90% PRELIMINARY ENGINEERING REPORT
for the
TOWN OF WAITSFIELD
WATER AND WASTEWATER FEASIBILITY STUDY

June 1, 2023

Project Number 227947

Prepared for:

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1.0 PROJECT PLANNING

The Town of Waitsfield engaged DuBois & King, Inc. for the completion of a water and wastewater feasibility study.

1.1 Location

The project is located in the Town of Waitsfield, Vermont. The Study Area is shown on Figure 1. It generally includes the Route 100 corridor from Tremblay Road, south through the Irasville Commercial, Village Business, and Village Residential districts, to the Limited Business District, as well as Tremblay Road between Route 100 and North Road. The study area also includes Old County Road and adjacent developments with roads that intersect Route 100, Tremblay Road, and Old County Road in this area. The Mad River runs through the project area.

Zoning Districts within the Study Area and the Town's Designated Village Center and associated buffer are shown on Figure 2. Under the Town's current zoning regulations, the study area includes the Irasville Commercial, Village Business, Village Residential, and Limited Business districts, as well as areas that are zoned as Agricultural-Residential.

Photographs of the proposed wastewater service area are included in Appendix A.

Waitsfield serves as the commercial center of the Mad River Valley, and is located between the villages of Moretown and Warren in central Vermont. The Town is bordered by Moretown and Duxbury to the north, Northfield to the east, Warren to the south, and Fayston to the west. There are no incorporated villages or Fire Districts in the Study Area. Waitsfield Village contains residences and commercial development, as well as municipal services. Existing development in Irasville is primarily commercial, through there are a few residences, as well as apartments and senior housing. Woodlands and agricultural land surround both village areas.

The Study Area contains a Town-owned municipal water system that is managed by a Water Commission under a budget separate from the Town budget.

1.2 Environmental Resources Present

State-mapped natural resources as imported from the Vermont Open Geodata Portal were mapped on the attached Figure 3, including:

- Surface water (lakes, ponds, and streams);
- Wetlands;
- Rare, threatened and endangered species;

- Significant natural communities;
- Deer wintering areas;
- Floodways;
- River corridors;
- Slopes over 30%;
- Groundwater source protection areas for public water supplies; and
- Hazardous waste sites, hazardous waste generators, and registered underground storage tanks.

The Mad River is an important environmental resource that runs through the project area. The river, and the mapped river corridor are shown on the attached mapping.

Areas where these resources are present within the Study Area represent constraints with respect to on-site soil-based wastewater disposal. On Figure 3, these environmental resources were overlaid with Vermont Onsite Sewage Disposal Soil Ratings of Not Rated, Not Suited, and Marginally Suited to map areas where significant constraints are present that make the installation of soil-based wastewater disposal systems potentially infeasible and/or very expensive.

Based on a review of Agency of Natural Resources mapping, a significant portion of the Study Area is mapped as Prime Agricultural Soils (soils of prime, statewide, or local importance). Wastewater collection and disposal system designs should be planned in such a way to limit impacts to the use of primary agricultural soils for agricultural purposes. New collection system infrastructure, such as force main or gravity sewer piping will most likely be installed at least four to five feet below grade, and as such will not significantly impact the use of prime agricultural soils for agricultural purposes.

1.3 Population Trends

US Census data for the Town of Waitsfield shows an increasing trend since 1960. The following table summarizes the Town population since 1980:

Table 1: Population Trends

Year	1980	1990	2000	2010	2020
Population	1,300	1,422	1,659	1,719	1,844
% Increase in 10 Years	55%	9.4%	17%	3.6%	7.3%
Average Annual % Increase	5.5%	0.94%	1.7%	0.36%	0.73%

According to the Waitsfield Town Plan, Waitsfield is expected to maintain a relatively stable rate of population growth through 2030, with an average annual growth rate of 1.2%. The plan recommends planning for a year-round population growth rate of 0.5 to 1.5%.

The wastewater needs analysis should account for wastewater demands increasing with population growth as well as the lack of available residential units in Waitsfield. For the purposes of wastewater planning and comparison of alternatives, a 20-year life cycle cost analysis is required. As such, for the purposes of this study, an average annual growth rate of 1% over 20 years (total increase in wastewater flows of 20% due to population growth) will be included in the wastewater needs assessment.

1.4 Community Engagement

Community engagement efforts conducted by the Town related to this project to date have included the following:

- A five-member working group of citizens was approved by the Waitsfield Selectboard to facilitate this feasibility study; the group met weekly from February 3 through May 12, 2022, and now meets monthly. Alice Peal, Committee Chair, and JB Weir, Planning and Zoning Administrator, coordinate the project with DuBois & King, Inc.
- At a September 27, 2022 Selectboard meeting, the board agreed to move forward with preparing a Request for Qualifications to select an engineering firm to complete a water and wastewater feasibility study.
- The project was discussed at the March 28, 2022 Selectboard meeting and received unanimous support from the board to proceed with the study.
- Project loan paperwork was reviewed and approved at the May 9, 2022 Selectboard meeting.
- A progress update was provided by the Town Administrator at the May 23, 2022 Selectboard meeting.
- A 30% progress meeting was held on June 23, 2022 to discuss the preliminary results of the water/wastewater needs assessment.
- A progress update was provided by the Committee Chair at the August 22, 2022 Selectboard meeting.
- The 60% report was presented to the Selectboard by the Engineer and the Committee Chair at the October 10, 2022 Selectboard meeting.
- A Public Informational Meeting on the 60% report was held on October 26, 2022.
- A Public Informational Meeting on the 90% report was held on December 5, 2022.

2.0 EXISTING FACILITIES

Existing land use in the study area includes residential, commercial, and municipal/institutional properties, including the Town Office, the Post Office, the Joslin Memorial Library, the General Wait House, the Waitsfield-Fayston Fire Department, Mad River Valley Ambulance, the Waitsfield Town Garage, and Waitsfield Elementary School. There are no municipal wastewater treatment facilities or public sewer systems in the Study Area, and the existing properties are served by individual and shared soil-based wastewater disposal systems.

The Study Area, which encompasses a total area of 1,699.4 acres, includes a total of 261 parcels located within the following zoning districts:

50 Village Residential
14 Village Business
65 Irasville Commercial
132 Non-Village (Agricultural-Residential and Limited Business)
261 Total Parcels

Waitsfield Village contains over a dozen small retail stores, offices, cafés, and restaurants, some with accessory apartments or residences, as well as the Mad River Valley Health Center and several public buildings. According to the Town Plan, the Irasville area functions as the Mad River Valley's downtown for commercial and service businesses, and hosts grocery stores, a pottery business, several restaurants, the Mad River Green and Village Square shopping centers, the Waitsfield Inn, a movie theater, lumber yard, multiple gas stations, as well as senior and affordable housing, additional commercial enterprises, and multiple single-family residences.

2.1 Project Location

The project Study Area is shown on Figure 1. The Study Area is located in the Town of Waitsfield, in Washington County, in the Mad River Valley.

2.2 History

There are no municipal wastewater treatment facilities or public sewer systems in the Study Area, and none are known to have existed historically. Information regarding the age of existing private wastewater systems is discussed in Section 2.3.

In 1999, the Town secured funding from the Vermont Agency of Natural Resources' revolving fund to study the feasibility of developing a municipal wastewater disposal facility to serve Irasville and, possibly, Waitsfield Village. As a result of preliminary analysis, the Town purchased a 12.2-acre parcel (the Munn site) located south of Irasville for $126,000 in November, 2000 as a potential wastewater treatment site.

In 2008, a two-phase plan to provide a sewer system in Irasville and pipe the waste to Munn field for treatment was developed. The total two-phase system was estimated to cost approximately $12 million. With grants and users funding the bulk of the project, a bond vote was held in March 2008 to finance the balance of the Phase I cost of $5.7 million project but was defeated. The Selectboard deferred reconsideration of a municipal wastewater system while proceeding with the municipal water system, which was approved in November 2008 after being narrowly defeated in two prior votes.

In 2011, a plan for a town-sponsored loan program to finance privately-owned, shared, decentralized wastewater systems was developed as an alternative to a municipally-owned system (the Waitsfield Community Wastewater Loan Program). The same year, a wastewater study entitled “Assessment of Decentralized Wastewater Options: A Survey of Needs, Capacity, and Solutions for Historic Waitsfield Village and Irasville, Vermont” was completed. The townspeople voted at the 2012 Town Meeting to approve allowing the Town to bond up to $250,000 to develop this program and this amount was subsequently supplemented by $750,000. The wastewater loan program allowed property owners in the Town center to borrow funds to build or repair wastewater systems and pay off the loans over 20 years to the Town, which in turn borrowed from the State of Vermont’s revolving loan fund. Four property owners took advantage of this program through 2016 with the funding that was available.

2.3 Condition of Existing Facilities

There are no municipal wastewater treatment facilities or public sewer systems in the Study Area. The existing properties are served by individual and shared soil-based wastewater disposal systems.

Wastewater facilities that were improved under the Waitsfield Community Wastewater Loan Program include:

- Parcel 223003.000, Winter Park, Low Strength Brewery Process Wastewater: 9,000 gpd total capacity, IDP-9-0329, 2018.
- Parcel 99147.000, Irasville Incubator & Storage, Increase in Disposal Capacity (several uses): 1,500 gpd, WW-5-0142-3, 2015.
- Parcel 99169.000, Localfolk Smokehouse/John Morris, Innovative/Alternative System: 3,450 gpd, WW-5-0156-2R, 2016.
- Parcel 99161.000, China Fun/Lin Xin Jun, Innovative/Alternative System for Restaurant and Single Family Home: 1,570 gpd, 2015.

Figure 4 is a map of existing wastewater facilities mapped in the 2011 wastewater study, as well as other existing wastewater disposal systems with state permitting records that indicate a disposal capacity of 500 gallons per day or greater.

The conditions for soil-based wastewater disposal within the study area are influenced primarily by the following factors:

- Suitability of the soils for wastewater disposal;
- Water supply; and
- Area available considering environmental constraints.

