shallow groundwater conditions, it is unlikely that any type of moderate to high development would be approved without public sewer service.



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CITY OF WHITEFISH - NORTH

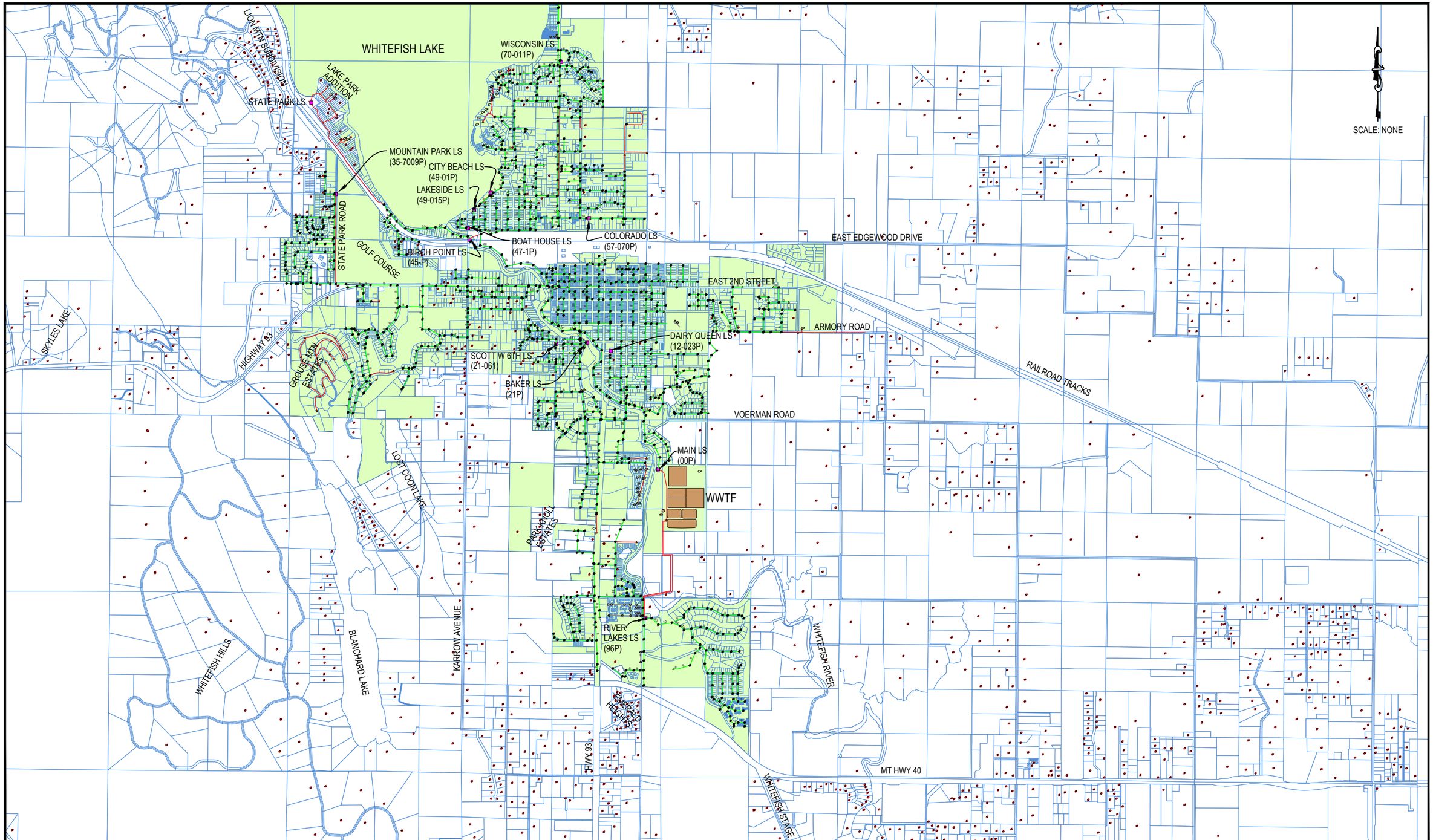
PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	WhitefishTreatment Facilities
	Manholes
	Manholes Private
	Mains
	Mains Private
	Grinder Pumps / STEP
	Lift Stations
	Force Mains
	Flathead County Septic Systems
	Clean Out
	Flathead County Parcel
	City Limits

FIGURE NUMBER
WF-1

MARCH 15, 2012



CARVER ENGINEERING
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CITY OF WHITEFISH - SOUTH

PUBLIC SEWER SYSTEM AND AREA SEPTIC SYSTEMS

Legend

Symbols	Description
	WhitefishTreatment Facilities
	Manholes
	Manholes Private
	Mains
	Mains Private
	Grinder Pumps / STEP
	Lift Stations
	Force Mains
	Flathead County Septic Systems
	Clean Out
	Flathead County Parcel
	City Limits

FIGURE NUMBER
WF-2

MARCH 15, 2012

YELLOW BAY - FLATHEAD LAKE BIOLOGICAL STATION

DESCRIPTION:

The Flathead Lake Biological Station is located on the east side of Flathead Lake adjacent to Yellow Bay, in Lake County. This facility is a biological research station that is operated by the University of Montana and also serves as an educational campus for the University. This campus consists of numerous research and educational buildings as well as necessary living quarters and associated buildings to support a year-round educational and research population, typically ranging between 30 to 120 people, depending on the season.

The campus is sewered by a gravity collection system that consists, for the most part, of 8" sewer mains that flow to a centrally located sewage lift station. Sewage is then pumped to a sewage treatment facility where it is treated, disinfected and is pumped via a permitted discharge line to Flathead Lake. Sewage sludge is land applied. Sewer service is also provided to the Yellow Bay State Park restroom facility located just east of the campus.

The sewage treatment facility was constructed in 1974 through an EPA grant, and is basically a packaged extended aeration facility with tertiary treatment for phosphorus removal. The overall capacity of the treatment facility is 33,000 gallons per day (gpd). According to Mark Potter, Director of Facilities for the Biological Station, current average flows in the summer are around 4,000 gpd and they average about 2,000 gpd in the winter. Peak flow is 10,725 gpd.

CAPACITY TO SERVE OUTSIDE OF EXISTING SERVICE AREA:

The Flathead Lake Biological Station's existing wastewater collection and treatment systems have excess capacity to possibly provide service to existing nearby properties presently served by on-site septic systems. However, looking at Figure YB-1, one can see there are not many existing septic systems in the near vicinity of the Biological Station. Additionally, Mark Potter has indicated that inquiries have been made by developers about serving properties outside the campus. With the exception of the Yellow Bay State Park, no other connections have been allowed. According to Mark Potter, the Biological Station's stance on outside sewer service requests has been to deny them, because allowing them would promote additional growth along Flathead Lake.

