CREAT SMRSA Manasquan Long-term Plan Plan Report

SOUTH MONMOUTH REGIONAL SEWERAGE AUTHORITY (MANASQUAN PUMP STATION)

CONTENTS

Background

This report summarizes the potential for reducing consequences that South Monmouth Regional Sewerage Authority (Manasquan Pump Station) may experience due to current and projected climate conditions. These consequences are the foundation of the risk that climate conditions may pose to those assets defined as vulnerable by the assessor.

System type	Wastewater Only
Volume treated (Million Gallons per Day)	6
Population served	50,000

The focus of this report is the SMRSA Manasquan Long-term Plan, defined as the following: Long-term plan to move Manasquan Pump Station. In each case, where consequences were assessed, the potential gains of implementing this plan were determined in comparison to current resilience to these same conditions. The ability to protect assets today is described in the Current Measures plan, where those practices and infrastructure protections that currently exist provide some level of consequence reduction in the face of assessed threats.

For each asset, a guided risk assessment was conducted based on the occurrence of multiple scenarios of the same threat; please see Attachment A. For example, the possible consequences to a pump station due to flooding could be assessed across several scenarios of historical or projected changes in precipitation. The time period over which to consider both threats and the ability to implement plans is a critical component of this assessment. The time period selected for this analysis was from 2022 to 2060, which aligns with the 2060 projected climate and sea level data provided in CREAT.

The types of consequences considered by the assessor in the risk assessment summarized in this report were selected based on the types of losses anticipated for those threats and assets being considered; please see Attachment B. For each type of economic consequence, a monetary scale was selected to

define levels of consequence to use during risk assessment. Regional economic consequences were also considered, with assessments being based on the utility's population served, state economic data from the U.S. Economic Census, business resilience factors for industries served by the water or wastewater system; the number of days the disruption lasts, and the percentage of customers affected by the disruption.

This report was generated based on the assessment conducted by John Smith (jsmith@42six.com).

Utility Information

This assessment covers a specific list of South Monmouth Regional Sewerage Authority (Manasquan Pump Station) assets and climate-related threats. These assets may include both physical infrastructure and natural resources. The results in this report only consider losses associated with these assets and threats; the scope of conditions can be expanded by revising the assessment in CREAT.

Assets	Floods
Manasquan Pump Station - Manasquan Pump Station	✓

Adaptation Planning

Utility assets can be protected by adaptive measures that effectively reduce the consequences if a threat were to occur. Both current measures, those already in place, and the potential plan described below, can afford some level of protection. Examples of measures include new infrastructure and changes in operation or practices.

Measures already in place represent the current resilience of a utility to projected changes in climate, even if these measures were implemented for reasons unrelated to climate change. The SMRSA Manasquan Long-term Plan plan provides some risk reduction that can be compared with the cost of implementing these adaptive measures. For a comparison of how the selected plan compares to all plans included in this assessment, please see Attachment C.

Current Measures	Relevant Threats
Current Measures – Existing adaptive measures.	Floods
Adaptive Measures	**Total Cost**
SCADA - SCADA system providing ability to monitor wet well levels, pumping rates, loss of power, etc.	$30,000
Emergency Response Training For Personnel - Conduct climate-related training (for example, tabletop exercises, knowledge building) for utility personnel and emergency response community. Draw from resources provided by associations and government agencies to provide information regarding the potential impacts of climate change and effectiveness of response actions.	$0
Emergency Response Plan - Flooding - Develop emergency response and recovery plans as part of overall flooding strategy. These plans should focus on flood frequencies and magnitudes that may become more frequent under projected future climate conditions, especially those that the community has limited experience dealing with. Plans should be coupled with other measures to limit consequences when possible.	$0
Bypass Connection and Emergency Bypass Pump - Backup diesel pump in event of loss of power at station and backup generator does not work - can deploy diesel-driven pump that takes place of electric pumps. Can be dedicated to Manasquan during pump emergency.	$50,000
Back-Up Power - Temporary Trailer Mounted Generator - Temporary trailer mounted generator (shared between multiple pump stations)	$120,000
Back-Up Power - Permanent Generator - Permanent generator on-site at Manasquan pump station. Establish alternate or on-site backup power supply or electrical switching equipment.	$100,000
Total Plan Cost	**$300,000**