2.3.1 Soil Suitability

Figure 5 is a map of on-site sewage disposal soil ratings throughout the Study Area, as imported from the Vermont Open Geodata Portal. The mapping data, the accuracy of which is considered planning-level and not representative of property-specific conditions, suggests a range of soil types in the study area as follows:

Table 2: Soil Suitability for On-Site Wastewater Disposal

Onsite Sewage Disposal Soil Ratings:
Overall Study Area

Soil Suitability Class	Estimated Acreage	Percent of Study Area
Well Suited	432.7	25%
Moderately Suited	475.3	28%
Marginally Suited	556.8	33%
Not Suited	204.5	12%
Not Rated	41.4	2%
	1,710.8	

Onsite Sewage Disposal Soil Ratings:
Irasville Commercial

Soil Suitability Class	Estimated Acreage	Percent of Irasville Commercial Village District
Well Suited	61.3	27%
Moderately Suited	78.2	34%
Marginally Suited	38.1	17%
Not Suited	46.5	20%
Not Rated	3.1	1%
	227.2	

Onsite Sewage Disposal Soil Ratings:
Village Residential

Soil Suitability Class	Estimated Acreage	Percent of Village Residential District
Well Suited	54.3	15%
Moderately Suited	132.5	38%
Marginally Suited	153.3	44%
Not Suited	1.5	0%
Not Rated	9.0	3%
	350.6	

Onsite Sewage Disposal Soil Ratings:
Village Business

Soil Suitability Class	Estimated Acreage	Percent of Village Business District
Well Suited	5.4	57%
Moderately Suited	0.0	0%
Marginally Suited	3.9	42%
Not Suited	0.0	0%
Not Rated	0.04	0%
	9.35	

In a general sense, soils that are mapped as well suited are typically adequate for installing in-ground leachfields; soils that are mapped as moderately suited often require larger in-ground, at-grade, or mound systems; and soils mapped as marginally suited may require mound systems with other site modifications and pre-treatment systems. Not Suited soils may require best-fix advanced pre-treatment and filtration systems or off-site disposal system options, or may simply be unsuitable for septic systems.

2.3.2 Water Supply

The Waitsfield Water System consists of a 186 gallons per minute (gpm) supply well located at 300 Long Road, a transmission main from the well site to a 407,000-gallon reinforced-concrete water storage tank at a former gravel pit just off Bushnell Road, and a water distribution system consisting of approximately 7.4 miles of pipe, hydrants, and gate valves.

Construction of the system was completed in 2012, and connection to the water system was optional. Figure 6 shows existing water facilities in the Study Area including the water distribution main, other existing supply wells, and well shields (isolation zones from leachfields) associated with the existing supply wells. Figure 6 also shows properties that are currently connected to the municipal water system. On-site wells can limit on-site wastewater capacity because of the required isolation distances between water supply wells and wastewater disposal systems[1].

The current effects of well shields associated within the village districts of Waitsfield are summarized in the following table:

[1] Vermont Agency of Natural Resources, DEC, Drinking Water and Groundwater Protection Division, Environmental Protection Rules, Chapter 1, Wastewater System and Potable Water Supply Rules, Effective April 12, 2019

Table 3: Effects of Existing Well Shields on Wastewater Capacity

Village District Parcels: Total and Well Shields Areas

District	Total Village District Parcels Area (ac)	Total Well Shields Area (ac)	% of Village Districts contained by Wells Shields
Irasville Commercial	227.2	29.8	13.1%
Village Residential	350.1	26.9	7.7%
Village Business	9.9	3.4	34.7%
	587.1	60.1	10.2%

Village District Parcels: Well Shield Areas with Well Suited Soils

District	Well Shields Area, Total (ac)	Well Shield areas with Well Suited soils (ac)	% of Well Shield Areas with Well Suited Soils
Irasville Commercial	29.8	15.1	51%
Village Residential	26.9	14.1	52%
Village Business	3.4	2.9	85%

Based on this spatial analysis, connection of these additional properties within the village districts to the Waitsfield Water System and abandonment of the existing private wells could free up approximately 32.1 acres of well-suited soils for on-site wastewater disposal. Considering other factors that affect siting of leachfields and how land is used, the actual wastewater disposal capacity that this would provide within the village districts would need to be determined on a lot-by-lot basis.

Assuming that a small percentage of the unencumbered well-suited soils would be converted to in-ground leachfields, the following table summarizes the equivalent wastewater disposal capacity that could be realized:

Table 4: Potential Wastewater Capacity Increases from Connecting New Water Customers

Assumed Percent of Land Converted to In-Ground Leachfields	Equivalent Area of Well-Suited Soils		Wastewater Disposal Capacity Estimate[2]	
5%	1.61	acres	104,955	gpd
	69,970	square feet	250	homes
2.5%	0.80	acres	52,478	gpd
	34,985	square feet	125	homes
1%	0.32	acres	20,991	gpd
	13,994	square feet	50	homes

2.3.3 Available Area

An available area analysis was conducted in GIS to identify which parcels in the Study Area would be constrained by inadequate lot size if required to install an upgraded on-site wastewater system, such as in the event that their existing leachfield failed or required significant repairs due to aging.

The available area analysis for the Study Area was conducted on a parcel-by-parcel basis by applying the state-required isolation distances of leachfields from natural and artificial features such as surface water, wetlands, steep slopes, supply wells, property lines, and buildings. The GIS map and tabular results of this analysis are included in Appendix B. After applying these isolation distances to individual parcels, the available area for on-site wastewater was calculated and compared to the following assumed areas needed[2]:

- Well-Suited Soils for Wastewater Disposal = 420 square feet
- Moderately-Suited Soils for Wastewater Disposal = 1,470 square feet
- Marginally-Suited Soils for Wastewater Disposal = 3,760 square feet

Properties that were identified as having potential limitations on area available as compared to the area required by this analysis are shown on Figure 7. The implications of the potential area limitations could include the following:

- The area limitations could result in a need for more expensive and complex wastewater facilities including pre-treatment.
- No issues may actually exist with the available area because the application rate of the soils, isolation distances, or wastewater design flows differ from the assumptions made in performing this analysis.
- The area limitations could make siting a replacement leachfield on the property infeasible.

Based on the analysis results, the number of parcels in the Study Area that may have available area limitations are summarized as follows:

[2] Wastewater flow assumed = 420 gpd; Well-Suited Soils = 1.5 gpd/sf for 4-foot wide in-ground trenches with 4-foot spacing; Moderately-Suited Soils = 0.5 gpd/sf for 4-foot wide in-ground trenches with 4-foot spacing; Marginally-Suited Soils = 1 gpd/sf for a mound with a 10-foot wide absorption bed.

Table 5: Available Area Limitations Calculations by District

Area	Number of Parcels	Number of Parcels with Possible Available Area Limitations	Percent of Parcels with Possible Available Area Limitations
Overall Study Area	261	110	42.1%
Irasville Commercial	65	42	64.6%
Village Residential	50	27	54.0%
Village Business	14	13	92.9%

The data was further reviewed for the effects of existing well shields on the available area for on-site septic disposal, and it was determined that the area limitation on 23 parcels could be addressed by removing the existing well shields (i.e., by connecting the lots to the municipal water system).

2.4 State Wastewater Permits Review

State Wastewater System and Potable Water Supply permitting records for the Study Area were reviewed, and the summary table is included in Appendix C. The permitting records provide insight into which properties are equipped with recently-constructed systems, the ages of the systems, the permitted use, and the wastewater design flows. The data also include notations on whether the state permits were issued for replacement of failed septic systems. A total of 22 septic systems were replaced due to failure of the existing systems since 1989, 16 of which were replaced due to failure since 2001. The existing wastewater facilities map, Figure 4, shows the locations of state-permitted septic systems within the Study Area.

2.5 Financial Status of Existing Facilities

There are no municipal wastewater treatment facilities or public sewer systems in the Study Area. All wastewater expenses are paid by the individual landowners.

2.6 Water/Energy/Waste Audits

No energy or waste audits have been conducted for this project.

The supply well for the municipal water system is permitted for a long-term yield of 186 gallons per minute. Over the course of a full year, this would result in total water production of 97,761,600 gallons. Water usage in the 12 months from November 2021 through October 2022 totaled 15,340,187 gallons. Based on annual usage, the water system is running at approximately 15.7% of its permitted capacity. As such, alternatives that involve connecting additional users to the water system would help improve the efficiency of water system operations.

3.0 NEED FOR PROJECT

The need for community wastewater is a common thread throughout the Town Plan. Excerpts from the Town plan regarding wastewater include:

- Housing: "Access to shared water and wastewater systems might also be necessary to achieve a significant improvement in cost savings when compared to normal, small accessory dwellings."
- Housing Policy: "Investigate and support development of wastewater resources in town centers."
- Economic Development Policy: "Support the creation and construction of wastewater resources in our Town center."
- Facilities and Services: "The lack of municipal water and wastewater hinders efforts to foster a compact settlement pattern, which can result in sprawl and a corresponding loss of the Town's rural character."
- Facilities and Services Policy: "Develop municipal wastewater systems to serve the Town center areas of Irasville and Waitsfield Village, in order to meet current needs as well as allow for additional growth in residential and commercial properties."
- Natural Resources: "Given the density of development and the lack of a comprehensive plan for wastewater disposal, the groundwater source areas in Irasville and Waitsfield Village are particularly at risk for contamination."
- Natural Resources Policy: "Support the establishment of municipal water and the further investigation of wastewater options to serve designated growth centers as a means of avoiding contamination of ground and surface waters."

Community needs for wastewater that were assessed and quantified as part of this study are summarized in the following sections.

3.1 Health, Sanitation, and Security

Functioning wastewater disposal systems are critical to protecting public health and the environment. An available area limitation on a developed lot indicates a lower potential for soil-based wastewater systems to provide treatment for full long-term protection of nearby receptors according to modern standards. Receptors in the Study Area that could be affected by septic system impacts include the Mad River, streams and tributaries, drinking water wells, and wetlands. Leachfields located within the mapped floodplain and river corridor are at risk of being impacted by flooding and river meandering and consequently causing water quality impacts to the Mad River and should be a prioritized need to be accommodated in a community wastewater system. Within the Irasville Commercial, Village Business, and Village Residential zoning districts, a total of 25 leachfields appear to be located within the mapped River Corridor, and 11 leachfields appear to be located within the mapped floodplain. Development of a village wastewater system, particularly for management of wastewater from small village lots, would provide protection for water quality in the Mad River.

