Facilities Plan for Sanitary Sewer Collection System Expansion

Pikes Bay Sanitary District

Bayfield County, Wisconsin

PIKES 145655 | May 11, 2018

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Bayfield County, Wisconsin

Prepared for:
Pikes Bay Sanitary District
Bayfield County, Wisconsin

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Facilities Plan for Sanitary Sewer Collection System Expansion

Pikes Bay Sanitary District

Prepared for Pikes Bay Sanitary District

1 Introduction

Pikes Bay Sanitary District (PBSD) is located in Bayfield Township of Bayfield County in northern Wisconsin. The Sanitary District surrounds much of the City of Bayfield including land adjacent to and upland from Lake Superior. A collection system of sanitary sewer pipes, manholes, service connections, lift stations and force mains convey wastewater from portions of the PBSD to the Greater Bayfield Wastewater Treatment Plant (GBWWTP). The GBWWTP serves both the City of Bayfield and the PBSD and is administered as part of an Intermunicipal Agreement between the two entities.

1.1 Purpose and Scope

The purpose of this Facilities Plan is to examine a portion of the PBSD which is currently not served by the collection system, and determine the feasibility of expanding the sanitary sewer collection system to serve this additional area. The scope of this plan includes examining certain components of the existing system, and defining land areas which can be effectively serviced by the expanded system. The plan will include discussion of the proposed components of the sanitary sewer infrastructure, construction cost projections, and funding discussion.

1.2 Location

The location of this study is the southwesterly part of the Pikes Bay Sanitary District, south of Pikes Creek and around Ski Hill Road. Refer to Exhibit No. 1 in Appendix A for an illustration of the overall sewer service study area. The area includes land along both sides of Highway 13 from Pikes Creek to the southern boundary of Bayfield Township, and both sides of Ski Hill Road from Highway 13 to its west end at the Mt. Ashwabay Ski and Recreation Area. Also examined was the area from Pikes Creek to the PBSD upper lift station, where a possible lift station location and a possible force main route could be considered. In addition to the Mt. Ashwabay Ski Area, the sewer service study area also includes residential housing, vacation lodging establishments, and the future Big Top Chautauqua performance venue. Also included is other undeveloped forested land.

2 Existing Features

A number of existing infrastructure features would be impacted by the expansion of the PBSD service area. The features include gravity sewers, lift stations and force mains, and also the GBWWTP. A discussion of the potentially impacted existing infrastructure features follows in this section.

2.1 Gravity Sanitary Sewer

Existing gravity sewer located within Port Superior Road conveys wastewater to the lower lift station and force main. A portion if this line has a history of infiltration and has been plugged and abandoned in place. It is envisioned that the abandoned portion could be lined, with unused service laterals abandoned, prior to potentially conveying additional wastewater from the study area to the lower lift station.

2.2 Lift Stations and Force Mains

Pikes Bay Sanitary District currently operates three lift stations, two of which are in the area between Pikes Creek and the Greater Bayfield Wastewater Treatment Plant. These lift stations pump waste water generated from connected properties toward the plant.

2.2.1 Lower Lift Station

The Lower Lift Station is located near the tennis courts at the Port Superior Marina. This lift station collects sewage flowing from surrounding gravity mains and pumps sewage to a manhole just upstream from the Upper Lift Station. A 4-inch diameter force main is utilized to convey the pumped wastewater to the east. This lift station consists of a 4-foot diameter wet well with 2- 10 HP pumps, controls, and 240V emergency power connection, upgraded in 2002. The 4-inch force main is being considered for replacement with 6-inch HDPE due to the fill and development which has occurred on top of the line.

2.2.2 Upper Lift Station

The Upper Lift Station is located off the east end of Pumphouse Road, approximately ¼ mile southwest of the GBWWTP. This lift station collects sewage flowing from surrounding gravity mains, including what is added by the discharge of force main from the Lower Lift Station. A 4-inch diameter force main pumps sewage from the Upper Lift Station to the GBWWTP. This lift station consists of 2-30 HP pumps, controls, 480V emergency power connection, installed in 1972.

2.3 Wastewater Treatment Plant

The Greater Bayfield Wastewater Treatment Plant (GBWWTP) is owned and operated by the Greater Bayfield Wastewater Treatment Plant Commission, under the cooperative administration of the City of Bayfield and the PBSD within the terms of their Intermunicipal Agreement. The plant receives wastewater from the surrounding land, as well as hauled-in waste from local haulers.

The maximum monthly design flow of the WWTP is 0.57 mgd. The current average influent flow is 0.129 mgd, over 4 times under the design flow of the plant. An agreement is in place between Bayfield and Pikes Bay Sanitary District for discharge of wastewater to the WWTP, without specific allocation of maximum flow limits. The initial capital investment of the WWTP was 18% PBSD and 82% City of Bayfield.

Flow enters the WWTP through a mechanical bar screen that removes large solids and then onto an anaerobic biological phosphorus tank. Back up chemical removal is available if biological phosphorus fails. From there, flow enters two oxidation ditches with an anoxic zone designed for denitrification. After the oxidation ditch, sludge is settled out in two final clarifiers. Tertiary treatment consists of disk filters and year round disinfection via ultraviolet technology. Final effluent is discharged to a dry run into Lake Superior.

Solids from the clarifiers are then aerobically digested and discharged to reed beds for further drying and storage.

3 Proposed Service Area and Projected Flows

3.1 Study Area

The sewer service study area as previously described in section 1.2 covers approximately 750 acres and is shown in Exhibit No. 1 in Appendix A. The sewer service study area was further defined by examining property ownership, zoning, topography, and other contributing factors.

3.1.1 Topography

The topography of the study area is generally sloping toward the north and east, toward the Pikes Creek watershed and Lake Superior shoreline. These hillside slopes vary with the steeper slopes near the Mt. Ashwabay area and tributary gullies leading toward Pikes Creek. Land nearer to the Lake Superior shore is flatter, especially toward the northeast part of the study area. The slope of Ski Hill Road varies from approximately 4% and 10%. Contour lines at 10-foot intervals are included in many of the exhibit drawings to reflect the general topography of the area.

3.1.2 Wetlands

Wisconsin DNR Surface Water Data Viewer (SWDV) database shows a number of isolated wetlands in the study area. In addition, the SWDV also shows a substantial wetland complex which flanks Pikes Creek which extends at least 3/4 mile west of Highway 13 to Lake Superior. This significant wetland complex is partially adjacent, and partially included within the northeast corner of the study area. Refer to the Surface Water Data Viewer Map in Appendix B.

3.1.3 Other Environmental Factors

Review of the WDNR registry of contaminated sites show three closed minor environmental sites in the general vicinity of the study area. One is at the Bayfield Hatchery and two near the Port Superior Marina area. These locations are outside of the potential construction area, and none of these sites would be expected to affect the proposed project. Once a more specific project design is underway, further investigation may be required within the in the final area of construction, especially if work is to be completed in previously developed areas or previous railroad corridor.

An Endangered Resource Preliminary Assessment (ERPA) has been completed for the corridor affected by the construction. The ERPA reveals that there are endangered resources in the project area, and further actions are required to ensure compliance with Wisconsin's Endangered Species Law. Therefore, an Endangered Species Resources Review should be conducted during the preliminary design phase to ensure impacts are minimized and/or avoided. The ERPA is included in Appendix B.

3.1.4 Soils

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, predominate soils types consist of a number of different soil complexes, all of which are considered to be very limited in suitability for septic tank absorption fields. Refer to the NRCS Soil Map and supporting data in Appendix B.

The presence or depth of subterranean rock or other tightly consolidated soils will need to be investigated in order to determine what design layout and trenching method is best for installation of planned underground improvements. Other subsurface soils and groundwater depth will also be important to the more detailed planning stages and design of the improvements, especially in the potential lift station location. It is recommended that a plan for soil borings be developed so a geotechnical firm can provide an adequate investigation and soils report in the early stages of project design.

3.1.5 Current Land Ownership and Zoning

The Land within the study area is all privately owned. Two areas excluded from the sewer service study area consist of a 40 acre parcel owned by Bayfield County on the south side of Ski Hill Road, and a 10 acre parcel owned by the State of Wisconsin Conservation Commission on the north side of Ski Hill Road. Land within the study area is primarily zoned Residential-Recreational Business (R-RB) along with a few parcels zoned Residential and a few parcels zoned Forestry. Refer to the Bayfield County Zoning Map and (zoomed in) detail of the Zoning Map in Appendix B.

3.2 Immediate Service Area

3.2.1 Area Description

The immediate service area with in the sewer service study area includes existing residences, existing lodging establishments, and recreation facilities as illustrated in Exhibit No. 2 in Appendix A. Due to the current plans to develop a new Big Top Chautauqua venue on 70 acres near the west end of Ski Hill Road, this development is considered to be within the immediate sewer demand.

3.2.2 Projected Flows

Wastewater flow for the immediate service area has been estimated to be 26,590 gallons per day average daily flow. This includes all existing facilities only, plus the proposed Big Top Chautauqua development. Refer to the Sanitary Sewer Flow Projections for the Immediate Service Area in Appendix C.

3.3 20-Year Projected Service Area

3.3.1 Area Description

The 20-Year planning period projection service area includes approximately 400 acres, along Ski Hill Road and Highway 13 as shown in Exhibit 3 in Appendix A. This design projection includes further development of the forties on the south side of Ski Hill Road similar to Ashwabay Heights subdivision with approximate 2.5-3.0 acre lots. This projection also includes a sewer extension south along Highway 13.

