TOWN OF RANGELEY, ME

Climate Adaptation Plan

MARCH 2022

Rangeley Municipal Wastewater Treatment Facility and Collection System

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Climate Adaptation Plan for the Rangeley Municipal Wastewater Treatment Facility and Collection System

Town of Rangeley, ME

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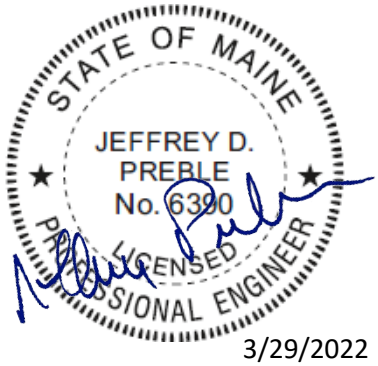
Professional Certification



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Section 1 Executive Summary

The Town of Rangeley, Maine (Town) was awarded funds by the Maine Department of Environmental Protection (Maine DEP) Clean Water State Revolving Fund (CWSRF) program to develop a Climate Adaptation Plan (CAP) for the Town's municipal wastewater treatment facility and collection system assets.

The Town owns and operates a sanitary sewer collection system that is about 9 miles in length and has four wastewater pumping stations. Most of the collection system was installed circa 1970. The Town owns and operates a municipal wastewater treatment facility on Frenchies Way. The lagoon facility is licensed to discharge up to 2.65 million gallons per week of treated sanitary wastewater on their 27-acre spray application fields during the spring, summer and fall seasons. During the winter, the facility is licensed to discharge up to an annual maximum of 29 million gallons of freeze-crystallized wastewater (through snowmaking) onto their 40-acre snow application areas. The Town's Chick Hill Wastewater Treatment Facility (WWTF) was constructed in 1997 and has not undergone a major upgrade since, although the land application fields for irrigation and snow making have been expanded since the original construction of the facility.

The goals of the CAP study are to:

i. Review the possible effects of climate change to the Rangeley system;
ii. Identify and assess possible climate change-related hazards specific to the Town's wastewater treatment facility, pumping stations, and collection system and their reliability;
iii. Evaluate potential adaptation and resiliency measures to the identified hazards; and
iv. Provide a cost-effective implementation plan to help protect the Town's critical assets and maintain wastewater collection system reliability.

Potential climate change impacts and the associated hazards applicable to the Town's assets and personnel are identified in Section 4 of the report. A risk assessment, including the likelihood of potential hazards affecting the Town's critical assets, was conducted and the findings were summarized in Section 5.2 (System-wide), Section 5.3 (Wastewater Treatment Facility), Section 5.4 (Pump Stations), and Section 5.5 (Collection System) of the report.

Hazard consequences identified that affect the entire system include poor travel conditions, hazardous working conditions, increased snow and wind loading to enclosures and panels, and extreme temperatures. The wastewater treatment facility was identified as being potentially at risk from localized flooding or ponding, utility power outages, and accessibility issues. Pump stations were identified as being potentially at risk from utility power outages, accessibility issues, increased inflow and infiltration (I/I) to the collection system and pump stations, and instrumentation and communications reliability issues. The sewer mains and manholes are potentially at risk from lake flooding, localized flooding or ponding, accessibility issues, soil erosion, and increased I/I to the collection system. In summary, 51 LF of gravity sewer and one SMH are within the FEMA 100-year floodplain.

Possible adaptation measures were identified and evaluated based on the findings of the risk assessments and are described in Section 5. The recommended adaptation measures were summarized in Section 6.1.1 (System-wide operational adaptations), Table 6-1 (Wastewater Treatment Facility), Table 6-2 (Pump Stations), and Table 6-3 (Collection System). Recommended adaptation measures can be grouped into one of two categories, operational or asset-specific measures. Operational adaptation measures are tasks or procedural changes that Town staff could undertake at minimal cost to prevent or mitigate potential hazard consequences. Asset-specific measures include

non-routine or one-time tasks, in-depth studies or evaluations, design modifications, or capital expenditures to achieve the goal of preventing or mitigating the potential hazard consequence.

Table 7-1 in Section 7 and at the end of the Executive Summary summarizes the system-wide recommended adaptation measure priorities and asset-specific adaptation measures for the WWTF, pump stations, and sewer segments. Table 7-1 includes conceptual-level project cost estimates for the asset-specific adaptation measures that will require a capital expense. Section 7 also includes a basis for the conceptual-level cost estimates and possible funding sources available to the Town for the recommended adaptation measures.

Table 1-1 CAP Implementation Plan & Estimated Costs

1- Highest Priority	2 - High Priority	3 - Moderate Priority	4 - Lower Priority

Priority	Critical Asset	Adaptation Measures	Timeline for Implementation	Estimated Equipment Cost*	Estimated Project Cost
1	System-Wide	Implement operational adaptation measures identified in the CAP report, section 6.1.1.	Ongoing	--	Included in O&M budget
1	WWTF & Pump Stations	Comprehensive communications and SCADA system upgrade to improve system reliability.	0-5 years	--	$100,000**
1	WWTF	Replace the existing snow pump and add a second pump to increase redundancy in the snow-making system.	0-5 years	$45,000 per 75 HP pump	$120,000
1	WWTF	Consider purchasing another snowmobile or winterized vehicle to improve accessibility and provide redundancy within the winter vehicle fleet.	0-5 years	$10,000-$20,000 for Snowmobile $5,000-$8,000 Winterized Side by Side or Tractor	--
1	WWTF	Consider installing life preserver ring stations around the lagoon perimeters to improve emergency rescue response time.	0-5 years	$500-$1,000	--

1	Pump Stations 1, 2, 3 and 4	Install bypass pumping assembly and pig launcher fitting to provide operational flexibility, complete station bypass, and option for future force main pigging/cleaning.	0-5 years	--	$65,000
1	Pump Stations 2, 3, and 4	Consider purchasing a portable trailer-mounted pump to increase operational flexibility and system reliability.	0-5 years	$81,000	--
2	WWTF	Improve accessibility to lagoons, fields, and monitoring wells by expanding winter road and trail maintenance and upgrading trails to snow fields and the monitoring wells.	5-10 years	--	$50,000-$75,0000 (Existing trail upgrades)
2	Pump Station No. 2	Create a written emergency operations plan in the event that the station needs septage hauling, backup power, or bypass pumping.	5-10 years	--	<$1,000
2	Pump Stations No. 1 and 2	Continue the Town's I/I reduction program, focusing on this area	5-10 years	--	<$1,000
2	Pump Stations No. 3 and 4	Upgrade the heating and cooling systems so a single thermostat controls both units.	5-10 years	--	$20,000 per station

3	WWTF	Replace the irrigation pumps from 1999 to insure continued redundancy in the irrigation field system.	5-10 years	$60,000 per 100 HP pump	$130,000
3	Collection System	Continue Town's private inflow source detection and removal program and remove illicit sewer connections.	Ongoing	--	$10,000-$20,000
3	Collection System	Continue the annual cleaning and CCTV inspection of areas suspected of higher I/I and grit build-up.	Ongoing	--	$3.00 - $5.00 / LF
4	Collection System	Evaluate drainage improvements in areas with significant local flooding or ponding of water on sewer manholes.	As needed	--	$10,000 - $20,000***
4	Collection System	Monitor cross-country sewer lines and interceptors for signs of ponding on manholes and embedment erosion.	As needed	--	--
4	Collection System	Evaluate sewer segments with higher infiltration rates for pipe relining upgrades.	As needed	--	--

*Final project cost will depend on scope of work, the extent of which is beyond the scope of this report.

** Cost based on 2018 quote from AEC Engineering for a comprehensive communications system upgrade.

***Cost estimate is for evaluation only. Cost for subsequent capital improvements not included

Section 2 Introduction

2.1 Goals & Approach

The Town of Rangeley was awarded a grant by the Maine Department of Environmental Protection (Maine DEP) Clean Water State Revolving Fund (CWSRF) program to develop a Climate Adaptation Plan (CAP) for the Town's wastewater treatment facility, pumping station, and sewer collection system assets.

The goals of the CAP are to review the possible effects of climate change, identify and assess possible climate change-related threats specific to the Town's municipal wastewater treatment facility and collection system, evaluate potential adaptation measures, and provide a cost-effective implementation plan to help protect the Town's critical assets and maintain wastewater collection and treatment system reliability. The Town has retained Wright-Pierce to assist with the development of the CAP.

The approach to developing the Town's CAP included:

1. A review of historic information on environmental hazards based on past observations by Town personnel, infrastructure data, GIS information, record drawings, and readily available Federal Emergency Management Agency (FEMA) 100-year Base Flood Elevation (BFE) floodplain mapping, including the addition of 2 to 3 feet of elevation above the FEMA 100—year BFE based on NEIWPCC's TR-16: Guides for the Design of Wastewater Treatment Works guidance on flood protection.
2. Supplemental field reconnaissance by Wright-Pierce personnel.
3. An evaluation of the effects of floodplain inundation on critical assets and system reliability as well as the ability to access critical infrastructure during periods of floodplain inundation.
4. An evaluation of the impacts from changes to precipitation patterns, storm intensity, duration, and frequency on critical assets.
5. An evaluation of weaknesses in community or utility support systems that may be impacted by climate change and the consequences on the Town's system reliability.
6. An evaluation of the impact that wind-related hazards (e.g., falling trees/utility poles/wires) may have on critical infrastructure.

2.2 Participating Personnel

The key participating personnel in the development of the CAP were the Rangeley Wastewater Treatment Superintendent and operators, the Public Works Department, local emergency management agency personnel and Wright-Pierce. The CAP has been funded by Maine DEP and is subject to Maine DEP review and approval.

It is recommended that the results of the CAP report be shared with the Town's municipal Board of Selectmen for future planning and emergency/natural disaster coordination purposes.

Section 3 Existing Conditions

3.1 Wastewater Treatment Facility

Rangeley's Chick Hill Wastewater Treatment Facility (WWTF) is located on Frenchies Way in Rangeley, ME. The Chick Hill WWTF was constructed in 1997 to replace the original activated sludge WWTF that was located on Robbins Avenue in Rangeley (now the location of Pump Station No. 2). The Chick Hill WWTF is an aerated lagoon facility with groundwater effluent discharge via seasonal spray irrigation and snowmaking. The WWTF is licensed to discharge up to 2.65 million gallons per week of treated sanitary wastewater onto their 27-acre spray application areas during the spring, summer and fall seasons. During the winter, the facility is licensed to discharge up to an annual maximum of 29 million gallons of freeze-crystallized wastewater (through snowmaking) onto their 40-acre snow application fields. The Town monitors groundwater quality by semi-annual groundwater sampling from series of groundwater observation wells around the WWTF site.

Raw wastewater is collected by a series of gravity sewers into Pump Stations No. 1 and No. 2 located in the urban center of Rangeley. Flows collected at Pump Station No. 1 are pumped to gravity sewer on School Street that flows toward Pump Station No. 2 at the end of Robbin Avenue. Wastewater flows to Pump Station No. 2 pass through a manual bar rack and aerated grit chamber to remove large debris, rags and grit that could damage pumps and other treatment equipment before entering the pump station's wetwell. Flows are then pumped from Pump Station No. 2 to Pump Station No. 3 on Mendolia Drive and from Pump Station No. 3 to Pump Station No. 4 on Loon Lake Road and then onto the Chick Hill WWTF.

