# *Making a Dramatic Impact on Water Loss*

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American Water Works Association
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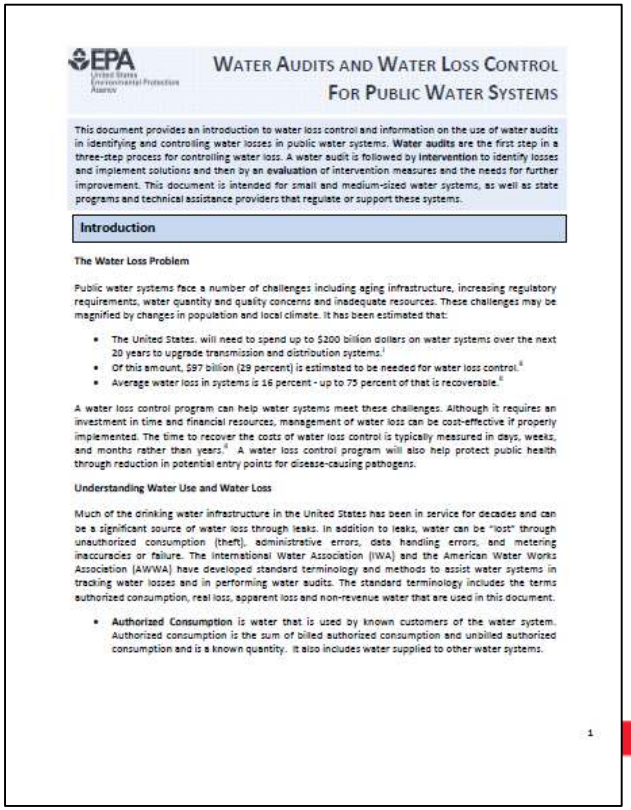
# Overview

- The Problem
- Management
- 3 Success Stories

# Water Loss the problem

EPA Fact Sheet: *Water Audits and Water Loss Control for Public Water Systems* (2013)

- The United States will need to spend up to **$200 billion** on water systems over the **next 20 years** to upgrade transmission and distribution systems.
- Of this amount, **$97 billion** (49%) is estimated to be needed for water loss concerns.
- Average water loss in systems is 16%.
- Up to 75% of that is recoverable.



EPA United States Environmental Protection Agency

WATER AUDITS AND WATER LOSS CONTROL FOR PUBLIC WATER SYSTEMS

This document provides an introduction to water loss control and information on the use of water audits in identifying and controlling water losses in public water systems. **Water audits** are the first step in a three-step process for controlling water loss. A water audit is followed by **intervention** to identify losses and implement solutions and then by an **evaluation** of intervention measures and the needs for further improvement. This document is intended for small and medium-sized water systems, as well as state programs and technical assistance providers that regulate or support these systems.

**Introduction**

**The Water Loss Problem**

Public water systems face a number of challenges including aging infrastructure, increasing regulatory requirements, water quantity and quality concerns and inadequate resources. These challenges may be magnified by changes in population and local climate. It has been estimated that:

- The United States will need to spend up to $200 billion dollars on water systems over the next 20 years to upgrade transmission and distribution systems.[1]
- Of this amount, $97 billion (29 percent) is estimated to be needed for water loss control.[2]
- Average water loss in systems is 16 percent - up to 75 percent of that is recoverable.[3]

A water loss control program can help water systems meet these challenges. Although it requires an investment in time and financial resources, management of water loss can be cost-effective if properly implemented. The time to recover the costs of water loss control is typically measured in days, weeks, and months rather than years.[4] A water loss control program will also help protect public health through reduction in potential entry points for disease-causing pathogens.

**Understanding Water Use and Water Loss**

Much of the drinking water infrastructure in the United States has been in service for decades and can be a significant source of water loss through leaks. In addition to leaks, water can be "lost" through unauthorized consumption (theft), administrative errors, data handling errors, and metering inaccuracies or failure. The International Water Association (IWA) and the American Water Works Association (AWWA) have developed standard terminology and methods to assist water systems in tracking water losses and in performing water audits. The standard terminology includes the terms authorized consumption, real loss, apparent loss and non-revenue water that are used in this document.

- **Authorized Consumption** is water that is used by known customers of the water system. Authorized consumption is the sum of billed authorized consumption and unbilled authorized consumption and is a known quantity. It also includes water supplied to other water systems.

1

# Water Loss management

AWWA Best Practice in Water Loss Control: *Improved Concepts for 21st Century Water Management*

## Best Practice in Water Loss Control:

### Improved Concepts for 21st Century Water Management

In 2003 the American Water Works Association (AWWA) adopted improved best practice methods for defining and measuring water loss in water distribution systems. This transition into a new era of effective water management marked a departure from previous terms and practices no longer useful to the industry. The following explains this departure from obsolete practices and articulates key points and best practices in water loss control today.

