

# Medway's Integrated Water Resources Management Plan

## IWRMP Update Workshop

IWRMP Task Force  
Medway DPS  
January 10, 2018



# Agenda

1. Introductions
2. Project Overview/Status
3. Evaluation of Scenarios
4. Decision Model Results
5. Feedback and Selection of Preferred Scenario
6. Next Steps
  - Fine-Tuning
  - Conceptual Designs

## IWRMP Phase II

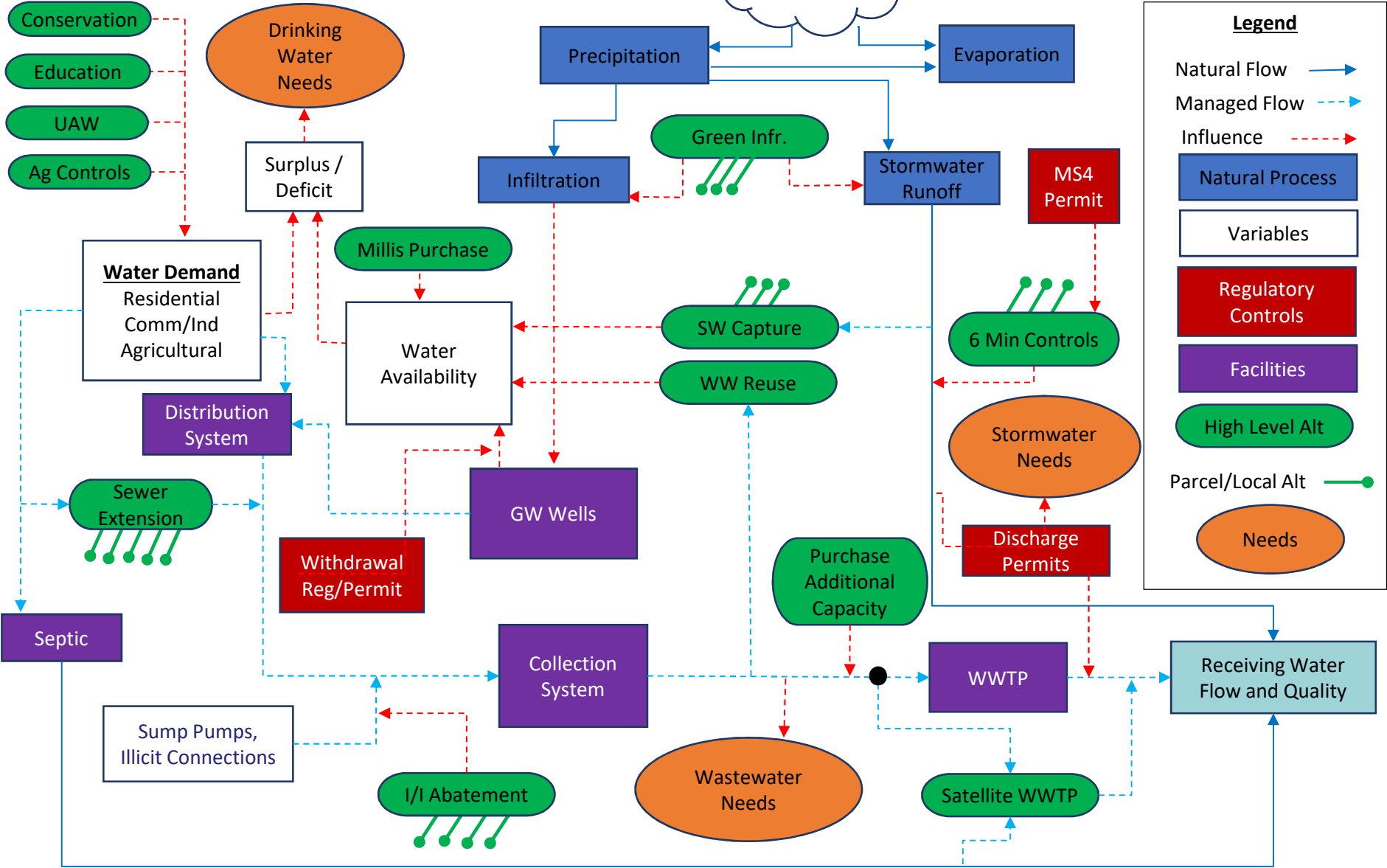
- Document Existing Conditions
- Identify Needs
- Identify Alternatives to Address Needs
- Evaluate Alternatives and Select Preferred Solutions**
- Conceptual Design
- Develop IWRMP (in progress)
- Develop Implementation Schedule



## Decision Model

- Simulate dynamic interactions between systems:
  - Rainfall ↓, Groundwater ↓
  - Impervious Cover ↑, Runoff ↑
  - Population ↑, Water Demand ↑, Wastewater ↑
  - Limits: permits, water availability, capacity
  - Tradeoffs: resources, quality
  