Once the wastewater is pumped to the WWTF, it enters a flow distribution structure and is directed to one of two 2.5 MG aerated lagoons for secondary treatment. The flow is then directed to the 27 MG capacity storage lagoon for final solids settling. At the time of this report, there was approximately a 1-foot sludge blanket at the bottom of the lagoon. The treated effluent from the storage lagoon is gravity fed to the Operations Building, where it goes through a strainer basket and is directed to one of two spray rooms. During the spring, summer, and fall, the flow is pumped through one of two spray field effluent pumps to the spray irrigation fields. During the winter, the flow is pumped through a single snow field effluent pump to the snow fields. The two spray field effluent pumps are VFD-controlled and are manually alternated each day. A 75-HP air compressor and air dryer are also located in the Operations Building. The air compressor is used to inject air into the snow field effluent pump discharge force main, as needed, during snowmaking process to reduce the risk of freezing of the snowmaking equipment during exceptionally low temperatures. A 45-kW propane generator is available to provide backup power to all the major process equipment in the WWTF.

The Town currently has three operational spray irrigation fields permitted for seasonal land application of the treated effluent (Fields 2, 6, and 7) and land reserved for two additional irrigation fields (Fields 1 and 3) to be constructed if future wastewater treatment capacity demand exceeds the capacity of the currently operating spray fields. On average, approximately 200,000 gallons per day of effluent are sprayed onto each field. The treated effluent is pumped through a series of HDPE trunk lines with perpendicular branching lines that create a distribution network of spray irrigation lines approximately 7 miles in length and with 90 spray heads.

Two currently licensed snow application fields (Fields No. 4 and 5) are used during the winter to freeze-crystallize the wastewater effluent by making snow, sometimes referred to as "snowfluent", described in Section 3.1.5. Both wastewater effluent and air are needed to create snowfluent, which are mixed within and discharged from snow spray guns. The wastewater flows through the center of the snow spray gun nozzle and compressed air is introduced

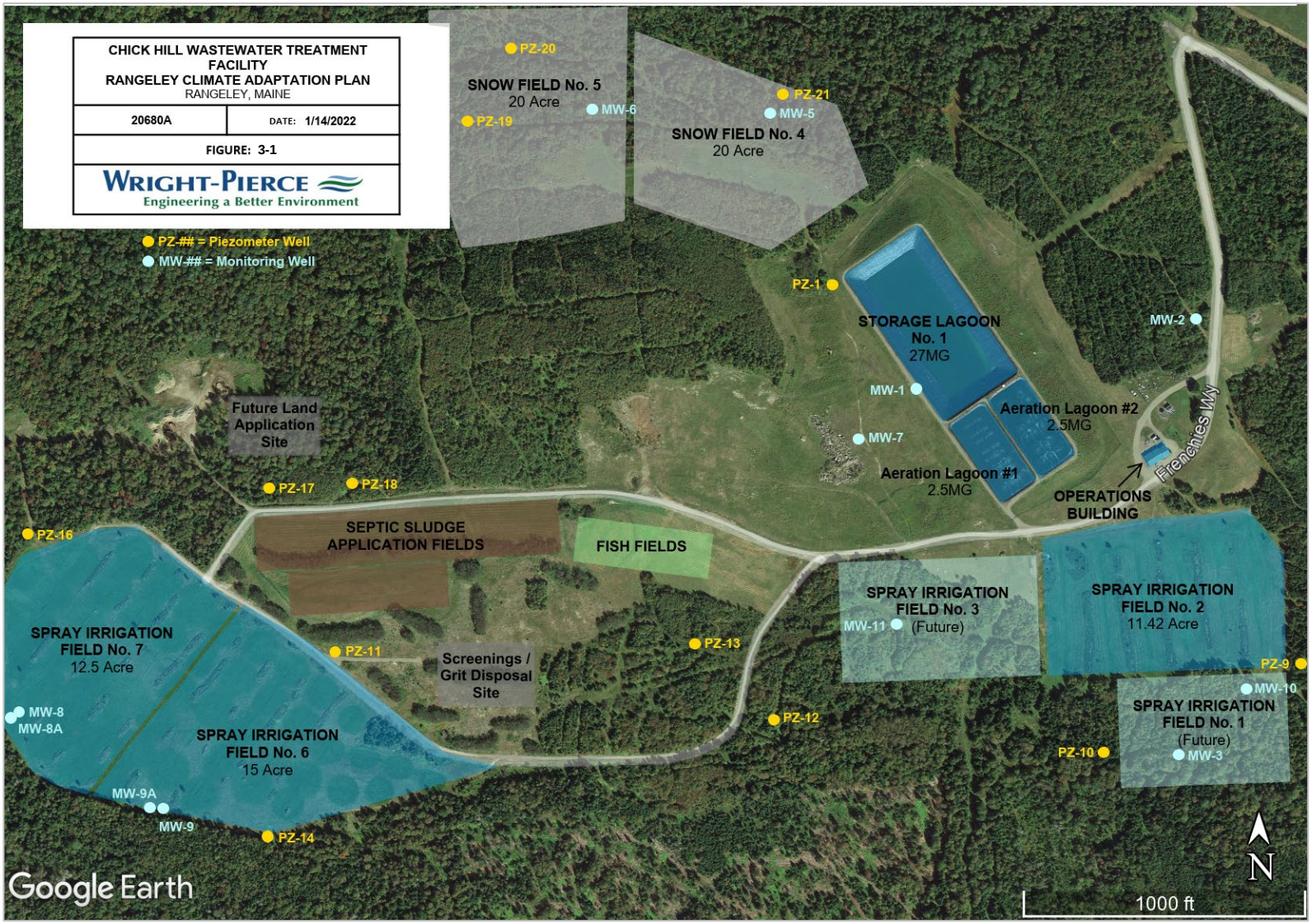
through a separate cavity on the edge of the nozzle. The wastewater and compressed air mix in the head of the spray gun and discharge through the nozzle, freezing on contact with the outside air, and thereby creating freeze-crystalized wastewater droplets or snowfluent. To keep the lines from freezing, all of the snow spray guns are run at the same time and then drained daily. In recent years, an average of about 17 million gallons of 'snowfluent' has been discharged onto the snow fields each winter. There are currently seven snow spray guns in use, with three standby units available if needed.

There are also two separately licensed biosolids land application fields that accept septic sludge and biosolids from 13 surrounding townships. These fields are used to direct apply approximately ½ million gallons of septage per year. A local fish hatchery facility also contracts with the Town for biosolids disposal services at the wastewater facility by land-applying the fish hatchery biosolids onto a "fish field" located on site approximately once a week.

Figure 3-1 provides a site map of the Chick Hill WWTF.

Using existing system information and data collected from a site inspection conducted by Wright-Pierce staff on August 19th, 2021, site conditions and possible climate change-related hazard consequences were reviewed. Our observations of existing conditions at the Chick Hill WWTF are summarized below for the major unit process and assets that could be affected by the climate change hazards described in Section 4.

Figure 3-1 Rangeley Wastewater Treatment Facility



3.1.1 Aeration and Storage Lagoons

Observations:

- Aeration Lagoon No. 1 and No. 2 capacities are each 2.5 million gallons.
- During normal operations, influent is pumped from Pump Station 4 past an air release valve and then the flow is split between aeration lagoon No. 1 and No. 2. Flow is then directed to the main storage lagoon.
- The Storage Lagoon has a 27-million-gallon capacity, bring the total lagoon system capacity to 32 MG.
- At the time of the site visit, the Storage Lagoon had just been emptied to the irrigation fields and there was approximately 1.5 million gallons in the lagoon and 1 foot of sludge depth.
- The Storage Lagoon water level is annually drawn down to provide additional storage capacity during the winter months when the irrigation fields cannot be used and effluent discharge capacity is reduced.
- An access path to the lagoons is plowed during the winter but does not extend around the perimeter of the Storage Lagoon. Snowmobiles allow access to the far side of the Storage Lagoon during winter.
- Due to the large surface area of the lagoons, a 1" rain event will add 184,000 gallons of rainwater directly into the lagoons and reduce their effective storage capacity by an equivalent amount.
- The entire lagoon is surrounded by a gated and locked fence which is inspected weekly. The facility entry points are gated and have warning signage.

Photos:

3.1.2 Operations Building

Observations:

- The building was constructed in 1997 and serves as the main operational and administrative building at the WWTF site.
- Major process equipment includes an effluent pumps strainer basket, two effluent spray irrigation field pumps, one effluent snow field pump, a 75-HP air compressor, and associated process piping.
- The irrigation field pumps were installed in 1997 and are Centrifugal Aurora Pumps. They have 100 HP motors with the capacity to pump 1550 GPM at 176 TDH.
- The snow pump was installed in 1999 and is a vertical turbine Ingersoll-Dresser Pump. It has a 75 HP motor with the capacity to pump 250 GPM at 809 TDH.
- The snow pump currently does not have any redundancy, but there are provisions to add a second snow pump in the future including a designated area on the floor and appropriate process piping fittings to accommodate the addition of a second pump.
- The operations building has cameras watching the building entries as well as the facility main entry.

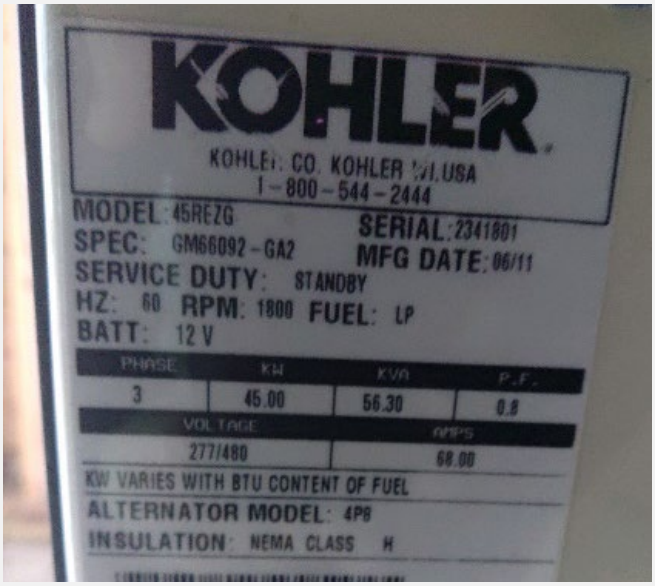
Photos:

3.1.3 WWTF Generator

Observations:

- The WWTF has a 45-kW propane-fueled backup generator that powers the entire facility, including all major process equipment.
- The generator and backup power supply system was installed in 2003.
- The generator has a 500-gallon liquid propane fuel storage tank located on site. This volume corresponds to a 1-week capacity at continuous operation at typical loading.
- There is currently one local propane delivery service (Dead River Company) who has a local on-site propane storage capacity of 30,000 gallons.
- The generator is housed inside a small building adjacent to the Operations Building.
- Due to the potential for extreme low atmospheric temperatures in Rangeley, the generator is equipped with a cold weather-package that includes provisions to keep the generator engine fluids from freezing.

Photos:



3.1.4 Irrigation Fields

Observations:

- The spray irrigation field equipment includes a network of HDPE effluent carrier pipes, valves and sprinkler heads.
- The spray irrigation fields are elevated above the WWTF and treatment lagoons to allow the effluent carrier lines to be drained by gravity when not in use during the winter months.
- Grass is harvested in the spray fields on a routine basis during the growing season by Wastewater Department staff to facilitate operations and improve access to the irrigation equipment.
- The irrigation fields and groundwater observation wells are currently accessible by a series of unpaved trails and gravel access roads.
- The Wastewater Department's staff use a combination of work trucks and all-terrain vehicles (ATVs) to access the irrigation fields and groundwater monitoring wells.
- Staff have noted that trees have fallen across trails around the facility in the past, temporarily obstructing access to irrigation fields.
- The access roads to the irrigation fields are seasonally maintained when the fields are in operation.