#### Improved Terminology: Non-revenue Water

In 2003 AWWA abandoned use of the term "unaccounted-for" water (UFW) because all volumes of water supplied within a distribution system go toward either beneficial consumption or wasteful loss. *All water sent into the distribution system can be accounted for.* Today, the industry term favored by AWWA and its Water Loss Control Committee when quantifying water loss is "non-revenue" water (NRW). **NRW is specifically defined to include the sum of specific types of water loss and any authorized, unbilled consumption that occurs within water distribution systems.**

#### Enhanced Performance Indicators to Measure Progress

Although percentage indicators—typically the ratio of authorized customer consumption to distribution system input—still exist in the industry, AWWA discourages use of percentage indicators, such as the "unaccounted-for" water percentage. Using percentage indicators to assess water loss in distribution systems gives a misleading and unreliable measure of utility performance because a percentage indicator

- is greatly affected by changing levels of customer consumption
- cannot distinguish among the specific components of non-revenue water occurring in a distribution system
- reveals nothing about water volumes and associated costs (the two most important factors in assessing water waste within a distribution system).

Today, the industry best practice for water loss auditing created by the International Water Association (IWA) and AWWA now quantifies **several key performance indicators, which provide vastly superior means for assessing water loss performance in distribution systems, while recognizing that contributing factors and potential corrective measures are specific to each water utility.**

American Water Works Association

*Dedicated to the World's Most Important Resource®*

# Water Loss management

## *The IWA/AWWA Water Balance Table*

| The IWA/AWWA Water Balance | | | | | | |
|---|---|---|---|---|---|---|
| Volume From Own Sources (corrected for known errors) | System Input Volume | Water Exported (corrected for known errors) | Billed Water Exported | | | Revenue Water |
| | | Water Supplied | Authorized Consumption | Billed Authorized Consumption | Billed Metered Consumption | Revenue Water |
| | | | | | Billed Unmetered Consumption | |
| | | | | Unbilled Authorized Consumption | Unbilled Metered Consumption | Non-revenue Water |
| | | | | | Unbilled Unmetered Consumption | |
| | | | Water Losses | Apparent Losses | Customer Metering Inaccuracies | |
| | | | | | Unauthorized Consumption | |
| | | | | | Systematic Data Handling Errors | |
| | | | | Real Losses | Leakage on Transmission and Distribution Mains | |
| Water Imported (corrected for known errors) | | | | | Leakage and Overflows at Utility's Storage Tanks | |
| | | | | | Leakage on Service Connections up to the Point of Customer Metering | |