Based on geospatial analysis, about 44% of the properties in the Study Area (118 out of 267 properties) were identified as having potential limitations because of physical constraints if the existing on-site wastewater system were to need replacement in the future. However, within the village districts where smaller lot sizes exist, the percentage of parcels with area limitations are substantially higher (59% in the Village Residential District; 70% in Irasville Commercial; and 92% in the Village Business District). Development of a community wastewater system could provide an affordable septic system replacement option for lots with spatial limitations and protect water quality.

Based on the mapping of existing water supplies and leachfields, at least 32 properties within the village areas appear to have conflicts between the "well shield[3]" for an existing potable water supply well and an existing septic system leachfield. This conflict presents a risk to human health because of the higher risk of contamination occurring in the supply well from the leachfield effluent. Water and wastewater improvements in the village could eliminate the existing water supply-leachfield conflicts.

3.2 Aging Infrastructure

Homeowner guidance from the Environmental Protection Agency (EPA) indicates the average lifespan of a septic system is 15 to 40 years. GIS data for parcels in the Study Area was used to estimate the ages of existing septic systems using the following criteria in order of ranking:

1. The date shown on State permitting records for the property (if applicable).
2. The date of existing drilled wells on the property (if applicable) based on well logs from the Vermont Open Geodata Portal.
3. The date of construction of existing buildings on the property from the Town GIS database.

The age analysis results are tabulated in Appendix D and shown geospatially on Figure 8. The following table shows the age analysis results for the entire study and within the existing zoning districts.

[3] A well shield, so described based on its shape, is an area around a supply well in which no leachfields should be located based on the risk of contaminants from the septic system impacting the water supply. The shield is drawn with a 100 foot downslope arc and a 200 foot upslope arc, with lines perpendicular to the ground contours connecting the 100-foot arc (starting from the elevation of the supply well) to the 200-foot arc.

Table 6: Existing Wastewater System Ages by Area

	< 20 yr			≥ 20 yr			≥ 30 yr			≥ 40 yr		
	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total
Overall Study Area	36	25	61	113	63	176	91	40	131	74	29	103
Irasville Commercial	3	14	17	18	27	45	13	13	26	8	11	19
Village Residential	6	4	10	19	18	37	15	14	29	11	7	18
Village Business	0	3	3	1	8	9	0	7	7	0	6	6
non-Village	27	4	31	75	10	85	63	6	69	55	5	60

	not available			land	Total			
	Res.	Comm.	Total	Total	Res.	Comm.	land	Total
Overall Study Area	1	7	8	22	150	95	22	267
Irasville Commercial	0	3	3	6	21	44	6	71
Village Residential	1	0	1	2	26	22	2	50
Village Business	0	0	0	2	1	11	2	14
non-Village	0	4	4	12	102	18	12	132

The results of this analysis show that the majority of aged septic systems in the study area are residential septic systems located outside the village districts. Residential parcels in the study area represent over 57% of the total parcels in the study area, while more than 71% of the septic systems that have reached their expected lifespan of 40 years are residential.

Based on these age analysis results, wastewater alternatives designed to meet the needs of each area for a 20-year period should account for the following percentages of the existing leachfields reaching their expected lifespan within that time period:

Table 7: Aged Wastewater Systems by Area

Area	No. of Parcels With Septic Systems ≥20yr	% of Parcels With Septic Systems ≥20yr	% of Parcels With Septic Systems ≥40yr
Overall Study Area	176	65.9%	38.6%
Irasville Commercial	45	63.4%	26.8%
Village Residential	37	74.0%	36.0%
Village Business	9	64.3%	42.9%
non-Village	85	64.4%	45.5%

Approximately 39% of the parcels in the overall study area appear to have reached their expected lifespan, and that percentage will increase to 66% over the next 20 years. The Village Residential District has the highest percentage (74%) of existing parcels with older septic systems that will reach their expected lifespan within the next 20 years.

3.3 Reasonable Growth

A parcel-by-parcel review of existing land uses in the Study Area was conducted to estimate total wastewater design flows. Existing wastewater design flows were estimated using a combination of data in the following priority order:

1. Permitted wastewater design flows.
2. Estimated water design flows from the Waitsfield Water System.
3. Unitized wastewater design flows from the Wastewater System and Potable Water Supply Rules applied to the apparent use of the property based on the GIS parcel description and Google imagery of the parcel.

Future wastewater design flows for each area were estimated based on an assumption of evenly-distributed population growth at an average annual rate of 1% over the next 20 years. Additional considerations for infill, development, and potential increases in zoning density will be accounted for in the alternatives analysis.

The tabular results are included in Appendix E. Wastewater design flows were estimated as follows:

Table 8: Wastewater Design Flow Estimates by District

All Parcels	Existing			Future			
	Residential	Commercial / Other	Total	Residential	Commercial / Other	Total	% Change
Agricultural-Residential (north)	21,500	11,200	32,600	27,100	23,700	50,800	56%
Agricultural-Residential (south)	5,300	7,900	13,200	22,200	9,700	31,900	142%
Irasville Commercial	5,800	55,200	60,900	8,200	62,400	70,600	16%
Limited Business	600	1,900	2,500	4,900	5,000	9,900	296%
Village Business	1,200	7,500	8,700	1,300	8,100	9,500	9%
Village Residential	8,100	11,500	19,500	12,500	13,900	26,400	35%
Needed New Residential				14,000		14,000	
Total	42,500	95,200	137,400	90,200	122,800	213,100	55%
Total of Village Districts Only	15,100	74,200	89,100	22,000	84,400	106,500	

(Village Districts = Irasville Commercial, Village Business, and Village Residential)

Residential wastewater design flows are nearly 2/3 of the existing wastewater flows outside the village districts, while non-residential wastewater design flows within the village districts represent approximately 78% of the total wastewater.

The combined existing wastewater design flows for the Irasville Commercial, Village Residential, and Village Business districts totals are estimated to be 89,100 gallons per day. By comparison, the combined wastewater design flows for the Irasville and Waitsfield village districts in the 2004 Facilities Plan was estimated to be 85,800 gallons per day. This equates to an estimated increase in wastewater design flows of 3.9% over 19 years, or approximately 0.21% average annual increase in wastewater design flows. Given that the population growth during roughly this timeframe was 0.73%, this suggests that the lack of wastewater infrastructure within the village may be a factor in driving growth to occur outside the village districts.

Several studies have been conducted in the Mad River Valley including:

- A Future for Affordable Housing in the Mad River Valley, 1991
- Mad River Valley Housing Study, 2006, Central Vermont Community Land Trust
- Mad River Valley Housing Study, 2017, Mad River Valley Planning District
- Mad River Valley Housing Demand & Market Analysis, 2020, Doug Kennedy Advisors

The studies reported similar reasons for the escalation of home and rental prices, including a lack of sewer and water infrastructure in designated growth areas. Demographic trends in the valley indicate an increase in households aged 65 or more years, and some growth is projected among households aged 25 to 34 years. Recommended priorities for housing development projects in the 2020 Kennedy report include:

- A mixed-income rental project oriented toward younger households.
- A rental project oriented toward low to low-moderate income seniors.
- An ownership project oriented toward first-time buyers.

Several members of the current wastewater committee have identified the demand for housing as the most compelling reason for needing community wastewater infrastructure in Waitsfield. In 2016, Mad River Valley Planning District held a community meeting at the Lareau Farm where the community discussed and ranked challenges; affordable/workforce housing was ranked No. 1. Wastewater infrastructure is important to the community to provide the means for the downtown area to be the focus of future growth and infill, keeping the development compact and mitigating sprawl.

3.4 Summary of Needs

Based on the needs analysis, the community's priority needs include:

1. Providing a replacement wastewater option for lots with aging leachfields and spatial limitations for replacing their existing wastewater system when it fails. Without an affordable option to replace aging septic systems, existing lots with "grandfathered"

systems that don't comply with current septic system standards may be challenged to put in a replacement system, which represents a threat to existing residential stock.

2. Removing current conflicts between the well shields for existing potable water supplies and existing on-site leachfields for protection of human health.

3. Protecting water quality in the Mad River (a key recreational resource for the community) and area wetlands, both of which are important natural resources.

4. Providing infrastructure to support the development of affordable residential and general residential demand in the community, and facilitating growth within the community's planned growth area.

4.0 ALTERNATIVES CONSIDERED

4.1 Description

Alternatives for wastewater in the Study Area include:

1. Do-nothing alternative. Do not construct a community wastewater system in Waitsfield. Management of wastewater would continue to be the responsibility of individual landowners and limit the potential for infill and development of affordable housing within the village zoning districts.

1A. Prioritizing Flows from Area-Limited Lots and Parcels Without Fully-Complying State-Permitted Septic Systems. This alternative would be implemented in combination with one of the alternatives below to reduce the size and cost of new wastewater treatment and disposal systems needed to accommodate some of the community's wastewater needs.

2. Connecting remaining properties with private wells in the Irasville and Waitsfield village districts to the water system. This alternative would remove the well isolation zones on existing lots within the villages, freeing up well-suited soils for in-ground wastewater disposal systems.

2A. Extension of Municipal Water in Parallel with Sewer Collection System Buildout. The existing municipal water system could be extended to the south from the current southerly limit near the Eagles Resort to serve the southern part of the study area and eliminate well shields overshadowing suitable soils in the southern part of the study area.

3. Provide increased disposal capacity at existing wastewater leachfields in well-suited soils within the Study Area. Existing capacities could be increased by expanding the leachfields and/or adding pre-treatment systems.

4. Developing community wastewater systems on one or more different sites. Leachfields and treatment systems with the potential for substantial wastewater disposal capacity could be developed on one or more sites with well-suited soils for on-site wastewater disposal.

5A/5B. Clustered Community Wastewater Disposal Systems. The preferred wastewater disposal sites identified in Alternatives 3 and 4 could be developed in the different geographic regions of the study area (north, Waitsfield village, Irasville, and south) to meet the community's wastewater needs throughout the study area.

To improve drinking water protection and help meet the Study Area's current and future water and wastewater needs, Village water system connections could be provided in conjunction with Alternatives 3, 4, 5A, or 5B.

4.2 Design Criteria

Design criteria for wastewater in the Study Area include the following:

1. Occur only on land that is controlled by the Town of Waitsfield, or that is available by acquisition of additional lands or easements.
2. Comply with the Indirect Discharge Rules and the Wastewater System and Potable Water Supply Rules, as applicable.
3. Comply with the Indirect Discharge Permit conditions, including aquatic biota protection.
4. Prevent surfacing of wastewater and wastewater effluent under normal operating conditions.
5. Provide unsaturated soil beneath the disposal field for treatment of the effluent prior to reaching groundwater.
6. Not cause deterioration of wetlands and other surface water resources.