Photos:

3.1.5 Snowfields and Snow Spray Guns

Observations:

- The access trails to the snowfields are not maintained during the winter operating months and the snowfields and snow spray guns are only accessible by snowmobile.
- One of the Wastewater Department's two available snowmobiles is near the end of its useful life (purchased in 1989) and is becoming unreliable.
- The particular band of snow guns that are currently installed are no longer available from the original manufacturer, but the Town has three spare guns in stock that can be used to repair or replace the existing snow guns, if necessary.
- The outdoor air temperature must be below 32^{O}F to make 'snowfluent'. Therefore, the Town must store effluent in the Storage Lagoon when winter atmospheric temperatures rise above freezing during the winter months when the spray irrigation fields are not available.
- The operators add supplemental compressed air to the fluid stream in the spray guns to increase the effluent fluid pressure and prevent the effluent from freezing in the spray gun nozzle when temperatures are lower than about 15^{O}F.
- When the 'snowfluent' pile reaches a certain height such that it can interfere with the snow gun's operation, Wastewater Department staff must manually remove snow around the spray guns.

Photos:

3.2 Pump Stations

Rangeley's municipal sewer collection system has four wastewater pumping stations that convey wastewater to the Chick Hill WWTF on Frenchies Way in Rangeley, Maine for treatment. The lower half of the sewer collection system is gravity fed into Pump Station No. 1 on Main Street and is then pumped to a terminus sewer manhole on School Street. Wastewater pumped from Pump Station No. 1 then flows by gravity sewer to Pump Station No. 2, which is located on Robbins Avenue. Pump Station No. 2 collects most of the upper portion of the sewer collection system in addition to flows from Pump Station No. 1. Historically, Pump Station No. 2 was the location of the old Rangeley WWTF before the Chick Hill WWTF was constructed and the old WWTF was decommissioned and demolished in 1997. Pump Station No. 2 includes a manually cleaned bar rack and an aerated grit chamber upstream of the Pump Station No. 2 wetwell. Flows from Pump Station No. 2 are pumped directly to Pump Station No. 3 on Mendolia Road and then on to Pump Station No. 4 on Loon Lake Road and finally to the WWTF on Chick Hill Road. In this way, Pump Stations No. 3 and No. 4 lift the collected wastewater from Pump Station No. 2 to the WWTF without additional sewer flows entering the collection system beyond the wetwell of Pump Station No. 2, except for the wastewater flows from the school.

The pump stations operate with two pumps running in a lead/lag sequence. These pumps turn on based on controls associated with the wet well depth. If a lead pump does not turn on or is overwhelmed, the lag will turn on to assist in handling the flows. The lead and lag pumps rotate every cycle. Each station has generators that can handle the full electrical loading of the station. In addition, a local company can be contacted to rent a portable generator if necessary.

Appendix A includes a GIS-based map of Rangeley's municipal wastewater pump stations and sewer collection system. The current FEMA 100-year floodplain has been overlaid onto the sewer system GIS map in Appendix B to help identify area that may be susceptible to flooding.

The pump station drywell entrances and equipment elevations were compared to the FEMA 100-year base flood elevation and are summarized in Table 2-1 at the end of this section.

Site conditions at each pump station and possible climate change-related hazard consequences were evaluated using existing wastewater collection system information and data collected from a site inspection conducted by Wright-Pierce staff on August 19th, 2021. Our observations of existing conditions at each station are summarized below for each pump station.

Table 3-1 Pump Station Elevation Overview

Pump Station Identification	Existing Grade Elevation (ft.)	Wetwell / Entrance Elevation (ft)	Pump Motors	FEMA 100-year BFE (NVGD 29)	100-year BFE +3ft (ft.)
Pump Station No. 1	1523.75 (NVGD 29)	1524.67 (NVGD 29)	1525.67	1520	1523
Pump Station No. 2	1531.33 (NVGD 29)	1530.94 (NVGD 29)		1528	1531
Pump Station No. 3	1628.50 (NVGD 29)	1629.00 (NVGD 29)		1520	1523
Pump Station No. 4	1743.50 (NVGD 29)	1744.00 (NVGD 29)	1744.50	1520	1523

Table 3-2 Pump Station Generator Elevation Overview

Pump Station Identification	Generator Type	Generator Elevations	FEMA 100-year BFE (ft.)	100-year BFE +3ft (ft.)
Pump Station No. 1	Kohler Power Systems 63 kW	4" Generator Pad Inside → 1525.17	1520	1523
Pump Station No. 2	Kohler Power Systems 100 kW	6-8" Generator Pad outside with 2" above grade → 1532.00	1528	1531
Pump Station No. 3	Kohler Power Systems 100 kW	6-8" Generator Pad outside with 2" above grade → 1628.67	1520	1523
Pump Station No. 4	Kohler Power Systems 100 kW	6-8" Generator Pad outside with 2" above grade → 1743.67	1520	1523

3.2.1 Pump Station No. 1

Pump Station ID	PUMP STATION NO. 1
Physical Address (911 Address)	2574 Main Street
Pump Type	Suction Lift
Pump Manufacturer	Gorman-Rupp
No. of Pumps	2
Motor Size	15 HP
Year Constructed	2005. Construction finished 2006
Connection to Utility Power	CMP- Overhead
Emergency Power Source	Automatic standby propane generator (63 KW)
Instrumentation & Controls	Pressure Transducer with low and high float switches. Flowmeter
Motor Control	VFD

NOTES:

- Pump Station is outside of current FEMA 100-year floodplain.
- 1,000 gallon propane tank for generator.
- Only 40 ft of static head to Pump Station No. 2.
- Wetwell is 22 feet deep; station used to be underground ejector station.
- Finished floor of pump station control building is roughly 5-6 feet above the average water level in Rangeley Lake.
- Broken pipelines have allowed lake water to enter wetwell in the past.
- No bypass assembly or pig launcher present.
- Town has on-call services with local septage hauler in the event of station failure.

- Operators mentioned that the pressure transducer sometimes doesn't read the wet well water level appropriately. Regular calibration and cleaning should prevent this, but when this happens, it's possible that the high water alarm would not indicate an issue until the backup mechanical floats activate the pumps. This could lead to the Pump Station No. 1 pumps then activating and possibly overwhelming the smaller Pump Station No. 2 wetwell just upstream of Pump Station No. 1 during high flow periods.
- Common alarms with a few indications (high level, low level, high temp, low temp, pump on/off).
- You can hear when the pumps are working too hard.

3.2.2 Pump Station No. 2

Pump Station ID	PUMP STATION NO. 2
Physical Address (911 Address)	29 Robbins Ave
Pump Type	Suction Lift
Pump Manufacturer	Gorman-Rupp
No. of Pumps	2
Motor Size	40 HP
Year Constructed	2008- Pumps replaced
Connection to Utility Power	CMP- Underground connection
Emergency Power Source	Automatic standby propane generator (100 KW)
Instrumentation & Controls	Pressure transducers with manual read-out at the station. Backup low and high control floats.
Motor Control	Allen Bradley 40 HP VFD. Installed in 2018

NOTES:

- Pump Station is outside of current FEMA 100-year floodplain
- Constructed on the original WWTF site.
- Manually cleaned bar rack and aerated grit chamber (outdoors) are original to that facility.
- Bar rack is cleaned every day to reduce ragging
- Grit chamber can be bypassed to direct incoming flow directly from bar rack to wet well
- Wetwell is 10 feet deep and fills up quickly. This station is the top priority in emergency situation.
- Flow coming into both structures can be shut off and isolated via an isolation gate located in the aerated grit chamber
- Isolation valve for discharge force main is buried in the yard.

- Common alarms with a few indications (high level, low level, high temp, low temp, pump on/off).
- No bypass assembly or pig launcher present.
- Recent pandemic has put a strain on this pump station with more rags present and higher sustained flows.
- Single 1,000-gallon propane tank for the standby power generator.
- Station receives flow from all of town.
- There appeared to be adequate site access.
- Bollards are present to protect the station from vehicles.
- The station's access drive is maintained by the Town Wastewater Department during the winter.
- The general design layout of Station No. 2 is the same as Stations No. 3 and No. 4.
- You can hear when the pumps are working too hard.

3.2.3 Pump Station No. 3

Pump Station ID	PUMP STATION NO. 3
Physical Address (911 Address)	23 Mendolia Rd
Pump Type	Suction Lift
Pump Manufacturer	Gorman-Rupp
No. of Pumps	2
Motor Size	40 HP
Year Constructed	2008- pumps replaced new motor in 2018
Connection to Utility Power	CMP- underground connection- meter across the street.
Emergency Power Source	Automatic standby propane generator (100 KW)
Instrumentation & Controls	Pressure transducers with manual read-out at the station. Backup low and high control floats.
Motor Control	Allen Bradley 40 HP VFD. Installed in 2018

NOTES:

- Pump Station is outside of current FEMA 100-year floodplain
- New pump motors were installed in 2018. Extra motor is stored at Pump Station 3.
- All other process equipment and piping look to be original to station's construction (2008).
- Davit crane mount available for pump retrieval.
- Wet well is cleaned annually.
- Shut-off valve present to prevent backflow from vertical pipe sections.
- Utility power brownouts have historically caused VFD failures, requiring the VFD to be manually reset by the operators.
- No bypass assembly or pig launcher present.
- Two 1,000 gallon propane tanks for generator.

- Syphon Line from Pump Station 3 to discharge, where it drains to Pump Station 4.
- Common alarms with a few indications (high level, low level, high temp, low temp, pump on/off)
- Adequate site access and bollards, but gravel rather than paved
- Wetland located at the bottom of an adjacent hill- significant change in grade.
- Pump cycles every time
- You can hear when the pumps are working too hard.
- HVAC system is on two separate thermostats for heating and cooling, which causes interference issues in the winter when the heaters are running.
- Same pump station layout as Pump Station No. 2 and Pump Station No. 4.

3.2.4 Pump Station No. 4

Pump Station ID	PUMP STATION NO. 4
Physical Address (911 Address)	211 Loon Lake Rd
Pump Type	Ultra V-Series Suction Lift
Pump Manufacturer	Gorman-Rupp
No. of Pumps	2
Motor Size	40 HP
Year Constructed	2008- Pumps replaced
Connection to Utility Power	CMP- underground from nearby telephone pole
Emergency Power Source	Automatic standby generator (100 KW)
Instrumentation & Controls	Pressure transducers with manual read-out at the station. Backup low and high control floats.
Motor Control	Allen Bradley 40 HP VFD. Installed in 2018

NOTES:

- Pump Station is outside of current FEMA 100-year floodplain
- Generator was installed in 2008 but replaced in 2010 because the engine oil froze and damaged the generator engine when local temperatures were -20°F.
- Two 1,000 gallon propane tanks onsite for standby generator. About 5,000 gallons of propane consumption per year.
- Local propane supplier automatically refuels the station's propane tanks after 48 hours of power loss.
- Station alarms present: high water level, low water level, high temp, low temp, pump on/off.

- Accessibility has historically been an issue during intense storms with high winds due to trees down across Loon Lake Road.
- Utility power brownouts have historically caused VFD failures, requiring the VFD to be manually reset by the operators.
- No bypass assembly or pig launcher present.
- Gravel driveway; adequate site access and bollards present to protect station from vehicles.
- Drainage ditch along road shoulder with culvert under pump station driveway. Doesn't appear to be high risk of surcharge or influence on station if adequately maintained.
- Large trees located about 15 feet from the powerlines, but none overhanging lines.
- HVAC system is on two separate thermostats for heating and cooling, which causes interference issues in the winter when the heaters are running
- You can hear when the pumps are working too hard.