3.3.2 Projected Flows

Wastewater flow for the 20-Year planning period has been estimated at approximately 45,000 gallons per day average daily flow. This includes all existing facilities as described in the immediate service projection, as well as the Highway 13 South extension, and redevelopment as described. Refer to the Sanitary Sewer Flow Projections for the Intermediate 20-Year Projection Service Area in Appendix C.

3.4 Ultimate Service Area

3.4.1 Area Description

The ultimate future projection service area includes further development and redevelopment of the remaining Residential-Recreational Business (R-RB) areas within the study area. Along Highway 13, west side redevelopment doubling density to 1 acre lots, and increasing density of development on the lake side by 33% was projected. Additional residential development of remaining parcels to densities of 2.5-5.0 acre lots was also projected. Refer to Exhibit 4 in Appendix A for an illustration of the ultimate sewer service area projection.

It should be noted that this projection is beyond the planning period for this study. However, it is important to have an understanding of ultimate conditions which may need to be served by sewers which could become undersized in the future.

3.4.2 Projected Flows

Wastewater flow for the Ultimate Future Service Area has been estimated at 85,000 gallons per day average daily flow. This includes all existing facilities and all projected development and redevelopment as described. Refer to the Sanitary Sewer Flow Projections for the Ultimate Future Service Area in Appendix C.

4 Proposed Sewer Extension

4.1 Gravity Sewer Main

The sewer service study area can be primarily served by a proposed gravity sewer along Ski Hill Road and Highway 13. The proposed gravity sewer is shown on Exhibit 5 in Appendix A. It is expected that the Ski Hill Road gravity sewer can be constructed with a combination of open cut construction and directional drilling methods. In steeper areas of Ski Hill Road, the proposed pipe profile may need to include drop manholes to prevent excessive pipe slopes. Excessive pipe slopes can result in relatively high sewage flow velocities creating problems with solids collecting in the lines. In addition, directional drilling can be complicated with shallow bedrock or cobbles,

and a geotechnical evaluation (soil borings) are recommended during the preliminary design phase to confirm soil conditions.

The road right-of-way and property lines along Ski Hill Road vary in relation to the actual road location according to the Bayfield County GIS system, when comparing the digital property lines to aerial photography. According to the GIS mapping, the roadway itself of Ski Hill Road appears to be physically located mostly on the properties to the south, and not centered on the dividing property line as is often expected. Generally the prescriptive rights of a public right-of-way in unplatted lands is defined by a 66 foot corridor centered on the center of the traveled way. In the case of Ski Hill Road, this appears to be different that having 66 feet centered on the property line dividing north and south properties. A topographic survey and property research during the preliminary design phase is recommended to define the right-of-way corridor. This information would help determine whether the gravity line can be constructed along the road shoulder or if it should be constructed under the pavement. In either case, the proposed cost estimates include allowances for pavement removal and replacement.

The gravity sewer along Highway 13 will similarly need to be constructed along the Highway edge, with regard to the location of the pavement within the Highway right-of-way and adjacent wetland areas. This segment also may need to be directionally drilled or open cut as conditions may dictate.

4.2 Lift Station

Following conveyance in the gravity sewer, sewage from the proposed sewer service area will be pumped by a new lift station and force main from the vicinity of the Pikes Creek Bridge to the existing gravity sewer in Port Superior Road. Refer to Exhibit No. 5 in Appendix A for an illustration of the gravity sewer, lift station, and force main locations.

The proposed lift station location on the south side of the bridge would likely require an easement from a private property owner.

Because of the overall topography of the area being uphill of the lift station site, the structure depth would not be extremely deep and may allow an installation of a wet well of typical 15 to 20-feet deep. This is beneficial to the installation costs, especially as groundwater significantly affects construction costs of deeper excavations.

The new lift station will likely be a duplex pump station designed to pump the peak flow for the intermediate future service area. The wet well itself is sized large enough for the flow estimates for the ultimate future service area, but the pumps would need to be looked at for possible replacement. One pump shall be capable of pumping 126 gpm, the peak flow the lift station would receive under normal circumstances. Maximum horsepower of the proposed pumps would be in the 7.5-10 range.

The proposed wet well would be a 6 foot manhole, and approximately 4.5 feet deeper than the lower invert into the manhole. An integral valve vault is recommended with a control panel located on a concrete pad nearby.

4.3 Force Main

The proposed force main may be installed within Highway right-of way, depending on the outcome of a topographic survey during the preliminary design phase and available right-of way space. An alternate location for the proposed force main is within the abandoned railroad trail owned by WDNR.

The proposed force main will be plastic material (either HDPE or fusible PVC) directionally drilled beneath Pikes Creek and adjacent wetland areas, to avoid any impacts to wetlands and Pikes Creek.

At 126 gpm, a 4 inch diameter force main is recommended. At design flow, the velocity in the line would be 3.2 feet per second.

4.3.1 Connection Point

Connection to the existing PBSD facilities is anticipated to be within Port Superior Road, just upstream of the lower lift station. This segment of existing gravity sewer has a history of infiltration and a portion of the line has been plugged and abandoned in place. It is envisioned that the abandoned portion could be lined without disturbance of the street, with unused service laterals abandoned, prior to conveying the additional wastewater from the study area to the lower lift station.

4.4 Sewer Service Laterals

Existing residences and businesses would be responsible for connection to the proposed collection system. Connection wyes and lateral pipe could be installed at locations likely to expect future hookup. If lateral pipes need to cross the existing roadways, a determination should be made whether these service pipes should be installed at the time of the project or at a later date.

4.5 Other Recommendations

4.5.1 Existing Lift Stations and Force Mains

The capacity of the existing lift stations and force mains affected by the extension of the PBSD collection system to serve the sewer service study area have been studied.

The Lower Lift Station normally sees peak flows of 14 gpm. With the addition of the intermediate service area flow, this will increase to 140 gpm. Based on these flows, the existing 450 gallons of operating range is adequate. The pumps at the Lower Lift Station are only sized for 125 gpm, and this would need to be increased to at least 140 gpm to handle the peak flow to the lift station. This may be accomplished with upgrading the impeller of the existing pumps, but would need to be analyzed further. The existing forcemain is adequate.

The Upper Lift Station normally sees peak flows of 15 gpm. With the addition of the intermediate service flow area, this will increase to 141 gpm. Based on these flows, operating range. The pumps at the Upper Lift Station are sized… The existing forcemain…

4.5.2 Wastewater Treatment Plant

The GBWWTP is currently operating well below design flow and meeting limits. Current flows average 0.57 mgd, with monthly design flow at 0.129 mgd. Ultimate future service area would increase flow by 0.085 mgd, increasing the average flow to approximately 0.66 mgd, still well below the design flow.

Since the wastewater from Pikes Bay will be mainly domestic, it is assumed that as long as the total flow to the plant remains below the design flow it is anticipated the WWTP will have no problems biologically with treatment.

4.6 SCADA

The new lift station will notify operators of alarms with an autodialer. If grant funding is secured, SCADA upgrades for all lift stations should be considered as all lift stations within PBSD have outdated systems or no SCADA at all.

4.7 Emergency Operations

The proposed lift station would be equipped with connections for a portable generator capable of running the lift station. WDNR allows for one portable generator to run up to 3 lift stations. The portable generator would be owned and operated by PBSD.

5 Cost Projections

5.1 Opinion of Probable Construction Cost

A preliminary estimate of total project costs has been developed for the gravity sewer, new lift station and new force main. It is anticipated that this cost would be funded by special assessments to the benefitting users, net of grant funds which may be secured.

A separate preliminary estimate has been prepared for modifications to the existing lift station facilities.

Cost estimates are included in Appendix D.

5.2 Grant and Loan Funding Potential

Several loan and grant funding programs may be available to be explored to help fund the extension of the Pikes Bay Sanitary District collection system.

- Community Development Block Grant – Public Facilities Program
- Community Development Block Grant – Public Facilities for Economic Development Program
- Wisconsin Economic Development Corporation – Community Development Investment Grant
- Wisconsin Department of Natural Resources – Clean Water Fund Program
- USDA - Rural Development WEP and Community Facilities Programs

5.3 Projected Connection Fees

Connection Fees for new users will be assessed per Sanitary District Ordinance and current Fee Schedule. The current PBSD Wastewater Connection Fee is $5,000 and the current Sewer Connection Charge is $_____.

5.4 User Fees

Based on the current CBWWTP cost allocation spreadsheet, projected O&M treatment costs for new users have been developed and are included in Appendix D.

5.5 Special Assessments

Special assessments are anticipated for use to cover initial capital costs net of grant funding, for new gravity sewer, new lift station, and new force main. Users would be required to connect to the expanded collection system within 6 months or as otherwise allowed by ordinance, and special assessment could be paid by a one-time payment or spread out for a period of ___ years.

The estimated total project cost of approximately $1.5M, would be assessed on a “potential REU” basis as determined by the intermediate service area projections. Based on approximately 400 REU’s, the REU assessment would be approximately $4,000 per REU.

6 Schedule

Big Top Chautauqua anticipates opening of the new venue in May of 2021. This would be the critical target date for the completion of a collection system extension to serve this area. As such, working backwards, it is recommended that construction would commence in the Spring of 2020. Funding assistance applications and preliminary design efforts would therefore be initiated in the Fall of 2018 and/or Spring of 2019 as applicable.

Based upon current WDNR Clean Water Fund (CWF) program deadlines, CWF Funding Application and biddable plans and specifications would be required to be submitted in September of 2019, following submittal of an Intent to Apply (ITA) and Priority Evaluation and Ranking Form (PERF) by October 30, 2018.