Although that position is clearly understandable, providing service to existing nearby development with on-site septic systems, that could be adversely impacting the quality of water in Flathead Lake, might even be a better position to take. Excessive flows and future development could be restricted by a Connection Agreement.

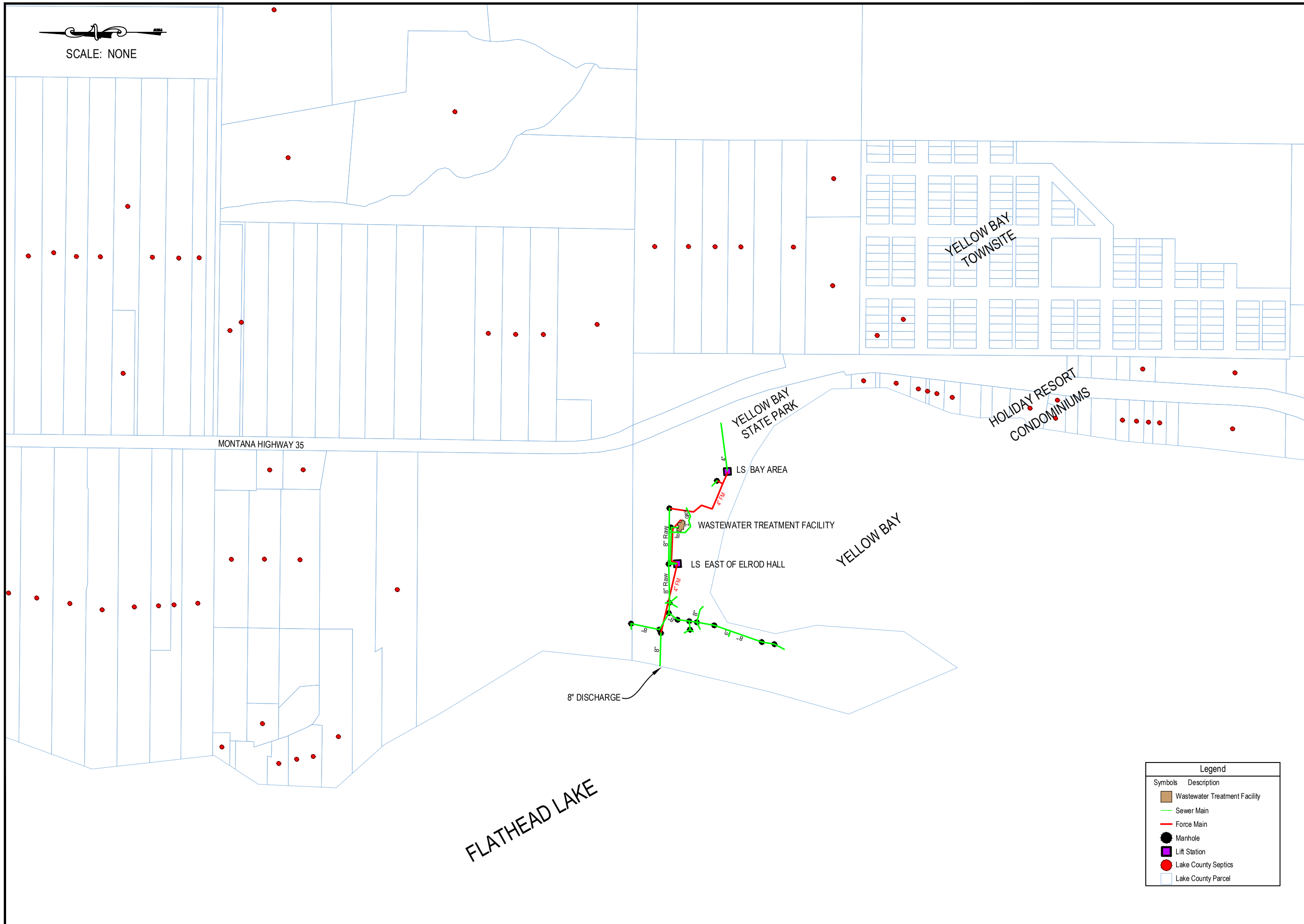

FIGURE NUMBER
YB-1

DATE
MARCH 15, 2012

YELLOW BAY - FLATHEAD LAKE BIOLOGICAL STATION SEWER SYSTEM AND AREA SEPTIC SYSTEMS

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ON-SITE WASTEWATER TREATMENT SYSTEMS (SEPTIC SYSTEMS)

Introduction:

On-site wastewater treatment systems, or septic systems as they are more commonly called, have been in existence in one form or another for thousands of years, from pit privies and cesspools to high-tech systems that purport to produce disinfected effluent fit for human consumption. Septic tanks for primary treatment were reported to be in use in the late 1800's and the discharge of septic tank effluent to subsurface drainfield systems became common in the mid-1900's. Many septic tank and drainfield systems in use today are based on technologies developed more than 100 years ago. Their sizes, configurations and material components may have changed over time; however, the basic premise of a tank to remove settleable solids, floatable grease and scum, followed by the effluent being discharged to a subsurface soil absorption field, or drainfield, has been around for more than a half century.

Septic tank effluent which is discharged to subsurface drainfields contains significant concentrations of bacteria, viruses and nutrients, as well as heavy metals and synthetic organic contaminants. The soils surrounding the drainfields provide further treatment through biological processes, filtration and adsorption. These systems have been proven to be very effective in treating residential wastewater effluent if they are installed in areas with suitable soils and with sufficient separations (horizontal and vertical) to ground and surface water, bedrock or restrictive layers. However, as reported in the EPA Onsite Wastewater Treatment Systems Manual (EPA/625/R-00/008), only about one-third of the land area in the United States has soils suitable for conventional subsurface soil absorption systems. The densities of septic systems in some areas may exceed the capacities of even suitable soils to properly treat septic tank effluent.

State and County public health departments are charged with adopting and enforcing on-site wastewater treatment and disposal regulations in Montana, as they are in most other states. Flathead and Lake Counties have been and continue to be at the forefront in developing progressive rules and regulations that govern the design, construction and use of on-site wastewater systems. They set the standards by which other counties in Montana, and even in nearby states, follow. That being said, most of the rules and regulations that focus on the proper treatment of wastewater have only been in effect since the 1980's, some not since the 1990's. Prior to that, although rules and regulations did exist, the primary focus was on disposal of septic tank effluent. It was not until the discovery of septic tank effluent, or some of the constituents of septic tank effluent, migrating to ground and surface waters did the importance of wastewater

treatment, as well as the proper sizing, design and siting of on-site wastewater systems really start to take hold. Some of these discoveries led to the creation of public sewer districts and the construction of public wastewater collection systems to remove existing on-site wastewater systems from areas where soils were not capable of properly treating septic tank effluent or where groundwater levels were too shallow.