*NOTE: All data in volume for the period of reference, typically one year.*

## The IWA/AWWA Water Balance

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| | | | | Unbilled Authorized Consumption | Unbilled Metered Consumption | Non-revenue Water |
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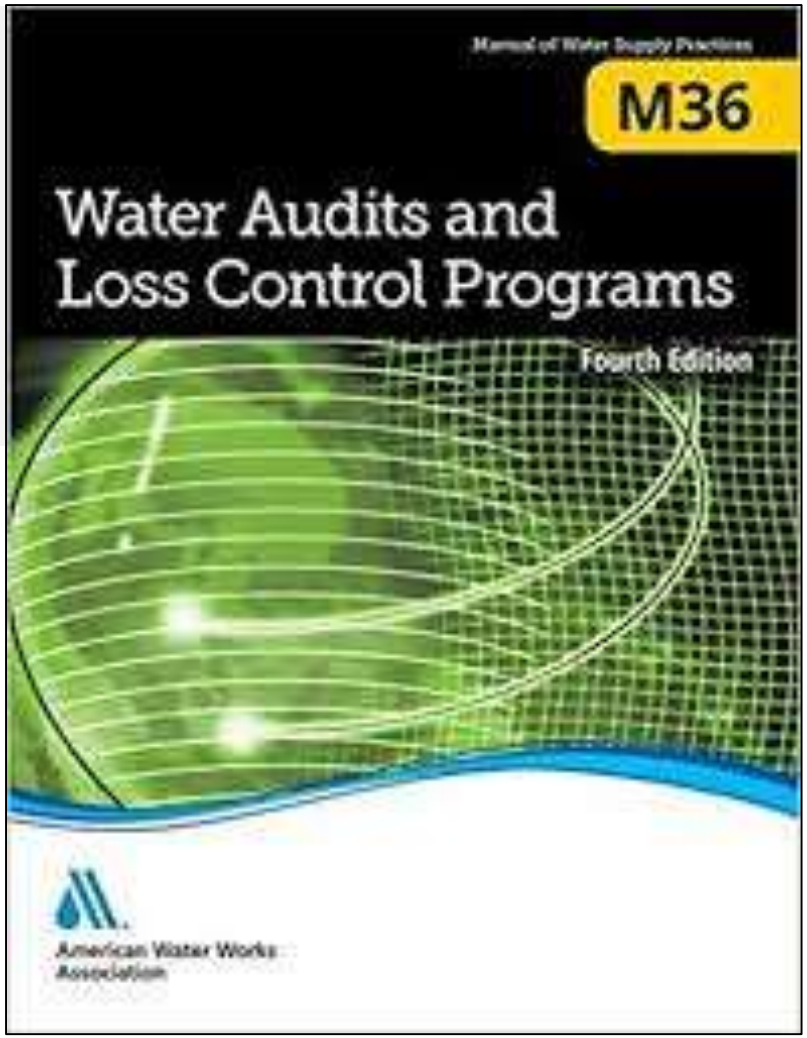
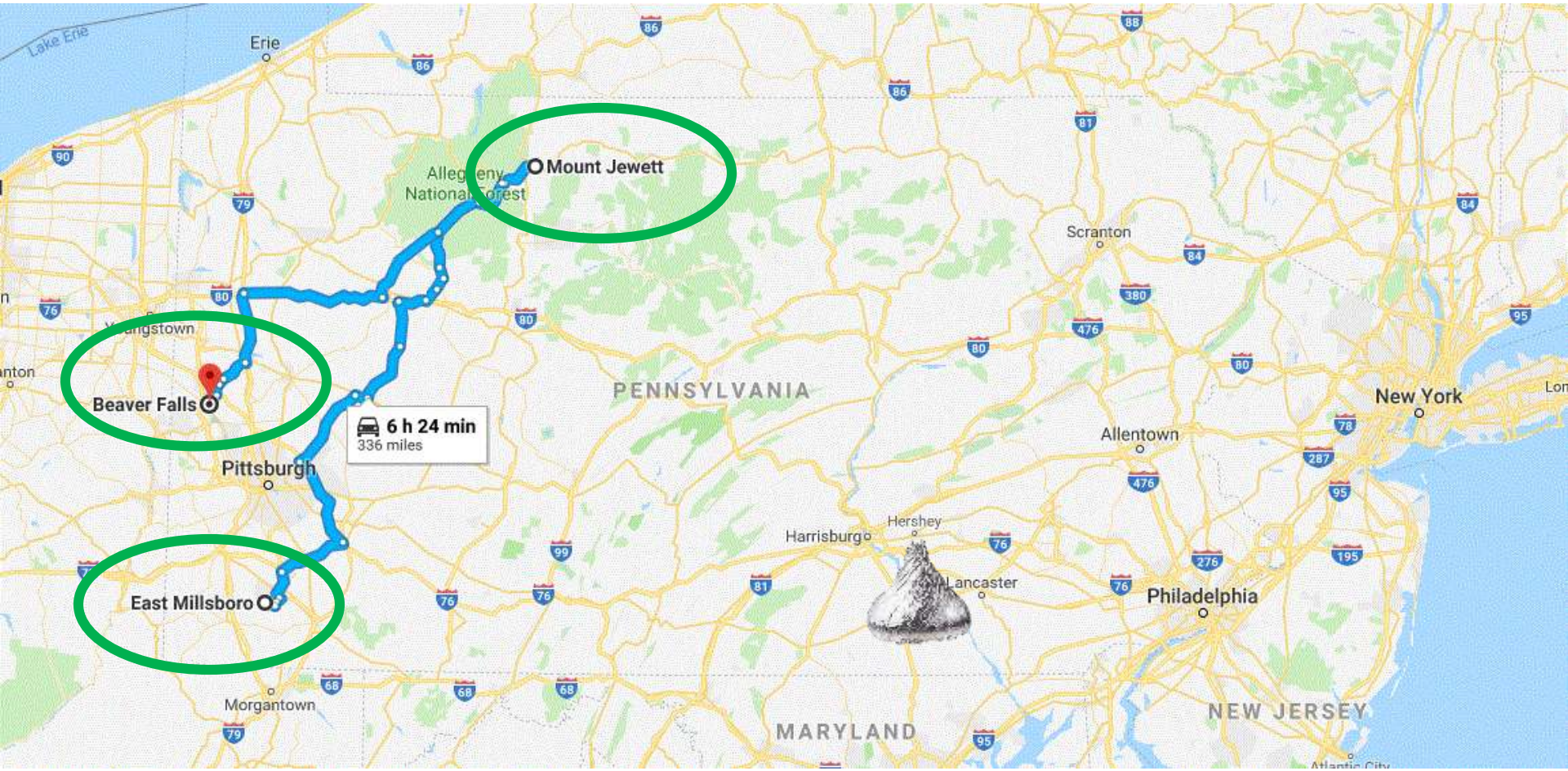
# Water Loss management

Control Programs

- Water Audit
- Intervention
- Evaluation



# Three Success Stories



# 1. SR6 Waterline Replacement

**Aqua PA, Western Area**
Mt. Jewett, PA
McKean County

# SR6 Waterline Replacement

- Water Sources:
  - 6 wells
  - 1 spring
- Pumping capacity 180,000gpd
- 1 booster pump station
- 2 tanks
- 1,500 customers
- Aqua PA bought in 2015

# SR6 Waterline Replacement

- 2016 PennDOT resurfacing project
- Lower Lindholm Rd to Bridge St.