7 Alternatives

7.1 Trucking Waste

Without extending the collection system, waste from the new venue and surrounding areas may be able to be trucked to the WWTP. A holding tank would be needed to temporarily store the wastewater prior to a hauler arriving. This would be very disruptive during large events and due to variability of the flow, the holding tank would need to be quite large or multiple trucks would be needed to haul the waste. This would not benefit the WWTP as large slugs of wastewater, not dampened by a collection system would hit the WWTP all at once. It is unlikely that the WWTP equipment would be sized for such slug loads.

This option is not ideal for Pike’s Bay or the Bayfield WWTP.

7.2 Onsite Treatment

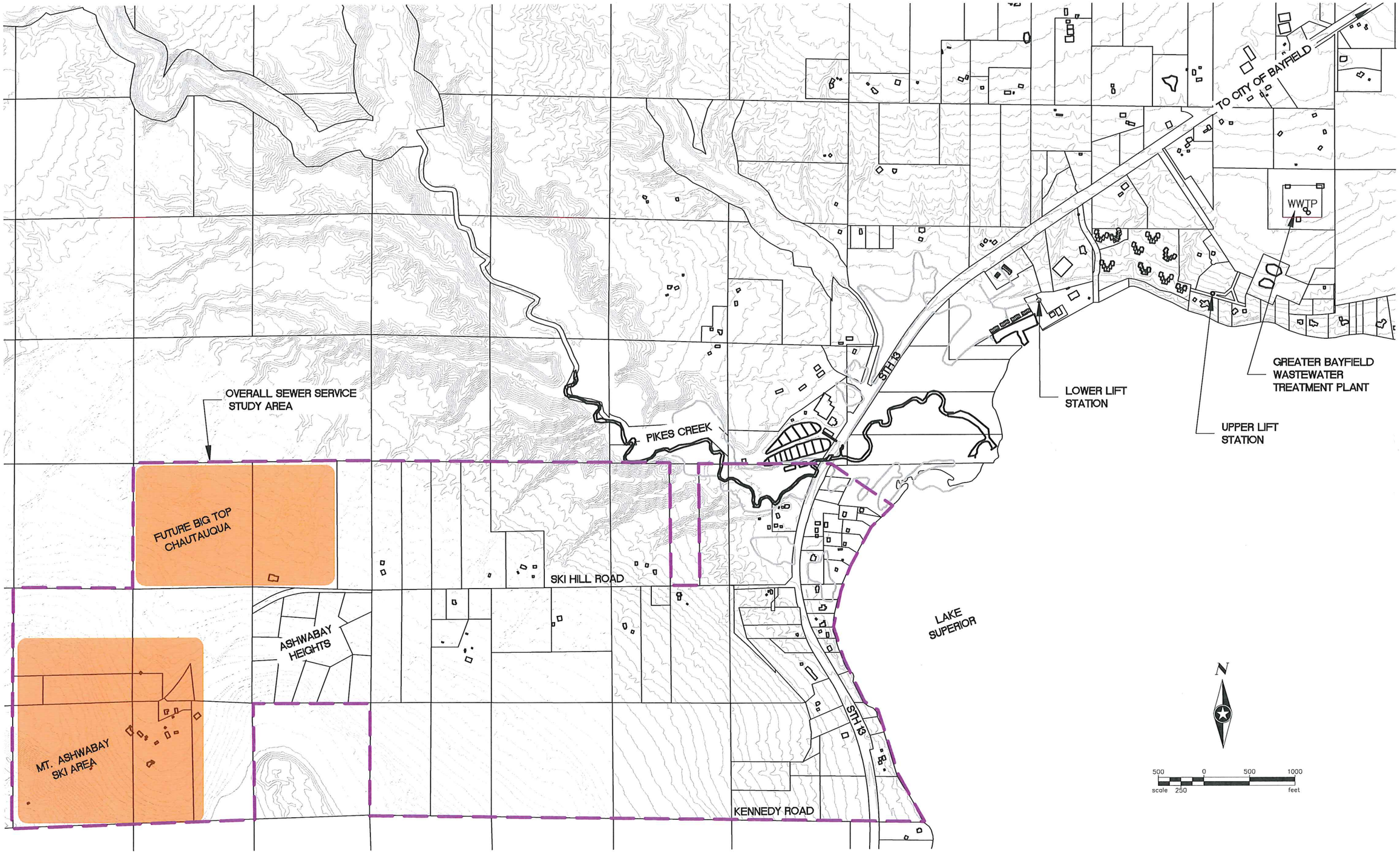
Onsite treatment would consist of the businesses and homes included in the ultimate future service area all using private onsite wastewater treatment (septage) systems. Due to Pikes Bay already investing in the WWTP and the capacity at the WWTP, this is not a preferred option. Most treatment plants run optimally near their design flows and it would be a benefit to both parties for Pikes Bay to continue discharging to the WWTP.

8 Summary

From and engineering standpoint, the proposed improvements are feasible….

Appendix A

Exhibits



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FILE NO.
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DATE:
5/10/2018

OVERVIEW MAP
PIKES BAY SANITARY DISTRICT
BAYFIELD COUNTY, WISCONSIN

EXHIBIT NO. 1

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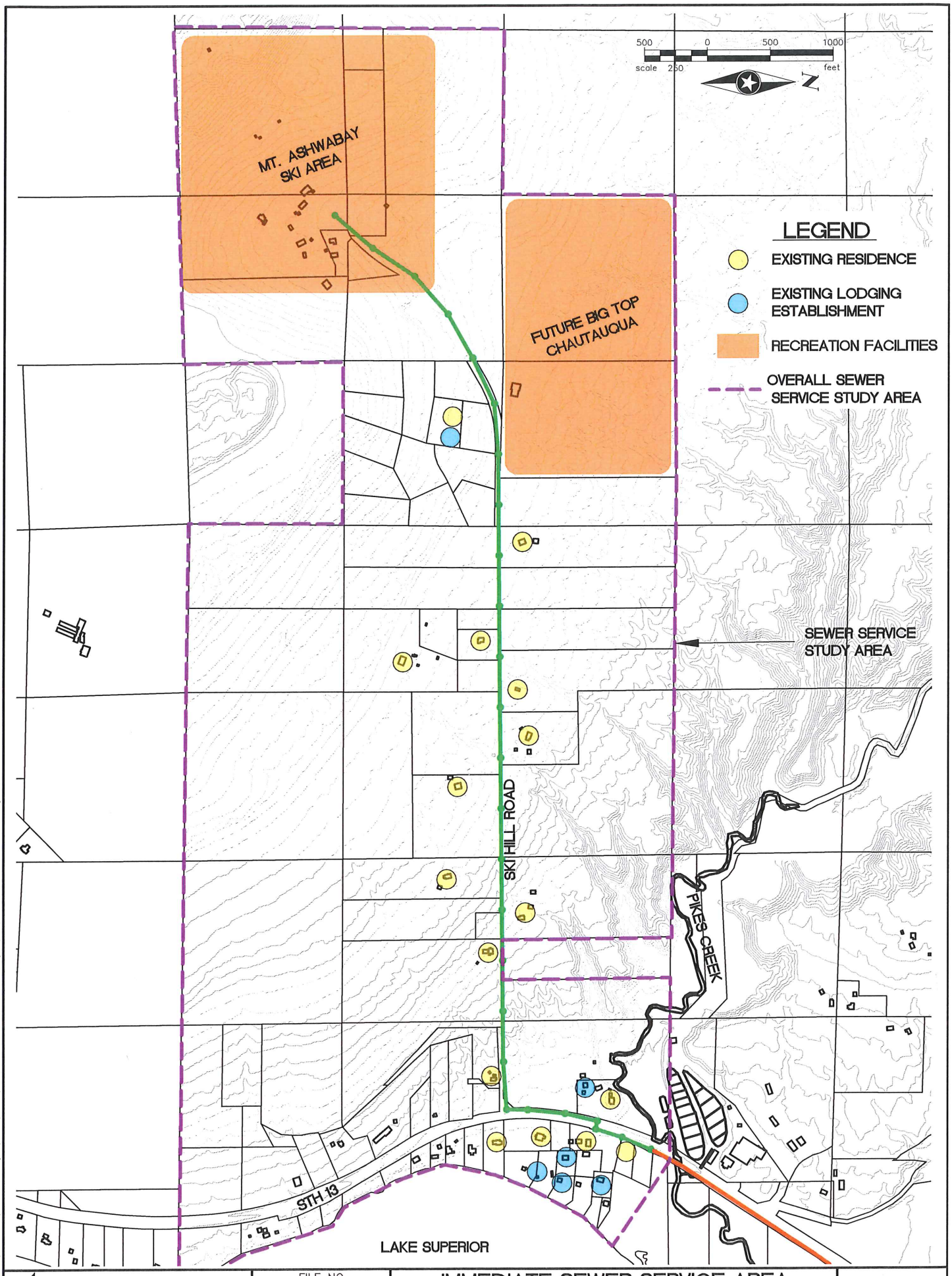

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IMMEDIATE SEWER SERVICE AREA