4.3 Alternatives Maps, Advantages, and Disadvantages

Comparisons for the alternatives outlined in Section 4.1 are provided in this section, and conceptual plans for each scenario or combination of scenarios are included in Appendix F.

4.3.1 Scenario 1 - Do Nothing

Under the "do nothing" scenario, no new community wastewater facilities would be developed, and wastewater would continue to be managed by individual landowners. The "do nothing" scenario is illustrated as Scenario 1 in Appendix F, which shows the known locations of existing wastewater facilities and water supplies.

Scenario 1
Important Considerations

Advantages	Disadvantages
1. Does not require any current investment in wastewater infrastructure.	1. The burden of replacing aging leachfields and/or failed systems remains on the individual landowner. 2. Does not remove current conflicts between well shields for existing potable water supplies and existing leachfields, leaving an ongoing risk to public health. 3. Continued risk to water quality in the Mad River and area wetlands. 4. Does not provide new areas for infill development. 5. With no municipal wastewater system, developers must pay for the design, permitting, and construction of private wastewater systems themselves, increasing the costs and time for development and infill.

4.3.2 Scenario 1A – Prioritizing Flows from Area-Limited Lots and Parcels Without Fully-Complying State-Permitted Septic Systems

A significant number of private septic systems in the project area have obtained state permits and installed septic systems that meet the Wastewater System and Potable Water Supply Rules, either by full compliance, or by a permitted variance from fully complying with the rules.

The following table summarizes the wastewater design flows for parcels that appear to have state wastewater permits that are fully-compliant with current wastewater rules:

Table 9: Wastewater Design Flows for Parcels with Septic Systems Compliant with State Wastewater Rules (gpd)

	Existing			Future		
	Residential	Commercial / Other	Total	Residential	Commercial / Other	Total
Agricultural-Residential (north)	3,400	6,500	9,900	4,000	18,000	22,100
Agricultural-Residential (south)	3,800	3,500	7,300	12,900	4,100	17,000
Irasville Commercial	3,300	24,000	27,300	4,000	26,200	30,100
Limited Business		1,000	1,000		1,200	1,200
Village Business		1,400	1,400		1,400	1,400
Village Residential	2,500	6,100	8,600	5,600	7,900	13,500
Total	13,000	42,500	55,500	26,500	58,800	85,300

If area-limited parcels without fully-compliant state-permitting leachfields are prioritized for wastewater capacity within the community wastewater system, the wastewater design flows are reduced as follows:

Table 10: Wastewater Design Flows, Existing and 20-Year Projection (gpd) For Area-Limited Parcels Without a Fully-Complying[4], State-Permitted Septic System

Area-Limited Parcels (w/out Compliant WW Permit)	Existing			Future			
	Residential	Commercial / Other	Total	Residential	Commercial / Other	Total	% Change
Agricultural-Residential (north)	3,200		3,200	3,900		3,900	22%
Agricultural-Residential (south)	600	4,300	4,900	1,000	5,100	6,100	24%
Irasville Commercial	1,300	24,200	25,500	2,100	27,400	29,500	16%
Limited Business							
Village Business	1,200	4,400	5,600	1,300	4,900	6,300	13%
Village Residential	3,200	3,000	6,200	4,100	3,100	7,200	16%
Total	9,500	35,900	45,400	12,400	40,500	53,000	17%

Under this alternative, properties with septic systems that are fully-compliant with State rules would continue to be managed by the individual landowners. Parcels with septic systems that don't fully comply with State rules would be connected to some form of a community wastewater system (Scenarios 3 and 4). The "prioritizing flows" scenario is illustrated in Scenarios 1A+3 and 1A+4 in Appendix F.

[4] Under this alternative, it is assumed that the wastewater design flows for existing state-permitted septic systems that were not installed to replace a failed system are fully-compliant with State rules

Scenario 1A
Important Considerations

Advantages	Disadvantages
1. Reduces the volume of wastewater design flow to be managed in new or increased-capacity wastewater treatment and disposal facilities, reducing the capital costs, operating costs, and energy usage of the community system. 2. Retaining fully-complying state-permitted existing systems still provides a level of clean water protection because the permitted systems meet current standards. 3. Providing sewer service to area-limited lots reduces the threat of impacts to surface water and groundwater quality by addressing the wastewater needs of properties with limited ability to build a fully-complying replacement system at an affordable price.	1. May not eliminate current conflicts between well shields and existing leachfields. 2. Ongoing risk to water quality associated with private systems that are not properly maintained by their owners. 3. Will not free up as much land for potential infill-type development as with larger-capacity wastewater solutions. 4. Does not directly address the Town's needs for additional housing. 5. Existing wastewater systems will not be funded through the CWSRF or USDA Rural Development programs.

4.3.3 Scenario 2 - Connect Remaining Village Properties to Water System

Under this scenario, properties within the Irasville Commercial, Village Residential, and Village Business zoning districts that aren't currently connected to the Waitsfield municipal water system would be connected to the water system and their existing water supply wells would be abandoned. This would unencumber land that is currently overshadowed by the current well shields, allowing the land to support leachfields without a risk of contaminating potable water supplies.

The "village water" scenario is illustrated as Scenario 2 in Appendix F. Figure 7A shows the effect of connecting all village lots to the water system on the available area limitations described in Section 2.3.3. As shown, a total of 23 lots in the villages would no longer be area-limited if the existing private wells and associated well shields are eliminated by connecting the existing structures to the water system.

Scenario 2
Important Considerations

Advantages	Disadvantages
1. The water system infrastructure to support this alternative has already been developed and operational for 10 years. 2. Water connections (service stubs) are already in place for most properties. 3. Land within the village districts that is currently overshadowed by well shields would be unencumbered, freeing up area to support on-site leachfields and increased development density. 4. Would eliminate an estimated 30 conflicts between well shields for existing potable water supply wells and existing leachfields that are closer to the supply wells than current wastewater standards require. This would reduce the risk of contamination from leachfields impacting potable water supplies and affecting human health. 5. Low interest funding for this alternative is likely available through the Vermont Drinking Water State Revolving Fund and USDA Rural Development; terms would likely include a subsidized interest rate of 0 to 2%. 6. Connection of the additional users to the water system would result in a reduction in cost to all connected customers.	1. Does not improve wastewater conditions for properties without access to suitable soils for a wastewater disposal system, or with properties with other physical constraints for siting a fully-complying leachfield. 2. The Town may need to may need to subsidize connecting to the water system within the service area mandatory. 3. Would require amending the bylaws and acquisition of easements from landowners. 4. Development density within the village would still be limited because of the amount of land occupied by on-site leachfields. 5. Does not provide enough increased wastewater capacity to meet the combined existing and future wastewater needs of the villages.

4.3.4 Scenario 2A – Extension of Municipal Water in Parallel with Sewer Collection System Buildout

Under this scenario, the water system would be extended from its current southerly point near the entrance to Eagles Resort to the southern extent of the study area. A number of lots in the south portion of the study area have potential for development of housing to meet the Town's needs, and access to municipal water would help facilitate the needed housing development. This scenario has not been evaluated as a stand-alone approach for the purposes of this study, but would be implemented in conjunction with the buildout of a community sewer collection system, running the water distribution main in parallel with the sewer system, a minimum of 10 feet apart (likely on opposite sides of the road).

This “extension of water to south” scenario is illustrated as Scenario 2A in Appendix F.

Scenario 2A
Important Considerations

Advantages	Disadvantages
1. The water system is currently operating at less than 20% capacity and has more than adequate capacity to serve this area. 2. Existing well shields on parcels in the south would be eliminated, freeing up area to support increased development density and clustered development patterns, consuming less land to support the development. 3. Low interest funding for this alternative is likely available through USDA Rural Development. Terms and interest rates have not yet been evaluated under this study. 4. Connection of the additional users to the water system would likely result in a reduction in cost to all connected customers. 5. Additional water use would foster more daily turnover in the water system, while not significantly impacting water operations costs. 6. Would provide fire protection to the southern portion of the study area.	1. Development in the southern part of the study area that is supported by the water extension would be outside the villages. 2. Extension of water systems to new areas is not eligible for funding under the Drinking Water State Revolving Fund.

4.3.5 Scenario 3 - Increase Disposal Capacity in Existing Wastewater Leachfields

Under this scenario, it is assumed that the disposal capacity in existing wastewater leachfields would be increased as follows:

1. Re-constructing the leachfields piping for pressure distribution, constructing the replacement trenches already designed for the leachfield (and building them with pressure distribution piping), and installing an

effluent pump station between the septic tank(s) and the leachfield. By modifying the leachfields for pressure distribution and sizing the leachfields for 150% of the design flow, the requirement for a replacement area is eliminated.[5] This would result in a 33% increase in the disposal capacity for a septic system with septic tanks and no advanced treatment.

2. Adding advanced treatment[6] to the septic system. For systems with less than 6,500 gallons per day of disposal capacity, this would double the disposal capacity of the leachfield if the disposal site has the hydraulic capacity to receive the additional wastewater filtrate while maintaining vertical separation from the mounded seasonal high water table.

3. Adding filtration or tertiary wastewater treatment to existing disposal systems with more than 6,500 gallons per day of disposal capacity (Indirect Discharge systems). The addition of an intermittent sand filter could be used to double the disposal capacity, a recirculating sand filter could triple the disposal capacity, and tertiary treatment could quintuple the disposal capacity.

D&K reviewed the database of state-permitted septic systems in Appendix C and the soil suitability mapping in Figure 5 to identify existing leachfields with a permitted disposal capacity greater than 500 gpd that may have potential to increase the available disposal capacity as described above. Figure 9 and Appendix G show the existing wastewater disposal systems within the project area that appear to have potential for increasing capacity. None of the landowners of these septic systems have been contacted regarding their potential willingness to consider allowing modifications to increase their wastewater capacity and participating in a decentralized village wastewater program.

As shown, four of the existing systems each have the potential to provide a moderate increase in disposal capacity by a net capacity increase of 9,600 gpd to 21,420 gpd if the described changes are technically feasible and permittable, and if the necessary easements can be negotiated with landowners. Altogether, the 14 existing disposal sites have the potential to provide a net increase in capacity of over 89,900 gpd.