On-Site Wastewater System Failure:

Septic system failures can fall into two (2) general categories – failure due to age or hydraulic overloading and failure resulting in contamination of ground or surface water. The vast majority of septic systems failures reported in studies, surveys or local health department databases are systems that fail due to age or hydraulic overloading. In order to detect system failure by ground or surface water contamination, detailed site-level monitoring is necessary and such monitoring is both costly and labor intensive. Unless dye testing can show the migration of septic tank effluent from a specific system to ground or surface water, as has been done in several cases in Flathead County, most studies are more broad in scope and are intended to determine if contamination is being caused by a large number of septic systems.

Hydraulic overloading can be caused by the decreased infiltrative capacity of the soils at the absorptive surface that can result from system age or by lack of adequate system maintenance. Hydraulic overloading can also be caused by improper sizing of the system, in most cases the drainfield component of the system, by over-estimating the infiltrative capacity of the soils or by under-estimating the quantity of wastewater discharged to the system. Leaking plumbing fixtures – toilets, sinks, showers, etc. – are notorious causes of hydraulic overloading; however, these types of failures can often be corrected by repairing the leaking fixtures. Improper system construction can also lead to system failure and most often this type of failure occurs a relatively short time after the system has been placed in use. System owners are not likely to repair or replace a failing system unless sewage backs up into their residence or commercial structure or until sewage ponds on the ground surface.

Local health departments can track these failures when application is made for a replacement system. Each failed system should be carefully evaluated to determine the cause or causes and all failures should be mapped or cataloged. Over time a pattern of failures may become evident possibly indicating that systems are not performing well in certain types of soils. This could result in changes in sizing requirements or system design in specific areas of the County.

Wastewater Flow Rates:

If there is one aspect of on-site wastewater system design that is the most confusing and creates the most controversy, it is typical residential average daily wastewater flow rate. There have been numerous studies and yet very little consensus as to what is a typical average daily flow. Prior to 1994, most studies indicated the average daily wastewater flow from residential dwelling units ranged from 50 to 70 gallons per person per day (commonly referred to as gallons per capita per day, gpcd) In 1994 the U.S. Energy Policy Act (EPACT) standards went into effect to improve water use efficiency. National flow rates for showerheads, faucets, toilets and urinals were established. Residences built after 1994 or retrofitted with water use efficient fixtures were reported to have typical average daily wastewater flows of 40 to 60 gallons per person per day.

The EPA Onsite Wastewater Treatment Systems Manual (EPA/625/R-00/008) uses 60 gpcd in its calculations for mass loading of various constituents of residential wastewater, and the Montana Department of Environmental Quality (MDEQ) uses 100 gpcd in its design requirements for system sizing and design. The MDEQ uses an average of 3 persons per 3-bedroom residential unit and therefore uses a total of 300 gallons per day (gpd) per dwelling unit. They increase the daily flow by 50 gpd for each bedroom over 3 bedrooms. Lake County uses the same sizing requirements as the MDEQ and Flathead County uses a base of 350 gpd per 3-bedroom dwelling unit with an increase of 100 gpd for every additional bedroom. Therefore, an on-site wastewater system for a 5-bedroom house must be sized at 400 gpd when using MDEQ or Lake County standards and at 550 gpd when using Flathead County standards.

In the 2010 Census data, the number of persons per household varies throughout the various towns and cities in Flathead and Lake counties. For purposes of quantifying flows from on-site wastewater systems in this section of the report, 2.50 persons per household will be used with an average daily flow of 200 gpd per household. This equates to 80 gpcd which is a little higher than per capita wastewater flows from the EPA Onsite Wastewater Treatment Systems Manual, but it is still reasonable. It should be noted that the 200 gpd per household, or per on-site wastewater system, is the same wastewater flow used in the MDEQ analyses for non-degradation.

Number of On-Site Wastewater Systems:

An accurate count of the number of on-site wastewater systems within the study area is difficult to obtain. When work on this study first started, there were 14,952 septic systems in the Flathead County GIS database. As reported in a study conducted by the Flathead City-County Health Department (Cassidy *et al,* 2008), there were at that time 21,276 permits in the Health Department's computer database dating back to the late

1960's, with approximately 18,000 of those having enough information to be geographically located. As of the end of 2011, there are now 22,133 septic system permits in the Health Department's database.

As the number of septic systems in the GIS database was significantly less than the number of permits in the Health Department's database, a separate study was conducted to identify existing development throughout the Flathead County portion of the watershed study area that were not shown on the Flathead County GIS mapping system. The Montana Cadastral Mapping website was used in this study to identify existing development outside of existing public sewer system collection areas. Existing County GIS maps were prepared with the locations of all septic systems in the GIS database showing. Based on the premise that if there was a dwelling or commercial structure on a tract or parcel, and it was outside of a public sewer system collection area, it had an on-site wastewater system. There was no attempt made to add attributes to each new system such as property address or age of system. This study resulted in the addition of 6,026 septic systems to the database. The total number of systems in the Flathead County GIS database is now 20,978. It should be noted that the total number of systems is still likely lower than the actual total as the number of systems serving mobile home parks could not be determined and properties with mobile homes were often shown as having "No dwellings exist for this parcel". Visual determinations had to be made on some of these properties.

This separate septic system identification study did not extend into Lake County as septic systems locations shown on GIS mapping for Lake County were determined using the Montana Cadastral mapping system using the same premise as was used in Flathead County. If a property was developed, it had an on-site wastewater system if the property was outside of a public sewer system service area. In a causal look at some of the existing septic system locations in Lake County, it would appear that an update of the septic system mapping is warranted. There are a total of 10,532 septic system in the GIS database for Lake County, but only 4,899 are within the watershed study area. Added to those in Flathead County, there is a total of 25,877 septic systems in the watershed study areas.

Using 200 gpd per on-site wastewater system, there is a "calculated" total of 5.1754 million gallons (mgd) of wastewater being discharged each day – 4.1956 mgd in Flathead County and 0.9798 mgd in Lake County. The "actual" totals are likely less as it is unrealistic to assume there is 100% occupancy for all development served by on-site wastewater systems. These numbers are huge but it must be understood that these quantities of wastewater are being discharged over a very large area. There are, however, areas with high densities of septic systems where the quantity of wastewater effluent being discharged is a concern. Especially if the soils in these areas are not capable of adequately treating the wastewater before it migrates to ground or surface waters.

Table SS-1 below shows the levels of various constituents and the resulting concentrations of those constituents in typical residential wastewater.