Potential Plan	Relevant Threats
SMRSA Manasquan Long-term Plan – Long-term plan to move Manasquan Pump Station	Floods
Adaptive Measures	**Total Cost**
Facility Location - Relocate Pump Station - Move Manasquan Pump Station to higher elevation to reduce risks from coastal flooding and sea level rise. Would have to reconstruct Force Main pipeline and reroute gravity system. Relocate utility structure to higher elevations to reduce risks from coastal flooding and exposure as a result of coastal erosion or wetland loss.	$20,000,000
Total Plan Cost	**$20,000,000**

Risk Assessment Results

Below is a summary of the results obtained from risk assessments for each scenario. These results indicate the change in monetized risk attributable to the implementation of SMRSA Manasquan Long-term Plan relative to the resilience already provided by Current Measures. Total risk, as shown in the tables below, is the sum of assessments made for asset-threat pairs, assigned based on the determination that an asset is imperiled by the assigned threat.

Baseline Scenario

	Current Measures	Selected Plan
Economic Consequences	$426,000 - $2,333,500	$0 - $1,475,500
Regional Economic Consequences	$162,737	$0
Regional Economic Impacts	1 days without service 2 percent customers without service	0 days without service 0 percent customers without service

Warmer, Wetter, Stormy, Higher Flows, Moderate SLR – This warmer, wetter, stormy, higher flows and moderate sea level rise scenario includes projected annual and hot day temperature, and projected annual and January, August and September precipitation. It also includes changes in 100-year storm events for a more stormy future, as well as maximum surface water flow data for higher future flows. This scenario includes a moderate rate of sea level rise, based on information from a New Jersey guidance document. This scenario might contribute to higher storm surge and inland flows directly impacting the Manasquan pump station, as well as access to the pump station.

	Current Measures	Selected Plan
Economic Consequences	> $3,443,000	$0 - $1,475,500
Regional Economic Consequences	$813,685	$0
Regional Economic Impacts	2 days without service 5 percent customers without service	0 days without service 0 percent customers without service

The overall risk reduction performance of this plan, compared to other plans in this assessment, is listed below by scenario. The plan described in this report is at the top with any other plans considered in this CREAT analysis listed below.

Monetized Risk Reduction			
Plan	**Total Cost**	**Baseline Scenario**	**Warmer, Wetter, Stormy, Higher Flows, Moderate SLR**
SMRSA Manasquan Long-term Plan	$20,000,000	$420,737 - $1,188,737	> $2,781,185
SMRSA Manasquan Short-term Plan	$10,000	$420,737 - $1,188,737	> $2,360,448

Next Steps

This report documents the risk reduction possible from implementing the SMRSA Manasquan Long-term Plan adaptation plan at South Monmouth Regional Sewerage Authority (Manasquan Pump Station). These results are a useful input into the decision making process, either as metrics supporting the decision to implement or defer taking action or as a documentation of additional data and information needed to make an informed decision.

If results indicate that more information is needed, please consider the following approaches for re-visiting the analysis to refine or improve results:

- Investigate costs of adaptation options to reduce uncertainty in plan costs;
- Review consequence level definitions to narrow ranges based on utility- or region-specific economic factors;
- Expand the number of assets assessed to better characterize risk posed to the system; and
- Collect additional data on the influence of climate on threats being assessed to ensure definitions are well-informed and detailed enough to compare with thresholds for asset damage or loss.

Once CREAT results meet the expectations of decision makers and partners, consider a strategy for integrating risk reduction results into overall planning in a way that ensures climate adaptation can be combined with other priorities to support holistic prioritization and selection of plans. This strategy will be a powerful tool for using risk assessment frameworks, like CREAT, as new threats present themselves and as an increasing number of assets may be vulnerable to these threats.

Beyond the CREAT risk assessment process, there are opportunities to learn from other water utilities through the exchange of information and experience. Sharing the results of your assessment and planning activities with others could benefit similar utilities that may be facing similar challenges. One way to share your progress and lessons learned is to contribute your story to the Case Study and Information

Exchange Map. This map contains stories from utilities across the Nation, each contributed to help other water sector utilities with their own adaptation planning processes and decision-making.

Attachment A – Scenario Data

At a minimum, each assessment will consider a single 'Baseline' scenario, often based on historical climate data provided in CREAT for the utility location. This data is from daily observations of temperature, precipitation, streamflow data, and coastal data from selected reporting stations (see CREAT Methodology Guide for more details on sources and methods). The following reporting stations were used for South Monmouth Regional Sewerage Authority (Manasquan Pump Station).