# SR6 Waterline Replacement scope

Pipe

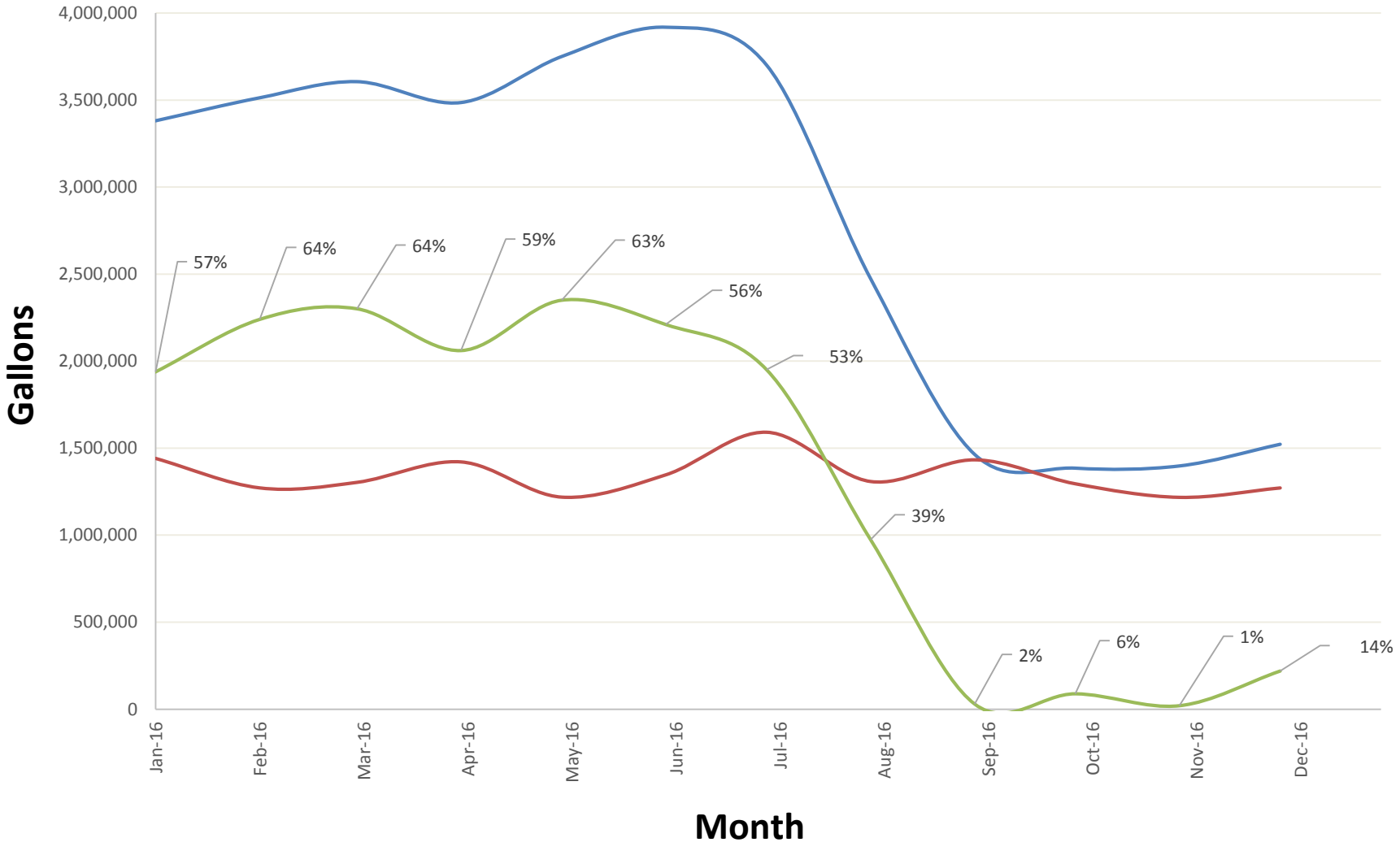
- 8,670 LF of 12” DIP
- 854 LF of 8” DIP
- 65 LF of 4 & 6” DIP

15 Hydrants

74 Services

# SR6 Waterline Replacement

# Non-Revenue Water (2016)



# SR6 Waterline Replacement results

Construction between 5/31/16 and 8/2/16

- Project Cost: $1,822,050
- Pre-Project NRW: approx. 60% (2MG/month)
- Current NRW: approx. 10% - 15%

SUCCESS!!

# 2. Milfred Terrace Reservoir Improvements

**Tri County Joint Municipal Authority**
East Millsboro, PA
Washington County

# Milfred Terrace Reservoir

Also Fayette and Greene Counties
WTP permitted capacity 2.0MGD

- 5 tanks and 1 reservoir
- 6 booster pump stations
- 10,000 customers

# Milfred Terrace Reservoir

- Built in 1950’s
- 198.5’ x 198.5’ trapezoidal
- 8’ max. depth
- 2.0MG storage

# Milfred Terrace Reservoir

- 12” waterline connection
- Floating cover
- Concrete tile floor
- Suspected problems?