3.3 Collection System

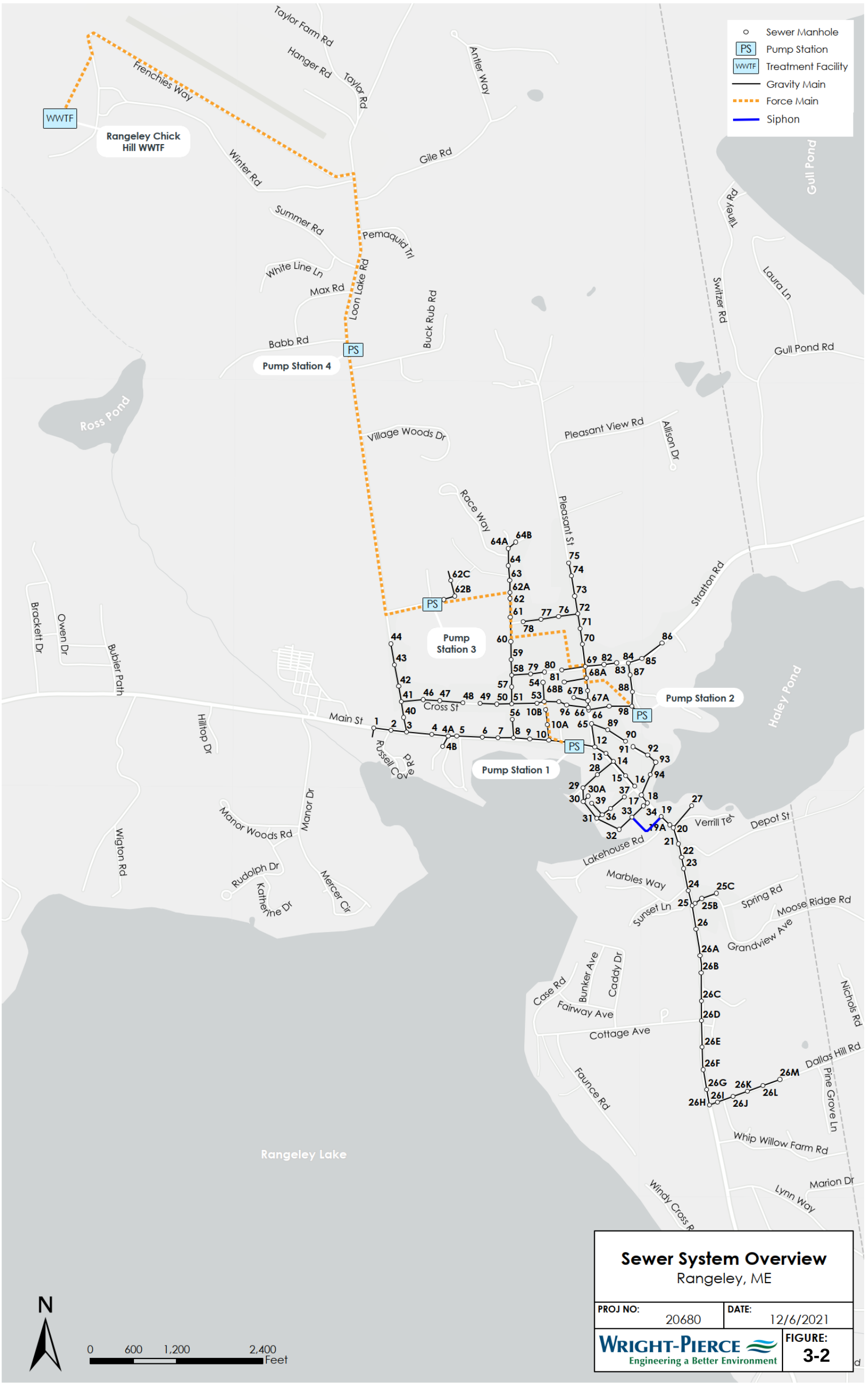
Rangeley's municipal sewer collection system serves 510 accounts, including year-round and seasonal residences and commercial businesses in the Town of Rangeley. There are no industrial users connected to the sewer system at present. Wastewater is conveyed to the Chick Hill WWTF by a mix of low-pressure force main pipes and gravity sewers. There is also a 6-inch diameter single barrel cast iron siphon that conveys flows from the southern portion of the collection system under the outlet stream connecting Haley Pond and Rangeley Lake toward the downtown area. The municipal collection system includes about 9 miles of asbestos-cement and PVC sewer mains, 128 sewer manholes, and four publicly owned pumping stations. Figure 3-2 below shows an overview of the Town's municipal wastewater collection system, and Appendix B includes a GIS-based map of the sanitary sewer system including the FEMA 100-year and 500-year floodplains.

Most of the collection system pipes are currently constructed of asbestos-cement (transite) pipe material. Asbestos-cement pipes are replaced with new PVC pipes as the sewer mains are replaced. The Town of Rangeley contracts for annual sewer cleaning and inspection services with a local contractor. In a typical year, 70-80% of the collection system is cleaned and inspected, giving the Town excellent and up-to-date records of the sewer system condition.

Anecdotally, broken sewer pipes allowed significant groundwater near Rangeley Lake to enter the sewer system in the past. However, at present, there is currently no significant groundwater infiltration in the sewer system. The Town also contracts for sewer relining services on an as-needed basis to help extend the life of the sewer mains and limit excessive groundwater infiltration into the system. The most significant sources of extraneous water entering the sewer collection system are sump pumps and floor drains conveying groundwater and stormwater from the basements of private residences and commercial businesses.

A limited portion of the sewer collection system appears to be located in low-lying and flood prone areas. The areas that were identified as within the FEMA 100-year floodplain can be seen in Figure B-1 in Appendix B. Additional details on the sewers within the FEMA 100-year floodplain is summarized in Table 5.3 and is discussed Section 5.5 of the report.

Figure 3-2 Rangeley Collection System Overview



Section 4 Description of Climate Change Impacts

4.1 Potential Climate Change Impacts

Climate change is a term that refers to a change in the average weather conditions or the time variation of weather patterns within a defined geographic region. Climate changes can have negative impacts on service utilities and should be considered as part of a utility's long-term planning process. Climate change can have amplified effects in certain geographic regions, depending on the region's topography, proximity to waterbodies and typical meteorological conditions. The first step in considering the potential impacts of climate change on a utility is to determine which impacts are most applicable to the utility's geographic region. Potential climate change impacts and the associated hazards applicable to the Town of Rangeley's wastewater collection and treatment system assets and Wastewater Department personnel are discussed in detail in the following sections. Hazards applicable to Rangeley's municipal wastewater collection and treatment system have also been summarized in Table 4-1 at the end of Section 4.

Utility climate adaptation planning should also consider how climate change may affect future service capacity needs and a utility's ability to meet them. According to projections prepared by the State of Maine Office of Policy and Management, the Town of Rangeley is projected to see a small population increase of 1.6% between 2016 and 2036 (Maine State Economist Department of Administrative and Financial Services, 2018). If actual wastewater capacity demand matches these projections, the Chick Hill WWTF should have adequate capacity over the 20-year planning period to accommodate the additional expected demand.

Rangeley's wastewater collection and treatment system experiences periods of excess inflow and infiltration (I/I) during severe wet weather events and periods of heavy snowmelt and runoff. As previously mentioned in Section 3, excess water entering the collection system is mainly attributed to sump pumps and floor drains connected to the sanitary sewer. Excess water in the collection system effectively reduces sewer pipe capacities and treatment and storage capacity at the Chick Hill WWTF. Reduced sewer capacity can limit the collection system's ability to accommodate additional future wastewater demand and increases the risk of sanitary sewer overflows (SSOs). At the Chick Hill WWTF, excess flows increase energy consumption by increasing pump run times and effectively decrease available lagoon storage capacity. Decreased lagoon storage capacity is of particular concern during the "shoulder seasons" of late fall and early spring when it is too warm to make 'snowfluent' but is still outside of the permitted spray irrigation season in Rangeley's waste discharge license.

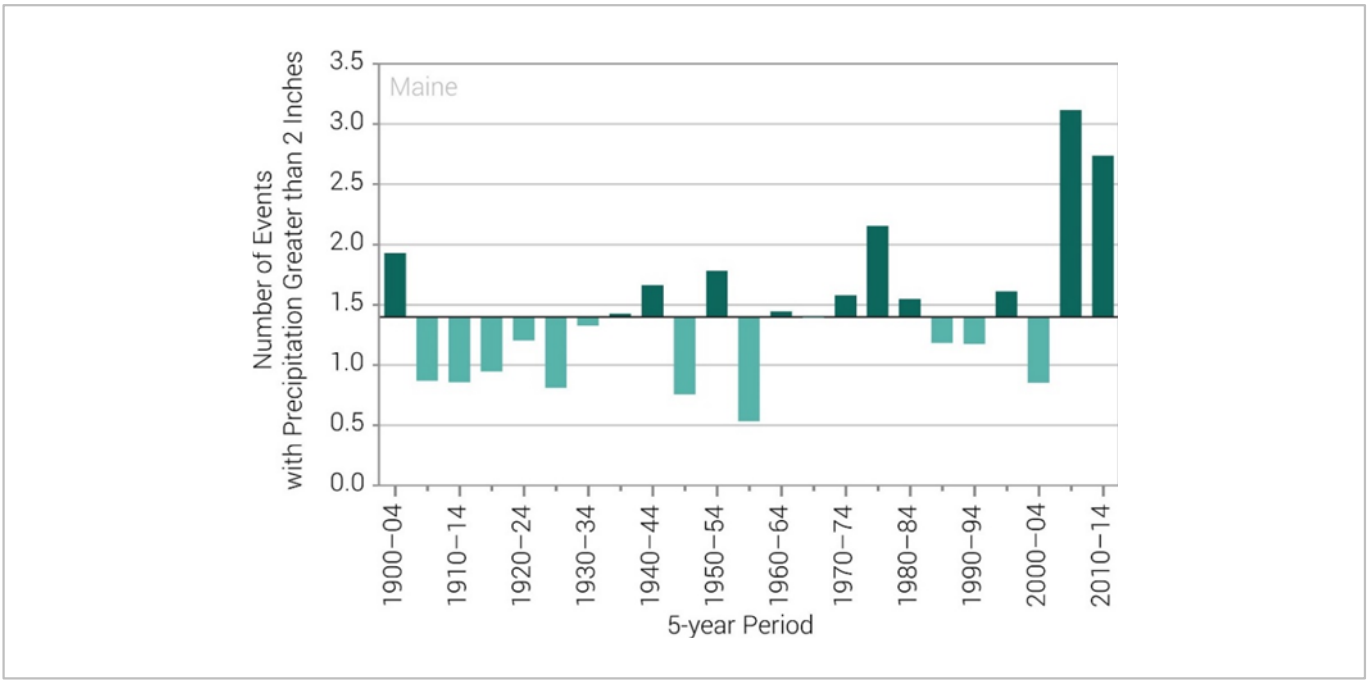
Without specific I/I rates from flow metering to provide a baseline for current I/I in the collection system, it would be difficult to conclude that potential additional I/I from changing precipitation patterns will have a significant impact on collection system and WWTF capacity over the next 20 years. However, in general, it can be assumed that more intense and/or prolonged storm events will generate more runoff, especially during period of significant snowmelt when the ground is still frozen and has limited ability to assimilate runoff via infiltration, leading to increased rainfall-induced inflow into the sanitary sewers via basement sump pumps and floor drains after heavy precipitation events. Infiltration into the collection system will also tend to increase over time as pipes and manholes age and deteriorate.