Data Type	Station/Site/ Cell ID	Station Name	Latitude	Longitude
Temperature	2208		40.2506	-74.2500
Hot Days Station	USC00284987	LONG BRANCH OAKHURST	40.2797	-74.0047
Precipitation	2208		40.1153	-74.0328
Intense Precipitation Station	USC00280721	BELMAR 2 SW	40.1500	-74.0667
Streamflow Gage	1408029	Manasquan River near Allenwood NJ	40.1467	-74.1222
Streamflow Projection Point	2002087	Manasquan River	40.1460	-74.1211
Tide Gauge	8531680		40.4700	-74.0100

If additional scenarios are listed below, these conditions are also defined based on the same measurements; however, the basis for these scenarios are possible changes in climate, based on climate model data in CREAT or other information or previously determined critical thresholds. The following measurements and data were selected to define the scenarios in this assessment:

Scenarios	Threats
Baseline Scenario	Floods
Warmer, Wetter, Stormy, Higher Flows, Moderate SLR – This warmer, wetter, stormy, higher flows and moderate sea level rise scenario includes projected annual and hot day temperature, and projected annual and January, August and September precipitation. It also includes changes in 100-year storm events for a more stormy future, as well as maximum surface water flow data for higher future flows. This scenario includes a moderate rate of sea level rise, based on information from a New Jersey guidance document. This scenario might contribute to higher storm surge and inland flows directly impacting the Manasquan pump station, as well as access to the pump station.	Floods

Measurement	Baseline	Warmer, Wetter, Stormy, Higher Flows, Moderate SLR
Annual Average Temperature (Fahrenheit)	52.93	--
Annual Degree Change in temperature (Fahrenheit)	--	4.23
Annual Number of hot days over 90 °F (Days)	8	--
Annual Number of hot days over 95 °F (Days)	1	--
Annual Number of hot days over 100 °F (Days)	0	--
Annual Total Precipitation (Inches)	47.68	--
January Total Precipitation (Inches)	4.04	--
August Total Precipitation (Inches)	4.63	--
September Total Precipitation (Inches)	4.07	--
Annual % Change in precipitation (%)	--	11.49
January % Change in precipitation (%)	--	18.86
August % Change in precipitation (%)	--	13.31
September % Change in precipitation (%)	--	14.38
100-year storm event (Inches/24hr)	6.25	--
100-year storm event (Inches/72hr)	7.27	--
100-year storm event (%)	--	17.29
Annual Total Vertical Land Movement* (Inches/Yr)	-0.09	--

Annual Average Maximum Flow (Cubic Feet/Second)	1,587.26	2,643.65
Total Sea Level Rise (Feet)	0.00	3.30
Annual Average Number of days with tidal flooding (Days)	5	365
Storm Surge (feet)	7.10	8.10

* Baseline relative sea-level rise (SLR) is typically a rate based on vertical land movement (VLM), if available

Attachment B – Consequence Definitions

CREAT provides the user the ability to assess economic consequences across specific categories often used by water utilities to gauge the value of assets. The default names for these categories are:

- Utility Business Impacts,
- Utility/Equipment Damage,
- Source/Receiving Water Impacts, and
- Environmental Impacts.

Each category is assessed on a scale with four levels, each with a range of monetized loss that quantifies the impact of a threat to each vulnerable asset. For South Monmouth Regional Sewerage Authority (Manasquan Pump Station), the default values for these monetary losses were provided based on population served, ownership, system type and capacity (see CREAT Methodology Guide for details on data sources and methods).