- Goal: quantify the tradeoffs and sensitivities as a guide for decision making

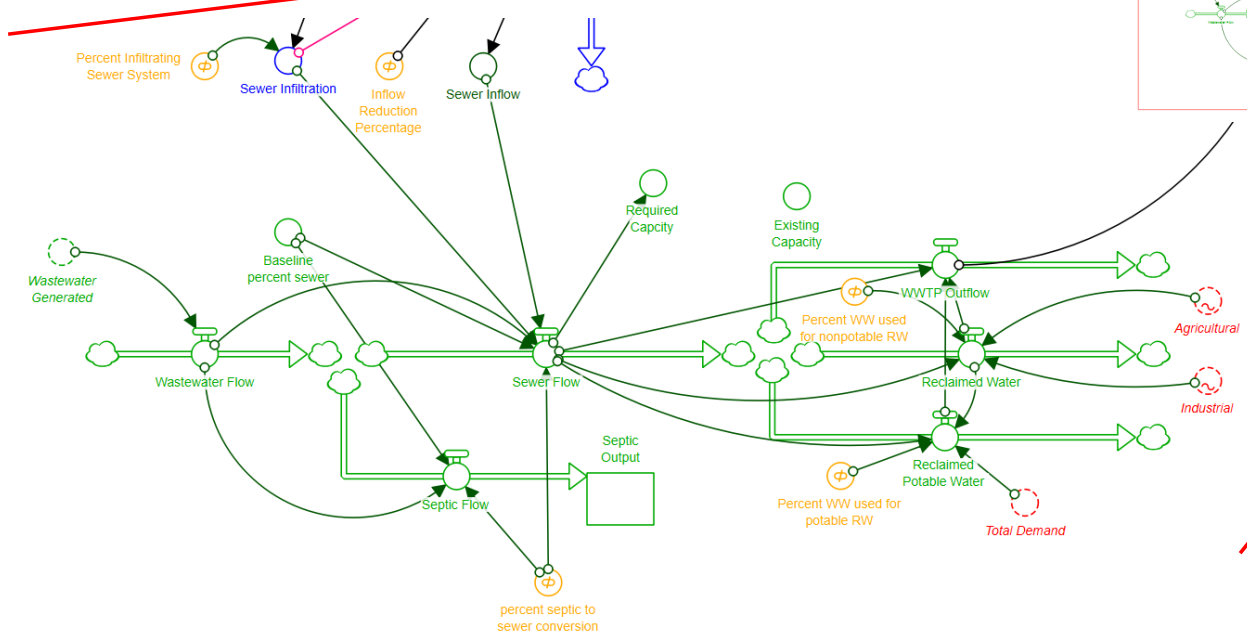
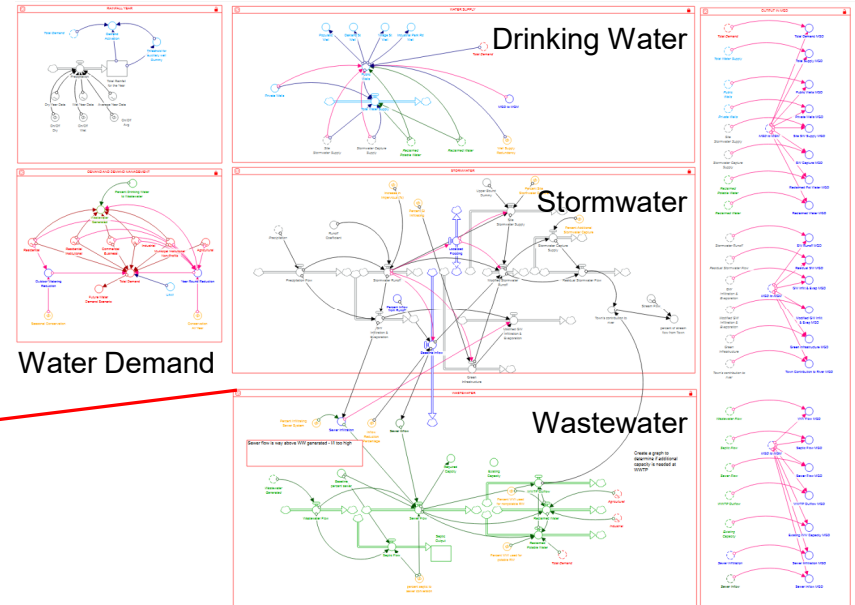
Past and Future Climate



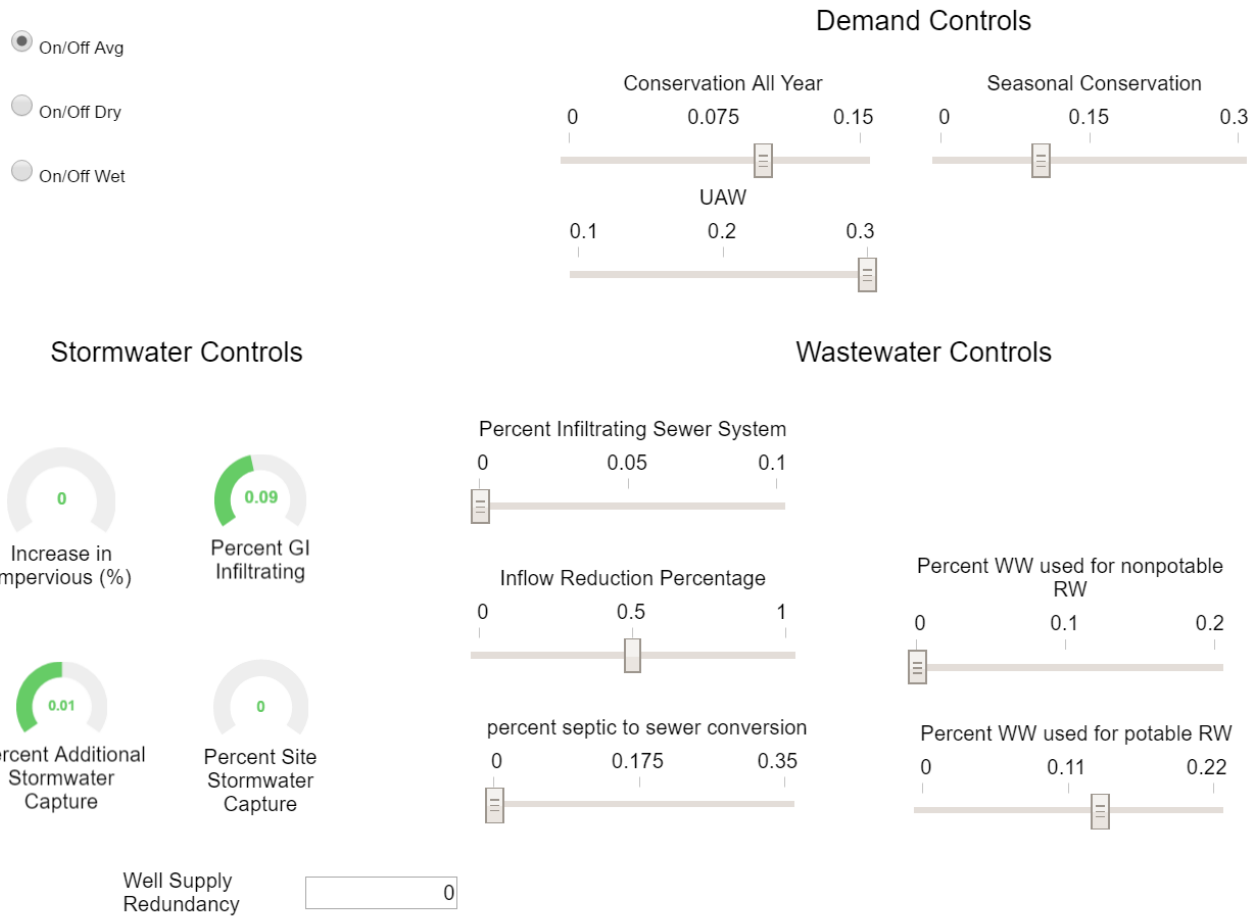
## Model Parameters

- Management Alternatives: Simulated change from today's conditions
- Monthly Variability
- Precipitation: Dry/Average/Wet Years
- Calibration/Verification
  - Recent Water Supply Data (2011-2016)
  - 2007-2017 Wastewater Flows