# Milfred Terrace Reservoir scope

**Cover**

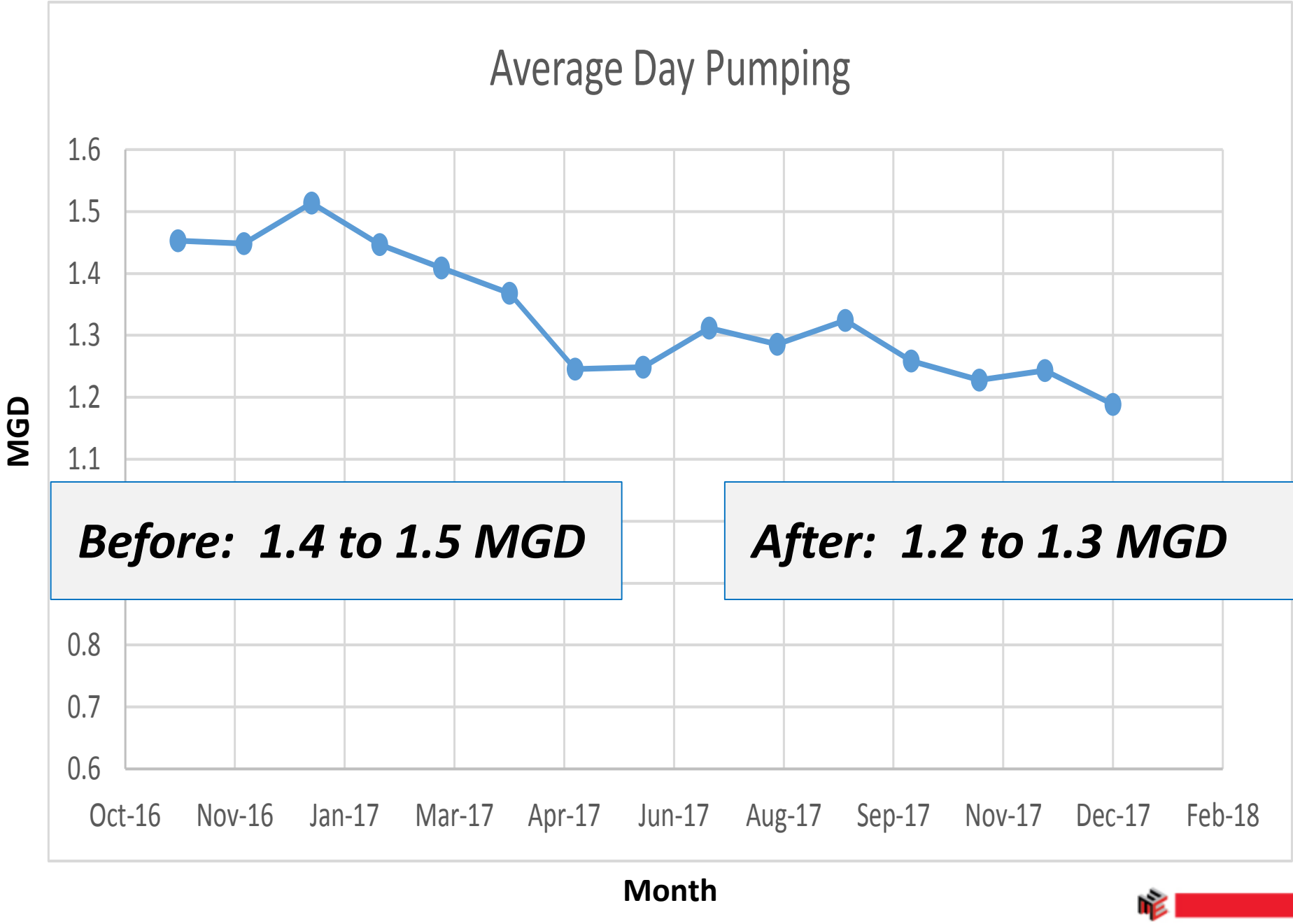
- Existing floating cover modified to serve as liner
- Cut to expose floor for installation of mixing system
- New Cooley Inc. floating cover installed

