

Water CIP Risk Analysis
10/09/2019
Town of Purcellville

The Risk Analysis was completed using standards derived from a 2018 study conducted by Utah State University's Buried Structure Laboratory titled, " Water Main Breaks Rates In the USA and Canada: A Comprehensive Study."

The study compiles the collective experience of 308 utilities with a total of 200,000 miles of pipe serving a population of 52 million.

Three metrics were chosen from the study to determine likelihood of breakage:

1. Pipe Age
2. Pressure
3. Recorded Breaks

Data ranges were calculated
using the following parameters:

Pipe Age – Along with age, the type of material used to construct the pipe weighs heavily in the determination of stability. Prior to WWII, stronger and thicker material was used in the construction of cast iron pipe. The war effort took its toll on raw materials, and manufacturers went to a lower grade solution. The effects of this change can be documented with frequency of breaks in CI installed after WWII.

Pipe Breakage by Age Data Range Computation

*Decade of construction with recorded breaks in 2018 by %:

30s = .1
40s = .1
50s = .27
60s = .2
70s = .37
80s = .25
90s = .1

Likelihood Range - .1-.4

* Cast Iron cited from 1930 – 1960, Ductile Iron cited from 1960-2000

Pipe Pressure – The mean pressure value for water supply pipes in the Utah study group is 69 psi. That being said, any pressure on supply pipes has an adverse effect on integrity. The pressure risk measure was based on this premise. PSI is converted into a scalable value with higher pressures having greater impact on likelihood of failure.

Recorded Breaks – Although this is a very important metric, the town data on this is not complete. The average replacement based on breakages within the study group was 11 per year within the same span of pipe made from the same materials. Using the data we have, the range for pipe failure due to multiple breakage was determined to be .1-.11.

Likelihood Computation

Pipe Age x Pipe Pressure x Frequency of Breaks = Likelihood of Failure

Severity Rating

Catastrophic - 5 Operating conditions are such that environment, element, subsystem or component failure, or procedural deficiencies may commonly cause major system loss resulting in potentially hazardous conditions and inability to provide adequate supply or meet fire protection regulation 12VAC5-590-1120 thereby requiring immediate corrective action.