# Stella Model Configuration



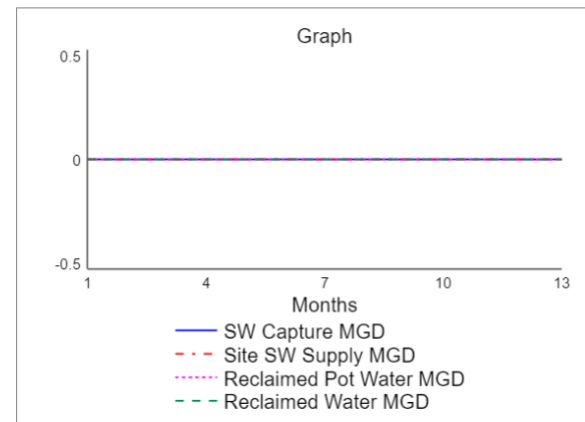
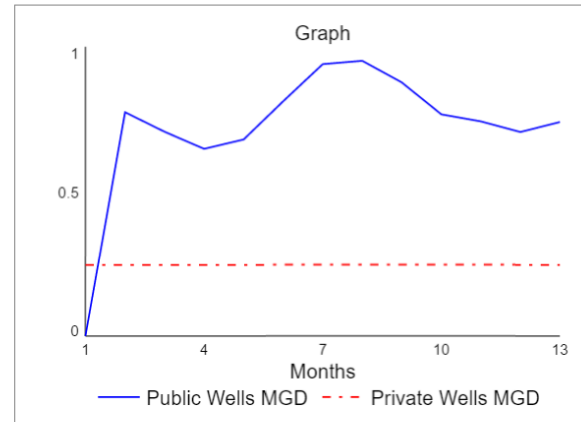
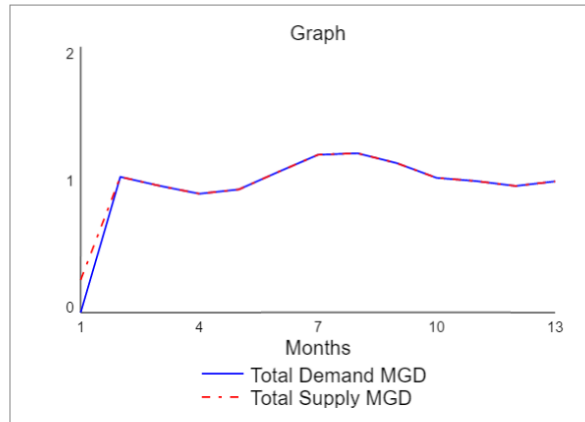
# Decision Model Management Variables





# Decision Model – Sample Output

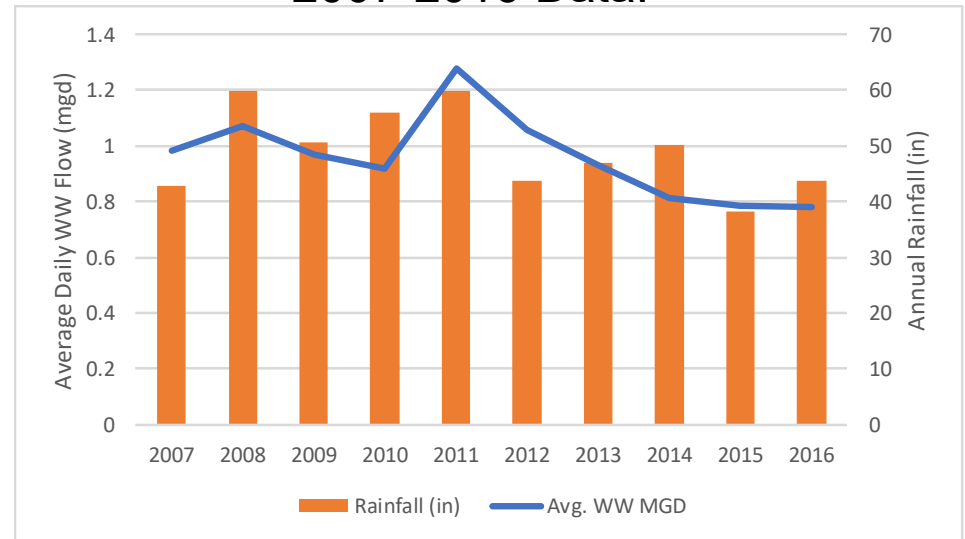
## WATER SUPPLY OUTPUT



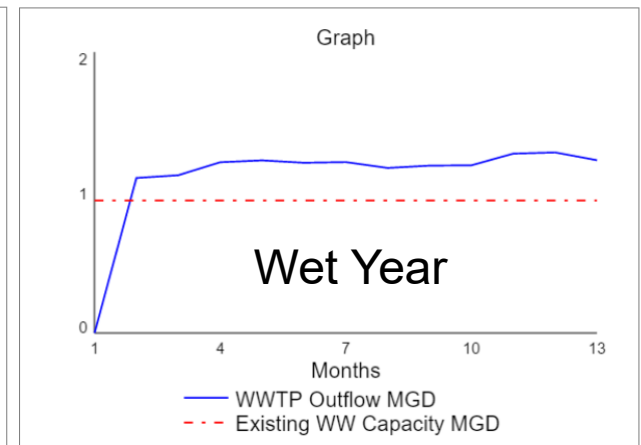
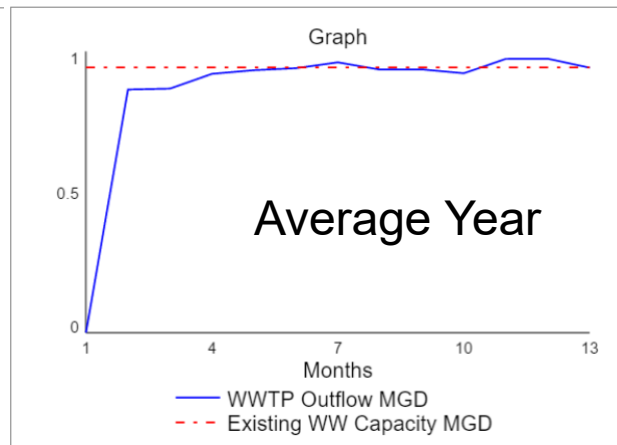
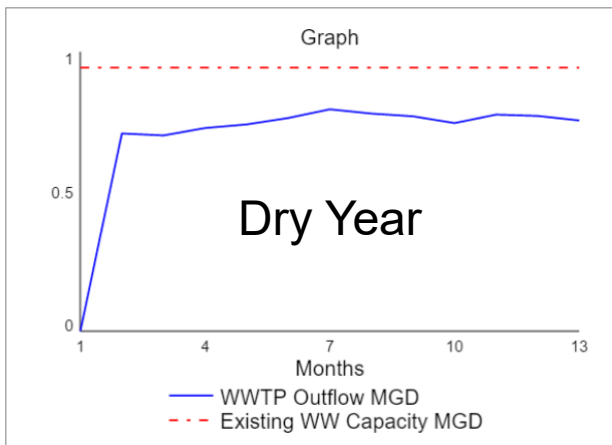
Draft Results

# Decision Model WW Calibration

2007-2016 Data:



## Simulation Results:



Draft Results

# Scenario Summary

<b>Scenario 1:</b> Maintain Existing Conditions	Baseline conditions
<b>Scenario 2:</b> Maximize Water Resource Systems Investment	Address all alternatives and implement to maximum influence
<b>Scenario 3:</b> Minimize Water Resource Systems Investment	Minimize plan cost, focus on administrative/inexpensive alternatives.
<b>Scenario 4:</b> Drinking Water Investment	Focus on water system only
<b>Scenario 5:</b> Stormwater (MS4) Investment	Focus on stormwater system only
<b>Scenario 6:</b> Wastewater Investment	Focus on wastewater system only
<b>Scenario 7:</b> Water Independence	Focus on water reuse from CRPCD
<b>Scenario 8:</b> Hybrid/Optimized	Town preferred alternatives