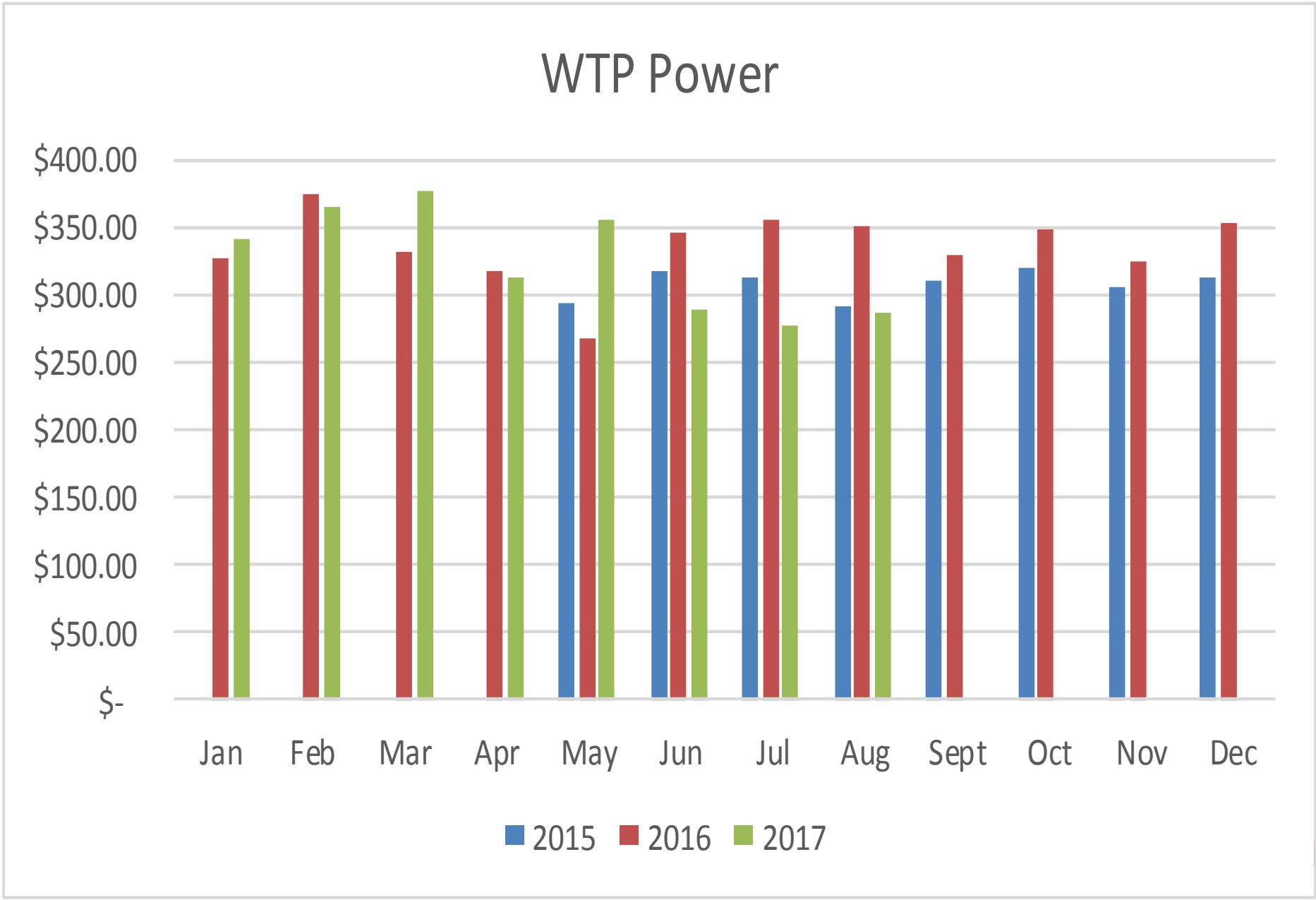
# Milfred Terrace Reservoir scope

**Mixing - passive**

- Tideflex Hydrodynamic Mixing System
- Bidirectional pipe header
- 8 Inlet duckbill valves
- 6 Outlet check valves

Level monitoring instrumentation


Average Day Pumping
MGD
1.6
1.5
1.4
1.3
1.2
1.1
0.8
0.7
0.6
Oct-16
Nov-16
Jan-17
Mar-17
Apr-17
Jun-17
Aug-17
Sep-17
Nov-17
Dec-17
Feb-18
Month
Before: 1.4 to 1.5 MGD
After: 1.2 to 1.3 MGD


WTP Power
$400.00
$350.00
$300.00
$250.00
$200.00
$150.00
$100.00
$50.00
$-
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
2015
2016
2017