Table SS-1 - Constituent Mass Loading & Concentrations in Typical Residential Wastewater [1]

	Mass Loading [2] (grams/person/day)	Concentration (mg/L)	Mass Loading [2] (lbs/day/system)
Total solids (TS)	153 - 267	505 - 882	0.8434 - 1.4718
Volatile solids	87 - 113	287 - 373	0.4796 - 0.6229
Total suspended solids (TSS)	47 - 100	155 - 330	0.2591 - 0.5513
Volatile suspended solids	33 - 80	109 - 264	0.1819 - 0.4410
Biochemical oxygen demand (BOD)	47 - 87	155 - 287	0.2591 - 0.4796
Chemical oxygen demand (COD)	153 - 200	505 - 661	0.8434 - 1.1025
Total nitrogen (TN)	8 - 23	26 - 76	0.0441 - 0.1268
Ammonia (NH_3)	1 - 3	3 - 10	0.0055 - 0.0165
Nitrites & Nitrates (NO_2) & (NO_3)	<1	<1	–
Total phosphorus (TP)	1 - 3	3 - 10	0.0055 - 0.0165
Fats, oils & grease	16 - 24	53 - 79	0.0882 - 0.1323
Volatile organic compounds	0.03 - 0.09	0.10 - 0.30	0.0002 - 0.0005
Surfactants	3 - 5	10 - 17	0.0165 - 0.0276
Total coliforms (TC) [3]	–	10^8 - 10^{10}	–
Fecal coliforms (FC) [3]	–	10^6 - 10^8	–

[1] For typical residential dwellings equipped with standard water-using fixtures and appliances

[2] Based on 2.5 persons per dwelling and 80 gallons/person/day or 200 gallons/day/system

[3] Concentrations presented in Most Probable Number or organisms per 100 milliters

Source: EPA Onsite Wastewater Treatment Manual (EPA/625/R-00/008) - Table 3-7 (This table was modified to reflect 2.5 persons per dwelling & 80 gallons/person/day and lbs/day mass loading)

Based on a total of 25,877 septic systems in the watershed study areas of Flathead and Lake Counties, Table SS-2 on the following page show the total mass loading of several residential wastewater constituents over the entire study area.

Table SS-2 - Constituent Mass Loading in Study Area

	Concentration (mg/L)	Mass Loading [1] (lbs/day/system)	Mass Loading [2] (total lbs/day)
Total solids (TS)	505 - 882	0.8434 - 1.4718	21,833 - 38,086
Total suspended solids (TSS)	155 - 330	0.2591 - 0.5513	6,707 - 14,266
Biochemical oxygen demand (BOD)	155 - 287	0.2591 - 0.4796	6,707 - 12,411
Total nitrogen (TN)	26 - 76	0.0441 - 0.1268	1,142 - 3,281
Total phosphorus (TP)	3 - 10	0.0055 - 0.0165	142 - 427
Fats, oils & grease	53 - 79	0.0882 - 0.1323	2,283 - 3,424

[1] Based on 2.5 persons per dwelling and 80 gallons/person/day or 200 gallons/day/system

[2] Based on a total of 25,877 septic systems in the watershed study areas of Flathead and Lake Counties

Source: Concentrations in this table are from the EPA Onsite Wastewater Manual (EPA/625/R-00/008) Table 3-7 (Concentrations have been modified to reflect 2.5 persons/dwelling and 80 gpd/person)

SEPTAGE – TREATMENT AND DISPOSAL

DESCRIPTION:

"Septage" is defined as liquid and solid material pumped from a septic tank, cesspool or other primary holding or treatment source. In a typical properly functioning septic tank, scum accumulates on the surface, clarified liquid occupies the middle of the tank, while sludge settles at the bottom. When a tank is pumped, all three (3) components are removed from the tank. In Montana, the material pumped from on-site residential wastewater systems (septic systems) is referred to as "domestic septage". This includes septic systems serving office buildings, retail businesses, schools and service related enterprises where the majority of wastewater generated is from private and public restrooms, sinks, showers, etc., and where the characteristics of the wastewater is similar to that from residential septic systems. "Domestic septage" also includes waste material pumped from holding tanks, portable toilets and Type III marine sanitation devices. Material pumped from grease traps and sumps is referred to as "commercial septage", but since it is often mixed or combined with domestic septage prior to being disposed, the term "septage" in this report will refer to all types of materials pumped from residential and commercial systems. Materials pumped from industrial sources, few of which exist in Flathead and Lake Counties, that contain higher concentrations of heavy metals and toxic materials, cannot be disposed of by land applications and are therefore not included as "domestic septage" or "commercial septage" in this report.

Although septage can be treated and disposed at public wastewater treatment facilities, few such facilities allow the disposal of septage. Concerns over possible adverse affects on the plant's treatment processes are commonly mentioned as reasons for not allowing the disposal of septage. With the exception of the Columbia Falls WWTF and the Polson WWTF, both of which currently accept septage from portable toilets (porta-potties), and the Whitefish WWTF who also accepts some septage from porta-potties and from those septic tank effluent pump (STEP) systems the City is responsible for maintaining, no other public wastewater treatment facility will accept septage. Septage is a very high strength waste and without proper treatment prior to being discharged to a public wastewater treatment facility, it very well could adversely affect a treatment process. Because of this, the vast majority of septage is disposed of by land application.

Septic tank pumpers and their land application sites are required to be licensed by the Montana Department of Environmental Quality (MDEQ). The MDEQ's Solid Waste Management Section is responsible for the review, licensing and oversight of septic tank pumpers and their disposal sites. The individual Counties assist in the review and recommendation process for new land application sites, they conduct

vehicle inspections, and they respond to complaints relating to the land application of septage, but remarkably that is their only involvement. It should be the other way around. The Counties should have primary control over the review, licensing and oversight of septic tank pumpers and septage disposal sites, if they have the desire and resources to do so.

CHARACTERISTICS OF SEPTAGE:

Septage is highly variable and organic, with significant levels of grease, grit, hair and debris. It also has very strong odors, an objectionable appearance and has high levels of parasites, viruses and bacteria. As there are many factors that can influence the characteristics of septage – user habits, pumping frequency, characteristics of the water supply, climate, piping materials, the presence of water conservation fixtures, garbage disposals, water softeners and household chemicals – it is difficult to specify "typical" characteristics of septage. Table SP-1 lists the physical and chemical characteristics of septage as found in literature.

Table SP-1 - [(1)] Physical and Chemical Characteristics of Septage As Found In Literature, With Suggested Design Values [a, b]

Parameter	Minimum	Maximum	Average	Mean	Suggested Design Value
Total Solids (TS)	1,132	130,475	34,106	38,800	40,000
Total Volatile Solids (TVS)	353	71,402	23,100	25,260	25,000
Total Suspended Solids (TSS)	310	93,378	12,862	13,000	15,000
Volatile Suspended Solids (VSS)	95	51,500	9,027	8,720	10,000
Biochemical Oxygen Demand (BOD)	440	78,600	6,480	5,000	7,000
Chemical Oxygen Demand (COD)	1,500	703,000	31,900	42,850	15,000
Total Kjeldahl Nitrogen (TKN)	66	1,060	588	677	700
Ammonia Nitrogen (NH_3-N)	3	116	97	157	150
Total Phosphorus (TP)	20	760	210	253	250
Alkalinity	522	4,190	970	—	1,000
Grease	208	23,368	5,600	9,090	8,000
pH	1.5	12.6	—	6.9	6.0

[a] All values are expressed as mg/L, except for pH

[b] The data presented in this table were compiled from many sources. The inconsistency of individual data sets results in some skewing of the data and discrepancies when individual parameters are compared. This is taken into account in offering suggested design values

[(1)] Data in this table, including footnotes, was taken from the US EPA Handbook entitled "Septage Treatment and Disposal", 1984, EPA-625/6-84-009

Table SP-2 lists the heavy metal concentrations "typically" found in domestic septage.