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
	Maintain Existing Conditions	Maximize Water Resource Systems Investment	Minimize Water Resource Systems Investment	Drinking Water Investment	Stormwater (MS4) Investment	Wastewater Investment	Water Independence	Hybrid/Optimized
<b>Water Resources Management Activities</b>								
Indoor water conservation	✓	+	+	+	✓	✓	✓	✓
Outdoor water conservation	✓	+	+	+	✓	✓	✓	✓
Manage unaccounted for water	✓	+	✓	+	✓	✓	+	✓
Reduce infiltration sources into sewer system	✓	+	✓	✓	✓	+	+	✓
Reduce inflow sources into sewer system	✓	+	✓	✓	✓	+	+	✓
Improve sewer system operations	✓	+	✓	✓	✓	+	+	✓
Address localized flooding	✓	+	✓	✓	+	✓	+	✓
On-site stormwater capture (rain barrels)	✓	+	+	✓	+	✓	+	✓
Availability of emergency water supply from neighboring town (to accommodate largest source offline -Populatic)	✗	✓	✗	✓	✗	✗	✗	
Provide redundant well	✗	✓	✗	✓	✗	✗	✗	
Improve well production/increase permit limits	✗	✓	✓	✓	✗	✗	✗	

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
	Maintain Existing Conditions	Maximize Water Resource Systems Investment	Minimize Water Resource Systems Investment	Drinking Water Investment	Stormwater (MS4) Investment	Wastewater Investment	Water Reuse	Hybrid/Optimized
<b>Water Resources Management Activities</b>								
Improve well production/increase permit limits	x	✓	✓	✓	x	x	x	
Water treatment	x	✓	x	✓	x	x	✓	
Manage future development water demands	x	✓	✓	✓	x		x	
Manage impervious cover for new developments	x	✓	✓	x	✓	x	x	
Increase infiltration through Green Infrastructure	x	✓	x	x	✓	✓	x	
Town-wide stormwater capture (BMPs, rain gardens)	x	✓	x	x	✓	x	✓	
Improve MS4 enforcement	x	✓	✓	x	✓	x	x	
Manage water quality through grey infrastructure	x	✓	x	x	✓	✓	✓	
Manage septic failures	x	✓	✓	x	x	✓	✓	
Septic to sewer conversion through sewer extension	x	✓	✓	x	x	✓	✓	
Availability of treatment capacity at CRPCD	x	✓	✓	x	x	✓	✓	
Evaluate grey water for industrial and agricultural use	x	✓	x	x	x	✓	✓	
Evaluate indirect potable reuse (treat wastewater for groundwater injection)	x	✓	x	x	x	x	✓	

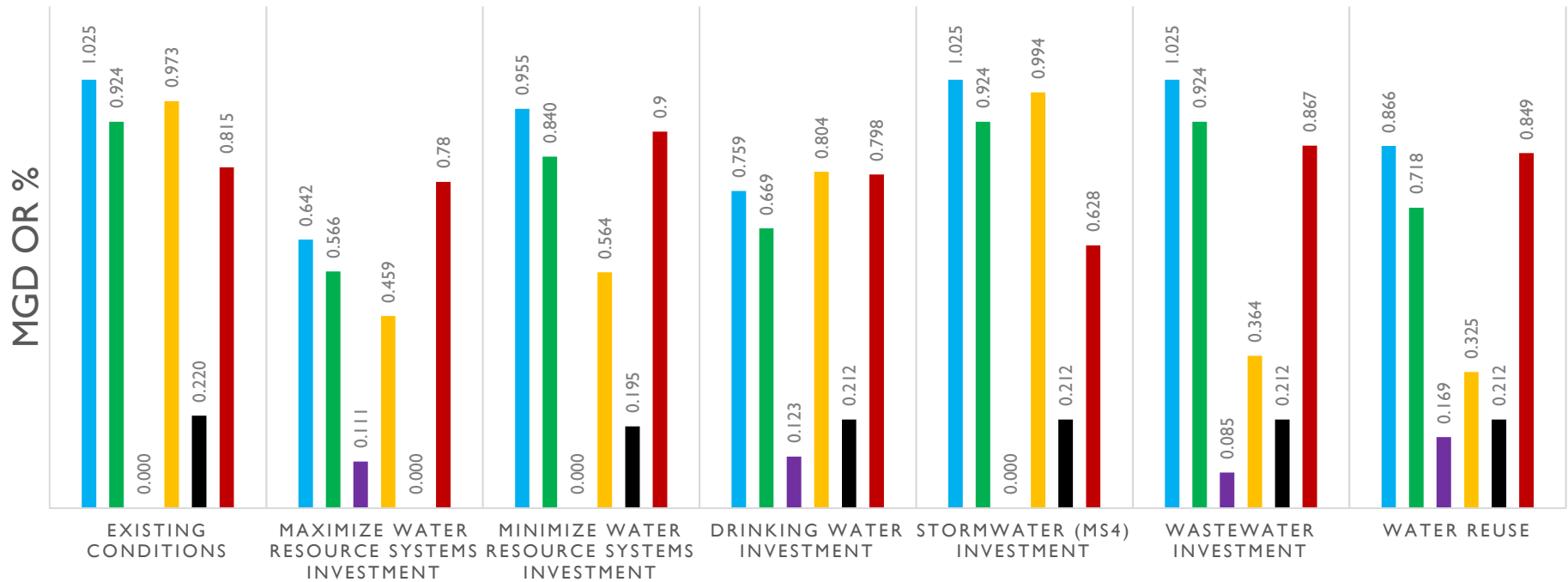
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
<b>Water Resources Management Activities</b>	Maintain Existing Conditions	Maximize Water Resource Systems Investment	Minimize Water Resource Systems Investment	Drinking Water Investment	Stormwater (MS4) Investment	Wastewater Investment	Water Reuse/Water Independence	Hybrid/Optimized
Indoor water conservation	-	<b>+15%</b>	<b>+5%</b>	<b>+15%</b>	✓	✗	✗	✓
Outdoor water conservation	-	<b>+30%</b>	<b>+5%</b>	<b>+30%</b>	✓	✗	✗	✓
Manage unaccounted for water	-	<b>+10%</b>	+	+	+	+	+	✓
Reduce infiltration sources into sewer system	-	<b>+100%</b>	<b>+5%</b>	✓	✓	<b>+100%</b>	<b>+71%</b>	✓
Reduce inflow sources into sewer system	-	<b>+10%</b>	<b>+5%</b>	✓	✓	<b>+10%</b>	<b>+3%</b>	✓
Improve sewer system operations	-	✓	✓	✓	✓	✓	✓	✓
Address localized flooding	-	✓	✓	✓	✓	✓	✓	✓
On-site stormwater capture (rain barrels)	-	<b>+2%</b>	<b>+1%</b>	<b>+2%</b>	<b>+2%</b>	✓	<b>+2%</b>	✓
Availability of emergency water supply from neighboring town (to accommodate largest source offline -Populatic)	✗	✓	✗	✓	✗	✗	✗	
Provide redundant well	✗	✓	✗	✓	✗	✗	✗	
Improve well production/increase permit limits	✗	✓	✓	✓	✗	✗	✗	