PIKES BAY SANITARY DISTRICT
BAYFIELD COUNTY, WISCONSIN

EXHIBIT NO. 2

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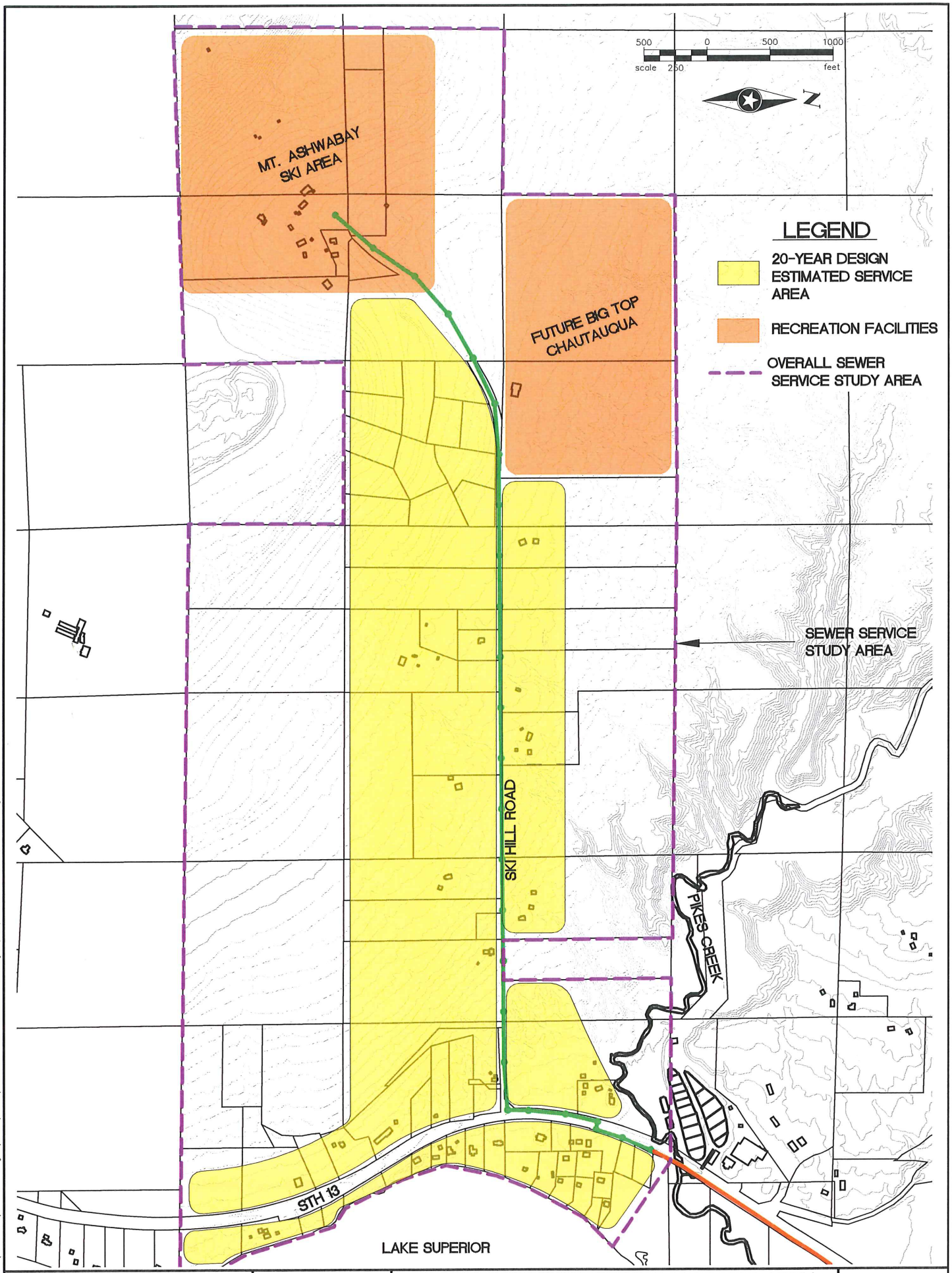

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20-YEAR DESIGN SEWER SERVICE AREA

PIKES BAY SANITARY DISTRICT
BAYFIELD COUNTY, WISCONSIN

EXHIBIT NO. 3

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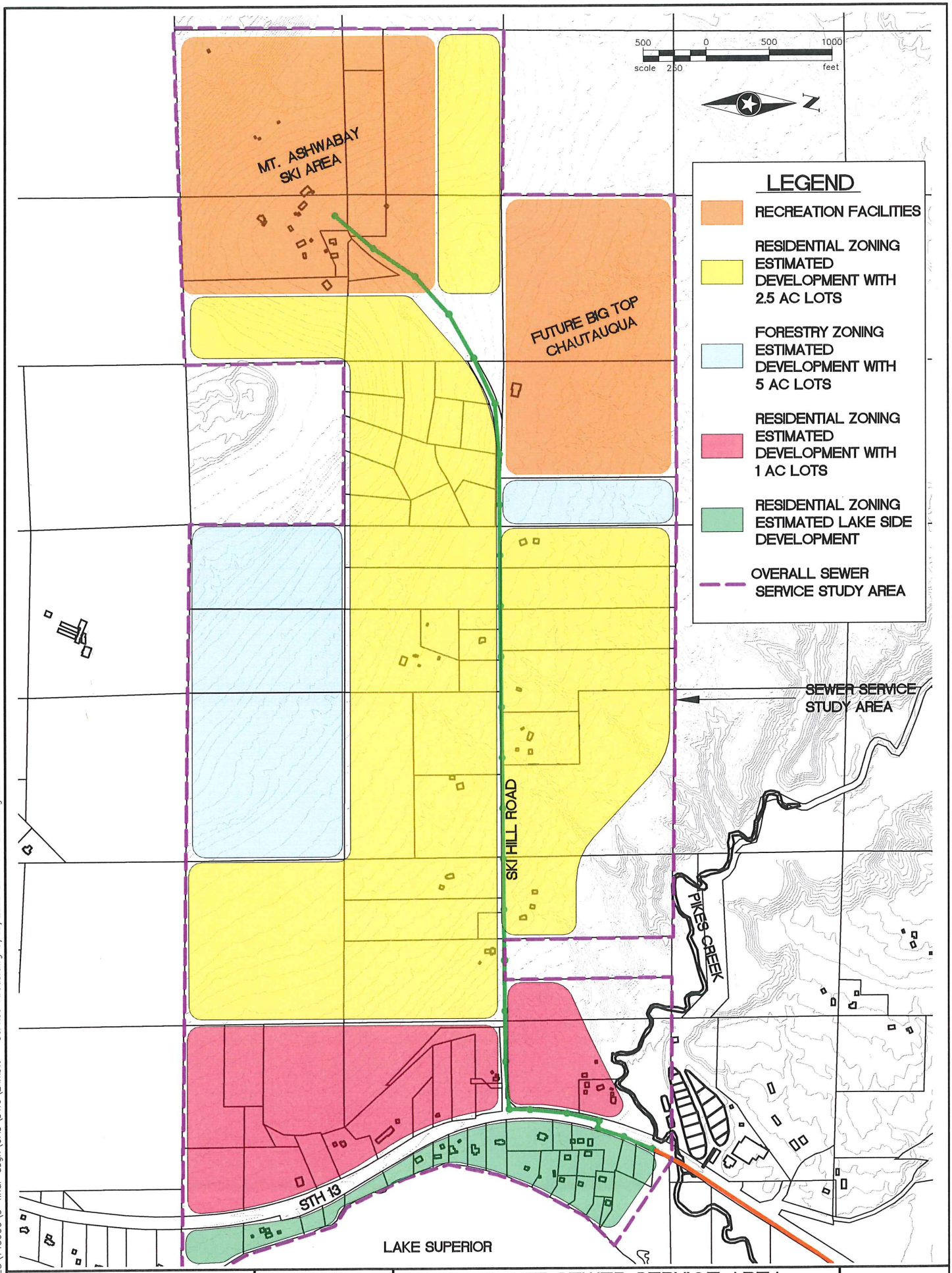

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ULTIMATE SEWER SERVICE AREA

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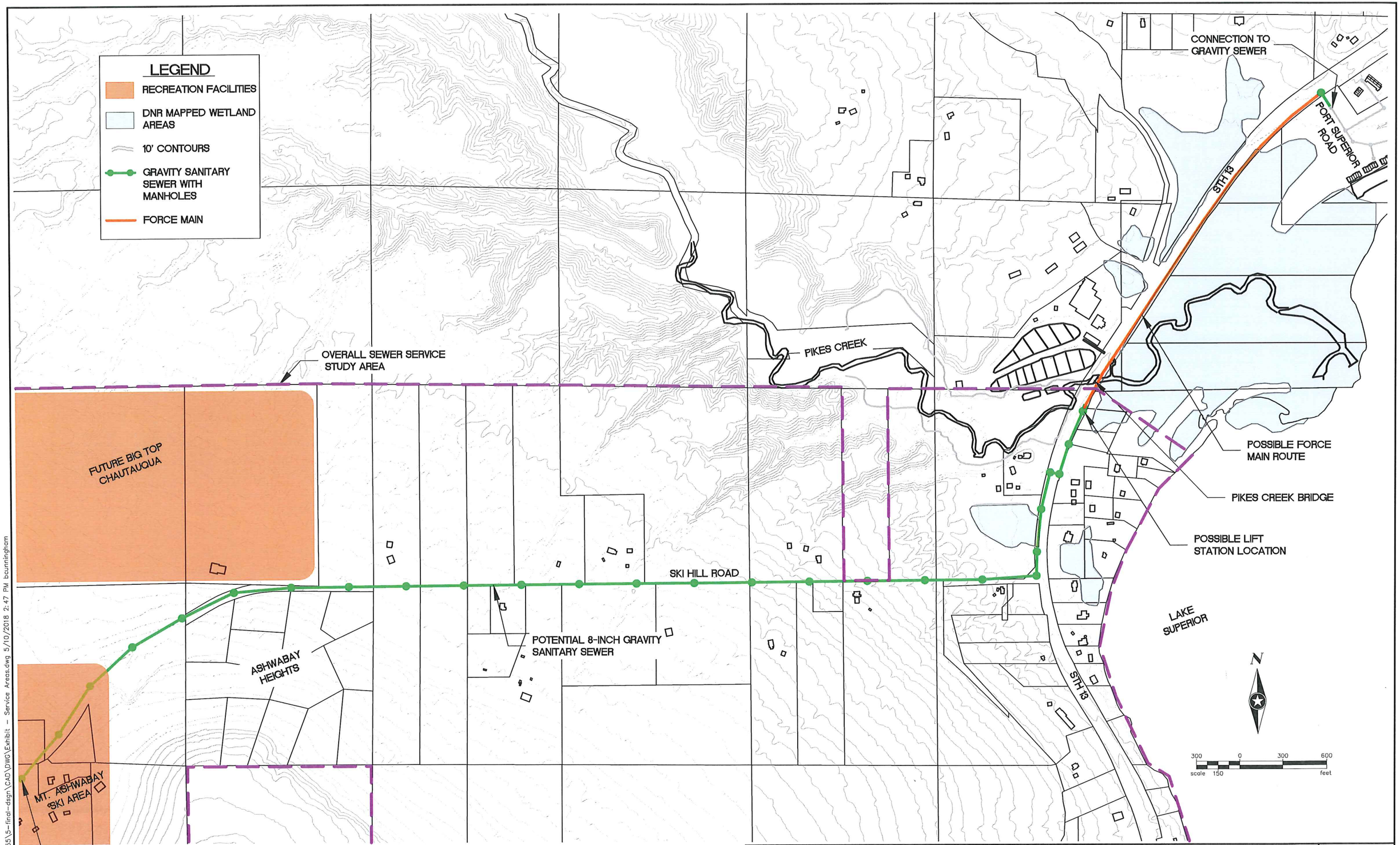
BAYFIELD COUNTY, WISCONSIN