Increasing the disposal capacity at the Mad River Green and at the Waitsfield Elementary School appears to have the potential to provide a net increase of

[5] Environmental Protection Rules, Chapter 1, Wastewater System and Potable Water Supply Rules, 1-902(b)(1)

[6] Advanced treatment systems include intermittent or recirculating sand filters and innovative/alternative treatment systems approved by the Agency of Natural Resources, Department of Environmental Conservation

40,120 gpd in disposal capacity. This could provide sufficient capacity to accommodate the existing area-limited lots in Waitsfield Village and Irasville (37,300 gpd) with very limited capacity to support any additional infill development. However, if combined with village water (Scenario 2), which reduces the number of lots that are area-limited, the capacity to support infill development would be increased. This potential "increase disposal capacity" scenario is illustrated on Scenario 1A+3 and Scenario 2 in Appendix F.

Scenario 3
Important Considerations

Advantages	Disadvantages
1. Wastewater permit amendments can often more easily be obtained than permits for new wastewater facilities. 2. Previous test pit information from the permitting files for the existing leachfields can be used to help estimate the maximized hydrologic capacity of the disposal system. 3. Develops wastewater capacity in locations already occupied by wastewater systems, and not "greenfields" that are currently undeveloped. 4. As a decentralized approach, this alternative can potentially provide disposal capacity in relatively close proximity to the area being served by the wastewater system. 5. Provides a replacement wastewater option for lots with aging leachfields and spatial limitations. 6. Removes current conflicts between well shields and existing leachfields. 7. Provides improved protection of water quality in the Mad River and area wetlands. 8. Subsidized low interest funding and possibly grants for this alternative are available through the Vermont Clean Water State Revolving Fund (CWSRF) and USDA Rural Development. 9. Existing landowners in Town and the Town's water system operator already	1. Requires multiple disposal sites and acquisition of easements from multiple landowners. 2. The process of acquiring multiple easements and developing multiple sites can be slow, and delay progress on housing development. 3. Land will be needed to house the necessary wastewater treatment facilities, and the siting and design of treatment facilities will need to be planned in such a way to mitigate potential impacts on the current occupants and neighbors of adjacent properties. If limited area is available, the treatment facilities may need to be located on a separate lot and pumped to the disposal site. 4. In order to meet the existing and future wastewater demands in the project area, this alternative will require that some of the wastewater in the project area continue to be managed in existing private leachfields. 5. Management and operation of the wastewater facilities in multiple locations may require a higher level of effort and administration than a community system with fewer treatment and disposal facilities.

have experience in operating advanced wastewater treatment systems.

10. The wastewater capacity can be scaled incrementally over time to match future wastewater capacity to future growth in demand.

4.3.6 Scenario 4 - New Community Wastewater Disposal Systems on One or More Sites

Under this scenario, one or more new wastewater disposal systems would be constructed on currently undeveloped land. D&K reviewed the mapping and information from the 2004 Facilities Plan to identify what potential large disposal sites were considered in the previous planning effort. Parcels containing relatively large areas of soil that is mapped as well-suited for wastewater disposal were also identified by reviewing the information on Figure 5. After adjusting the potential area available by excluding the mapped environmental constraints on Figure 3, the remaining area of well-suited soils for a potential disposal site was identified as shown by the polygons on Figure 10.

Appendix H includes a summary of planning-level information on the mapped potential disposal sites. With the exception of Town-owned land, none of the landowners of these potential disposal sites have been contacted regarding their potential willingness to consider allowing development of a community wastewater system on their property.

Constructing an advanced wastewater treatment facility and indirect discharge disposal system on the Munn site has the potential to provide 90,274 gpd of disposal capacity. If all of the area-limited lots in the study area are connected to the community wastewater system, the total existing wastewater flows are estimated to be 45,400 gpd, which leaves 44,874 gpd of capacity to support new development, infill, and other existing properties, not accounting for the necessary allowance for infiltration in the collection system. This scenario is illustrated as Scenario 1A+4 in Appendix F.

Constructing an advanced wastewater treatment facility and indirect discharge disposal system on the Munn site also has the potential to accommodate all of the existing wastewater needs in Irasville and Route 100 south of the village (76,600 gpd) with 13,674 gpd of capacity to support new development, infill, and other existing properties, not accounting for the necessary allowance for infiltration in the collection system. This scenario is illustrated as Scenario 4 in Appendix F.

Scenario 4
Important Considerations

Advantages	Disadvantages
1. The highest ranked potential disposal site is already owned by the Town and a preliminary site design has already been developed during previous planning efforts. 2. A smaller number of treatment and disposal facilities as compared to a decentralized, larger number will not involve as many landowners for procurement of easements, or neighbors to be considered for mitigating potential impacts. 3. A smaller number of community disposal systems can likely be developed faster and with more certainty than a large number of decentralized systems. 4. Provides a replacement wastewater option for lots with aging leachfields and spatial limitations. 5. Removes current conflicts between well shields and existing leachfields. 6. Provides improved protection of water quality in the Mad River and area wetlands. 7. Subsidized low interest funding and possibly grants for this alternative are available through the Vermont Clean Water State Revolving Fund (CWSRF) and USDA Rural Development. 8. Existing landowners in Town and the Town's water system operator already have experience in operating advanced wastewater treatment systems. 9. The wastewater capacity can be phased in over time, allowing the Town to "turn on" additional capacity as the residential solutions are proposed by the private sector.	1. Disposal sites at the north and south end of the project area may require longer force mains and larger pump station capacities to deliver wastewater to the treatment and disposal facilities as compared to a decentralized approach with treatment and disposal facilities in multiple locations around the project area. 2. Constructing community treatment and disposal systems impacts "greenfields" that are currently undeveloped. 3. In order to meet the total existing and future wastewater demands in the project area, this alternative will either require development of more than one community treatment and disposal system, and/or that some of the wastewater in the project area continue to be managed in existing private leachfields. 4. Management and operation of tertiary wastewater treatment facilities typically requires a higher level of expertise than smaller treatment and disposal facilities.

4.3.7 Scenarios 5A & 5B – Clustered Community Wastewater Disposal Systems

Under this scenario, the preferred new and increased-capacity wastewater disposal systems identified in Scenarios 3 and 4 would be constructed in different geographic regions within the service area to provide clustered community wastewater systems throughout the study area.

As shown in Appendix I, one clustered system in each geographic region of the study area could provide a total disposal wastewater treatment and disposal capacity of 309,254 gpd, which exceeds the entire existing and future wastewater needs estimated in Table 8 (213,100 gpd).[7]

A comparison of the community's estimated wastewater needs in each geographic region as compared to the estimated maximum disposal capacity of the preferred clustered system location in the region is provided in the following table:

Table 11: Clustered Community Wastewater Disposal Capacity vs. Geographic Need

Geographic Portion of Study Area	Presumed Clustered Wastewater System to Serve the Area	Potential Capacity to Meet Total Existing and Future Wastewater Needs
Route 100 North	Spaulding Lot	With advanced treatment, appears to have the potential capacity (161,850 gpd) to meet the existing and future needs for Route 100 north, Waitsfield Village and Irasville (157,300 gpd).
Waitsfield Village	Waitsfield School District	Insufficient potential additional capacity (21,420 gpd) to meet the village's current (28,200 gpd) or future needs without additional disposal capacity from existing systems being maintained in place and/or additional disposal capacity in another clustered disposal system
Irasville	Mad River Green	Insufficient capacity (18,720 gpd) to meet Irasville's current (60,900 gpd) or future needs without additional disposal capacity from existing systems being maintained in place and/or additional disposal capacity in another clustered disposal system
Route 100 South	Munn Site	With tertiary treatment, provides sufficient capacity (90,274 gpd) for the existing and future needs in the south (41,800 gpd) with

[7] Previous design and permitting information was used to estimate the treatment and disposal capacity of the Munn Site. However, the potential maximum treatment and disposal capacities for the other clustered community wastewater systems are based on general soil mapping, area available based on GIS mapping data, and general planning-level information. Test pits and site-specific hydraulic testing are strongly recommended as a next step if other clustered community wastewater sites are being seriously considered as part of the Town's preferred alternative.

		substantial reserve capacity (48,474 gpd) to support Irasville as well

Constructing an advanced wastewater treatment facility and indirect discharge disposal system on the Munn site in combination with increasing the treatment and disposal capacities in the Waitsfield Elementary School system may have the potential capacity (111,694 gpd) to accommodate the existing wastewater flows from Irasville and Waitsfield Village with an allowance for population growth (104,900 gpd)[8], but does not provide capacity to support future housing development and economic activity.

Constructing an advanced wastewater treatment facility and indirect discharge disposal system on the Munn site in combination with increasing the treatment and disposal capacities in the Mad River Green and Waitsfield Elementary School systems has the potential capacity (130,394 gpd) to accommodate the existing wastewater flows from Irasville and Waitsfield Village with an allowance for population growth (106,500 gpd), but not including wastewater flows from Route 100 North or South. This scenario is illustrated as Scenario 5A in Appendix F.

Constructing advanced wastewater treatment facilities and indirect discharge disposal systems on the Munn site and the Spaulding site (252,124 gpd combined potential capacity) has the potential to accommodate all of the existing and future wastewater needs (213,100 gpd) in the study area (Irasville, Waitsfield Village, and Route 100 North and South) along with capacity to support future housing development and economic activity. This scenario is illustrated as Scenario 5B in Appendix F.

Scenarios 5A & 5B
Important Considerations

Advantages	Disadvantages
1. The highest ranked potential disposal site is already owned by the Town and a preliminary site design has already been developed during previous planning efforts. 2. The wastewater collection system could be customized to reduce costs, as some interconnections between regions may not be necessary. 3. Wastewater pumping costs could be reduced by minimizing double-pumping of wastewater from one end of the study area to another.	1. The preferred disposal sites in the north and south impact "greenfields" that are currently undeveloped. 2. Management and operation of tertiary wastewater treatment facilities typically requires a higher level of expertise than smaller treatment and disposal facilities.