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
	Maintain Existing Conditions	Maximize Water Resource Systems Investment	Minimize Water Resource Systems Investment	Drinking Water Investment	Stormwater (MS4) Investment	Wastewater Investment	Water Reuse	Hybrid/Optimized
<b>Water Resources Management Activities</b>								
Improve well production/increase permit limits	x	✓	✓	✓	x	x	x	
Water treatment	x	✓	x	✓	x	x	✓	
Manage future development water demands	x	✓	✓	✓	x		x	
Manage impervious cover for new developments	x	<b>-15%</b>	<b>-5%</b>	x	<b>0%</b>	x	x	
Increase infiltration through Green Infrastructure	x	<b>20%</b>	x	x	<b>20%</b>	✓	x	
Town-wide stormwater capture (BMPs, rain gardens)	x	<b>2%</b>	x	x	<b>2%</b>	x	<b>2%</b>	
Improve MS4 enforcement	x	✓	✓	x	✓	x	x	
Manage water quality through grey infrastructure	x	✓	x	x	✓	✓	✓	
Manage septic failures	x	✓	✓	x	x	✓	✓	
Septic to sewer conversion through sewer extension	x	<b>100%</b>	<b>12%</b>	x	x	✓	✓	
Availability of treatment capacity at CRPCD	x	✓	✓	x	x	✓	<b>0.04%</b>	
Evaluate grey water for industrial and agricultural use	x	<b>20%</b>	x	x	x	<b>20%</b>	<b>20%</b>	
Evaluate indirect potable reuse (treat wastewater for groundwater injection)	x	<b>22%</b>	x	x	x	<b>22%</b>	<b>22%</b>	

# Scenario Tradeoffs

## SCENARIO SUMMARY

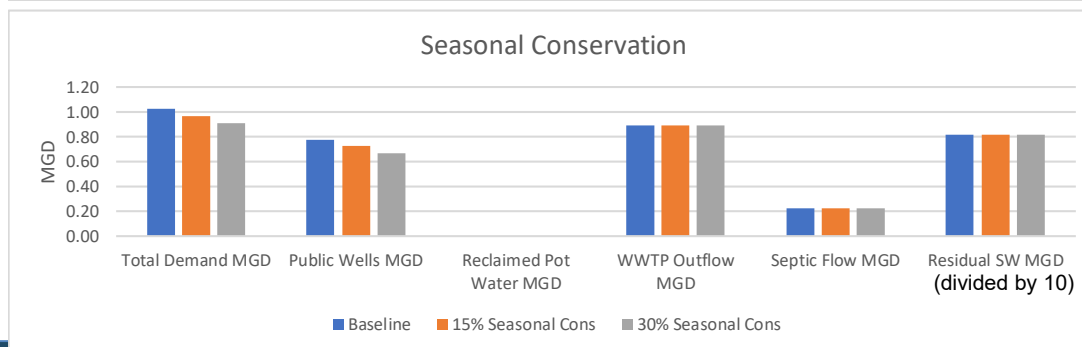
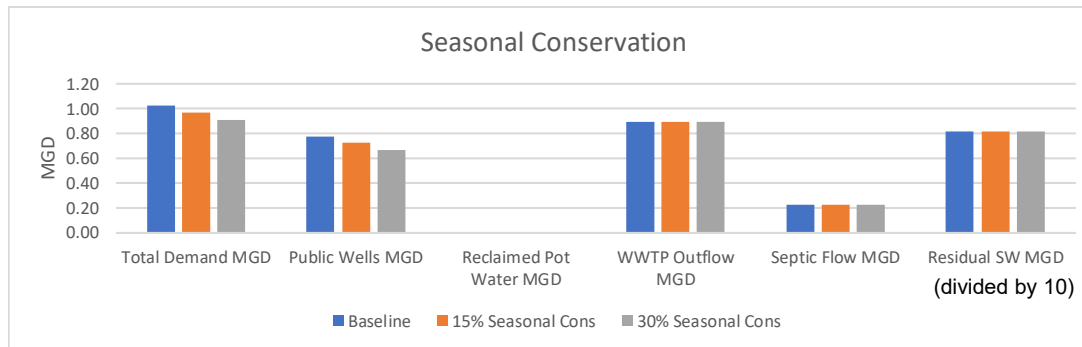
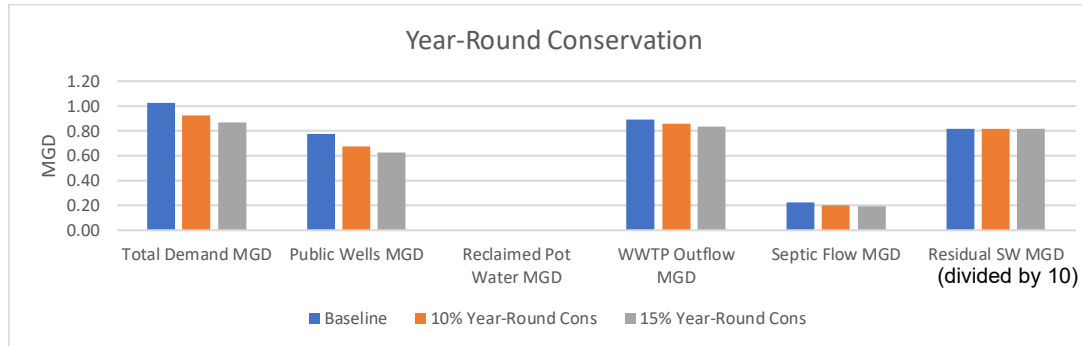
- Total Demand
- % of Well Usage with Largest Out of Service
- Reclaimed Potable Water Supply
- Sewer flow to WWTP
- Septic Flow
- Average SW discharge to River /10