Table SP-2 - Heavy Metal Concentrations in Septage [1]

Parameter	*Minimum	*Maximum	*Average	*Mean	*Suggested Design Value
Aluminum (Al)	2.00	200	48	48	50
Arsenic (As)	0.03	0.5	0.16	0.16	0.20
Cadmium (Cd)	0.03	10.8	0.27	0.71	0.70
Chromium (Cr)	0.60	2.2	0.92	1.10	1.00
Copper (Cu)	0.30	34.0	8.27	6.40	8.00
Iron (Fe)	3.00	750	191	200	200
Mercury (Hg)	0.0002	4.0	0.23	0.28	0.25
Manganese (Mn)	0.20	32.0	3.97	5.00	5.00
Nickel (Ni)	0.20	37.0	0.75	0.90	1.00
Lead (Pb)	2.00	8.4	5.20	8.4	10.00
Selenium (Se)	0.02	0.3	0.076	0.10	0.10
Zinc (Zn)	2.90	153.0	27.4	49.0	40.0

* All values are expressed as mg/L

[1] Data in this table, including footnotes, was taken from the US EPA Handbook entitled "Septage Treatment and Disposal", 1984, EPA-625/6-84-009

LAND APPLICATION:

In the MDEQ Septic Pumper Guide, land application is described as "… the spreading, spraying, injection, or incorporation of pumpings onto or below the surface of the land to take advantage of the soil enhancing qualities of the septage." In ARM 17.50.802, the term "pumpings" is defined as "… the materials, liquid and solid, removed from a cesspool, septic tank, privy, portable toilet, grease trap, or car wash (or similar) sump that may be land applied for a beneficial purpose. The term also includes other primarily liquid wastes that may be land applied for a beneficial purpose. These include, but are not limited to, wastes from food processing operations, septage that contains commercial and industrial wastewater, and wastes from snow melt wastewater sumps. The term does not include commercial or industrial wastes that contain hazardous wastes or hazardous substances above regulatory thresholds."

Federal (EPA) regulations governing the application of domestic septage to land used infrequently by the general public are contained in 40 CFR, Subchapter O, Part 503, and are commonly referred to as the "503 regulations". Such "nonpublic contact sites" include agricultural fields, as are most commonly used in Flathead and Lake Counties, but can also include forest land and reclamation sites. Land application is an

economical method of handling septage and it can be an environmentally sound method IF properly managed. If properly managed, it provides a beneficial use of waste organic matter and nutrients without adversely affecting public health or the environment.

As previously mentioned, individuals that pump septic tanks, privies, porta potties, sumps, etc. in Montana are required to be licensed by the MDEQ and their disposal sites are also required to be licensed. In the "New Disposal Site Application Form", (See Figure SP-1 at the end of this section) specific information is required, if land application is selected, on the type of crop, crop nitrogen requirement, depth to groundwater, soil type, number of acres available for land application, slope, use of adjacent lands, and several other site specific details. With each new land application site, a Land Application Operation and Maintenance Plan must be provided. Each new land application site must be approved by the local county health department.

The license for each disposal site is to be renewed each year; however, the renewal application (See Figure SP-2 at the end of this section) does not ask for the same site specific information as does the New Disposal Site Application. Although crop type and crop nitrogen requirements may change from year to year, no information on crop type or nitrogen uptake is requested on the Renewal Application Form. A copy of this form is also included at the end of this section. The form does ask for information on total acreage available for application, total acreage proposed for this year, number of acres used for disposal during the previous year, the volume of pumpings applied during the previous year and the estimated total gallons during the new license year. This is all very useful information, but some pumpers do not provide the required information on the License Renewal Form so compiling accurate data on land application in Flathead County is very difficult.

From the crop nitrogen requirements, which are to be reported on the New Disposal Site Application Form in "pounds per acre per year", an agronomic or annual application rate (AAR) is determined. The AAR for domestic septage is determined using the following formula:

$$\text{AAR (gallons/acre/year)} = \frac{\text{Pounds of Nitrogen for Crop Yield}}{0.0026}$$

For wastes from pit privies, portable toilets, recreational vehicles and boats or marine wastes, the AAR is determined using the following formula:

$$\text{AAR (gallons/acre/year)} = \frac{\text{Pounds of Nitrogen for Crop Yield}}{0.0052}$$

Licensed pumpers are required to keep a Land Application Summary Log and submit copies of the log twice each year to the MDEQ. Information requested on the log, but not routinely provided in its entirety, includes the date of application, the location of the land application site, type of material applied (septage, portable toilet, grease

trap, carwash sump, etc.), the volume in gallons, area of application in square feet or acres, time of application, nitrogen requirement of crop, method of reducing vector attraction (tillage, lime or injection), pH of septage if lime is added and the time until the application area was tilled and when the litter was picked up.

Vector Attraction. A "vector" is defined as any rodent, insect or other organism capable of transmitting disease to humans. Because the characteristics of septage attracts vectors, the reduction of vector attraction at septage application sites is essential in mitigating the transmission of diseases. For the application of domestic septage to nonpublic contact sites, there are three (3) acceptable methods of reducing vector attraction:

- Subsurface injection
- Incorporation (surface application followed by plowing or tilling within 6 hours)
- Alkali (normally lime) stabilization where a pH of 12 or greater must be maintained for 30 minutes prior to application

In Flathead and Lake Counties, plowing or tilling within 6 hours of the septage being applied is the most common method of vector attraction reduction.

Licensed pumpers are also required to either screen the septage prior to application or to pick up nondegradable materials within 6 hours of application. Screening is usually done by discharging the septage through a simple screen or basket on the truck between the outlet and the splash or spreader plate. This removes plastics and other nondegradable materials from the septage being applied to the soil. Reportedly, most pumpers in Flathead and Lake Counties do not screen septage prior to land application and instead pick up nondegradable materials by hand.