4.1.1 Precipitation and Extreme Weather Trends

The Maine Climate Council's Scientific and Technical Subcommittee published a report in August 2020 that summarizes observed climatic changes and expected effects of continued climate change in Maine. Statewide, total annual precipitation (rainfall and snowfall) has increased by about 6.1 inches since 1895 (MCC STS, 2020). The most pronounced increase has occurred over the last 20 years, with Maine experiencing more frequent and intense

extreme precipitation events. The Fourth National Climate Assessment, published in 2017, also showed that heavy precipitation events in the Northeast have increased at a higher rate than any other region in the United States (Easterling et al. 2017, Kunkel et al. 2013, USGCRP, 2017, as cited in MCC STS, 2020). Large infrequent rain events (within the annual 99th percentile precipitation) have also increased by 55% in the Northeast during the last 50 years (Easterling et al. 2017, as cited in MCC STS, 2020). At nine out of the eleven long term weather stations in Maine, the highest number of days with 2 inches or more of precipitation occurred within the most recent decade. Figure 3-2 is a graphical depiction of extreme precipitation events in Maine since 1900. Each bar represents the five-year average number of storm events with precipitation totals of 2 inches or greater in relation to the long-term average, represented by the horizontal line across the chart.

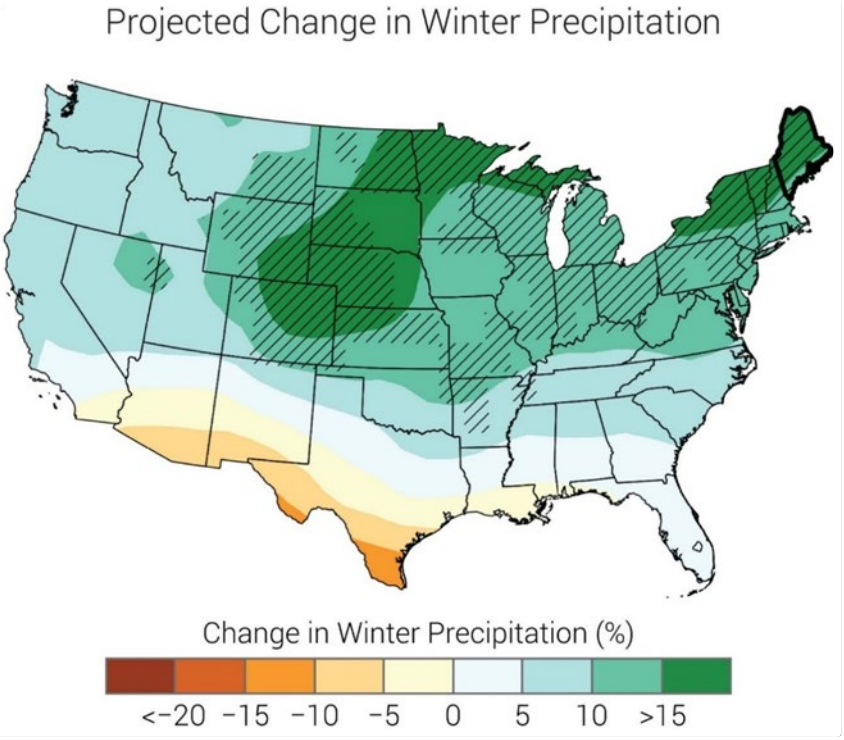
Figure 4-1 Observed Number of Extreme Precipitation Events



Source: Runkle et al., 2017

Most current climate models predict that total annual precipitation in Maine will increase over time, with a significant increase in precipitation occurring as rainfall during the summer and early fall (Collow et al. 2016; Frie et al. 2015; Hoerling et al. 2016; Howarth et al. 2019; Huang et al, 2017, as cited in MCC STS, 2020). Some studies predict an increase in winter precipitation in Maine as well. Figure 3-1 shows predicted changes in total annual winter precipitation across the country within 50 to 70 years. By these modeled estimates, the Rangeley area is expected to see a 10-15% average increase in annual winter precipitation (Runkle et al. 2017). It should be noted that climatic models are limited in their ability to predict the exact timing of precipitation with respect to changing seasonal atmospheric temperature trends, so it cannot be concluded if the predicted precipitation increases shown in Figure 4-1 will take the form of increased snowfall, rainfall, or both.

Figure 4-2 Projected Winter Precipitation Changes



Source: Runkle et al., 2017

4.1.2 Storm Recurrence Intervals and Flooding

The recurrence interval of a certain sized precipitation or storm event is defined as the amount of time that elapses between events of that same size. For example, if a year passes between two storm events with 1 inch of precipitation, the recurrence interval of a 1-inch storm in this example is said to be one year.

The National Weather Service tracks historical precipitation events reported from permanent weather stations across the country. This historical precipitation record is publicly available and can be used for long-term utility resiliency planning purposes to help predict the expected future recurrence of certain storms, using their average recurrence interval. Of particular interest are large and intense storms that can cause hazardous travel conditions, flooding and property damage. These severe storms tend to occur infrequently, so their recurrence interval is relatively large. Examples of these infrequent storms are the so-called "100-year" or "500-year" storm, meaning the time that has elapsed between these storms has been, on average, over 100 or 500 years, respectively.

The Federal Emergency Management Agency (FEMA) periodically performs flood insurance studies using historical precipitation data from the National Weather Service, topographic information, land cover information and sophisticated hydrologic modeling software programs to model and predict the extent of expected flooding in a region from storms equivalent in size and intensity to the 100-year and 500-year storm events. FEMA publishes Flood Insurance Rate Maps (FIRMs) as part of these studies to help depict the modelling results and the potential extent of

flooding during these severe storms. These maps are available to the public and are an excellent resiliency planning resource for communities and utilities.

The New England Interstate Water Pollution Control Commission (NEIWPCC) also publishes recommended guidelines and design standards for wastewater infrastructure in its Technical Report #16 (TR-16), Guides for the Design of Wastewater Treatment Works. TR-16 includes design standards for wastewater infrastructure in or adjacent to the published FEMA 100-year and 500-year floodplains. TR-16 recommends that new wastewater facilities such as pump stations and WWTFs be designed to protect their critical equipment against structural or functional damage by locating the critical equipment at least 3 feet above the published FEMA 100-year base flood elevation (BFE) and non-critical equipment at least 2 feet above the 100-year base flood elevation. Critical equipment is further defined in TR-16 as:

"conveyance and treatment system components identified for protection including, but not limited to, all electrical, mechanical, and control systems associated with pump stations and treatment facilities that are responsible for conveyance of wastewater to and through the treatment facility to maintain primary treatment and disinfection during the flood event. Other equipment that, if damaged by flood conditions, will prevent the facility from returning to pre-event operation after cessation of flood conditions is also critical equipment" (TR-16, 2016).

TR-16 also recommends that critical and non-critical equipment in existing treatment facilities and pump stations constructed prior to the publishing of NEIWPCC's updated guidelines on flood protection be protected in a similar manner against the published 100-year base flood elevation, where practical. In situations where it is not technically or financially feasible to protect these facilities to the 100-year base flood elevation, it is recommended that both critical and non-critical equipment be protected from flooding to the greatest extend practical.

GIS-based maps of Rangeley's municipal sewer collection system and WWTF, overlaid with the 2018 Preliminary FEMA 100-year and 500-year floodplain layers, were generated as part of this study to help visualize the potential extent of flooding from these storm events in relation to the municipal wastewater system assets. These maps are included in Appendix B.

4.1.3 Summary of Potential Climate Change Impacts

Based on a review of the available historic data on observed weather trends and predicted future climate changes from current climatic models, it appears that climate change in the Rangeley area could potentially manifest in the form of larger shorter-duration, high precipitation intensity storms occurring more frequently than in the past. Published climate change data and research also appears to indicate that annual average precipitation in the Rangeley area is likely to increase over time as part of a projected trend towards wetter summer, fall and winter seasons. From a resiliency planning perspective, it is important to consider the potential financial and social impacts that more frequent severe flooding could have on the Town of Rangeley and the additional strain it could put on the municipal wastewater system's long-term reliability.

4.2 Potential Hazards

The projected climate changes described in the previous section could cause or contribute to potential hazards to Rangeley's wastewater infrastructure that are summarized in Table 4.2.1 and 4.2.2 below. Table 4-1, at the end of this section, provides a summary of the climate change impacts, potential hazards, and associated hazard consequences that were analyzed as part of the Climate Adaptation Plan study.

4.2.1 Potential Flood Hazards

Hazard: Lake Flooding

Description:	Flooding of the land adjacent to the banks of rivers, lakes, and streams because of precipitation, snow melt or a combination of both. Flooding can cause catastrophic damage to equipment and structures, render critical assets temporarily inaccessible and impact emergency response time.
Applicability:	Rangeley's Chick Hill WWTF and four major wastewater pump stations are not within or nearby the 100-year floodplain of Haley Pond or Rangeley Lake. There are some segments of the wastewater collection system that lie within or nearby the 100-year floodplain.

Hazard: Flash Flooding

Description:	Flooding that begins within 6 hours of heavy rainfall or other causes (e.g., dam or levee breach). Flooding can cause catastrophic damage to equipment and structures, render critical assets temporarily inaccessible and impact emergency response time. Flash flooding can be a greater risk for urban areas with increased percentages of impervious ground cover and for low-lying areas without stormwater infrastructure.
Applicability:	The risk of flash flooding in Rangeley would likely be localized to relatively large impervious areas such as the denser urban downtown, parking lots, and paved roadways. Pump Stations No. 1 and No. 2 are both located in the urban part of Rangeley. However, there is stormwater infrastructure present in the impervious areas surrounding Pump Station No. 1 and neither station has experienced significant flooding during historical flash flood conditions.

4.2.2 Potential Storm Characteristics Hazards

Hazard: Increased Storm Intensity

Description:	Storm intensity is a measure of precipitation magnitude over time. As storm intensity increases, greater magnitudes of rainfall occur over a specific period. As the rate of precipitation increases, the rate of runoff and stormwater flows also increases. If precipitation outpaces the rate at which soil can absorb the precipitation and the soil then becomes saturated, increased surface runoff and ponding can occur. This can lead to secondary hazards such as flooding, storm surge in waterbodies, poor travel conditions, power and communication systems outages, SSOs, accessibility issues, and soil destabilization.

Applicability: Secondary hazards such as power outages, localized flooding and poor travel conditions associated with increased storm intensity could significantly impact several of the Town's critical assets and operational procedures. Due to its geographic location, Rangeley has experienced relatively frequent prolonged power outages stemming from intense rainstorms and blizzard conditions coupled with high winds.

Hazard: Increased Storm Duration

Description: Storm duration is the amount of time elapsed between the start and end of precipitation. An increase in the average storm duration could translate to more prolonged storm events and high groundwater conditions, leading to secondary hazards such as flooding, poor travel conditions, power outages, SSOs, and accessibility issues.

Applicability: Prolonged town-wide utility power and telecommunication outages and localized flooding in some low-lying and flood-prone areas from increased storm duration could affect system reliability and operational procedures. Rangeley has historically experienced relatively frequent and sometimes prolonged utility power outages, including an 8-day power outage in November 2019 and a 2-week power outage in 1997.

Hazard: Increased Storm Frequency

Description: Storm frequency is a measure of the time between each storm event. As storms become more frequent, secondary hazards such as flooding, poor travel conditions, power and communication systems outages, SSOs, and accessibility issues tend to occur more frequently or may be exacerbated.

Applicability: Increased storm frequency could potentially lead to more frequent town-wide power outages and localized flooding issues at several of the Town's assets in flood-prone areas and affect typical operational procedures.