EXHIBIT NO. 4



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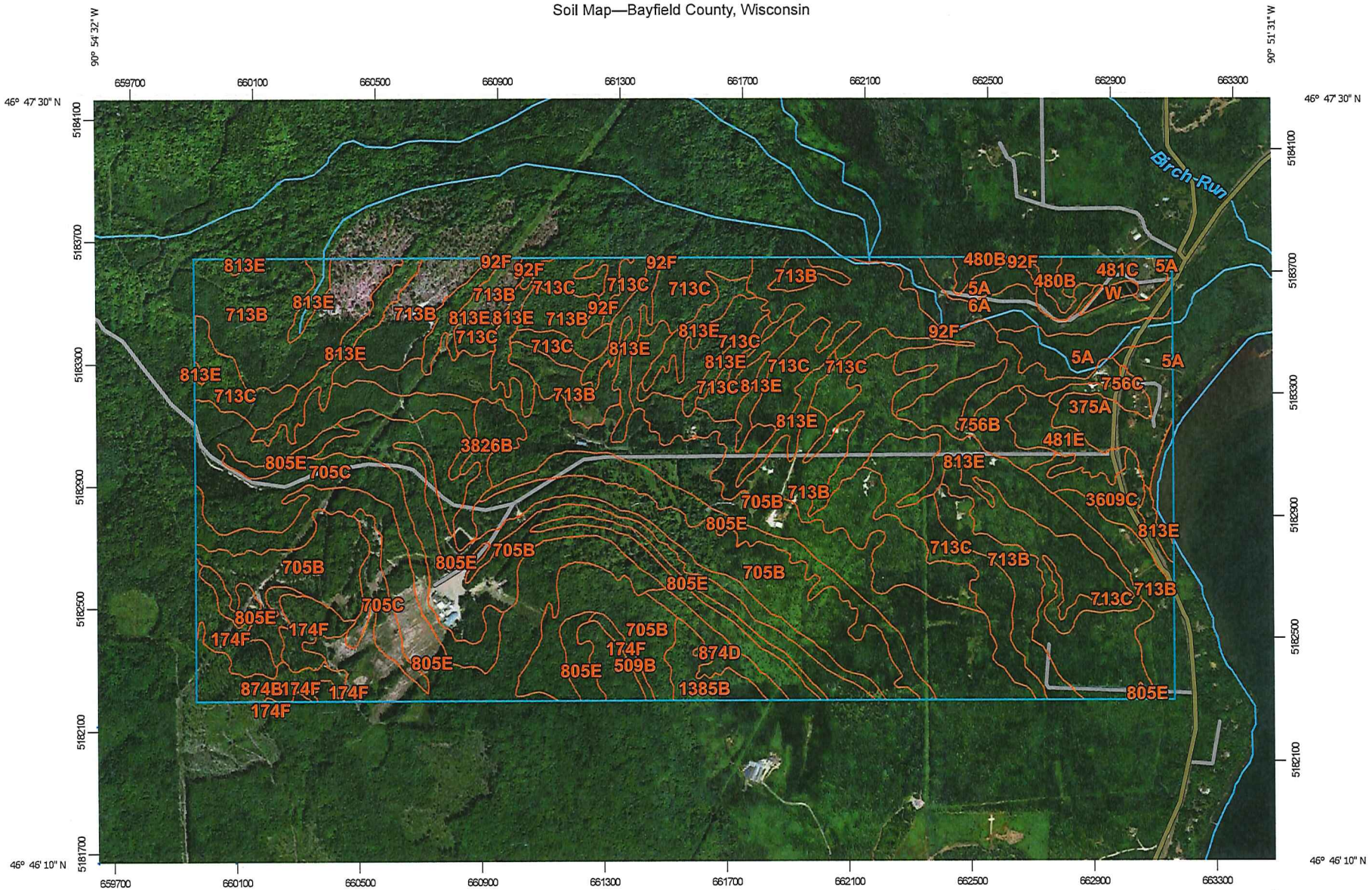
SEWER LAYOUT EXHIBIT
PIKES BAY SANITARY DISTRICT
BAYFIELD COUNTY, WISCONSIN

EXHIBIT NO. 5

Appendix B

Reference Information

Soil Map—Bayfield County, Wisconsin



Map Scale: 1:17,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bayfield County, Wisconsin
Survey Area Data: Version 19, Oct 5, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jul 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5A	Arnheim mucky silt loam, 0 to 1 percent slopes, frequently flooded	21.8	1.9%
6A	Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded	22.0	1.9%
92F	Udorthents, ravines and escarpments, 25 to 60 percent slopes	60.7	5.3%
174F	Rubicon sand, 30 to 60 percent slopes	22.1	1.9%
375A	Robago fine sandy loam, lake terrace, 0 to 3 percent slopes	20.7	1.8%
480B	Portwing-Herbster complex, 0 to 6 percent slopes	3.3	0.3%
481C	Cornucopia silt loam, 6 to 15 percent slopes	8.6	0.8%
481E	Cornucopia silt loam, 15 to 45 percent slopes	11.6	1.0%
509B	Gogebic fine sandy loam, 1 to 6 percent slopes, stony	7.3	0.6%
705B	Cublake-Croswell-Ashwabay complex, 0 to 6 percent slopes	251.2	21.9%
705C	Cublake-Croswell-Ashwabay complex, 6 to 15 percent slopes	70.9	6.2%
713B	Kellogg-Allendale-Ashwabay complex, 2 to 6 percent slopes	182.2	15.9%
713C	Kellogg-Allendale-Ashwabay complex, 6 to 15 percent slopes	146.1	12.7%
756B	Superior-Sedgwick complex, 0 to 6 percent slopes	15.9	1.4%
756C	Superior-Sedgwick complex, 6 to 15 percent slopes	4.7	0.4%
805E	Sultz-Ashwabay-Rubicon complex, 15 to 45 percent slopes	136.3	11.9%
813E	Manistee-Kellogg-Ashwabay complex, 15 to 45 percent slopes	102.2	8.9%
874B	Keweenaw, stony-Rubicon complex, 0 to 6 percent slopes	13.3	1.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
874D	Keweenaw, stony-Rubicon complex, 15 to 30 percent slopes	8.4	0.7%
1385B	Cublake-Keweenaw, stony, complex, 0 to 6 percent slopes	9.8	0.9%
3609C	Abbaye loamy sand, 6 to 15 percent slopes	12.9	1.1%
3826B	Allendale-Wakeley-Kinross complex, 0 to 6 percent slopes	10.0	0.9%
W	Water	2.0	0.2%
Totals for Area of Interest		**1,148.8**	**100.0%**

Sewage Disposal

This table shows the degree and kind of soil limitations that affect septic tank absorption fields and sewage lagoons. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches or between a depth of 24 inches and a restrictive layer is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Saturated hydraulic conductivity (Ksat) is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a Ksat rate of more than 14 micrometers per second are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Sewage Disposal

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
5A—Arnheim mucky silt loam, 0 to 1 percent slopes, frequently flooded					
Arnheim	85	Very limited		Very limited	
		Flooding	1.00	Ponding	1.00
		Ponding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.47	Seepage	0.53
6A—Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded					
Moquah	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.72	Seepage	0.53
92F—Udorthents, ravines and escarpments, 25 to 60 percent slopes					
Udorthents, ravines and escarpments	85	Not rated		Not rated	
174F—Rubicon sand, 30 to 60 percent slopes					
Rubicon	90	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
		Slope	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		
375A—Robago fine sandy loam, lake terrace, 0 to 3 percent slopes					
Robago	85	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.47	Seepage	0.53

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
480B—Portwing-Herbster complex, 0 to 6 percent slopes					
Portwing	50	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.53
				Slope	0.32
Herbster	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.53
481C—Cornucopia silt loam, 6 to 15 percent slopes					
Cornucopia	80	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
		Slope	0.37	Seepage	0.53
481E—Cornucopia silt loam, 15 to 45 percent slopes					
Cornucopia	80	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
		Slope	1.00	Seepage	0.53
509B—Gogebic fine sandy loam, 1 to 6 percent slopes, stony					
Gogebic, stony	85	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Slope	0.32