QUANTITIES OF PUMPED MATERIALS:

As mentioned earlier, there are typically three (3) layers or components in a properly functioning septic tank – a scum layer consisting grease, fats and floatable matter at the top; sludge and heavier solids at the bottom; and a clarified liquid (effluent) in the middle. The sludge and scum layers remain in the tank and slowly accumulate over time, whereas the clarified liquid moves through the tank and eventually out to the drainfield. As the sludge and scum layers build, the capacity of the tank, or the tank's wastewater detention time, decreases. As the detention time decreases, less solids settle out of the incoming wastewater before being discharged to the drainfield. This can clog soils in the drainfield reducing the drainfield's infiltrative or absorptive capacity. When the rate at which effluent is being applied to the drainfield exceeds the infiltrative or absorptive capacity of the soils within the drainfield system, effluent will either break out onto the ground surface or it will back up into the building's plumbing and possibly

flood lower level floors. This constitutes a drainfield failure and it requires a new drainfield system.

To extend the life of a drainfield, it is commonly recommended to pump a septic tank every 3 to 5 years; however, the rate of sludge and scum accumulation in a septic tank is highly variable. The 3 to 5 year recommendation has been around since the early 1970's when septic tank capacities were commonly 750 to 900 gallons. A 1,000-gallon tank is now the minimum size for 1 to 3-bedroom residences with a 1,500-gallon tank required for 4 to 5-bedroom residences. The frequency a septic tank needs to be pumped is dependent on the size of the tank, the number of people in the residence generating wastewater flow to the tank, the volume of solids in the wastewater, and the use of a garbage disposal. Devices can be made or purchased to measure the depth of the scum layer and the sludge depth; however, the task of measuring scum and sludge levels to determine when a septic tank actually needs to be pumped is somewhat unpleasant and it is something most homeowners would not routinely perform. When a tank is pumped, the homeowner should ask the pumper what the scum and sludge levels were and ask the pumper what the pumping frequency should be.

Although the recommended pumping frequency is 3 to 5 years, based on the number of septic tanks in Flathead County and the quantity of septage reported by licensed pumpers to the MDEQ, actual pumping frequencies appears to be about every ten (10) years. According to the Flathead City-County Health Dept., there are a total of 22,133 septic system permits in the Department's database as of the end of 2011. In the Flathead County GIS database, there was a total of 14,952 septic systems in Flathead County; however, an additional 6,026 septic systems were identified in a study using the Montana Cadastral Mapping website to identify developed properties in the county. It was assumed that if a property was developed and was outside of a public sewer system service area, the property had a septic system. With this addition, the new total number of septic systems in the Flathead County GIS database is 20,978. It should be noted that this number is still likely low as the number of systems serving mobile home parks could not be determined using the Montana Cadastral Mapping and some properties with mobile homes were identified as having no dwelling on the parcel. Visual determinations could not always be made on many of these properties.

The 22,133 permits in the Flathead City-County Health Department's database may also be misleading, as it counts replacement systems and does not include systems installed prior to the County's permit system in the late 1960's, although many of those systems have likely since been replaced. Is also probable that a number of systems were installed illegally without a permit, and the County's database does not include existing septic tanks on the Evergreen Water & Sewer District's or the City of Whitefish's public wastewater collection systems. There are approximately 1,600 septic tank effluent pump (STEP) or septic tank effluent gravity (STEG) systems on the Evergreen Water & Sewer District system that the District is responsible for maintaining

and about 50 STEP systems on the Whitefish collection system that the City is responsible for maintaining. Septage from the STEP systems on the Whitefish system is taken to sludge drying beds at the City's wastewater treatment facility. Septage from the STEP and STEG systems on the Evergreen system is land applied.

In trying to rationalize the various counts of existing septic tanks in Flathead County and understanding that each of the counts may be lower than the actual number of septic tanks in the County, an approximate total of 25,000 septic tanks will be used to quantify the amount of septage being generated with an typical or average capacity of 1,000 gallons per tank. If the pumping frequency of septic tanks was every 3 to 5 years as recommended, 5.00 to 8.33 million gallons of septage would be pumped each year and would be disposed of by land application at licensed sites throughout the County. Based on records obtained from the MDEQ for 2010, the septic tank pumping frequency is closer to every 10 years. As shown in Table SP-3 on the following page, there was a total of 3,286,387 gallons of the various types of materials pumped in 2010, of which 2,513,582 gallons was septage or from septic tanks. With 25,000 septic tanks, at 1,000 gallons per tank, the pumping frequency would be every 9.95 years. In 2008, the total quantity of septage was 2,435,115 gallons and in 2009 it was 2,815,985 gallons. There were undoubtedly fewer septic tanks in 2008 and 2009 but the frequency of pumping is still going to be in a range of 8 to 10 years.

As shown in Table SP-3, there was a total of 3,088,982 gallons of septage and other types of pumpings that were land applied in 2010. However, based on information obtained from MDEQ Septic Tank Pumper program, it is difficult to determine the exact amount of acreage in Flathead County that is licensed for land application of septage and other types of pumpings, as information on the total number of acres that were actively being used by licensed pumpers as land application sites was incomplete. Some licensed pumpers keep reasonably complete records of their pumping and land application operations, but most do not. From looking at information available for those licensed pumpers that do keep reasonably complete records, it would appear that actual application rates are well within the established agronomic or annual application rates (AARs) for those specific application sites.

As shown in Table SP-3, Ready Freddy pumped 40% (1,240,132 gallons) of the total quantity of waste material pumped in Flathead County in 2010. Unfortunately, MDEQ records on the number of acres Ready Freddy actively uses each year for land application are not available, and the actual application rate in 2010 is, therefore, impossible to determine. It is known the AAR on the agricultural land that Ready Freddy does use is reported to be 28,846 gallons/acre/year. To meet the "required" AAR, a total of 43 acres would be needed if the material was uniformly applied throughout the acreage. The crop type is unknown, but the nitrogen requirement of the crop would have to be 75 lbs/acre to equate to that AAR.

Table SP-3 - Quantites of Waste Pumpings in Flathead County in 2010

Company	Septage (gallons)	Portable & Vault Toilets (gal)	Grease Traps (gal)	Sumps (gallons)	Other (gallons)	Land Application - AAR Site 1 (gal/acre/yr)	Land Application - AAR Site 2 (gal/acre/yr)	Disposal at WWTF (gallons)
READY FREDDY	946,332	90,900	33,250	117,650	52,000	28,846		
KEN PEDERSEN EXCAVATING	298,000	-----	11,000	-----	-----	34,615		
MELS PUMPING SERVICE	444,500	-----	6,500	-----	-----	53,846		
NORTHWEST PORTABLES	-----	71,360	-----	-----	-----			71,360
A-1 SANITATION	147,000	-----	11,000	-----	14,000	28,846	26,923	
RAY BAIER SEPTIC SERVICE	333,700	-----	-----	-----	-----	30,769		
PEE WEE	-----	125,645	-----	-----	-----			125,645
ACME CHEMICAL TOILET RENTAL	-----	2,900	-----	-----	-----			
SHUR CLEAN SERVICES	318,050	-----	8,000	-----	-----	28,846		
SHUR CLEAN PORTABLE TOILETS	-----	31,195	-----	-----	-----			
J & M SEPTIC PUMPING	26,000	-----	-----	-----	-----			
CV BUILDING SYSTEMS	-----	-----	-----	-----	-----			
LAPP OF LUXURY LOO	-----	400	-----	-----	-----			400 [1]
TOTAL INDIVIDUAL QUANTITIES	**2,513,582**	**322,400**	**69,750**	**117,650**	**66,000**			**197,005**
TOTAL COMBINED QUANTITY	**3,286,387**							
TOTAL QUANTITY LAND APPLIED	**3,088,982**							