Hazard: Excessive Wind Speed

Description: Excessive wind speeds can result in direct damage to buildings, enclosures or equipment exposed to the outdoors and can lead to secondary hazards from downed trees, utility poles and power lines such as dangerous working conditions, structural damage, power and communication systems outages and accessibility issues.

Applicability: Assets directly exposed to the outdoors and located near large trees, utility poles and/or overhead power lines may be at increased risk of damage or failure from secondary hazards brought on by excessive wind speed. Electrically operated equipment at the Town's wastewater facilities would be affected by more frequent utility power and communication system outages.

Table 4-1 Climate Change Impacts & Potential Hazards Overview

Climate Change Impact	Potential Hazards	Hazard Consequences
Increased Flood Risk	Lake Flooding	• Localized flooding or ponding • Accessibility issues from temporary flooding • Soil erosion • SSOs from excess I/I exceeding system capacity
	Flash Flooding	
Storm Characteristics	Increased Storm Intensity	• Localized flooding or ponding • Soil erosion • Poor travel conditions • Utility power outages • Hazardous working conditions • SSOs from excess I/I exceeding system capacity • Increased snow loading to enclosures • Accessibility issues from excess snowfall • Extreme temperatures
	Increased Storm Duration	
	Increased Storm Frequency	
	Excessive Wind Speeds	• Utility power outages • Increased wind loading to enclosures and panels • Downed trees causing equipment damage.

Section 5 Evaluation of Climate Change Impacts

5.1 Risk Assessment Overview

One of the Climate Adaptation Plan study goals is to assess how climate change hazards could impact the Town's ability to reliably serve the sewer users, meet regulatory obligations and provide a safe working environment for its staff. Wright-Pierce staff conducted a site visit in August 2021 to assess potential climate change hazard vulnerabilities and possible consequences on the Town's critical wastewater system infrastructure. The site visit was supplemented with a desktop analysis of the entire wastewater collection and treatment system using data collected during the site visit, existing record drawings, previously completed studies and GIS data. Potential hazard consequences and their impact on wastewater assets were assessed to determine their likelihood of occurring and to help prioritize adaptation measures.

Critical wastewater system components were identified as the Chick Hill Wastewater Treatment Facility, the four major pump stations, and the sewer collection system sewer mains and interceptor sewers. Tables 5-1 and 5-2 provide a screening-level risk assessment overview of hazard consequence applicability to the Chick Hill WWTF and pump station assets, respectively.

Table 5-1 WWTF Screening-Level Risk Assessment Overview

Hazard Consequence ● – Applicable	Aeration and Storage Lagoons	Operations Building/WWTF Generator	Irrigation Fields	Snowfields and Snow Spray Guns
Localized flooding or ponding	●			
Utility Power Outage		●		
Accessibility issues	●		●	●

Table 5-2 Pump Station Screening-Level Risk Assessment Overview

Hazard Consequence ● – Applicable	Pump Station No. 1	Pump Station No. 2	Pump Station No. 3	Pump Station No. 4
Utility Power Outages	Potentially applicable to all stations			
Accessibility issues				●
Increased I/I to collection system and pump stations	●	●		

Hazard Consequence ● – Applicable	Pump Station No. 1	Pump Station No. 2	Pump Station No. 3	Pump Station No. 4
Poor instrumentation and communications reliability*	●	●	●	●
Extreme Temperatures			●	●

*Tertiary hazard that exacerbates other climate related hazard consequences.

Hazard consequences that apply to all areas of the municipal wastewater collection and treatment system include:

- Poor travel conditions
- Hazardous working conditions
- Increased snow loading to enclosures
- Increased wind loading to enclosures and panels
- Extreme temperatures

Table 5-3 summarizes the extent of wastewater treatment facility unit processes, pump stations, and collection system assets within the FEMA 100-year floodplain.

Table 5-3 FEMA 100-year Floodplain Summary

Area ID	Floodplain Total
Force main sewer in 100-year floodplain (linear feet (% of all sewer))	0 (0%)
Gravity sewer in 100-year floodplain (linear feet (% of all sewer))	51 (0.17%)
Total number of manholes in 100-year floodplain (number (% of all manholes))	1 (0.78%)
Total number of pump stations in 100-year floodplain (number (% of all pump stations))	0 (0%)

*See Appendix B for maps of FEMA 100-year floodplain.

Sections 5.2, 5.3, 5.4, and 5.5 that follow provide more detailed descriptions of the risk assessment findings in each area of the municipal wastewater collection and treatment system: system-wide (5.2), WWTF (5.3), pump stations (5.4), and collection system areas (5.5), respectively. The sections include identified hazard vulnerabilities, possible consequences, and applicability to the wastewater system or a specific critical asset.

5.2 System Wide Risk Assessment

Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Poor travel conditions, hazardous working conditions, and accessibility issues from excess precipitation.
Applicability:	Poor travel conditions would be limited to relatively large rainstorms and blizzards. Town of Rangeley staff are sometimes expected to travel during hazardous travel conditions and to be working outdoors during heavy rain or snowfall conditions, increasing the risk of slips, trips, and falls. Frostbite and hypothermia are also risks during freezing conditions. Increased winter precipitation in the form of snowfall could hinder access to the WWTF, remote portions of the collection system, and the pump stations.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Increased snow and wind loading to buildings, enclosures, and panels
Applicability:	It is assumed that all buildings, enclosures, and panels were designed and constructed in accordance with the current local building codes for snow and wind loading as a condition of the original building permits. If changes have been made to the local building code wind and snow loading requirements since the original installation of these facilities, it is possible that these facilities, while grandfathered into the current code, do not meet current building requirements for snow and wind loading.

5.3 Wastewater Treatment Facility Risk Assessment

AERATION AND STORAGE LAGOONS	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Localized flooding or ponding
Applicability:	Site grading around the lagoons allows drainage of surface runoff away from these facilities, so there is little to no risk of flash flooding from the surrounding area affecting the lagoons' treatment capacity. However, increases in direct precipitation into the lagoons form more frequent and intense storms creates a moderate risk by reducing the lagoons' available storage capacity. For example, a 3-inch rain event would contribute nearly half a million gallons of water into the three lagoons, which would not be enough to flood the lagoon capacity but could be enough to temporarily disrupt the normal operations of discharging effluent. The potential reduction in available storage capacity from a large rain event is particularly critical during the "shoulder" seasons of late fall and early spring,

	when air temperatures are too warm to make "snowfluent" but the WWTF is outside of its permitted window to discharge effluent via the spray irrigation fields.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Restricted access
Applicability:	There is a moderate risk from restricted lagoon accessibility along the northern end of the Storage Lagoon in the winter because the lagoon access road is only plowed to the southern end of the Storage Lagoon's perimeter. The impact of the restricted access is moderate because it could hinder response times during emergency situations and because the lagoons require some maintenance.
OPERATIONS BUILDING	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Utility Power Outages
Applicability:	The risk of increased utility power outages affecting the Operations Building is relatively high because historically, utility power outages in the Rangeley area have occurred fairly frequently. An increase in the frequency of larger storms in the area will likely exacerbate utility power outages. The impact of a utility power outage on the Operations Building is mitigated by the WWTF's propane standby power generator. Therefore, the overall risk from utility power outages is low.
IRRIGATION AND SNOW FIELDS	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Restricted access
Applicability:	The risk of restricted accessibility is high because the spray irrigation fields, snow fields and their associated monitoring wells are only accessible by unpaved utility roads and trails, some of which are only navigable by ATV. In the winter, the snow fields are only accessible by snowmobiles. One of the Wastewater Department's snowmobiles has reached the end of its expected useful life and is becoming less reliable, further increasing the risk of restricted access to the snow fields in the winter. The impact of restricted accessibility is high because the spray field irrigation lines and snow guns require maintenance and operational adjustments on a routine basis. The Chick Hill WWTF waste discharge license also requires the

	groundwater monitoring wells to be sampled at least twice a year. More importantly, because these areas are further away from the main WWTF facility, in the case of an emergency, these areas would be difficult to access. At the snow fields, the operators must re-position or shovel out the nozzle heads periodically when the snow builds up too high, which is difficult with the existing snowmobiles. Therefore, the overall risk to the spray irrigation and snow fields from restricted accessibility is high.

5.4 Pump Station Risk Assessment

PUMP STATION NO. 1	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Utility Power Outage
Applicability:	The risk of utility power outage is high because the Rangeley area has historically experienced frequent utility power outages, including extended outages that have lasted over a week. The impact of utility power outages is mitigated by the pump station's standby propane power generator. Wastewater assets, including pump stations are also priority areas for CMP power restoration, which reduces the impact of these outages. Therefore, the overall risk to the pump station from a utility power outage is low.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Increased I/I to the pump station
Applicability:	The risk of increased I/I to the station is moderate because this station receives gravity sewer flows from roughly half of the sewer user base. Increased runoff from more frequent and intense storms may translate to increase inflow from basement sump pumps and floor drains during wet weather. In the past, broken sewer service pipes have also allowed groundwater fed by Rangeley Lake to enter the sewer system and significantly increase flows to Pump Station No. 1. Increased seasonal rainfall in the Rangeley area could lead to longer periods of high groundwater conditions throughout the year, further increasing I/I entering the sewer system. The impact of increased wet weather flows to the station could have the potential to significantly increase pump run times and energy consumption at the station during wet weather and possibly overwhelm the small 15 HP pumps during peak flows. The pump station's force main is not equipped with a bypass assembly so if the pumps were unavailable or unable to pump the flows, the Town would need to contact a local septage hauler to pump and store incoming flows to avoid a wetwell overflow. Therefore, the overall risk to the pump station from increased I/I is moderate.

PUMP STATION NO. 2	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Utility Power Outage
Applicability:	The risk of utility power outage is high because the Rangeley area has historically experienced frequent utility power outages, including extended outages that have lasted over a week. However, the impact of utility power outages is mitigated by the pump station's standby propane power generator. Wastewater assets, including pump stations are also priority areas for CMP power restoration, which reduces the impact of these outages. Therefore, the overall risk to the pump station from a utility power outage is low.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Increased I/I to the pump station
Applicability:	The risk of increased I/I to the station is moderate because the station receives flow from almost all of the collection system by gravity plus flows pumped from Pump Station No. 1. Increased I/I into the sewer system will likely increase peak flows to the station during wet weather and further increase the risk of overwhelming the station's relatively shallow wetwell (roughly 10 feet deep) during high flows if the station's pumps were to fail to pump the flows. The pump station's force main is not equipped with a bypass assembly so if the pumps were unavailable or unable to pump the flows, the Town would need to contact a local septage hauler to pump and store incoming flows to avoid a wetwell overflow. Therefore, the overall risk from increased I/I to the pump station is moderate.
PUMP STATION NO. 3	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Utility Power Outage
Applicability:	The risk of utility power outage is high because the Rangeley area has historically experienced frequent utility power outages, including extended outages that have lasted over a week. Utility power brownouts have also caused the VFDs to fail in the past, requiring a manual reset by operators. The impact of utility power outages is somewhat mitigated by the pump station's standby propane power generator. Mechanical floats in the wetwell for back-up pump control also reduce the impact of utility brownouts on VFD failures. Wastewater assets, including pump stations are also priority areas for CMP power restoration, which

	reduces the impact of these outages. Therefore, the overall risk to the pump station from utility power outages is considered moderate. The pump station's force main is not equipped with a bypass assembly so if the pumps were unavailable to pump the flows, the Town would need to contact a local septage hauler to pump and store incoming flows to avoid a wetwell overflow.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Extreme temperatures
Applicability:	The risk of extreme temperature impacts is high because Rangeley frequently experiences temperatures well below 0°F in the winter and temperatures occasionally exceeding 90°F in the summer. The current HVAC system is run from two separate thermostats in the pump station's control building for heating and air conditioning, which has led to inefficient heating and cooling of the control building airspace at times. Inefficient ventilation of the control building could put the station's electrical equipment and VFDs at risk from occasional overheating and generate uncomfortable working conditions for operators. Therefore, the overall risk of extreme temperatures is considered high.
PUMP STATION NO. 4	
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Utility Power Outage
Applicability:	The risk of utility power outage is high because the Rangeley area has historically experienced frequent utility power outages, including extended outages that have lasted over a week. Utility power brownouts have also caused the VFDs to fail in the past, requiring a manual reset by operators. The impact of utility power outages is somewhat mitigated by the pump station's standby propane power generator. Mechanical floats in the wetwell for back-up pump control also reduce the impact of utility brownouts on VFD failures. Wastewater assets, including pump stations are also priority areas for CMP power restoration, which reduces the impact of these outages. The pump station's force main is not equipped with a bypass assembly so if the pumps were unavailable to pump the flows, the Town would need to contact a local septage hauler to pump and store incoming flows to avoid a wetwell overflow. Therefore, the overall risk to the pump station from utility power outages is considered moderate.
Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Restricted access
Applicability:	The risk of restricted access to the station from increased storm intensity and frequency is considered moderate because intense storms have historically

	knocked down large trees along Loon Lake Road, temporarily restricting access to the station. Restricted road access to the station could reduce response times during an emergency scenario. The Wastewater Department staff also have limited control over tree blowdown risk on public roads. Therefore, the risk overall to the station from restricted access is moderate.