[8] Not accounting for the required infiltration allowance

4. Provides a replacement wastewater option for lots with aging leachfields and spatial limitations.
5. Removes current conflicts between well shields and existing leachfields.
6. Provides improved protection of water quality in the Mad River and area wetlands.
7. Subsidized low interest funding and possibly grants for this alternative are available through the Vermont Clean Water State Revolving Fund (CWSRF) and USDA Rural Development.
8. Existing landowners in Town and the Town's water system operator already have experience in operating advanced wastewater treatment systems.
9. The wastewater capacity can be phased in over time, allowing the Town to "turn on" additional capacity as the residential solutions are proposed by the private sector.

3. Requires multiple disposal sites and acquisition of easements from landowners.
4. The process of acquiring easements and developing multiple sites can be slow, and delay progress on housing development.
5. Land will be needed to house the necessary wastewater treatment facilities, and the siting and design of treatment facilities will need to be planned in such a way to mitigate potential impacts on the current occupants and neighbors of adjacent properties. If limited area is available, the treatment facilities may need to be located on a separate lot and pumped to the disposal site.
6. Management and operation of the wastewater facilities in multiple locations may require a higher level of effort, administration, and costs than a community system with fewer treatment and disposal facilities.

4.4 Environmental Impacts

A comparison of the relative environmental impacts and benefits of the alternatives is outlined in the following table:

Table 12: Relative Environmental Impacts and Benefits

Scenario	Clean Water Benefit	Protection of Human Health	Impact to Environmental Resources	Energy Demand	Replace Aging Infrastructure	Sprawling Development	Overall Relative Environmental Benefit/ Impact
1. Do-Nothing Alternative	None	Minimal	Potential impacts from failing systems	Low	No improvement	Expected to increase	Poor

1A. Prioritizing Flows from Area-Limited Un-Permitted Lots	Moderate	Substantial benefit	Low to moderate	Low to moderate	Substantial benefit	Minimal mitigation	Good
2. Connect Remaining Village Properties to the Water System	None	Substantial benefit	Minimal	Low	Improves options for landowners to replace	Provides some mitigation	Good
2A. Extension of Municipal Water in Parallel with Sewer System	None	Moderate benefit	Low	Low	Improves options for landowners to replace	Provides some opportunity for mitigation	Fair
3. Increase Disposal Capacity in Existing Wastewater Leachfields	Substantial	Potential for moderate benefit	Low	Moderate	Substantial benefit	Provides mitigation	Good
4. One or More New Community Wastewater Disposal Systems	Substantial	Substantial benefit	Low to moderate	Moderate	Substantial benefit	Provides substantial mitigation	Good
5A/5B. Clustered Community Wastewater Disposal Systems	Substantial	Substantial benefit	Low to moderate	Moderate	Substantial benefit	Provides substantial mitigation	Good

4.5 Land Requirements

The need for easements or land purchases for each of the scenarios is summarized as follows:

1. Do-Nothing Alternative: No additional land acquisition by the Town is necessary.

1A. Prioritizing Flows from Area-Limited Lots and Parcels without Fully-Complying State-Permitted Septic Systems: Reduces the amount of land required to support options 3, 4, and 5.

2. Connect Remaining Village Properties to the Water System: Permanent easements would need to be acquired for installation of water services from the existing curb stops to the homes.

2A. Extension of Municipal Water in Parallel with Sewer Collection System Buildout: No additional land requirements if the water main is installed within the existing Route 100 right-of-way.

3. Increase Disposal Capacity in Existing Wastewater Leachfields: Permanent easements or land purchases would be needed for each existing wastewater system that is to be improved.

4. One or More New Community Wastewater Disposal Systems: The Town already owns one potential treatment and disposal site, but would need permanent easements or land purchases to develop additional capacity on another property.

5A/5B. Clustered Community Wastewater Disposal Systems: The Town already owns one potential treatment and disposal site, but would need permanent easements or land purchases to develop additional capacity on the other potential disposal site properties.

4.6 Potential Construction Problems

A public water system was constructed to serve the northern and village portions of the project area. Construction challenges in this area included:

- Shallow ledge in some areas.
- Protection of features within developed neighborhoods including trees, sidewalks, landscaping, etc.
- Traffic control on a busy state road.
- Crossings of the Mad River and conflicts with the bridge structures.

Similar challenges would be expected in the southern portion of the project area, and also may include:

- Wetter soil conditions than in the village area.
- Potentially unsuitable soils when trenching in wet areas.

Some additional challenges currently affecting the construction industry include:

- Supply chain issues affecting the availability and increasing the cost of materials.
- Labor shortages affecting contractor availability and costs.

4.7 Sustainability Considerations

4.7.1 Water and Energy Efficiency

Water and energy efficiency considerations for each of the scenarios is summarized as follows:

1. Do-Nothing Alternative: Water and energy usage is determined by individual landowners.

1A. Prioritizing Flows from Area-Limited Lots and Parcels without Fully-Complying State-Permitted Septic Systems: This scenario would not be expected to affect water usage. The energy demand under Scenarios 3, 4, and 5 would be decreased because the pump stations and wastewater treatment facilities would be handling lower flows.

2. Connect Remaining Village Properties to the Water System: Water usage efficiency would be improved under this scenario, and energy usage in the community would be expected to decrease, as individual landowner well pumps would be eliminated, and the water system is already sized to accommodate these additional users.

2A. Extension of Municipal Water in Parallel with Sewer Collection System Buildout: This scenario would increase water usage in the municipal water system, which would be a benefit to the system because it is currently operating at well under capacity. Water usage efficiency in the community would be improved under this scenario.

3. Increase Disposal Capacity in Existing Wastewater Leachfields: This scenario would not be expected to affect water usage. Multiple pump stations and wastewater treatment facilities with energy demands would be developed under this option.

4. One or More New Community Wastewater Disposal Systems: This scenario would not be expected to affect water usage. Multiple pump stations and larger-scale wastewater treatment facilities with energy demands would be developed under this option.

5A/5B. Clustered Community Wastewater Disposal Systems: These scenarios would not be expected to affect water usage. Pump stations would handle less compounded wastewater flow than a system with a single treatment facility. Wastewater treatment facilities with substantive energy demands would be developed under these options.

4.7.2 Green Infrastructure

Scenarios 1 and 1A (as a stand-alone) do not provide an opportunity for green infrastructure.

The addition of water meters to new homes connected to the water system under Scenario 2 and Scenario 2A are expected to result in water efficiency improvements in the community as a whole.

Wastewater pumps for the needed pump stations in Scenarios 3, 4, and 5A/5B can be selected for energy efficiency.

Operational energy efficiency, minimization of residuals, and building envelope energy efficiency need to be considered in the selection and design of wastewater treatment facilities in Scenarios 3, 4, and 5A/5B. Alternative wastewater collection methods such as septic tanks with effluent by gravity may also be considered, potentially reducing wastewater pipe and pump sizes, the number of manholes needed, and overall costs and impacts of construction.

4.7.3 Other

Overall housing needs and affordable housing are a significant need in the community. The scenarios rank as follows in terms of providing opportunity for housing and affordable housing to be developed, particularly within the Town's targeted growth area:

1. Scenario 5B: Provides the maximum opportunity to address the housing needs.
2. Scenario 5A: Provides the maximum opportunity to address the housing needs in Irasville and Waitsfield Village, but not on Route 100 North or South.
3. Scenario 4: Provides wastewater capacity to support housing development, but does not free up as much land within the growth area as Scenarios 5A/5B.
4. Scenario 2A: Boosts the potential for supporting housing development in Scenarios 5A/5B and 4 by providing for all of the infrastructure needed.
5. Scenario 3: Provides wastewater capacity to support housing development, but does not free up as much land within the growth area as Scenarios 5A/5B or 4.
6. Scenario 2: Frees up some land within the growth area for additional wastewater capacity to be developed, but the additional wastewater systems will occupy land within the preferred growth area. Boosts the potential for supporting housing development in Scenarios 3, 4, and 5A/5B.
7. Scenario 1A: Lowers the benefits achieved under Scenarios 3 and 4 by leaving more land within the growth area encumbered by existing septic systems.
8. Scenario 1: Does not address the current housing shortage or affordable housing needs.

4.8 Cost Estimates

A Preliminary Opinion of Probable Construction Costs (OPCC) and Project Cost Summary (PCS) for each of the scenarios described in Section 4.3 are included in Appendix J. Following is a comparative summary of the costs:

Table 13: Project Costs Comparison

Scenario	Collection (or Distribution) OPCC	Treatment and Disposal OPCC	Engineering, Legal, Administrative, Land Acquisition	Total Project Capital Cost	Average Annual Operation Maintenance and Repair Costs	Estimated Users at Full Buildout (ERUs[9] unless otherwise noted)
2	$ 0.32 Mil.	N/A	$ 87,000	$ 0.41 Mil.	$ 3,500	101.9
2A	$ 1.66 Mil.	N/A	$ 395,000	$ 2.06 Mil.	$ 6,000	25 parcels
1A+3	$ 5.05 Mil.	$ 1.13 Mil.	$ 1,335,600	$ 7.52 Mil.	$ 91,000	119.0
1A+4	$ 13.0 Mil.	$ 2.76 Mil.	$ 3,188,200	$ 19.0 Mil.	$ 96,000	416.7
4	$ 5.78 Mil.	$ 2.75 Mil.	$ 1,802,500	$ 10.3 Mil.	$ 91,000	416.7
5A	$ 7.31 Mil.	$ 3.88 Mil.	$ 2,317,200	$ 13.5 Mil.	$ 154,000	553.1
5B	$ 13.4 Mil.	$ 6.46 Mil.	$ 3,954,600	$ 23.9 Mil.	$ 155,000	935.2

[9] ERUs = Equivalent Residential Units; for example: a single family residence connected to a >50,000 gallons per day wastewater system is estimated to generate 210 gpd of wastewater, so an ERU is the total wastewater flow in gpd divided by 210 gpd.

5.0 SELECTION OF ALTERNATIVE

The potential community wastewater and water alternatives were evaluated and compared in terms of life cycle costs and non-monetary factors for the selection of a preferred alternative.

5.1 Life Cycle Cost Analysis

A life cycle present worth analysis was completed[10] to provide a comparison of the alternatives. The analysis converts all costs to present day dollars for a planning period of 30 years using a "real" discount rate[11]. Life cycle costs considered include:

- Total capital cost (including construction plus non-construction costs).
- Annual operation & maintenance costs based on a uniform series present worth calculation.
- The present worth of the salvage value of the project at the end of the 30-year planning period converted to present day dollars.