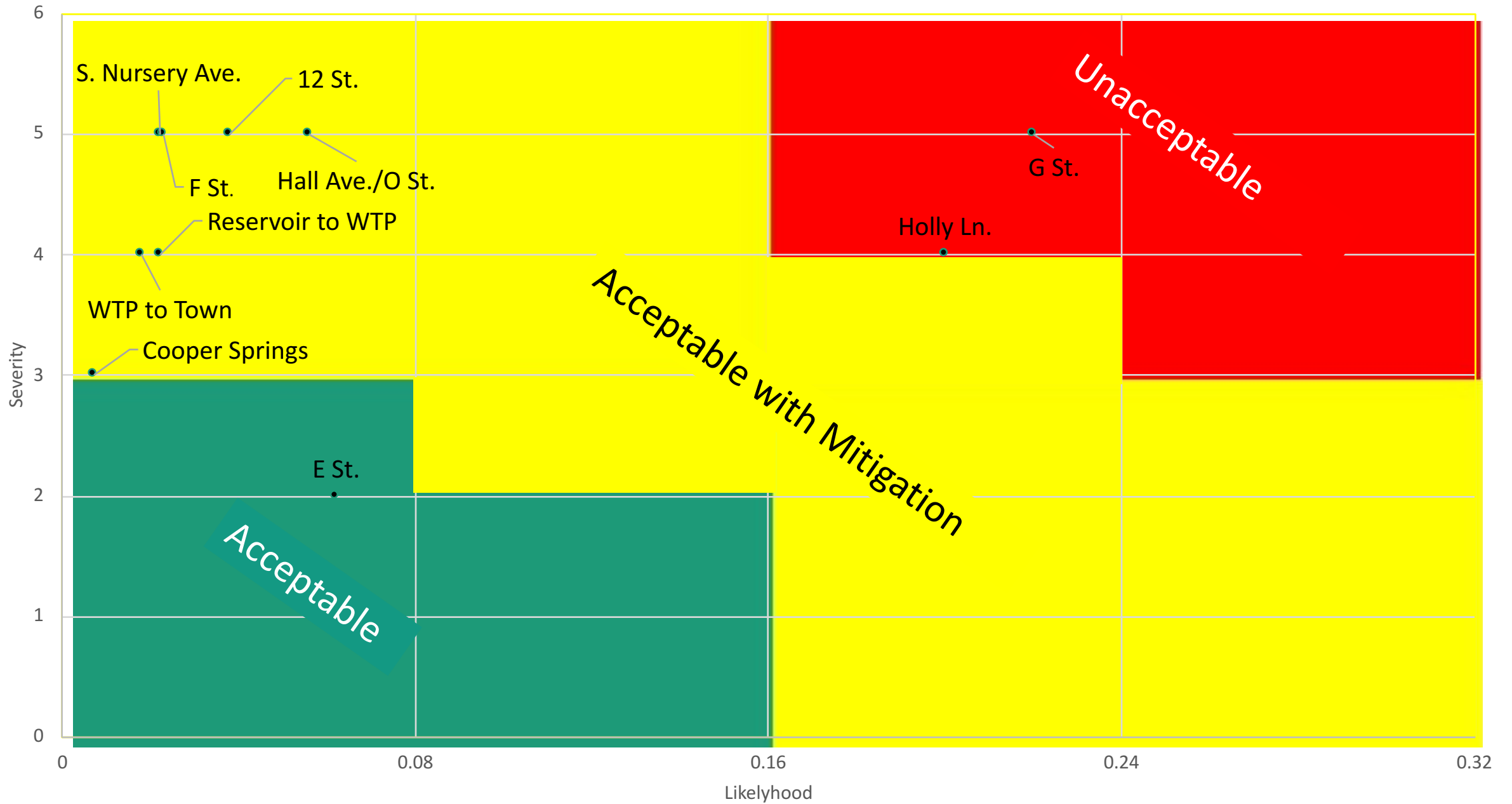
Critical - 4 Operating conditions are such that environment, element, subsystem or component failure or procedural deficiencies may attribute to property loss, inability to provide adequate supply, or major system damage thereby requiring corrective action.

Marginal - 3 Operating conditions may commonly cause minor systems damage such environment, design deficiencies, subsystem or component failure or procedural deficiencies, possible supply issues, can be counteracted or controlled without major system damage.

Negligible - 2 Operating conditions are such that environment, design deficiencies, subsystem or component failure or procedural deficiencies will result in no, or less than minor system damage with uninterrupted supply.

Insignificant - 1 Operating conditions are such that environment, design deficiencies, subsystem or component failure or procedural deficiencies will result in no noticeable effect on system supply.

WATER LINE RISK RATING



Factors Used to Determine CIP Needs

- Risk Analysis
- Transportation Projects
- Capacity Needs
- Regulatory Compliance

WATER FUND CIP

(in Thousands)

Projects	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	Ten Year Total	Beyond FY30
F Street Water Main Replacement	140	140										280	
12th Street Water Main Replacement		190	100									290	
Intake Structure for Hirst Reservoir	80	500	500									1,080	
Jeffries Filter Facility		300	300									600	
Cooper Springs Raw Water Main			240	880								1,120	
WTP to Town Water Main Replacement-PH 1				400	1,600							2,000	
Reservoir to WTP Raw Water Main					320	160	1,760					2,240	
Holly Lane Water Main Replacement					150	150						300	
G Street Water Main Replacement					150	550						700	
Additional Water Supply						650	650	650				1,950	
A Street Water Line Loop						126						126	
Water Treatment Plant Improvements										1,150	1,150	2,300	2,300
New Elevated Water Tank													3,422
WTP to Town Water Main Replacement-PH 2													2,300
E Street Water Main Replacement													337
LVSC Water Main Replacement													232
Springsbury Drive Water Main Extension													163
Rugby Court Water Main Extension													112
Total by Fiscal Year	220	1,131	1,140	1,280	2,220	1,636	2,410	650	-	1,150	1,150	12,987	8,865