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
705B—Cublake-Croswell-Ashwabay complex, 0 to 6 percent slopes					
Cublake	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	0.72	Depth to saturated zone	0.75
				Slope	0.08
Ashwabay	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	0.19
				Slope	0.08
Croswell	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Filtering capacity	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Slope	0.08
705C—Cublake-Croswell-Ashwabay complex, 6 to 15 percent slopes					
Cublake	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	0.72	Slope	1.00
		Slope	0.37	Depth to saturated zone	0.75
Ashwabay	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Slope	1.00
		Slope	0.37	Depth to saturated zone	0.75
Croswell	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Filtering capacity	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Slope	1.00
		Slope	0.04		

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
713B—Kellogg-Allendale-Ashwabay complex, 2 to 6 percent slopes					
Kellogg	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	0.99
				Slope	0.32
Allendale	25	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	1.00
				Slope	0.32
Ashwabay	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Slope	0.32
				Depth to saturated zone	0.19
713C—Kellogg-Allendale-Ashwabay complex, 6 to 15 percent slopes					
Kellogg	40	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Slope	1.00
		Slope	0.37	Depth to saturated zone	0.99
Allendale	25	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	1.00
		Slope	0.04	Slope	1.00
Ashwabay	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Slope	1.00
		Slope	0.37	Depth to saturated zone	0.19

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
756B—Superior-Sedgwick complex, 0 to 6 percent slopes					
Superior	50	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.53
				Slope	0.32
Sedgwick	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.53
				Slope	0.08
756C—Superior-Sedgwick complex, 6 to 15 percent slopes					
Superior	50	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Slope	1.00
		Slope	0.37	Seepage	0.53
Sedgwick	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Slope	1.00
				Seepage	0.53
805E—Sultz-Ashwabay-Rubicon complex, 15 to 45 percent slopes					
Sultz	35	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Slow water movement	0.47	Seepage	1.00
Ashwabay	25	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
		Slow water movement	1.00	Seepage	1.00
		Slope	1.00	Depth to saturated zone	0.19
Rubicon	20	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
		Slope	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
813E—Manistee-Kellogg-Ashwabay complex, 15 to 45 percent slopes					
Manistee	40	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
		Slope	1.00	Seepage	1.00
Kellogg	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
		Slow water movement	1.00	Seepage	1.00
		Slope	1.00	Depth to saturated zone	0.99
Ashwabay	20	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
		Slow water movement	1.00	Seepage	1.00
		Slope	1.00	Depth to saturated zone	0.19
874B—Keweenaw, stony-Rubicon complex, 0 to 6 percent slopes					
Keweenaw	60	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
Rubicon	30	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	0.08
874D—Keweenaw, stony-Rubicon complex, 15 to 30 percent slopes					
Keweenaw	60	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
Rubicon	30	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
		Slope	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		

Sewage Disposal–Bayfield County, Wisconsin					
Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1385B—Cublake-Keweenaw, stony, complex, 0 to 6 percent slopes					
Cublake	50	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	0.72	Depth to saturated zone	0.75
				Slope	0.08
Keweenaw	30	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
3609C—Abbaye loamy sand, 6 to 15 percent slopes					
Abbaye	90	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Depth to saturated zone	1.00
		Slow water movement	0.47	Slope	1.00
		Slope	0.37	Seepage	0.53
3826B—Allendale-Wakeley-Kinross complex, 0 to 6 percent slopes					
Allendale	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Slow water movement	1.00	Depth to saturated zone	1.00
				Slope	0.08
Wakeley	30	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Organic matter content	1.00
		Slow water movement	1.00	Seepage	1.00
				Depth to saturated zone	1.00
Kinross	20	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Organic matter content	1.00
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Depth to saturated zone	1.00
W—Water					
Water	100	Not rated		Not rated	

Data Source Information

Soil Survey Area: Bayfield County, Wisconsin
Survey Area Data: Version 19, Oct 5, 2017

Town of Bayfield
Zoning Districts

County Zoning Districts

- (R1) - Residential - 1
- (R2) - Residential - 2
- (R3) - Residential - 3
- (R4) - Residential - 4
- (C) - Commercial
- (I) - Industrial
- (M) - Municipal
- (F1) - Forestry - 1
- (F2) - Forestry - 2
- (A1) - Agricultural - 1
- (A2) - Agricultural - 2
- (W) - Conservancy
- (R-RB) - Residential - Recreational Business

Roads

- Federal Highway
- State Highway
- County Road
- Town Road
- Private Road

Other Symbols

- MCD Boundary
- Section Lines
- Parcels
- 16000 Address Grid
- Streams
- Lakes

ZONING INFORMATION FURNISHED BY:

Bayfield County Zoning Department

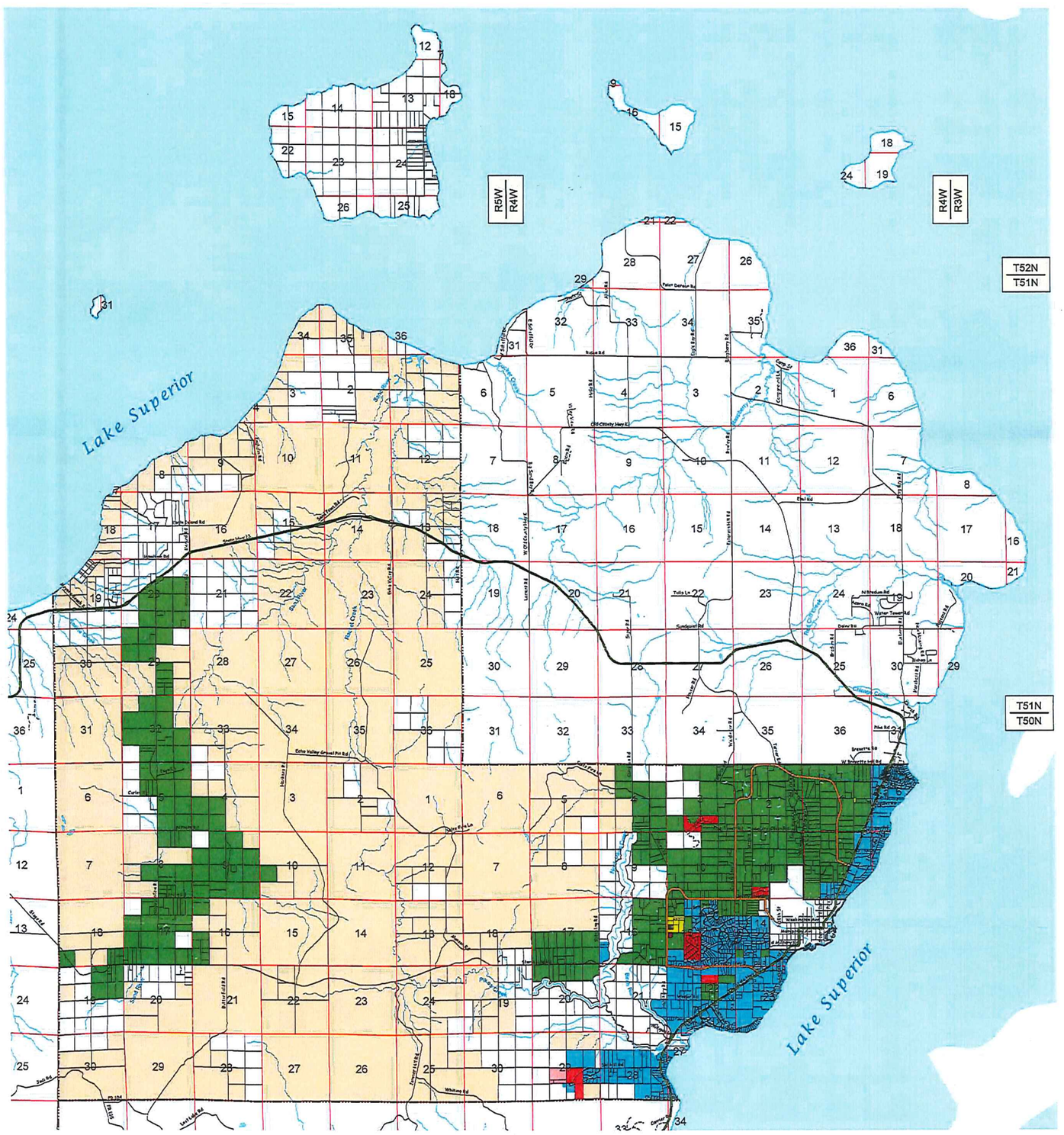
Northwest Regional Planning Commission

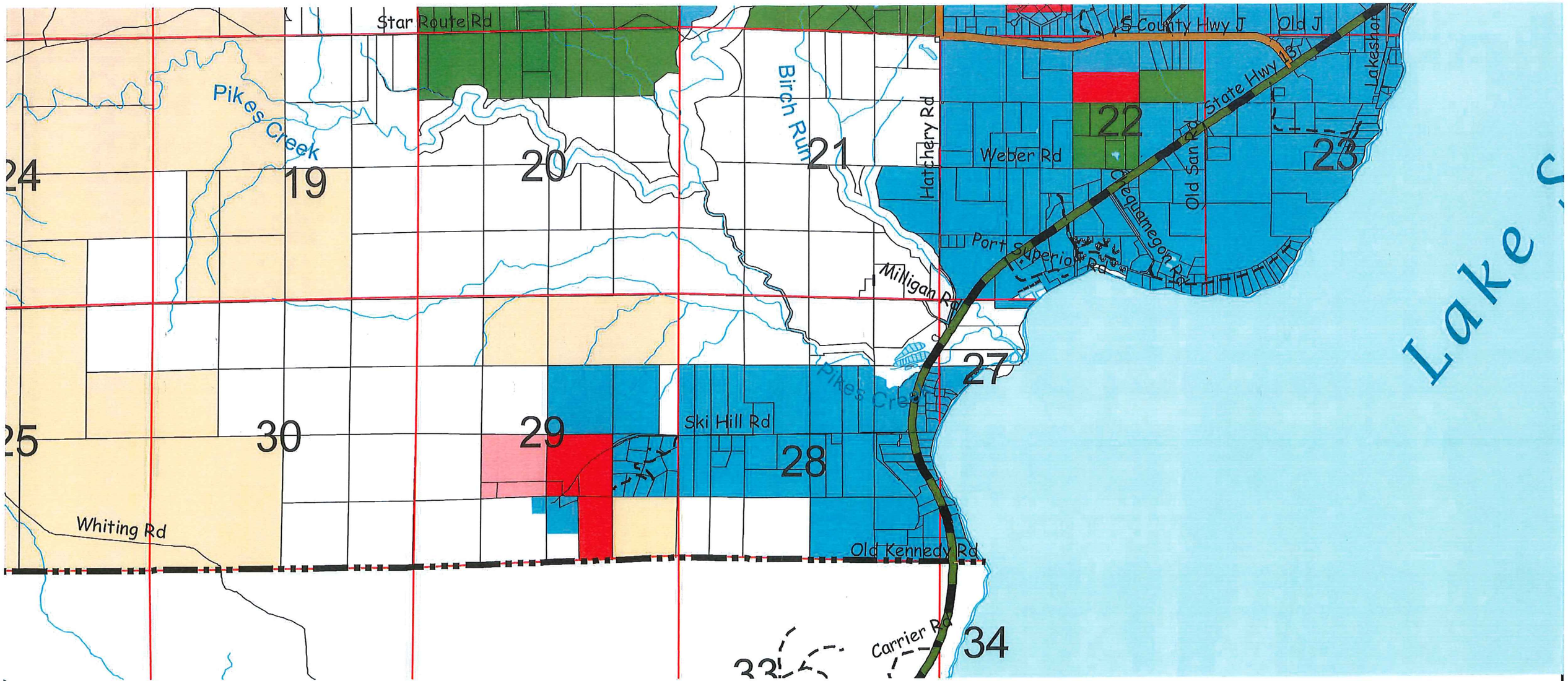
Bayfield County Land Records Department

The Zoning Districts portrayed on this map were derived from the Official Bayfield County Zoning District Map maintained by the Zoning Department. Bayfield County makes no warranty with respect to accuracy or completeness of this map and assumes no liability for its use or misuse.
This map was last updated on January 19, 2018.

1 0 1
Miles

NOTE: All islands are zoned F1 - Forestry 1




Star Route Rd
S County Hwy J
Old J
Pikes Creek
Birch Run
Hatchery Rd
Weber Rd
State Hwy 13
Old Sand Rd
Lakeshor
Chequamegon Rd
Port Superior Rd
Milligan Rd
Pikes Creek
Ski Hill Rd
Whiting Rd
Old Kennedy Rd
Carrier Rd
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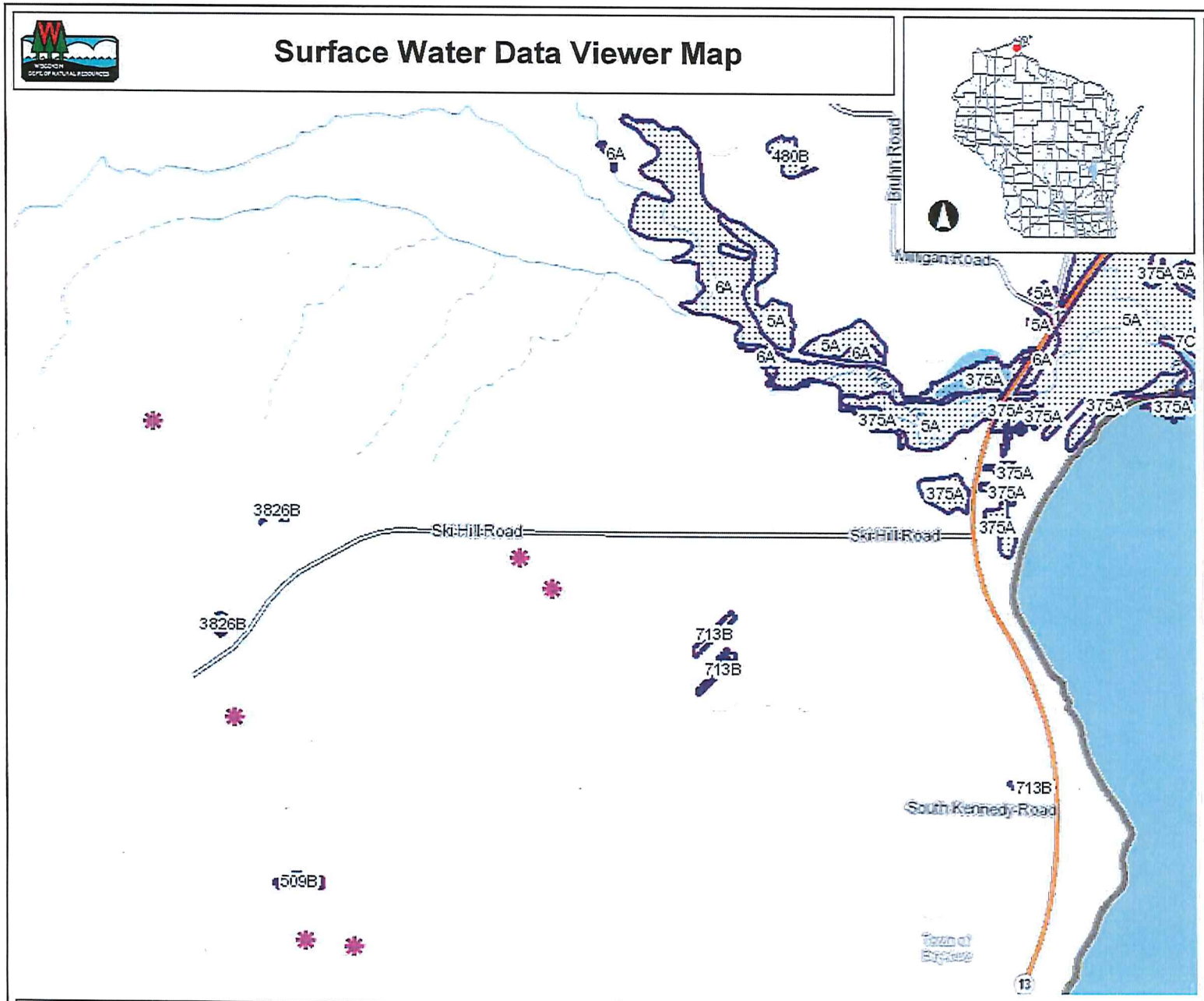
Surface Water Data Viewer Map



Legend

- NRCS Wetspots
- Wetland Indicators
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water

Notes

0.5 0 0.25 0.5 Miles

NAD_1983_HARN_Wisconsin_TM

1: 15,840

WISCONSIN
DEPT. OF NATURAL RESOURCES

Endangered Resources Preliminary Assessment

Created on **5/7/2018.** This report is good for one year after the created date.

Results

Endangered resources are present and the species present are legally protected. **Further actions are required to ensure compliance** with Wisconsin's Endangered Species Law (s. 29.604 Wis. Stats.) and the Federal Endangered Species Act (16 USC ss 1531-43). Therefore you should request an Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html.