Hazard: Increased Storm Intensity, Duration, and Frequency	
Description:	Extreme temperatures
Applicability:	The risk of extreme temperature impacts is high because Rangeley frequently experiences temperatures well below 0°F in the winter and temperatures occasionally exceeding 90°F in the summer. Like Pump Station No. 3, the current HVAC system is run from two separate thermostats in the pump station's control building for heating and air conditioning, which has led to inefficient heating and cooling of the control building airspace at times. Inefficient ventilation of the control building airspace could put the station's electrical equipment and VFDs at risk from occasional overheating and generate uncomfortable working conditions for operators. Therefore, the overall risk of extreme temperatures is considered high.

5.5 Collection System Risk Assessment

FORCE MAINS, INTERCEPTOR SEWERS, GRAVITY SEWERS, MANHOLES	
Hazard: Lake Flooding	
Description:	Localized flooding or ponding, restricted access, increased I/I to the collection system, soil destabilization and erosion
Applicability:	The risk of flooding is significant for segments of the sewer collection system that are within the FEMA 100-year floodplain. Table 5-3 and Appendix B identify and describe the extent of the collection system that is located within the Rangeley Lake or Haley Pond 100-year floodplains. Overall, there is a very small portion of the collection system within the 100-year floodplain. However, climate change could alter storm recurrence intervals and cause 100-year storm events to occur, on average, more often than statistically predicted. This could mean that larger flooding events are happening more frequently. Lake flooding increases the risk of inflow by potentially causing sewer manhole covers in the floodplain to float if inundated, and thereby allowing flood water to

	enter the sewer system. However, this was not identified as a historical concern by Wastewater Department staff. Lake flooding also raises the groundwater table in the floodplain, increasing the risk of excess infiltration into older sections of the sewer in the floodplain that tend to be more deteriorated. Lake flooding could also temporarily hinder access to sewers in the floodplain and destabilize the soil surrounding the structures. Therefore, the risk of lake flooding is high for portions of the collection system within the floodplain, but low for the overall system because most of the collection system is not within Rangeley Lake or Haley Pond's current 100-year floodplain.
Hazard: Increased Storm Intensity, Duration, Frequency	
Description:	Localized flooding or ponding, restricted access, increased I/I to the collection system, soil destabilization and erosion
Applicability:	The risk of increased sewer system infiltration from increased storm intensity, duration, and frequency (IDF) is high for all areas of the collection system that are older and at higher risk of leaks from deterioration (such as cracks and off-set joints). The risk of increased inflow into the sewer system is high during wet weather for areas of the collection system with inflow sources like roof and perimeter drains, or basement sump pumps connected to the sewer system. Although the Town of Rangeley does not experience significant I/I at the moment, as the collection system ages and as storm IDF increases, the likelihood of inflow and infiltration increases. The risk of secondary impacts like temporarily restricted access, localized flooding and ponding, and soil destabilization is high because portions of the Rangeley sewer collection system run along cross-country routes and/or are in low-lying and flood-prone areas that are more susceptible to these hazards than the portions of the system in the urban center of town. The impact of the hazards associated with increased storm IDF are high because the increased I/I has the potential to overwhelm the collection system or create secondary hazards like temporarily restricting access to portions of the system.

Section 6 Adaptation Measures

6.1 Evaluation and Prioritization of Adaptation Measures

Possible adaptation measures were identified and evaluated based on the findings of the risk assessments. Identified adaptation measures were grouped into two major categories: operational and asset-specific measures. The following section describes the recommended operational and asset-specific climate adaptation measures for the Town of Rangeley's wastewater collection and treatment system and their relative priority for implementation.

6.1.1 Operational Adaptation Measures

Operational climate adaptation measures are tasks or procedural changes that Town staff could undertake system-wide at minimal cost to prevent or mitigate potential climate-related hazard consequences. Some of these recommended operational adaptation measures have already been put in place by the Rangeley Wastewater Department and it is recommended that they continue to be implemented into the future. The recommended operational measures include:

- Continue to keep records of rain events to inform lagoon storage availability.
- Continue monitoring pump station flow trends during wet-weather events and snow-melt conditions.
- Continue to performing routine inspections of exposed equipment after heavy or intense precipitation events.
- Continue discussing utility power restoration priorities with utility power supply company.
- Continue to evaluate I/I reduction opportunities in the collection system.
- Continue to maintain a wet-weather management plan to cover emergency plans for operations, responsibilities of each employee, methods of communication, priorities for response, how to access the pump stations and WWTF equipment, etc.
- Continue to review a wet-weather management plan with current operations staff and any new hires.
- Continue to monitor large trees adjacent to roads or utility power lines and discussing potential risks with utility power supply company.
- Continue routine snow removal operations in the winter to improve access to critical assets.
- Exercise extreme caution and limiting travel time during poor travel conditions.

These recommended operational adaptation measures are considered best management practices, and because of their low cost and ease of implementation, should be a top priority for implementation or continued implementation for those already in place.

6.1.2 Asset-Specific Adaptation Measures

Asset-specific climate adaptation measures include observing and recording asset-specific climate-related trends over time (e.g., local flooding), non-routine or temporary measures, in-depth asset studies or evaluations, permanent design modifications, or capital improvements to achieve the goal of preventing or mitigating potential climate-related hazard consequences for a specific asset or asset class (e.g., pump stations). Tables 6-1, 6-2 and 6-3 summarize the recommended climate adaptation measures for the Rangeley WWTF, wastewater pump stations and sewer collection system, respectively.

Asset-specific adaptation measures in Tables 6-1, 6-2 and 6-3 have been assigned a priority for implementation based on adaptation measure effectiveness, criticality to system performance and reliability, and estimated implementation cost. Some adaptation measures are recommended for multiple assets but could have different project priorities

depending on the criticality of the adaptation measure for different assets. The implementation priorities have been color coded in Tables 6-1, 6-2 and 6-3 as follows:

1- Highest Priority	2 - High Priority	3 - Moderate Priority	4 - Lower Priority

Observing and recording asset-specific climate-related trends over time are also considered best management practices and because of their low cost and ease of implementation, are recommended as a top priority for implementation.

Table 6-1 WWTF Adaptation Measures

Recommended Adaptation Measure 1- Highest Priority / 2 - High Priority / 3 - Moderate Priority / 4 - Lower Priority	Aeration and Storage Lagoons	Operations Building and WWTF Generator	Irrigation Fields	Snowfields and Snow Spray Guns
Purchase another snowmobile or winterized vehicle to improve accessibility and provide redundancy in the winter fleet.				
Improve accessibility by managing utility roads such that a work truck or emergency vehicle could easily reach key points of the site in an emergency.				
Upgrade the SCADA system to provide ability for remote WWTF operation and to improve communications with the pump stations.				
Replace the existing snow pump and add a second pump to increase redundancy in the snow-making system.				
Replace the irrigation pumps from 1999 to insure continued redundancy in the irrigation field system.				
Consider installing life preserver ring stations along the lagoon perimeters to improve safety and emergency rescue response time.				

Table 6-2 Pump Station Adaptation Measures

Recommended Adaptation Measure 1- Highest Priority / 2 - High Priority / 3 - Moderate Priority / 4 - Lower Priority	Pump Station No. 1	Pump Station No. 2	Pump Station No. 3	Pump Station No. 4
Upgrade instrumentation and communications systems to improve remote monitoring of the station and integration into WWTF SCADA system.				
Create emergency contingency plan in the event that the station needs septage hauling, backup power, or bypass pumping.				
Continue the Town's I/I reduction program, focusing on this area.				
Install force main bypass pumping assembly and pig launcher fitting to provide operational flexibility and allow for force main cleaning.				
Consider purchasing a portable trailer-mounted pump to improve operational flexibility and to provide the ability to completely bypass the pump station in an emergency.				
Upgrade the heating and cooling systems to improve operational efficiency and reduce energy costs.				

Table 6-3 Collection System Adaptation Measures

Recommended Adaptation Measure 1- Highest Priority / 2 - High Priority / 3 - Moderate Priority / 4 - Lower Priority	Entire Collection System	Gravity Sewers	Force Mains	Manholes
Monitor cross-country sewer lines and interceptors for signs of ponding on manholes and embedment erosion.				
Continue Town's private inflow source detection and removal program and enforce illicit sewer connection ordinance to reduce sources of inflow.				
Evaluate drainage improvements in areas with significant local flooding or ponding of water on sewer manholes. Consider bolt-down or hinged manhole covers in flood-prone areas where drainage improvements are not practical.				
Continue the annual cleaning and CCTV inspection of areas suspected of higher I/I and grit build-up.				
Clean force mains in conjunction with recommended pig launcher installation at each pump station to maintain flow capacity.				
Evaluate sewer segments with higher infiltration rates for pipe relining upgrades.				

Section 7 that follows discusses the recommended climate adaptation plan for the Rangeley wastewater treatment and collection system.

Section 7 Recommended Adaptation Plan

7.1 Implementation Plan

A prioritized climate adaptation plan for implementing the recommended adaptation measures was prepared and is summarized in Table 7-1 below. The plan summary lists the recommended adaptation measures, including their color-coded priority level, recommended timelines for implementation and planning-level implementation costs. The planning-level costs were developed using standard cost estimating procedures consistent with industry standards. The project cost information presented herein is in current dollars and is based on ENR Index 12555 (January 2022). These estimates have been developed primarily for evaluating alternative solutions and are generally reliable for determining the relative costs of various options. Many factors arise during final design (e.g. owner selected features and amenities, code issues, etc.) that cannot be definitively identified and estimated at this time.