[1] The 400 gallons of portable & vault toilet waste from Lapp of Luxury Loo was disposed at a RV dump station

In a 2009 report prepared by Dick Montgomery, P.E., of the Flathead City-County Health Department, for the Flathead Regional Wastewater Management Group, it states, “There is approximately 800 acres under permit to dispose septage and septage-like wastes in Flathead County. Of that acreage, approximately 250 acres are actively in use as disposal sites.” Although the assumption is unrealistic, but if the 3,088,982 gallons of septage and other types of pumpings that were land applied in 2010, were uniformly applied over 250 acres of agricultural land, the application rate would be 12,356 gallons/acre. This would equate to an average nitrogen requirement of 32 lbs/acre for the various crop types and the expected yields of those crops. This would seem to be well within the recommended AARs for most crops grown in the Flathead Valley.

Without accurate information on the number of acres actively being used each year for land application of septage, the types of crop and expected yields for each application site, and the recommended AAR for each crop type, it is impossible to determine if septage is being properly applied or if septage is being applied in excess of approved application rates. The routine monitoring of soil nitrogen levels should be required at all licensed application sites and the AAR at each site should be adjusted accordingly. It is understood that the primary reason for the previously presented annual application rate calculations is to prevent the over application of nitrogen in excess of crop needs; however, crop types can change in any given year and with those changes, application rates also need to change. Nothing in the current annual application renewal process requires a periodic adjustment of AARs to changing crop types nor is there a requirement to monitor nitrogen background levels at disposal sites.

Although individual counties in Montana currently have some involvement in the MDEQ Septic Tank Pumper Program, that involvement is relatively minor. Primary control of the program should be at the County level with simple oversight from the MDEQ. That is if the individual counties have the desire and resources to do so. Specific to Flathead and Lake Counties, health departments in each County have more knowledge of the physical characteristics of current and proposed land application sites, they can more easily see when changes occur to a licensed application site, and they have more and better opportunities to interact with the licensed pumpers and the owners of the land application sites. Quite simply, they are in a much better position to effectively administer and manage a septic tank pumping program within their respective jurisdictions.

It was an objective of this study on septage to provide a map showing the current licensed land application sites throughout the Flathead Basin; however, information available from the MDEQ Septic Tank Pumper Program did not appear to be up to date and a septage disposal map would not have been very accurate or enlightening. Locations are provided with the DVD.

PERMITTING AND COMPLIANCE DIVISION
WASTE AND UNDERGROUND TANK MANAGMENT BUREAU
PO BOX 200901
HELENA, MT 59620-0901

SEPTIC TANK, CESSPOOL, AND PRIVY CLEANER

NEW DISPOSAL SITE APPLICATION FORM

(Complete one form for EACH new disposal site)

Section 1 **APPLICANT INFORMATION (Please Print)**			
Name of Applicant:	Name of Business:		DEQ License Number: ☐ *New Applicant*
Business Address:	City:	State:	Zip:
Mailing Address:	City:	State:	Zip:
County:	Phone Number:	Fax Number:	
Location of Business Operation Records:			

Section 2 **DISPOSAL SITE INFORMATION (Complete as applicable – use one form for EACH site)**		
Method of Disposal:	*(Check all that apply)*	
☐	Land Application Site	Complete Sections 3 & 5 of the application
☐	Wastewater Treatment Facility	Complete Sections 4 & 5 of the application
☐	Septage Processor or Composter	Complete Sections 4 & 5 of the application
☐	Licensed Class II Landfill	Complete Sections 4 & 5 of the application
Waste Category:	*(Check all that apply)*	***Estimated total gallons during license year:***
☐	Septage	
☐	Portable toilet/Vault toilet type waste	
☐	Grease Trap Waste	
☐	Sump Pumpings (specify type below)	
	☐ *Automatic Car Wash Bay Sump*	
	☐ *Attended Car Wash Bay Sump*	
	☐ *Unattended Car Wash Bay Sump*	
	☐ *Other Sump (specify type)* _____	
☐	Graywater	

Section 3 **LAND APPLICATION SITE INFORMATION (Complete ALL of Section 3 for Land Application sites)**	
Property Owner Full Legal Name: (ARM 17.50.803(5)a))	Property Owner Business/Organization Name as filed or registered with the Montana Secretary of State office: (ARM 17.50.803(5)(a))
Property Owner Phone Number:	Property Owner FEDERAL TAX ID #: (Required if property owner is a business)

SEPTIC PUMPER NEW DISPOSAL SITE APPLICATION FORM

Property Owner Mailing Address:	City:	State:	Zip:
Site Physical Address:	City:	State:	Zip:
Directions to Site:			

Legal Description of Site: *(to nearest ¼ section)* /4	Section:	Township:	Range:	County:

Number of acres available for land application:	Type of Crop:	Estimated Depth to Ground Water:
Number of acres proposed for land application during license year:	Crop Nitrogen Requirement: (pounds per acre per year --- *lbs N/acre/yr*)	Source of Ground Water Information:
Soil Type:	Present use of adjacent lands:	Approximate Slope:

Distance to nearest building:	Distance to closest surface water:	Is site zoned: *(If yes, list Zone. Zoning/Planning Officer signature required for zoned areas)*

SITE CRITERIA
The site must be located outside the 100-year floodplain.
Pumpings must not be applied within 150-ft of any state surface waters.
Pumpings must not be applied within 100-ft of any state, federal, county or city highway or road.
Pumpings must not be applied within 100-ft of a drinking water supply source.
Pumpings must not be applied to lands with a slope greater than 6%.
Pumpings being injected in to the soil must not be applied to lands with a slope greater than 12%.
The site must be capable of handling the projected pumpings without exceeding the annual application rate (AAR).
Pumpings must not be applied to lands that are likely to adversely affect threatened/endangered species or their habitat.
Public access to the site must be restricted.
Crop harvesting must be restricted at the site.
Animal grazing must be restricted at the site.
Litter will be controlled at the site. Litter must be removed within 6-hours of application.
Local Health Department restrictions:
Have all site criteria been complied with? ☐Yes ☐No If not explain:

PROVIDE THE FOLLOWING DOCUMENTS WITH THE APPLICATION

LAND APPLICATION OPERATION AND MAINTENANCE PLAN - *An operation and maintenance plan MUST BE INCLUDED and provides provisions for EACH of the following items:*

(a) Site access controls;
(b) Types and sources of wastes;
(c) Vector attraction, pathogen reduction measures;
(d) Applicable animal grazing and crop harvesting restrictions; **and**
(e) List of equipment available for managing each type of waste.