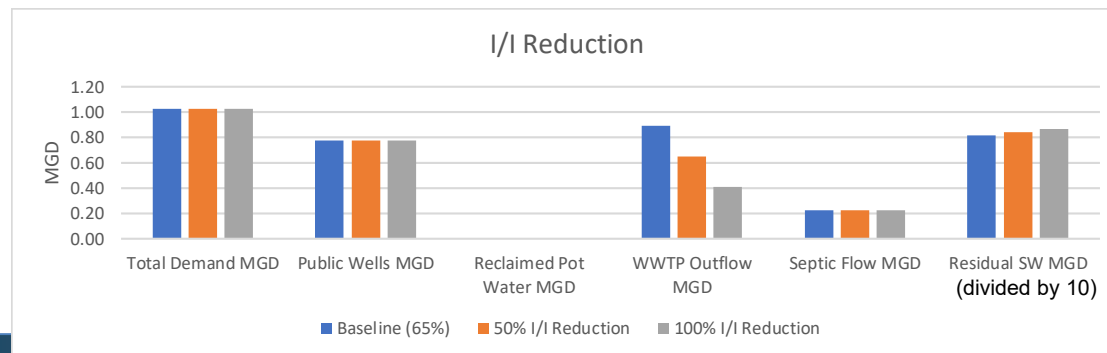
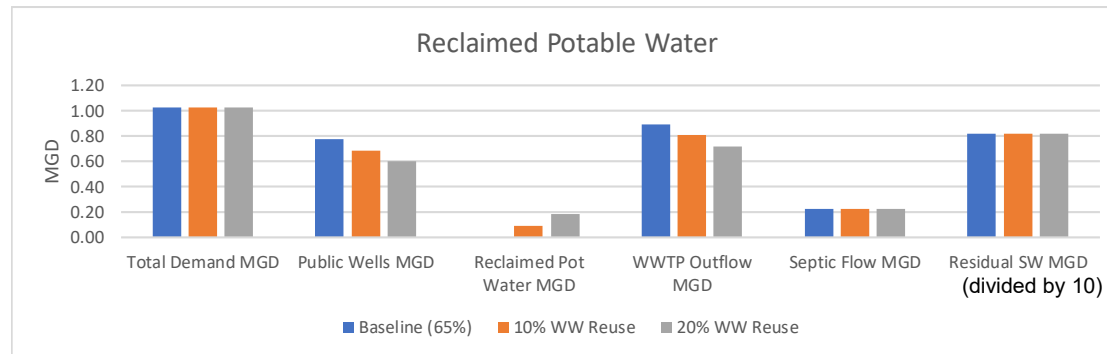
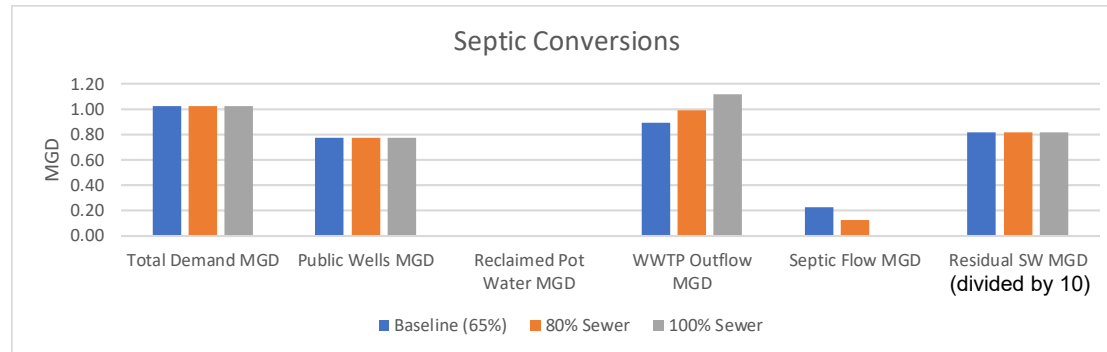
Draft Results