Because the scenarios evaluated represent projects of different scale serving varying subsets of the overall study area, the life cycle costs of each alternative were also compared in terms of the number of ERUs served by the project at full capacity. The life cycle cost analyses for each scenario are included in Appendix K. Following is a summary of the cost comparisons.

Table 14: Life Cycle Costs Comparison

Scenario	Total Net Present Value	Net Present Value per ERU
1 – Do Nothing	$ 5.88 Mil.	$ 17,000
2 – Village Water	$ 0.46 Mil.	$ 4,600
2A – Water Extension	$ 1.98 Mil.	Not Calculated
1A+3 – Increase Existing Capacity	$ 9.27 Mil.	$ 77,900
1A+4 – Area-Limited Lots to Munn Site	$ 19.5 Mil.	$ 46,800
4 – Irasville and Route 100 South to Munn Site	$ 11.8 Mil.	$ 28,500
5A – Irasville and Waitsfield Village to Clustered Sites	$ 16.4 Mil.	$ 29,700
5B – All of Study Area to New Clustered Sites	$ 25.5 Mil.	$ 27,300

Based on this comparison, Scenarios 4, 5A, and 5B have comparable value at full buildout.

[10] Life Cycle Cost Analysis completed according to RUS Bulletin 1780-2
[11] Real Discount Rate from Appendix C of OMB Circular A-94

5.2 Non-Monetary Factors

Evaluation of each alternative against the community's priority needs and other non-monetary factors is provided in the following table. It is notable that Scenario 2 is a necessary element to make Scenario 1A+3 feasible, and that Scenario 2 and/or Scenario 2A could be implemented in combination with Scenario1A+4, Scenario 4, Scenario 5A, or Scenario 5B.

Table 15: Non-Monetary Evaluation Matrix

Criteria	Alternatives Scoring (Scale of 0 to 4, with 4 being most favorable)					
	1	1A+3 (with 2)	1A+4	4	5A	5B
1. Sustainability: Provide a replacement option for lots with aging leachfields and spatial limitations	0	2	3	2	3	4
2. Human health protection: Eliminate conflicts between well shields and leachfields	0	4	3	2	3	4
3. Water quality: Protect Mad River and wetlands	1	2	2	2	3	4
4. Smart growth/sustainability: Support residential and growth within planned growth area	0	1	2	3	3	4
Energy efficiency: Relative energy usage compared to other alternatives	3	3	2	2	2	1
Green infrastructure: Potential to incorporate green approaches	0	2	3	3	3	3
Permitting/easements: Simplicity of permitting and obtaining easements	2	3	3	4	2	2
Operation and management: Simplicity of operations and management of system	3	2	2	2	1	2
SCORING FOR FOUR HIGHEST PRIORITIES	1	9	10	9	12	16
OVERALL RELATIVE SCORE	8	22	21	21	20	24

Based on this comparison of non-monetary factors, the do-nothing alternative should be eliminated from consideration. It is the lowest-ranked alternative by a significant margin, and fails to address the community's top four priorities.

Combined with village water and/or extension of the water system to the south, Scenario 1A+4, Scenario 4, Scenario 5A, or Scenario 5B would more completely address the community's goals of human health protection and smart growth/sustainability.

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

Based on the needs assessment and alternatives analysis, following is the preferred alternative.

Service Area

The proposed service area is identified on the attached service area map (Figure 11), and includes the village zones identified in the Waitsfield Town Plan, including the:

- Irasville Commercial District;
- Village Business District;
- Village Residential District; and
- ACCD Designated Village Center and 0.25-mile buffer.

Village Water

Funding agency requirements include several factors that affect costs and schedule including requirements for:

- All easements on private land to be in place before advertising the project for bid;
- Assessment of, and SHPO concurrence with, the potential effects on cultural resources including archaeology and historic preservation; and
- Build America, Buy America Act (BABAA) requirements for procurement of materials that can have a substantial impact on construction costs.

Based on the limited scale and scope of potential water service connections in the proposed service area, the use of federal funding to connect additional properties in the existing service area to the system is not practical given the additional requirements associated with the funding and the low potential to qualify for grants or subsidies. It is recommended that the Town consider connecting properties on a voluntary basis, subject to the ability of the Town to self-finance the new water system connections.

Village Wastewater

Based on a comparison of administrative, technical, and financial factors, the Munn site on the corner of Kingsbury Road and Route 100 is the preferred treatment and disposal site. Expansion of capacity at the Waitsfield Elementary School wastewater disposal system was also evaluated (in addition to the Munn site) and eliminated from further consideration at this time based on:

- Potential temporary impacts to the existing land use at the school;
- Insufficient capacity of the expanded elementary school system to fully meet the existing and future wastewater needs in the Waitsfield Village Business and Village Residential Zoning Districts; and
- Comparable capital costs and higher life cycle costs as compared to a single wastewater treatment and disposal facility at the Munn site.

Desktop review of the potential use of the Waitsfield Elementary site to treat and dispose of wastewater from the Village Residential and Village Business Districts, as compared to sending the Village Residential and Village Business District wastewater to the Munn site is included in Appendix L.

Copies of the capacity determination letters from the DEC in 2006 and 2008 are included in Appendix M. In a December 21, 2006 letter, the Vermont DEC issued a capacity determination of 90,274 gallons per day for the Munn site. This capacity needs to be reaffirmed as part of the Indirect Discharge Permitting process, but at that capacity, the Munn site provides sufficient capacity to meet the priority needs of the proposed service area.

Based on the needs assessment, the following have been identified as the priorities for current and future wastewater capacity that should be accommodated in the community wastewater system:

- Existing properties with leachfields that are 40 or more years old;
- Existing properties with leachfields that are located in a mapped floodplain;
- Existing properties with leachfields that are located in the River Corridor;
- Existing properties with leachfields that are located within well shields for existing private and public drinking water wells; and
- Capacity to accommodate connections for future housing development and economic activity.

These priorities offer the most potential benefit in terms of water quality protection for the Mad River, other streams, and wetlands; drinking water and overall human health protection; offset of the economic hardships of replacing failing and low-functioning septic systems; and addressing the community's need for future housing development and economic activity.

Estimated wastewater needs for the entire proposed service area are included in Appendix N. Existing leachfield locations (or assumed locations based on topography where not known) were compared to GIS mapping of floodplains, River Corridors, and well shields, and analyzed based on the estimated leachfield ages as well. Wastewater design flows for the lots with at least one of these highest priority categories of needs are summarized in Appendix O, and shown on Figure 12.

6.1 Preliminary Wastewater Project Design

The preliminary design for the recommended wastewater alternative is shown on the design plans in Appendix P. The wastewater project includes:

1. A wastewater collection system that includes primarily 8-inch diameter gravity sewer mains collecting to four municipal pump stations located at low points in the service area (one at the Waitsfield Elementary School, one at Bridge Street, one at Carroll Road, and one at Fiddlers Green).
2. Municipal septic tanks provided prior to each pump station.

3. The Waitsfield Elementary School, Bridge Street, and Carroll Road pump stations will share an effluent forcemain that conveys effluent to a gravity sewer line that drains to the final pump station at Fiddlers Green.
4. A small number of properties on the hill between the Village Residential District and Irasville will require private septic tanks with effluent pumping to connect to the system because a gravity sewer line is not feasible in the area due to shallow ledge.
5. A pump station at Fiddlers Green that will convey all of the effluent from the service area to the Munn site treatment and disposal facility on the corner of Kingsbury Road and Route 100.
6. A portable generator that can be used to power each of the municipal pump stations.
7. A 90,274 gpd tertiary wastewater treatment facility located at the Munn site.

The basis of design for major wastewater system elements is described below.

6.1.1 Collection System

The proposed wastewater collection system includes 8-inch gravity sewers where feasible, with a minimum slope of 0.004 feet per foot. Approximate depths of proposed sewer mains were planned based on providing sufficient pipe burial depth for freeze protection, and for accommodating building sewer connections from the locations that sewer services currently exit existing buildings.

Gravity sewer mains will collect wastewater from the service area to common community septic tanks to provide primary wastewater treatment prior to the proposed municipal pump stations. Proposed sewer manholes are located throughout the system at changes in direction and spaced no more than 400 feet apart.

Gravity sewer mains will be located within existing road rights-of-way where possible. Along the east side of Route 100 in Irasville, the plans currently include new cross-country sewer collection lines below the existing buildings, which will require easements from private landowners to accommodate. A wastewater dosing station is proposed to convey the wastewater from the Village Square shopping center across a low wetland area to the proposed Fiddlers Green municipal pump station.

Based on the proposed gravity sewer collection system length and size, an estimated 5,363 gallons per day infiltration allowance needs to be accounted for in the system design.

Proposed forcemains throughout the system will convey septic tank effluent, and as such, do not need to be sized for solids handling. This allows for lower maintenance, lower energy-use pumps to be utilized in the municipal pump stations.

A small number of properties on the hill between the Village Residential District and Irasville will require private septic tanks with effluent pumping to connect to the system because a gravity sewer line is not feasible in the area due to shallow ledge.[12]

The proposed municipal pump stations at the school, Bridge Street, and Carroll Road will share an effluent forcemain, and as such, will require double-check valves and shutoff valves prior to their points of connection to the shared forcemain.

Proposed municipal pump stations have been sized assuming that an emergency generator connection will be included in the pump station design, and the Town will have a portable emergency generator that is capable of powering any of the municipal pump stations in the event of a power outage. As such, the pump station volumes include an operating volume sized for 8 to 10 doses per day on an average day of wastewater flow, with four hours of emergency storage in the pump station above the normal operating level.

Proposed septic tanks and pump stations have been sized based on the maximum anticipated potential buildout design flows in the area that is being collected to each pump station as shown in Appendix Q, and as summarized in the following table.

Table 16: Septic Tanks and Pump Stations Design Flows

Municipal Septic Tanks[13] and Pump Station Location	Assumed Design Flow for Sizing Tanks (gpd)
Elementary School	33,000
Bridge Street	13,000
Carroll Road	37,000
Fiddlers Green	43,000[14]

[12] Costs for the private septic tanks with effluent pumping (where needed) are not currently included in the municipal project costs.

[13] Septic tank sizing based on Indirect Discharge Rules 14-1008(b), Table #14 at 0.75 times the design flow+1,125 gpd

[14] Additional septic tank capacity provided at Fiddlers Green for effluent flow to be received from the other pump stations.