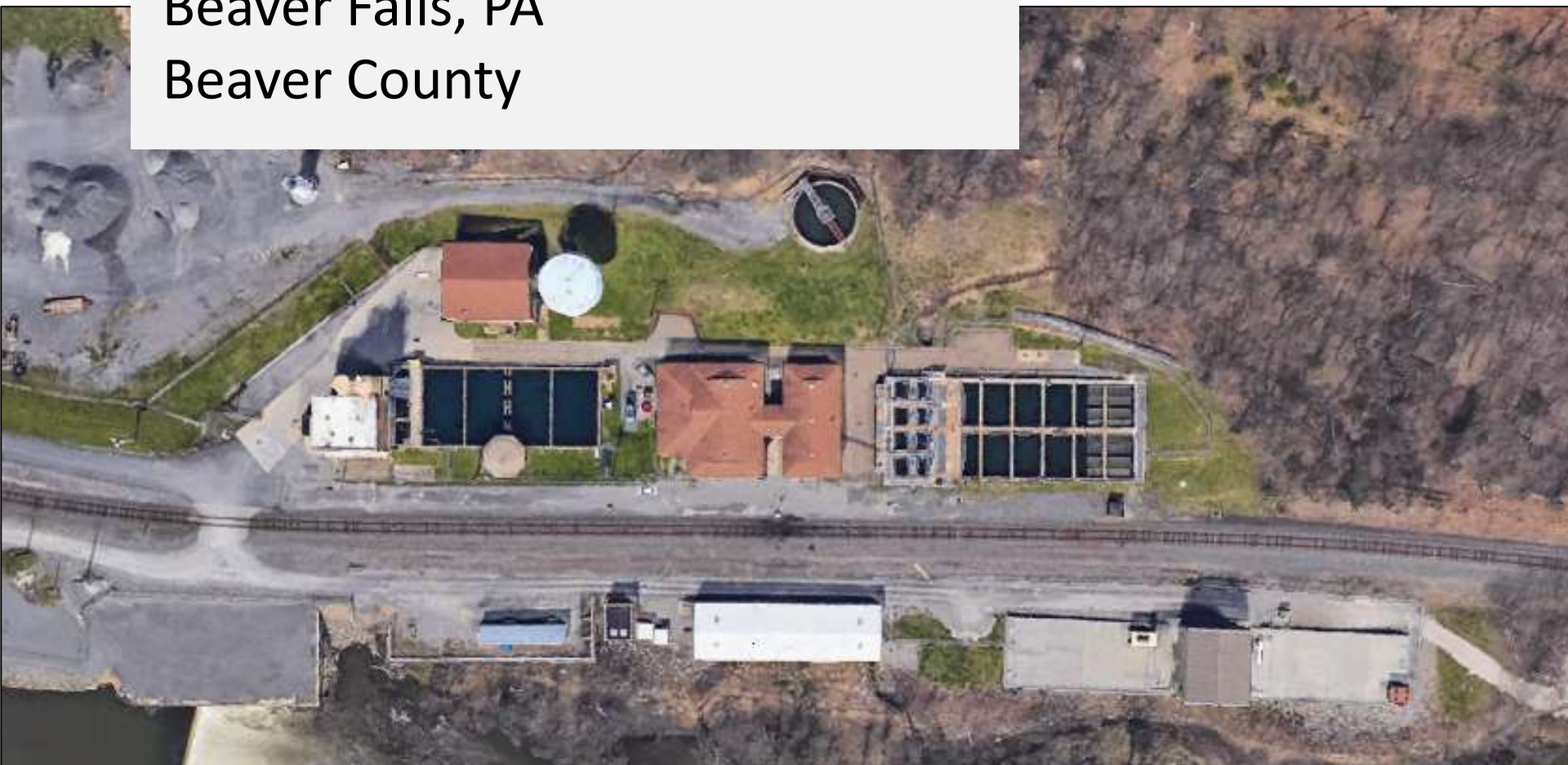
# Milfred Terrace Reservoir results

- Construction Cost: $303,905 (including mixing system)
- Power Savings:
  - June $56.58/day
  - July $77.16/day
  - August $63.27/day
- Total Power Savings: approx. $2,000/month
- Reduced chemical costs
- Shift eliminated
- Operational flexibility

SUCCESS!!

# 3. SR18 Waterline Replacement

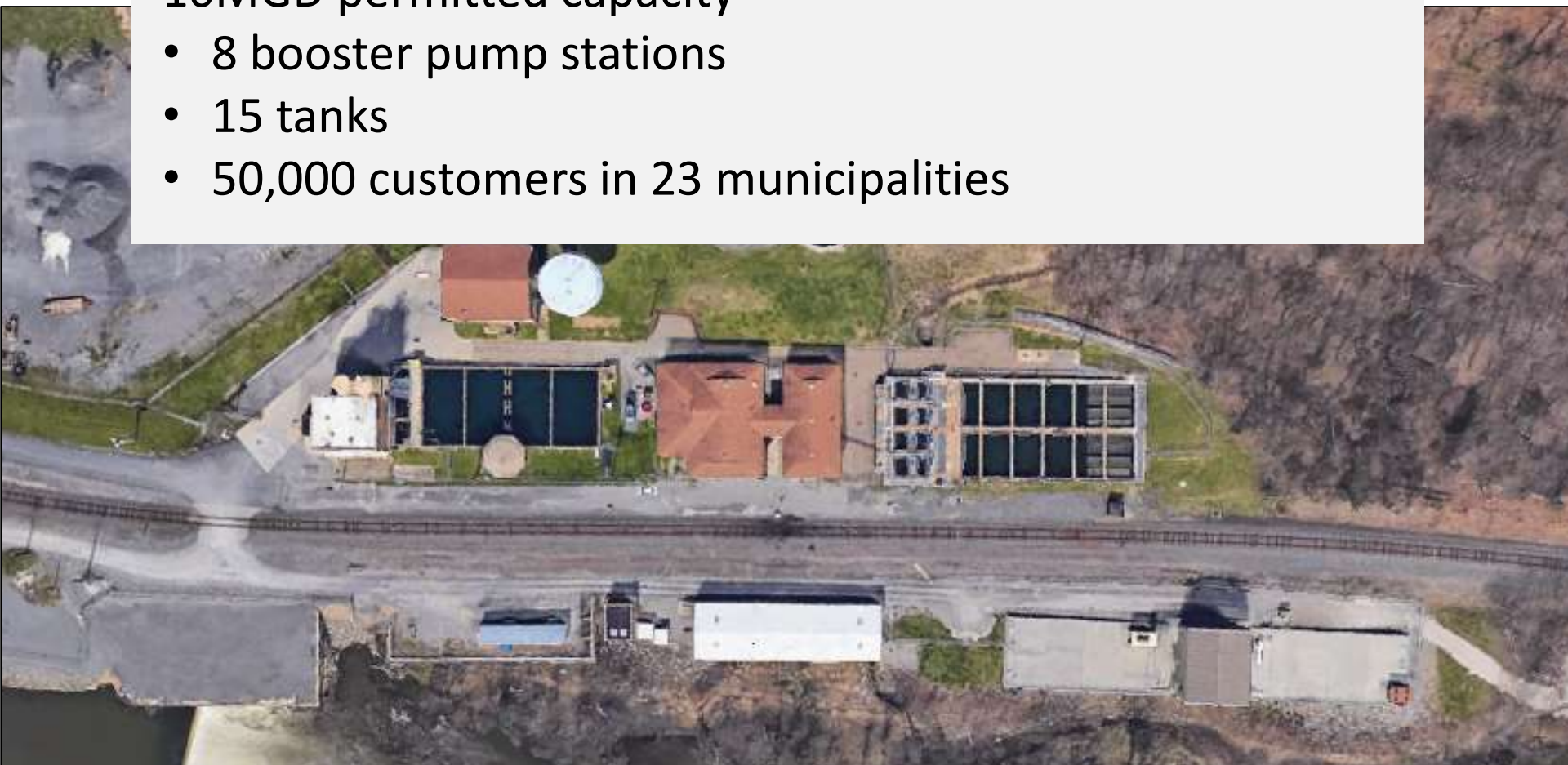
**Beaver Falls Municipal Authority**
Beaver Falls, PA
Beaver County