Economic Consequences

Consequence Category	Low	Medium	High	Very High
Utility Business Impacts – Operating revenue loss evaluated in terms of the magnitude and recurrence of service interruptions. Consequences range from long-term loss of expected operating revenue to minimal potential for any loss.	Minimal potential for loss of revenue or operating income $0 - $1,062,000	Minor and short-term reductions in expected revenue $1,062,000 - $2,124,000	Seasonal or episodic compromise of expected revenue or operating income $2,124,000 - $3,180,000	Long-term or significant loss of expected revenue or operating income > $3,180,000
Utility Equipment Damage – Costs of replacing the service equivalent provided by a utility or piece of equipment evaluated in terms of the magnitude of damage and financial impacts. Consequences range from complete loss of the asset to minimal damage to the equipment.	Minimal damage to equipment $0 - $168,000	Minor damage to equipment $168,000 - $426,000	Significant damage to equipment $426,000 - $1,026,000	Complete loss of asset > $1,026,000
Environmental Impacts – Evaluated in terms of environmental damage or loss, aside from water resources, and compliance with environmental regulations. Consequences range from significant environmental damage to minimal impact or damage.	No impact or environmental damage $0 - $31,500	Short-term damage, compliance can be quickly restored $31,500 - $79,000	Persistent environmental damage $79,000 - $189,000	Significant environmental damage > $189,000
Source/Receiving Water Impacts – Degradation or loss of source or receiving water quality or quantity evaluated in terms of recurrence. Consequences range from long-term compromise to no more than minimal changes to water quality or quantity.	No more than minimal changes to water quality $0 - $214,000	Temporary impact on source water quality or quantity $214,000 - $535,000	Seasonal or episodic compromise of source water quality or quantity $535,000 - $1,284,000	Long-term compromise of source water quality or quantity > $1,284,000

Regional Economic Consequences

CREAT provides the ability to monetize regional economic consequences by using the regional impact calculator developed for the Water Health and Economic Analysis Tool (WHEAT). The calculator uses state economic data from the U.S. Economic Census and business resilience factors for industries served by the water or wastewater system to determine the annual economic loss for the state caused by an outage to water or wastewater facility, according to the following equation.

State Annual Economic Loss = Sum of (Annual Revenue * Economic Loss Factor * RIMS II Output) for all industries in the state

The calculator then factors in information entered by the user about the extent and duration of the outage to determine the regional economic consequence, according to the following equation:

Regional Economic Consequence = State Annual Economic Loss * (Population Served by Utility / State Population) * (Percent Customers without Service / 100) * (Days without Service / 365.25)

Attachment C – Plan Comparison

As part of deciding which plan provides the most benefit for the investment, the comparison of costs to risk reduction in this report is only one factor. Based on entries by the assessor, the table below summarizes the other factors that may be important in selecting a plan to implement. The plan described in this report is at the top with any other plans considered in this CREAT analysis listed below.

Plan	Total Cost	Energy Impacts	Socio-economic Impacts	Community Public Health Impact
SMRSA Manasquan Long-term Plan	$20,000,000	MEDIUM	BENEFICIAL	BENEFICIAL
SMRSA Manasquan Short-term Plan	$10,000	NEUTRAL	NEUTRAL	NEUTRAL

Attachment D – Likelihood Sensitivity

For each scenario, there may be a range of likelihood where the cost of implementing SMRSA Manasquan Long-term Plan is comparable to the monetized risk reduction attainable after the potential adaptive measures have been implemented. To explore the influence that scenario likelihood would have on the comparison of costs to benefit, CREAT provides the ranges of likelihood where the intersections of cost and risk reduction represent “break even” points for utilities to consider in their planning. The following table lists the comparison of plan cost to risk reduction for each scenario.

Scenario	Wait and See	Consider Implementing Plan	Implement Plan
Baseline Scenario	0.00% - 100.00%	--	--
Warmer, Wetter, Stormy, Higher Flows, Moderate SLR	0.00% - 0.00%	0.00% - 100.00%	--

The definitions for the possible conclusions following comparison of cost with risk reduction are defined as follows:

- ***Wait and See*** - The range of implementation costs of the selected plan exceed the entire range of possible risk reduction for the threats in the selected scenario. Based on the current assessment, there would be a negative return on investment. It is possible that, based on additional experience and improved data, a later assessment may reduce this range of likelihood and support implementation;
- ***Consider Implementing Plan*** - The range of implementation costs for the selected plan overlap with the range of possible risk reduction for the threats in the selected scenario. Based on the current assessment, there would be an uncertain return on investment. Consider additional benefits from implementing this plan or return to conduct another assessment to support your decision regarding implementation of this plan; and
- ***Implement Plan*** - The entire range of implementation costs of this selected plan is below the entire range of possible risk reduction for the threats in the selected scenario. Based on the current assessment, there would be a positive return on investment. The monetized risk reduction alone provides adequate benefit to support your decision regarding implementation of this plan.