(*Section 3 – continued*)

	MAP - *A sketch or map MUST BE INCLUDED that provides the following:* **(a)** Property lines and boundary lines of : **(i)** acreage available for land application, and **(ii)** the acreage proposed for use during the license year; **and** **(b)** All roads, homes, buildings, water wells, surface waters, canyons, ravines, and floodplains within 500 feet of the property boundary
	State Historic Preservation Office (SHPO) – A cultural resource file search must be requested on the proposed land application site. SHPO charges a fee for this search. A copy of the "File Search Request Form" is attached or you may go on-line to SHPO's web page at: http://mhs.mt.gov/shpo/forms.asp Provide the following: **(a)** A copy of the SHPO file search results.

PROPERTY OWNER SIGNATURE/CERTIFICATION

I, _____, hereby certify that I am the Property Owner or Designated Representative of the Property Owner (***CIRCLE ONE)*** of the proposed disposal location and the applicant has my permission to use the site. By signing this form, I further certify that the applicant has provided me notification of the restrictions for crop harvesting and animal grazing following the land application of septage on the property.

SIGNATURE: _____ DATE: _____
TITLE: _____

Section 4
INFORMATION FOR DISPOSAL AT:
WASTEWATER TREATMENT FACILITY, SEPTAGE PROCESSOR, COMPOSTER, OR CLASS II LANDFILL

Facility Name:	
Facility Contact:	Phone Number:
Facility Location:	
Facility Mailing Address:	

WASTE TREATMENT FACILITY MANAGER SIGNATURE

I, _____, hereby certify that I am the Facility Operator, or Designated Representative of the Facility Owner or Operator (***CIRCLE ONE)*** of the proposed disposal location and the applicant has my permission to use the site.

SIGNATURE: _____ DATE: _____

TITLE: _____

Section 5
CERTIFICATIONS

APPLICANT CERTIFICATION

I _____, have completed this application for a specific disposal site. I hereby declare that the information provided is true and correct to the best of my knowledge, and that I have made reasonable inquiries where necessary to confirm such information.

SIGNATURE OF APPLICANT: _____DATE: _____

HEALTH OFFICER CERTIFICATION

I, _____ am the Health Officer or Designated Representative of the County. I certify that this disposal site meets the physical requirements of Montana laws and rules governing septage disposal, and any applicable local health requirements.

SIGNATURE: _____ DATE: _____

TITLE: _____

ZONING CERTIFICATION (*if required*)

I, _____, an official with knowledge of the zoning district covering the proposed disposal location, certify that the use of the site is in conformance with local zoning regulations.

SIGNATURE:_____ DATE: _____

TITLE: _____

PERMITTING AND COMPLIANCE DIVISION
WASTE AND UNDERGROUND TANK MANAGEMENT BUREAU
SOLID WASTE SECTION
PO BOX 200901
HELENA, MT 59620-0901

SEPTIC TANK, CESSPOOL, AND PRIVY CLEANER 2012 LICENSE RENEWAL APPLICATION FORM

Please provide your business contact information in Section 1. Please also specify the location of your business operation records.

You must also complete Sections 2 through 4. Please refer to the enclosed instructions to complete your application. Incomplete forms will be returned to the applicant and the renewal will not be processed until completed forms have been submitted.

WARNING: ***You may not operate your business UNTIL your 2012 license has been issued. There is no grace period for license renewals, only for the assessment of late fees. Please renew your license early to ensure compliance. Otherwise, you may risk license denial.***

SECTION 1: APPLICANT INFORMATION

Applicant full legal name*: (ARM 17.50.803(1)(a)):*	Name of Business/Organization as filed or registered with the Montana Secretary of State Office *(ARM 17.50.803(1)(a)):*		
	Business Federal Tax ID Number:		
Physical Business Address:	City:	State:	Zip:
Mailing Address (*If different from physical business address):*	City:	State:	Zip:

County:	Phone Number:	Fax Number:	E-Mail:

Location of Business Operation Records *(If the location of operator records change during the license year, you must provide notification in writing to DEQ*):

SECTION 2: COUNTIES WHERE SEPTAGE WILL BE COLLECTED

List all counties where you conduct business:

Have you added new counties since your 2011 license was issued? ☐ Yes ☐ No
If yes, which ones:

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SEPTIC TANK, CESSPOOL, AND PRIVY CLEANER
2012 LICENSE RENEWAL APPLICATION FORM

STP License #: **Business Name:**

SECTION 3: DISPOSAL SITE/DISPOSAL METHOD/WASTE TYPE INFORMATION

(NOTE – You must complete a separate Section 3 for EACH approved disposal site. Therefore, if you have more than one approved disposal site, please make additional copies of this page as necessary.)

Disposal Site Name/Site Owner Name *(full legal name or business name)*:

Site Legal Description (*to nearest ¼ section*): /4	Section:	Township:	Range:	County:

For Department Use ONLY – Lat/Long

Site Physical Address *or* Directions to the Site:

Property Owner Physical Address:	City:	State:	Zip:
Property Owner Mailing Address	City:	State:	Zip:
Property Owner Phone Number:			

METHOD OF DISPOSAL: *(Check all that apply)*		**Was this site used for septage disposal during the previous year?** YES	NO	**Total acreage available for application:**	**Total acreage proposed for this year:**	**Number of acres used for disposal during the previous year:**
☐	Wastewater Treatment Facility	☐	☐			
☐	Septage Processor or Composter	☐	☐			
☐	Licensed Class II Landfill	☐	☐			
☐	Land Application Site	☐	☐			

WASTE CATEGORY: *(Check all that apply)*		***Volume of pumpings applied at this site during the previous year:***	***Estimated total gallons during new license year:***
☐	Septage		
☐	Portable Toilet/Vault Toilet Type Waste		
☐	Grease Trap Waste		
☐	Sump Pumpings (specify type below)		
	☐ *Automatic Car Wash Bay Sump*		
	☐ *Attended Car Wash Bay Sump*		
	☐ *Unattended Car Wash Bay Sump*		
	☐ *Other Sump (specify type)* _____		
☐	Graywater		

SEPTIC TANK, CESSPOOL, AND PRIVY CLEANER
2012 LICENSE RENEWAL APPLICATION FORM

STP License #: **Business Name:**

SECTION 4: APPLICANT CERTIFICATION - OWNER SIGNATURE

In signing this application form, I certify that the above information is true and correct and, that as the applicant named above, I shall conduct the business of cleaning septic tanks, cesspools, or privies and disposing of septage in accordance with the laws and rules of the state of Montana.

PRINTED NAME: _____ DATE:_____

SIGNATURE: _____

TITLE: _____

Figure SP-2