Table 7-1 CAP Implementation Plan & Estimated Costs

1- Highest Priority | 2 - High Priority | 3 - Moderate Priority | 4 - Lower Priority

Priority	Critical Asset	Adaptation Measures	Timeline for Implementation	Estimated Equipment Cost*	Estimated Project Cost
1	System-Wide	Implement operational adaptation measures identified in the CAP report, section 6.1.1.	Ongoing	--	Included in O&M budget
1	WWTF & Pump Stations	Comprehensive communications and SCADA system upgrade to improve system reliability.	0-5 years	--	$100,000**
1	WWTF	Replace the existing snow pump and add a second pump to increase redundancy in the snow-making system.	0-5 years	$45,000 per 75 HP pump	$120,000
1	WWTF	Consider purchasing another snowmobile or winterized vehicle to improve accessibility and provide redundancy within the winter vehicle fleet.	0-5 years	$10,000-$20,000 for Snowmobile $5,000-$8,000 Winterized Side by Side or Tractor	--
1	WWTF	Consider installing life preserver ring stations around the lagoon perimeters to improve emergency rescue response time.	0-5 years	$500-$1,000	--

1	Pump Stations 1, 2, 3 and 4	Install bypass pumping assembly and pig launcher fitting to provide operational flexibility, complete station bypass, and option for future force main pigging/cleaning.	0-5 years	--	$65,000
1	All Pump Stations	Consider purchasing a portable trailer-mounted pump to increase operational flexibility and system reliability.	0-5 years	$81,000	--
2	WWTF	Improve accessibility to lagoons, fields, and monitoring wells by expanding winter road and trail maintenance and upgrading trails to snow fields and the monitoring wells.	5-10 years	--	$50,000-$75,0000 (Existing trail upgrades)
2	Pump Station No. 2	Create a written emergency operations plan in the event that the station needs septage hauling, backup power, or bypass pumping.	5-10 years	--	<$1,000
2	Pump Stations No. 1 and 2	Continue the Town's I/I reduction program, focusing on this area	5-10 years	--	<$1,000
2	Pump Stations No. 3 and 4	Upgrade the heating and cooling systems so a single thermostat controls both units.	5-10 years	--	$20,000 per station

3	WWTF	Replace the irrigation pumps from 1999 to insure continued redundancy in the irrigation field system.	5-10 years	$60,000 per 100 HP pump	$130,000
3	Collection System	Continue Town's private inflow source detection and removal program and remove illicit sewer connections.	Ongoing	--	$10,000-$20,000
3	Collection System	Continue the annual cleaning and CCTV inspection of areas suspected of higher I/I and grit build-up.	Ongoing	--	$3.00 - $5.00 / LF
4	Collection System	Evaluate drainage improvements in areas with significant local flooding or ponding of water on sewer manholes.	As needed	--	$10,000 - $20,000***
4	Collection System	Monitor cross-country sewer lines and interceptors for signs of ponding on manholes and embedment erosion.	As needed	--	--
4	Collection System	Evaluate sewer segments with higher infiltration rates for pipe relining upgrades.	As needed	--	--

*Final project cost will depend on scope of work, the extent of which is beyond the scope of this report.

** Cost based on 2018 quote from AEC Engineering for a comprehensive communications system upgrade.

***Cost estimate is for evaluation only. Cost for subsequent capital improvements not included

7.2 Potential Funding Sources

7.2.1 Internal Reserves

The Town has internal budget reserves for minor capital improvements and expenditures that could be used to fund limited climate adaptation measures. Reserve funds could be used for relatively low-cost operational or process modifications and/or minor capital improvement projects. This would be the preferred funding mechanism for the recommended CAP measures since using existing budget reserve funds does not require raising sewer user rates to cover the cost.

7.2.2 Local Revenue

For adaptation measures that cannot be covered by budget reserves alone, the Town could raise the revenues needed to cover costs by implementing a structured sewer user rate increase. Generated revenues could be used for low-cost operational or process modifications, and both minor and significant capital improvements. This would be a less desirable funding mechanism than using budgeted reserves because it would require increasing sewer user rates.

7.2.3 State Funding

Some adaptation measures requiring capital improvements may be eligible for financial assistance from the State of Maine through the Community Development Block Grant (CDBG) program, the CWSRF loan program, or other one-time State administered grant funding.

The Maine Department of Economic and Community Development (DECD) administers the CDBG program for the State of Maine. Grants are provided to municipalities and quasi-municipal entities for eligible capital improvement projects. The Town could apply for CDBG funds to implement recommended asset-specific adaptation measures with a significant capital cost. CDBG funding would be preferable to CWSRF loan funding because grant funds would not need to be repaid. To be eligible for CDBG funds, the Town would need to complete a grant application and other CDBG program requirements including an income survey, environmental review report and a preliminary engineering report. The Town would be competing in a state-wide pool of applicants for limited grant funds.

The Maine DEP CWSRF program provides grants and low-interest loans to local communities and quasi-municipal entities for wastewater infrastructure improvement projects. Asset-specific adaptation measures with a significant capital cost are likely be eligible for CWSRF grant or loan funding. CWSRF loan principal and interest would need to be fully repaid over the term of the loan (typically 20 years or the expected life of the asset) unless the Town qualified for a grant or principal forgiveness. To be eligible for a CWSRF loan, the Town would need to complete a CWSRF loan application with the Maine Municipal Bond Bank and other CWSRF program requirements including an environmental impact review report and preliminary design report.

As a result of the COVID-19 pandemic, the federal government released funds as part of the American Rescue Plan Act (ARPA) which were partially distributed through state programs, including the CWSRF program. Maine received the first of two allocations from ARPA in 2021. It is expected that the remainder of these funds will be released in 2022, with a portion included as part of the 2022 CWSRF program. It is expected that in the coming years, there will be a significant increase in CWSRF principal forgiveness funding available a result of the federal Infrastructure Investment and Jobs Act. This portion of CWSRF funding will be distributed as a blend of grants, loan principal forgiveness and low-interest loans (49% grants and 100% principal forgiveness loans and 51% as low-interest loans).

7.2.4 Federal Funding

The U.S. Department of Agriculture (USDA) Rural Development (RD) offers Water & Waste Disposal Predevelopment Grants to eligible communities to assist with the initial planning and development of RD Water & Waste Disposal direct loans/grants. RD also offers Water & Waste Disposal direct loans/grants for sanitary sewage disposal, solid waste disposal and stormwater drainage projects. The Town would likely qualify again for RD water & waste disposal loan and grant funding.

For CDBG, CWSRF and RD funding, applicants are required to prepare an environmental review report and preliminary engineering report. The State of Maine's CDBG and CWSRF programs are willing to accept an environmental impact review report and preliminary engineering report prepared for RD funding to satisfy their requirements. Therefore, if the Town intends to seek outside funding for the recommended asset-specific adaptation measures, it is recommended that an environmental impact review report and preliminary engineering report be prepared to RD standards to satisfy the preliminary requirements of all three funding programs.

There are several grant funding programs administered through FEMA for planning and construction projects to assist communities in the implementation of hazard mitigation measures and to improve flood resiliency. FEMA Flood Mitigation Assistance (FMA) grants are available for planning and construction projects that reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP). FEMA Building Resilient Infrastructure and Communities (BRIC) grants are also available to support communities as they undertake hazard mitigation projects, reducing the risks from disasters and natural hazards. The FEMA Hazard Mitigation Grant Program (HMGP) provides funding to help implement long-term hazard mitigation planning and projects following a presidential disaster declaration. The ongoing COVID-19 Pandemic has triggered this presidential declaration, allowing for funds to be released for this grant program. Both BRIC grants and HMGP can fund up to 75% of the project cost, requiring the Town of Rangeley to provide 25% of the cost in non-federal funding, which can be in the form of money or in-kind services.

To apply for the above FEMA grants, the Town would be required to submit a project application to the State Hazard Mitigation Officer for an initial review and presentation to the Regional FEMA office for final review and approval. The hazard mitigation project would also be required to conform with the State and local Hazard Mitigation Plans to be eligible for FMA grants. Depending on the grant and available funds each year, the Town could be competing for FMA grant funds within a national pool of applicants. Grant funding is the preferred funding method to implement CAP adaptation measures and could be a possible funding source for adaptation measures that reduce or eliminate the long-term risk of flood damage.

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Appendix A
Overview Rangeley Sewer Collection System

Sewer Manhole
PS Pump Station
WWTF Treatment Facility
Gravity Main
Force Main
Siphon

WWTF
Rangeley Chick Hill WWTF
Frenchies Way
Winter Rd
Taylor Farm Rd
Hanger Rd
Taylor Rd
Antler Way
Gile Rd
Summer Rd
Pemaquid Trl
White Line Ln
Max Rd
Loon Lake Rd
Buck Rub Rd
Babb Rd
PS
Pump Station 4
Ross Pond
Village Woods Dr
Gull Pond
Tinney Rd
Switzer Rd
Laura Ln
Gull Pond Rd
Pleasant View Rd
Allison Dr
Race Way
Pleasant St
Stratton Rd
Haley Pond
Pump Station 2
PS
Pump Station 3
PS
Pump Station 1
PS
Brackett Dr
Owen Dr
Bubier Path
Hilltop Dr
Main St
Cross St
Russell Cove Rd
Manor Woods Rd
Manor Dr
Wigton Rd
Rudolph Dr
Katherine Dr
Mercer Cir
Verrill Ter
Depot St
Lakehouse Rd
Marbles Way
Sunset Ln
Spring Rd
Moose Ridge Rd
Grandview Ave
Case Rd
Bunker Ave
Caddy Dr
Fairway Ave
Cottage Ave
Nichols Rd
Dallas Hill Rd
Pine Grove Ln
Faunce Rd
Whip Willow Farm Rd
Marion Dr
Lynn Way
Windy Cross Rd
Rangeley Lake

N
0 600 1,200 2,400 Feet

Sewer System Overview
Rangeley, ME

PROJ NO:	DATE:
20680	12/6/2021

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FIGURE: A-1

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Appendix B
Overview Collection System in FEMA 100-year Floodplain

B-1: FEMA Floodplain Overview

Sewer Manhole
PS Pump Station
WWTF Treatment Facility
Gravity Main
Force Main
100-Year Floodzone
500-Year Floodzone
Siphon

WWTF
Rangeley Chick Hill WWTF
Frenchies Way
Taylor Farm Rd
Hanger Rd
Taylor Rd
Antler Way
Winter Rd
Gile Rd
Summer Rd
Pemaquid Trl
White Line Ln
Max Rd
Loon Lake Rd
Buck Rub Rd
Babb Rd
PS
Pump Station 4
Ross Pond
Village Woods Dr
Pleasant View Rd
Allison Dr
Boundary of FEMA Floodmap
Gull
Tinney Rd
Switzer Rd
Laura Ln
Gull Pond Rd
Race Way
Pleasant St
Stratton Rd
Haley Pond
62C
62B
64A
64B
64
63
62A
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61
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57
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44
43
42
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40
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23
24
25C
25
25B
26
26A
26B
26C
26D
26E
26F
26G
26H
26I
26J
26K
26L
26M
Pump Station 2
Pump Station 1
PS
Brackett Dr
Owen Dr
Bubier Path
Hilltop Dr
Main St
Cross St
Russell Cove Rd
Manor Woods Rd
Manor Dr
Wigton Rd
Rudolph Dr
Katherine Dr
Mercer Cir
Lakehouse Rd
Verrill Ter
Depot St
Marbles Way
Sunset Ln
Spring Rd
Moose Ridge Rd
Grandview Ave
Case Rd
Bunker Ave
Caddy Dr
Fairway Ave
Cottage Ave
Faunce Rd
Nichols Rd
Dallas Hill Rd
Pine Grove Ln
Whip Willow Farm Rd
Marion Dr
Lynn Way
Windy Cross Rd
Rangeley Lake

N
0 600 1,200 2,400 Feet

Flood Zones
Rangeley, ME

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FIGURE: B-1

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