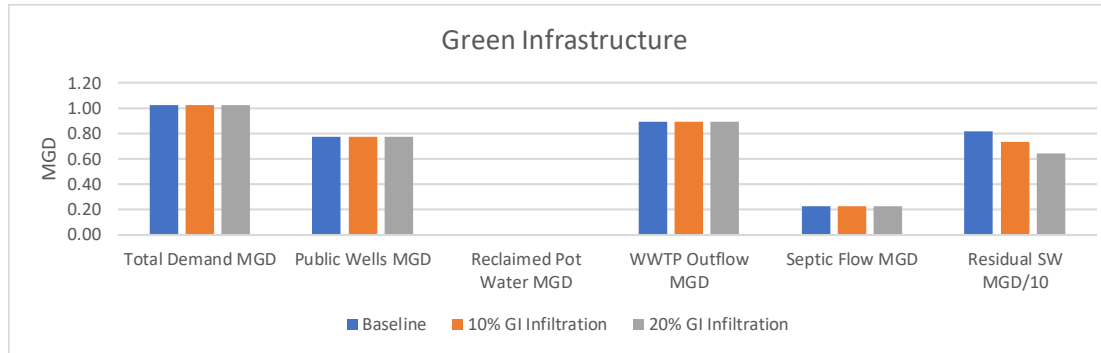
# Key Drinking Water Alternatives



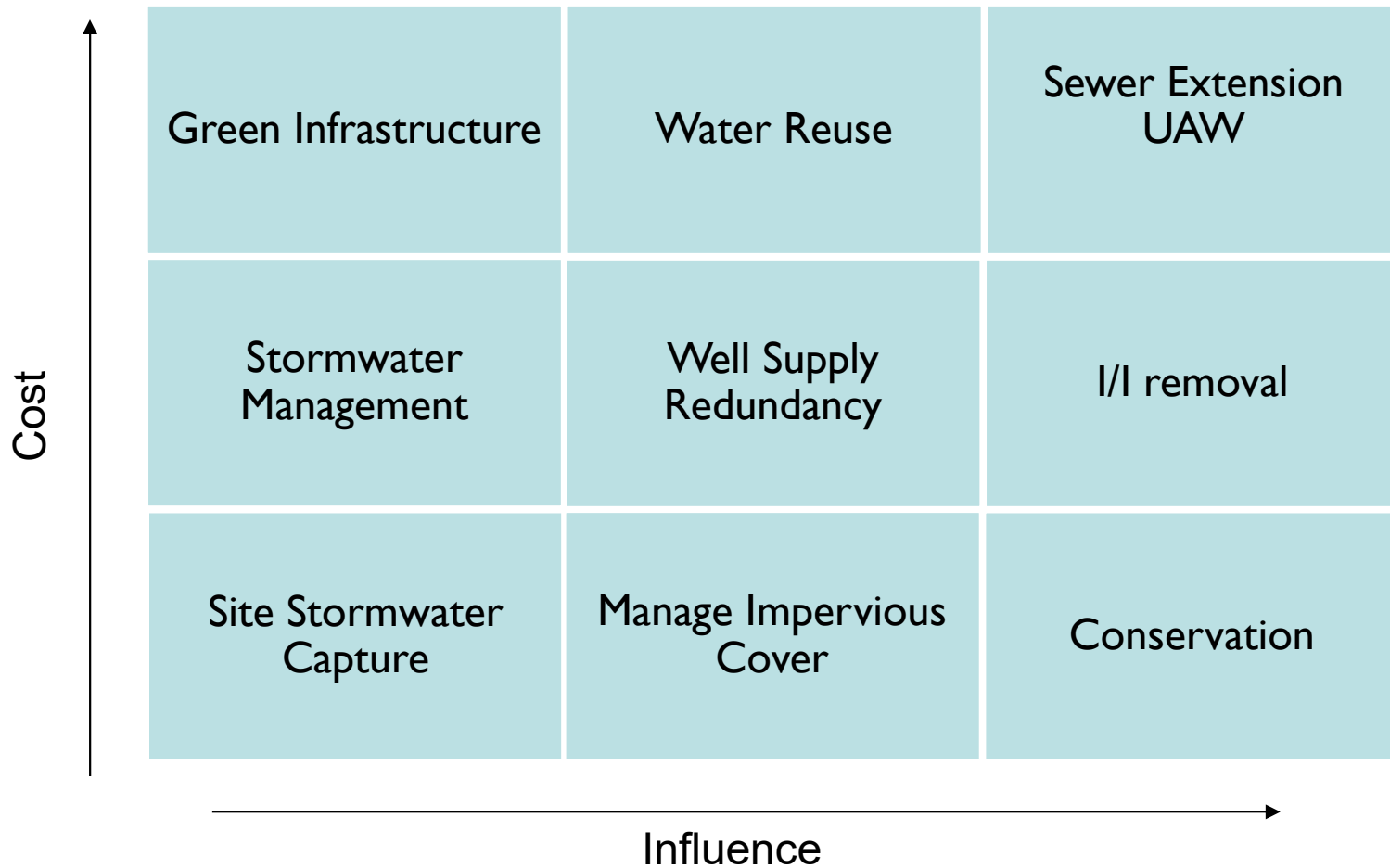
# Key Wastewater Alternatives



# Key Stormwater Alternatives

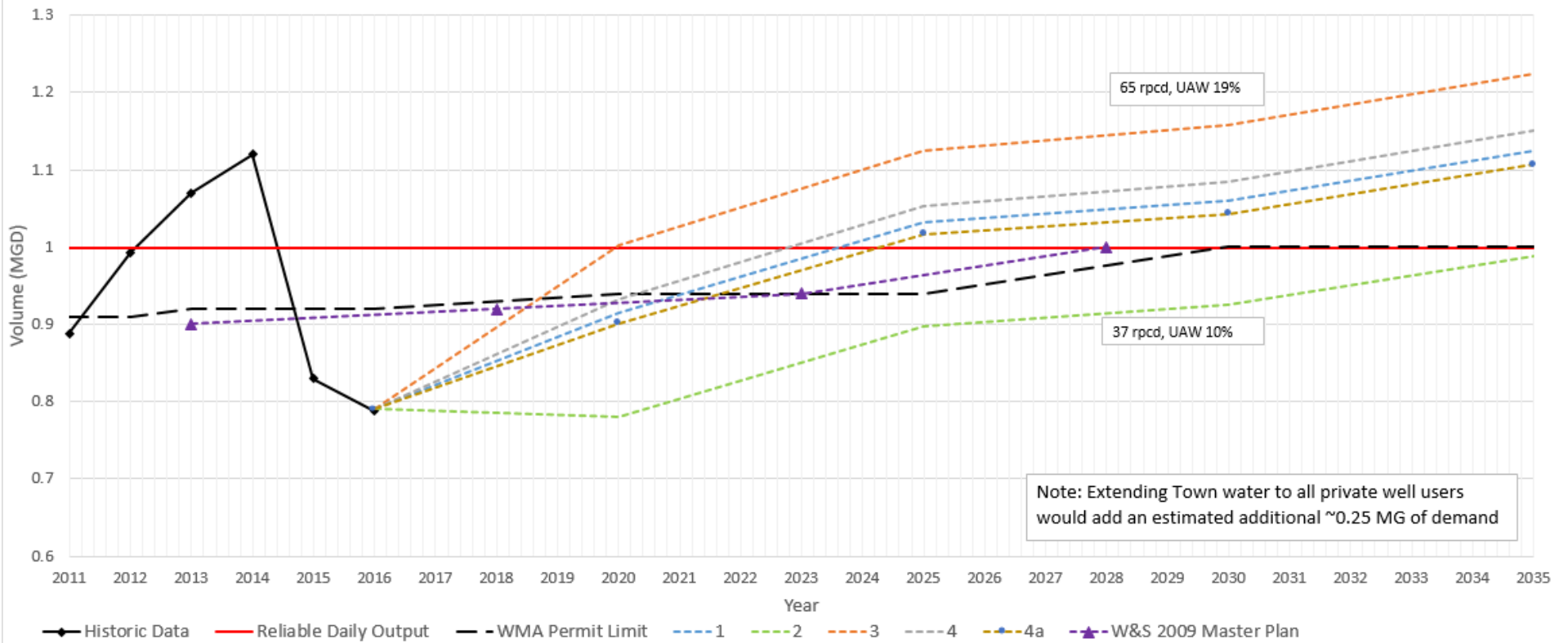


# Influence of Alternatives



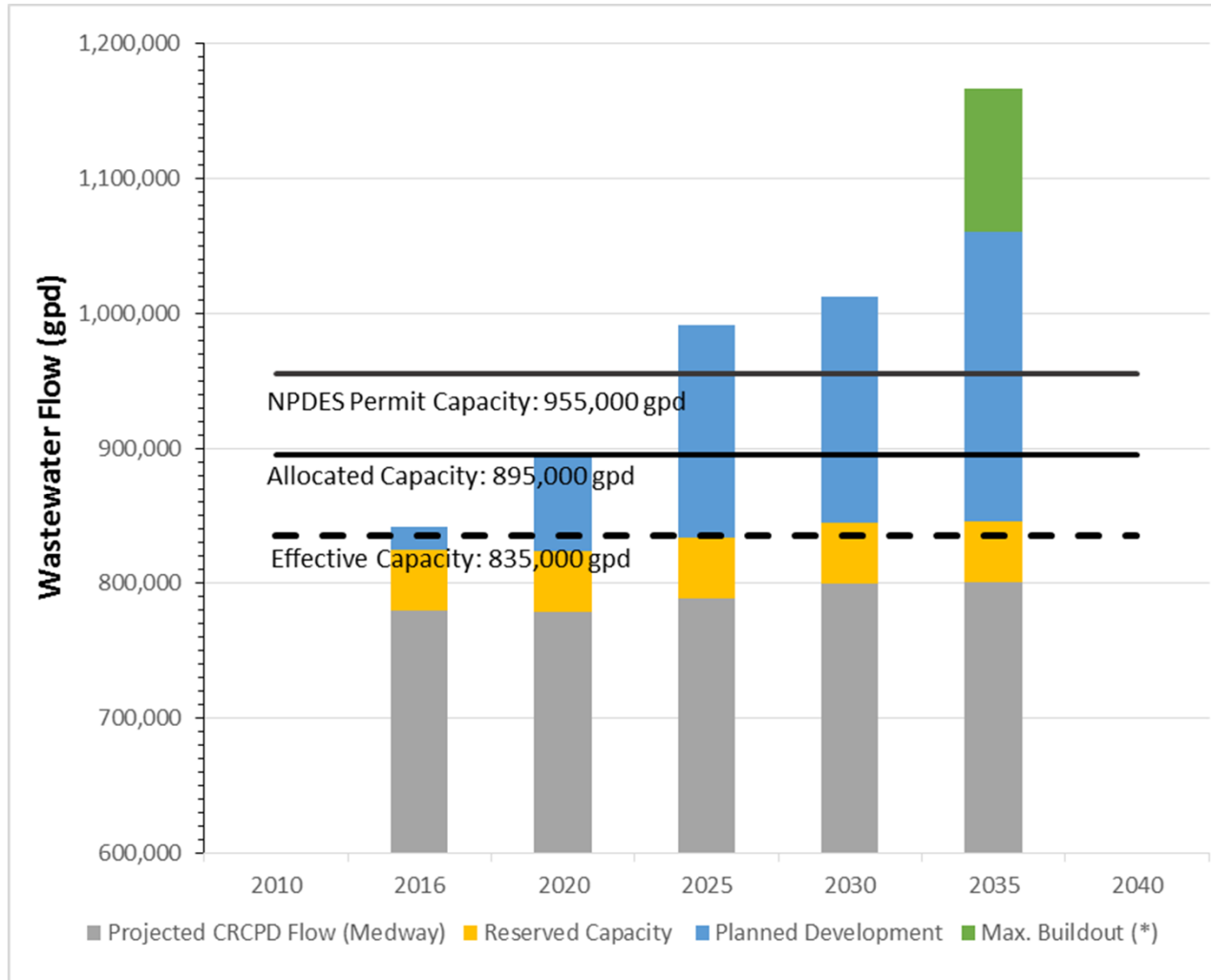
# Drinking Water

Average Daily Demand - Actual and Projected (MGD)



Scenario	Description
1	Future residential water Use at current (2016) rate and UAW at current (2016) value
2	Future residential water use at current (2016) rate and UAW at 10%
3	Future residential water use at 65 gpcd and UAW 2011-2016 avg. value
4	Future residential water use at 65 GPCD and UAW at 10% (Umass Donahue Population)
4a	Future residential water use at 65 GPCD and UAW at 10% (MassDOT Population)

# Wastewater Projections



# What Other Questions Should We Address?



# Next Steps Summary





## Next Steps

- Conceptual Design of Alternatives (Jan-Feb)
  - Evaluate Costs
- Draft Implementation Plan (Feb-Mar)
  - Review implementation schedule and costs
  - Workshop and Public Meeting in April
- Complete Draft IWRMP (April)



# Integrated Water Resources Management Plan

Thank you for your time!

# Reference Slides – from Fall Meeting

# Drinking Water

Needs	Solutions
Lack of well supply capacity	<ul style="list-style-type: none"><li>• annual well rehabilitation program to restore lost capacity; increase resiliency</li></ul>
Lack of well redundancy	<ul style="list-style-type: none"><li>• Satellite wells</li><li>• Replacement wells / wellfield</li></ul>
Unlikely to meet max daily demand with largest source offline  Within 2-5 years, may be unable to meet average day demand	<ul style="list-style-type: none"><li>• Emergency purchase agreement with Millis</li><li>• Alternative water sources<ul style="list-style-type: none"><li>• New supply well</li><li>• Stormwater capture</li><li>• Wastewater Reuse</li></ul></li></ul>

# Drinking Water

Needs	Solutions
Future supply deficit projected	Continue / enhance demand management <ul style="list-style-type: none"> <li>• Conservation education/outreach</li> <li>• Fixture retrofits</li> <li>• Rebates</li> <li>• Water ban</li> </ul>
New regulatory constraints (WMA) <ul style="list-style-type: none"> <li>• Offsets required for higher withdrawal authorization</li> </ul>	Consult with DEP on new WMA Permit application; identify credits
Iron & manganese levels requiring treatment	Construct treatment facility
Un-accounted for water (UAW) >10%	<ul style="list-style-type: none"> <li>• Meter testing / replacement program</li> <li>• Continue Annual Leak detection</li> <li>• Water main replacement as recommended in 2010 Master Plan</li> </ul>

# Wastewater

Needs	Alternatives
Data Gaps (flow metering)	<ul style="list-style-type: none"> <li>• Permanent meter to confirm flow to CRPCD</li> </ul>