# 3. SR18 Waterline Replacement

Eastvale Water Treatment Plant
10MGD permitted capacity

- 8 booster pump stations
- 15 tanks
- 50,000 customers in 23 municipalities



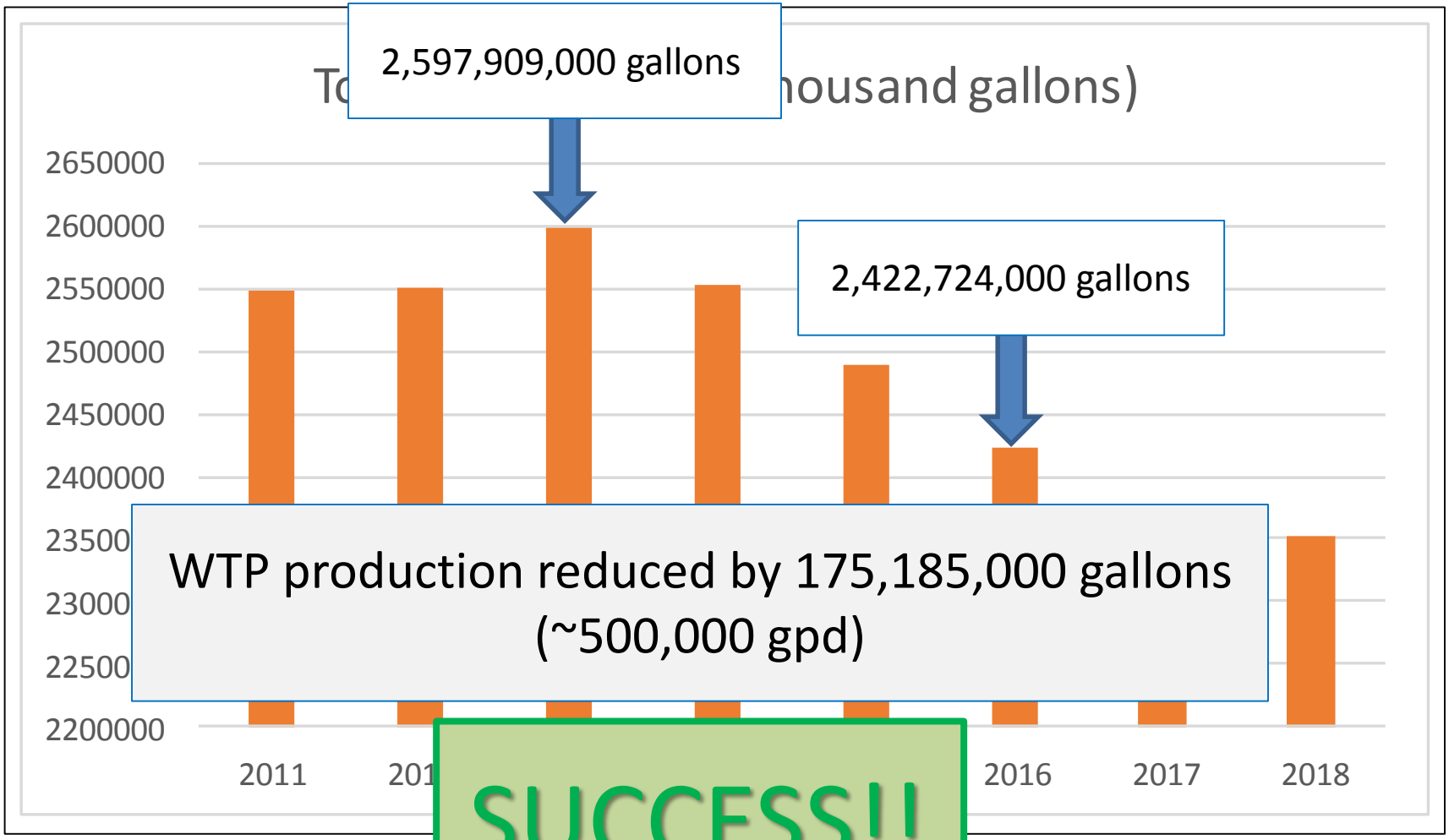
# SR18 Waterline Replacement details

- Near Geneva College
- 2014-2015 utility relocation
- PennDOT resurfacing project

# SR18 Waterline Replacement scope

- Surface elevation adjustment
- ~3,000 LF 12” PVC
- Sandy “wet” soil

# SR18 Waterline Replacement results




WTP production reduced by 175,185,000 gallons (~500,000 gpd)

SUCCESS!!

# Summary

- No project had a goal to impact water loss
- All projects had been deferred
  - Available budget
  - Difficult site conditions
  - Operational challenges
  - PennDOT implications
- Outcomes had measurable positive impacts
  - Financially
  - Operationally
- Reduction of *Actual Losses* is difficult to predict, and not fully understood until ***after*** project completion

**Check out our website:**
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**Connect with me on LinkedIN**

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# *Questions?*