6.1.2 Wastewater Treatment and Disposal Facility

To accommodate the highest priority needs of the service area and provide some capacity for housing and economic development, the proposed wastewater treatment and disposal facility needs to be designed to provide tertiary treatment. Based on the previous disposal capacity approval for the disposal site, the maximum capacity is 90,274 gallons per day.
Tertiary wastewater treatment options identified and evaluated with the potential to treat up to 90,274 gallons per day of wastewater effluent include:

- Membrane bioreactor systems.
- Sequencing batch reactor systems.
- Moving bed bioreactor systems.
- Open cell foam biofilter systems.

The majority of these systems can provide the required secondary treatment and nitrogen removal, and also require a chemical precipitation system to meet the required phosphorous discharge limits.

Product information on the technologies that have been evaluated is included in Appendix R. Based on a preliminary comparison of costs and operational considerations, the most feasible options that bear further consideration appear to be membrane bioreactor (MBR) systems or moving bed bioreactor (MBBR) systems. For the purposes of this preliminary design and cost analysis, a conceptual plan for an MBBR system is included in the project plans and costs.

6.2 Preliminary Village Water Connections Design

The preliminary design for potential village water service connections is shown on the design plans in Appendix S. For existing buildings, proposed water service entrances have been planned to enter the buildings in the same locations as the current water line entrance. Proposed water service sizes have been estimated based on current property use, with some lines upsized where there appears to be potential for higher use of the property. Proposed water service entrance details and meter details are consistent with the original water system construction plans.

6.3 Project Schedule

Following is the anticipated schedule for proceeding with the wastewater project.

Task	Dates
90% PER Public Informational Meeting	May 30, 2023
Final PER	June 2023
Draft Environmental Report	June 2023
Final Design and IDR Permitting	July 2023-September 2024
Bond Vote Warnings and Public Meeting	October 2024
Bond Vote (Voter Authorization to Incur Debt)	November 2024
Bid Phase	December 2024
Project Construction	Spring 2025-Spring 2026

6.4 Permit Requirements – Proposed Wastewater Project

6.4.1 Act 250

The project is expected to disturb an area of 10 acres and will likely require an Act 250 permit.

6.4.2 Indirect Discharge Permit

An indirect discharge permit will be required to construct the proposed wastewater treatment and disposal facilities. An updated capacity determination has been submitted to the DEC for review. The remainder of the permitting process will be determined with input from the Vermont DEC, and may include tasks such as updated background water quality monitoring and aquatic biota testing.

6.4.3 Wastewater System and Potable Water Supply Permit

The construction of a municipal sanitary sewer collection line, the connection of a building or structure to the collection line via a new sanitary sewer service line, and the construction of the service line, at the time of construction and operation of the municipal sanitary sewer collection line is exempt from requiring a Wastewater System and Potable Water Supply Permit provided that the sanitary sewer collection line and associated sanitary sewer service lines are part of a project approved by the Water Investment Division of the Department, the sanitary sewer service lines comply with the applicable technical standards of the Wastewater System and Potable Water Supply Rules, and that a designer completes a designer certification for the sanitary sewer service lines (which needs to be recorded and indexed in the Town's land records).

6.4.4 Vermont Stormwater Construction General Permit

Because the project disturbs more than one acre of land, coverage under the Vermont Construction General Permit (CGP) will likely be required. Based on the amount of disturbance, slopes and distance to surface water, the project will likely fall within the moderate-risk category.

6.4.5 Wetlands and Wildlife

Several wetlands are present throughout the project area, disturbance of which will be avoided to the extent feasible by the pipe alignment and by directional borings.

The project will be reviewed with the State of Vermont Wetlands Program and the US Army Corps to determine what permitting requirements may apply regarding wetlands and wildlife.

6.4.6 Floodplains and Rivers

The proposed treatment and disposal facilities are not located within a mapped floodway, flood hazard area, or river corridor.

Because the Mad River transects the proposed service area, the wastewater collection system will cross through the Floodplain and the Flood Hazard Area and River Corridor. The proposed wastewater system will eliminate several existing leachfields that are currently located within mapped floodplains and the river corridor. Stream alteration permitting will be avoided by directionally boring underneath the river. If any permanent sewer manholes or pump stations are placed in the 500-Year Floodplain or Flood Hazard Area, the structures will need to be designed to minimize the risk of flood damage by using measures such as watertight pump station hatches and manhole covers, and locating electrical equipment above the flood elevation.

6.4.7 Cultural Resources

An archaeological resources assessment and Phase 1B testing were previously conducted on the proposed disposal site and a signoff was issued by the Vermont Division for Historic Preservation (VDHP). The previous assessment and testing information have been resubmitted to VDHP for an updated review, and an archaeological resources assessment of the proposed collection system area has been scheduled for June 2023.

6.4.8 Managerial and Administrative

Establishment of a community wastewater system will require managerial and administrative systems including developing a sewage ordinance. The Town will need to plan for governance of the system, operation, maintenance, monitoring, and accounting functions including billing and collection of user fees. The Town has recent experience developing the required documents and administrative systems from establishing a water system in the earlier 2000s. The Town also has an experienced and well-qualified contract operator for the water system who is capable of operating the proposed wastewater collection, treatment, and disposal system.

For the proposed alternative, a preliminary list of easements that would be needed from private landowners is included in Appendix T.

6.5 Sustainability Considerations – Proposed Wastewater Project

6.5.1 Water and Energy Efficiency

Variable frequency drives and high efficiency pumps will be considered for the effluent pumps in the municipal pump stations. Power usage in these pump stations will be lower than if the collection system were designed for raw wastewater collection with solids handling pumps.

New electrical components will have to meet utility requirements limiting inductive loads, line noise and starting currents. Process components and building systems in the tertiary wastewater treatment facility will be reviewed for energy efficiency as part of the final design and selection process.

The potential opportunity for renewable energy at the wastewater treatment and disposal facility will be evaluated as a possible way to offset the additional energy usage from the wastewater facilities.

6.5.2 Green Infrastructure

Biological treatment of effluent will be provided in a tertiary wastewater treatment facility, as well as in and around the disposal beds by designing the beds to support aerobic conditions, and ensuring adequate soil exists between the bottom of the disposal bed and the seasonal high water table.

Primary treatment will be provided by septic tanks located at the municipal pump stations. Septic tanks use simple, naturally-occurring physical and biological processes to provide basic wastewater treatment. Use of an effluent pumping system design provides energy efficiency savings in daily pumping and treatment costs, and consumes fewer raw materials, as smaller-diameter forcemains can be used in the effluent collection system.

6.5.3 Other

There is finite soil area capable of providing economical wastewater disposal in the area to meet the community's needs. In this sense, wastewater disposal capacity is a non-renewable resource.

Establishment of a community wastewater system in Waitsfield will allow additional housing and development to occur within the Town's planned growth center. As such, the wastewater infrastructure will help mitigate sprawl and consumption of resources by supporting smart growth.

6.6 Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

A preliminary OPCC and Project Cost Summary for full buildout of the selected wastewater alternative are included in Appendix U. The OPCC for the proposed wastewater project is $12,768,800 and the Opinion of Total Project Capital Cost is $15,234,000.

A preliminary OPCC and Project Cost Summary for connecting village properties to water are included in Appendix V. The OPCC is $852,000 and the Opinion of Total Project Capital Cost is $1,071,800.

6.7 Annual Operating Budget – Proposed Wastewater Project

A Life Cycle Cost Analysis for the recommended wastewater alternative is included in Appendix W. As shown on the Life Cycle Cost Analysis for the proposed wastewater system (Scenario 6), the annual average operation and maintenance budget for the proposed system is $146,100. Annual loan payments will depend on the level of supplementary funding that is applied to help reduce construction costs, loan term (likely a 30 or 40-year period), and funding sources.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the needs assessment, the following have been identified as the priorities for current and future wastewater capacity that should be accommodated in the community wastewater system:

- Existing properties with leachfields that are 40 or more years old;
- Existing properties with leachfields that are located in a mapped floodplain;
- Existing properties with leachfields that are located in the River Corridor;
- Existing properties with leachfields that are located within well shields for existing private and public drinking water wells; and
- Capacity to accommodate connections for future housing development and economic activity.

These priorities offer the most potential benefit in terms of water quality protection for the Mad River, other streams, and wetlands; drinking water and overall human health protection; offset of the economic hardships of replacing failing and low-functioning septic systems; and addressing the community's need for future housing development and economic activity.

Analysis of how to address the community's wastewater needs considered several potential alternatives. Based on a number of factors, the recommended alternative is for a wastewater collection system to serve the Irasville Commercial District, the Village Business District, the Village Residential District, and the ACCD Designated Village Center and 0.25-mile buffer. Wastewater treatment and disposal at a proposed facility south of Irasville at the so-called Munn Site on an undeveloped lot owned by the Town on the corner of Route 100 and Kingsbury Road is recommended. A "tertiary" wastewater treatment facility that treats the wastewater and removes nitrogen and phosphorous is necessary to accommodate the wastewater flows.

The proposed wastewater project will provide a replacement wastewater system for 105 properties with leachfields greater than 40 years old, and/or that appear to be located in a floodplain, in a River Corridor, or in a drinking water well isolation shield. These priority wastewater needs total an estimated 65,697 gallons per day. Accounting for an estimated infiltration allowance of 5,363 gallons per day, the maximum wastewater treatment and disposal capacity of 90,274 gallons per day provides approximately 19,214 gallons per day of additional capacity to support new housing and economic growth.

Further analysis of the life cycle costs and operational considerations between the potential tertiary wastewater treatment facility options should be conducted, with a recommended selection to be included in the 30% Final Design phase. Because of the potential for affecting the project design, contacting landowners for preliminary discussions on obtaining the needed easements for the project, and developing the proposed easement language should also be incorporated into the 30% Final Design phase.

The OPCC for the proposed wastewater project is $12,768,800 and the Opinion of Total Project Capital Cost is $15,234,000, and significant grants and subsidies are needed to provide affordable user rates. It is recommended that the Town pursue federal funding opportunities with the potential to provide grants and subsidies.

The OPCC for providing village water connections is $852,000 and the Opinion of Total Project Capital Cost is $1,071,800. It is recommended that the Town consider connecting properties on a voluntary basis, subject to the ability of the Town to self-finance the new water system connections.