CRPCD discharge limits	<ul style="list-style-type: none"> <li>• Sewer moratorium</li> <li>• Infiltration/Inflow (I/I) Removal               <ul style="list-style-type: none"> <li>○ Flow Metering*</li> <li>○ Illicit Connections</li> <li>○ Private Inflow Sources</li> <li>○ CCTV Inspection</li> <li>○ Manhole Sealing</li> <li>○ Cured in Place Pipelining (CIPP)</li> </ul> </li> </ul>
Support Planned Buildout	<ul style="list-style-type: none"> <li>• Sewer Extensions</li> <li>• I/I Removal</li> <li>• Increase discharge limit at CRPCD</li> </ul>

# Wastewater

Needs	Solutions
<p>Septic systems failures</p> <ul style="list-style-type: none"> <li>• Physical limitations- High groundwater, extensive wetlands; poorly drained soils.</li> <li>• Protect Water Supply Sources</li> </ul>	<ul style="list-style-type: none"> <li>• Decentralized Treatment System</li> <li>• Sewer Extensions</li> <li>• Septic Needs Support Funds</li> </ul>
<p>Ongoing Maintenance</p> <ul style="list-style-type: none"> <li>• Fats, Oils, Grease (FOG)</li> <li>• Root Removal</li> <li>• System Condition Assessment</li> <li>• Pump Station Operation</li> </ul>	<ul style="list-style-type: none"> <li>• Support DPS Operations</li> <li>• CCTV Inspection of full system</li> </ul>
<p>Public Education</p>	<ul style="list-style-type: none"> <li>• FOG</li> <li>• Illicit Connections</li> <li>• Private Inflow Sources</li> </ul>

# Stormwater

Needs	Solutions
<p>Localized Flooding</p> <ul style="list-style-type: none"> <li>• Low Topography</li> <li>• Sedimentation</li> <li>• Blocked Catch Basins</li> <li>• Beaver Activity</li> </ul>	<ul style="list-style-type: none"> <li>• Implement Green Infrastructure</li> <li>• Address development standards</li> <li>• Support maintenance</li> </ul>
<p>Mapping of System</p> <ul style="list-style-type: none"> <li>• GIS mapping of drain system</li> <li>• Delineate Catchments</li> </ul>	<ul style="list-style-type: none"> <li>• Map Drain System in Problem and High Concern Catchments</li> </ul>
<p>Water Quality Monitoring at Outfalls</p> <ul style="list-style-type: none"> <li>• Dry Weather Flow</li> <li>• Water Quality Sampling</li> </ul>	<ul style="list-style-type: none"> <li>• Support DPS Operations</li> <li>• MS4 Funding</li> </ul>



# Stormwater

<b>Needs</b>	<b>Solutions</b>
<p>Maintenance</p> <ul style="list-style-type: none"><li>• Good Housekeeping</li><li>• Catch Basin Cleaning</li><li>• Street Sweeping</li></ul>	<ul style="list-style-type: none"><li>• Support DPS Operations</li><li>• MS4 Funding</li></ul>
<p>Public Education</p>	<ul style="list-style-type: none"><li>• Ongoing education programs</li></ul>
<p>Water Quality Improvements</p>	<ul style="list-style-type: none"><li>• 6 Minimum Controls</li><li>• BMPs</li></ul>