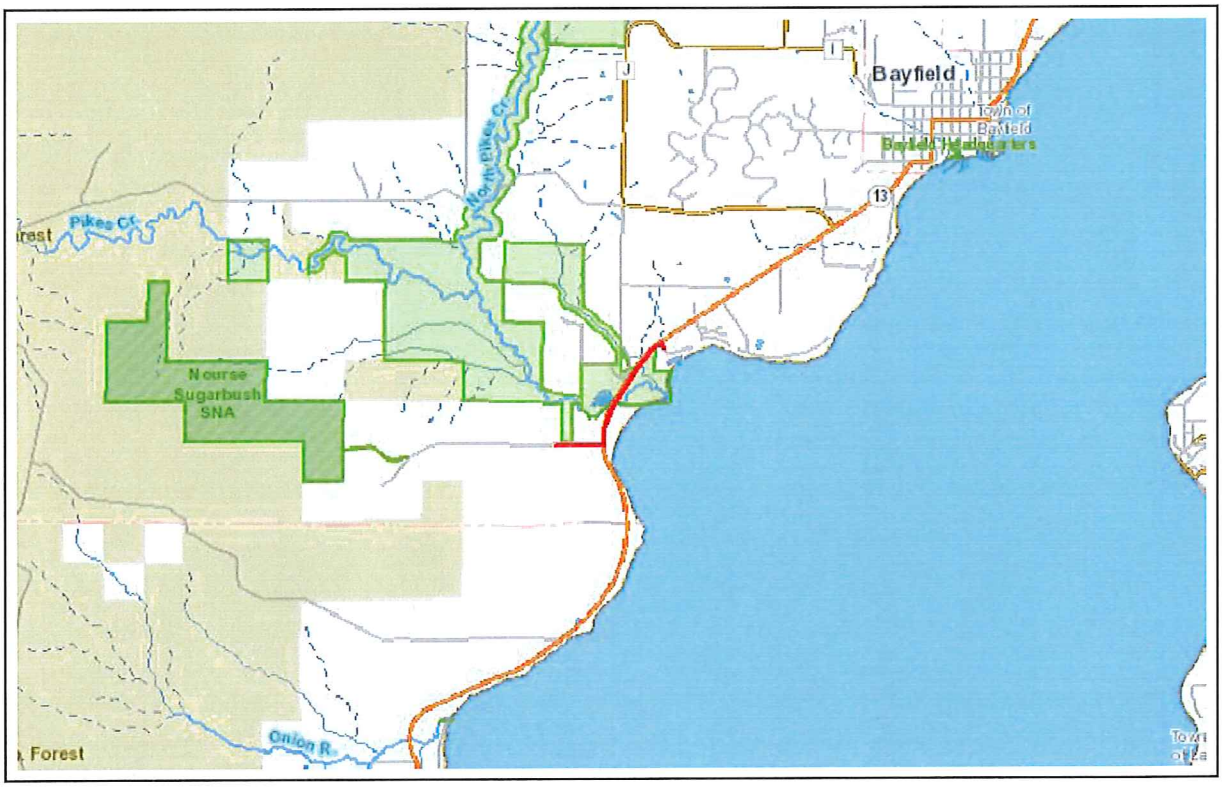
Project Information

Landowner name	
Project address	
Project description	

Project Questions

Does the project involve a public property?	Yes
Is there any federal involvement with the project?	No
Is the project a utility, agricultural, forestry or bulk sampling (associated with mining) project?	Yes
Is the project property in Managed Forest Law or Managed Forest Tax Law?	No

Project Area Maps



The information shown on these maps has been obtained from various sources, and is of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. Users of these maps should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/.

Appendix C

Sewage Flow Projections

PIKES BAY SANITARY DISTRICT
BAYFIELD, WISCONSIN
PIKES 145655

Sanitary Sewage Flow Projections

Immediate Service Area

Business	1	Mt. Ashwabay / Big Top Chautauqua						20000	gal/day
Lots	1	Ashwabay Heights	X	2	people/lot =	70	gpcd =	140	gal/day
Lots	10	Ski Hill Rd Single Family	X	3	people/lot =	70	gpcd =	2100	gal/day
Lots	4	Hwy 13 Single Family	X	3	people/lot =	70	gpcd =	840	gal/day
Rooms	4	Timber Baron Inn	X	2	people/unit =	50	gpcd =	400	gal/day
Rooms	8	Pinehurst B&B	X	2	people/unit =	50	gpcd =	800	gal/day
Units	11	Superior Rentals	X	3	people/unit =	70	gpcd =	2310	gal/day

Average Flow =	26590	gal/day		0.041	cfs	
Peak Flow =	0.041	X	4	0.165	cfs =	73.89 gpm

Assumptions:
Service Area includes existing facilities only, with the exception of proposed BTC
"Immediate" Service Area assumes connection of all homes and businesses along Ski Hill Rd, and Hwy 13 from Ski Hill Rd to Pikes Creek
Service Area upon initial construction may be considerably less until hookups occur

PIKES BAY SANITARY DISTRICT
BAYFIELD, WISCONSIN
PIKES 145655

Sanitary Sewage Flow Projections

Intermediate 20-Year Projection Service Area	400 Acres Total					
Business	1 Mt. Ashwabay / Big Top Chautauqua				20000	gal/day
Lots	13 Ashwabay Heights	3 people/lot =	70 gpcd	=	2730	gal/day
Lots	17 Ski Hill Rd North Side	3 people/lot X	70 gpcd	=	3570	gal/day
Lots	48 Ski Hill Rd South Side	3 people/lot X	70 gpcd	=	10080	gal/day
Lots	10 Hwy 13 West Side	3 people/lot X	70 gpcd	=	2100	gal/day
Lots	15 Hwy 13 Lake Side	3 people/lot =	70 gpcd	=	3150	gal/day
Units	11 Superior Rentals	3 people/unit =	70 gpcd	=	2310	gal/day
Rooms	4 Timber Baron Inn	2 people/unit =	50 gpcd	=	400	gal/day
Rooms	8 Pinehurst B&B	2 people/unit =	50 gpcd	=	800	gal/day

Average Flow =	45140 gal/day	=	0.070 cfs		
Peak Flow =	0.070 X	4	0.279 cfs =	125.44	gpm

Assumptions:
Individual developed lots along north side of Ski Hill Rd (further north is too far downhill)
Development of 40-acre pieces south of Ski Hil Rd similar to Ashwabay Hts
No development of Forestry zoned lots or other remote from roadways
Extension south along Hwy 13 with some additional lot development

PIKES BAY SANITARY DISTRICT
BAYFIELD, WISCONSIN
PIKES 145655

Sanitary Sewage Flow Projections

Ultimate Future Service Area												
				750	Acres Total							
Business	1	Mt. Ashwabay / Big Top Chautauqua									20000	gal/day
Lots	13	Ashwabay Heights				X	3	people/lot =	70	gpcd =	2730	gal/day
Acres	310	Ski Hill Rd Single Family	÷	2	Ac/Lot	X	3	people/lot X	70	gpcd =	32550	gal/day
Acres	88	Ski Hill Rd Forestry Zoned	÷	4	Ac/Lot	X	3	people/lot X	70	gpcd =	4620	gal/day
Acres	74	Hwy 13 Single Family	÷	1	Ac/Lot	X	3	people/lot X	70	gpcd =	15540	gal/day
Lots	20	Hwy 13 Lake Side				X	3	people/lot =	70	gpcd =	4200	gal/day
Units	11	Superior Rentals				X	3	people/unit =	70	gpcd =	2310	gal/day
Rooms	4	Timber Baron Inn				X	2	people/unit =	50	gpcd =	400	gal/day
Rooms	8	Pinehurst B&B				X	2	people/unit =	50	gpcd =	800	gal/day
Rooms	23	Future Lodging				X	2	people/unit =	50	gpcd =	2300	gal/day

Average Flow =	85450	gal/day	0.132	cfs		
Peak Flow =	0.132	X	4	0.529	cfs =	237.45 gpm

PIKES BAY SANITARY DISTRICT
BAYFIELD, WISCONSIN
PIKES 145655

Sanitary Sewage Flow Projections for Contributing Businesses

Mt. Ashwabay

Bathrooms	16	Fixtures	X	250	gal/fixture/day =	4000	gal/day
Seats	30	Bar	X	20	gal/seat/day =	600	gal/day
Seats	40	Concessions/Grill	X	20	gal/seat/day =	800	gal/day
People	20	Employees	X	25	gpcd =	500	gal/day
					Total	5900	gal/day
					Rounded up to	6000	gal/day

Assumptions:
Consistent use each day and all seasons
Water use by bathrooms, concession/grill, bar
Bar - 20 gal/seat
Short order restaurant - 20 gal/seat
Ski (Park or Golf course) with bathrooms - 250 gal/plumbing fixture
Employees - 25 gal/day each
Estimates of gallons/day based on consulting several sources in wastewater reference books, DNR code, local discussion

Big Top Chautauqua

Seats	2000	Attendees	X	5	gal/seat/day =	10000	gal/day
Seats	300	Catering Kitchen/Banquet	X	30	gal/seat/day =	9000	gal/day
People	25	Employees	X	25	gpcd =	625	gal/day
					Total	19625	gal/day
					Rounded up to	20000	gal/day

Assumptions:
Because Mt. Ashwabay and BTC are operating in opposite seasons, only the larger of the two flow calculations will be used
Water use by concert goers and catering/banquet hall
Theater - 5 gal/seat
Banquet Hall with Catering Kitchen - 30 gal/seat
Employees - 25 gal/day each
For large concerts over 2000 in attendance, portable latrines will be brought in
Estimates of gallons/day based on consulting several sources in wastewater reference books, DNR code, local discussion

Appendix D

Cost Estimates

PIKES BAY SANITARY DISTRICT
BAYFIELD, WISCONSIN
PIKES 145655
Preliminary Estimate of Total Project Cost

Item	Unit	Estimated Quantity	Estimated Unit Price	Estimated Item Cost
8-Inch PVC Sanitary Sewer, Open Trench Installation	LF	7500	$40.00	$300,000.00
10-Inch HDPE Sanitary Sewer, Directionally Bored	LF	1500	$80.00	$120,000.00
Sanitary Sewer Manhole and Casting	Each	24	$4,000.00	$96,000.00
Sanitary Sewer Service Wye and Lateral Pipe	LF	1000	$25.00	$25,000.00
Lift Station	Each	1	$200,000.00	$200,000.00
4-Inch PVC C900 Force Main, Open Trench Installation	LF	1500	$30.00	$45,000.00
4-Inch HDPE Force Main, Directionally Bored	LF	1000	$75.00	$75,000.00
Air Release Valve and Manhole	Each	1	$15,000.00	$15,000.00
Connect to Existing Sanitary Sewer	Each	1	$1,000.00	$1,000.00
Sewer Alignment Tree Clearing	Sta	50	$200.00	$10,000.00
Asphalt Patching - Roadway or Driveways	SY	7000	$20.00	$140,000.00
Turf Restoration	Acre	5	$2,000.00	$10,000.00
Erosion Control	LS	1	$15,000.00	$15,000.00
CIPP Lining of Existing Gravity Sewer	LF	200	$100.00	$20,000.00
Easement for New Lift Station	LS	1	$10,000.00	$ 10,000.00
		Item Total		$1,082,000.00
		Contingency (20%)		$216,000.00
		Engineering (20%)		$260,000.00
		Total		$1,560,000.00

Total San Sewer from Pikes Creek to Mt. Ashwabay	9000	LF
Total FM length from Pikes Creek to Superior Marina Condos	2500	LF

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