Re-Evaluation of CSO Abatement Approach Saves Small Maine Community Over $2 Million

Water Street, Gardiner, Maine

New England Water Environment Association
Annual Conference: Session No. 3
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Hoyle, Tanner & Associates, Inc.

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Authors

- **Steve Freedman**, AECOM
- **Eric Lemont**, AECOM
- **Dan Marks**, Hoyle, Tanner & Associates
- **Doug Clark**, Gardiner Wastewater Director

Contributors

- **Chuck Applebee**, Former Gardiner Wastewater Director
- **Arthur Robinson**, Chief Wastewater Operator

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Agenda

- Project Overview
- CSO Abatement: Past, Present and Future
- Related Project Elements
- Project Costs
- Schedule

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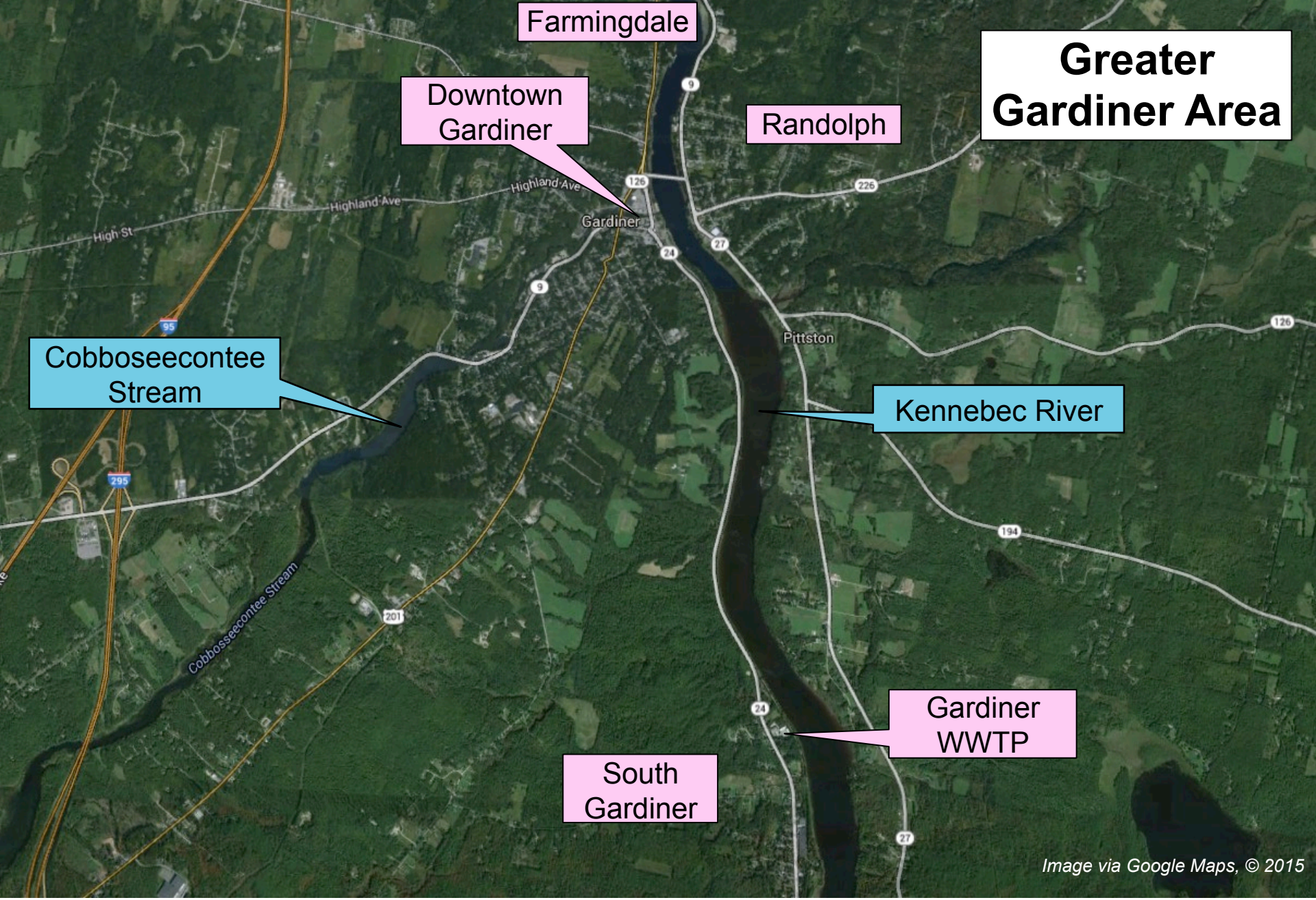

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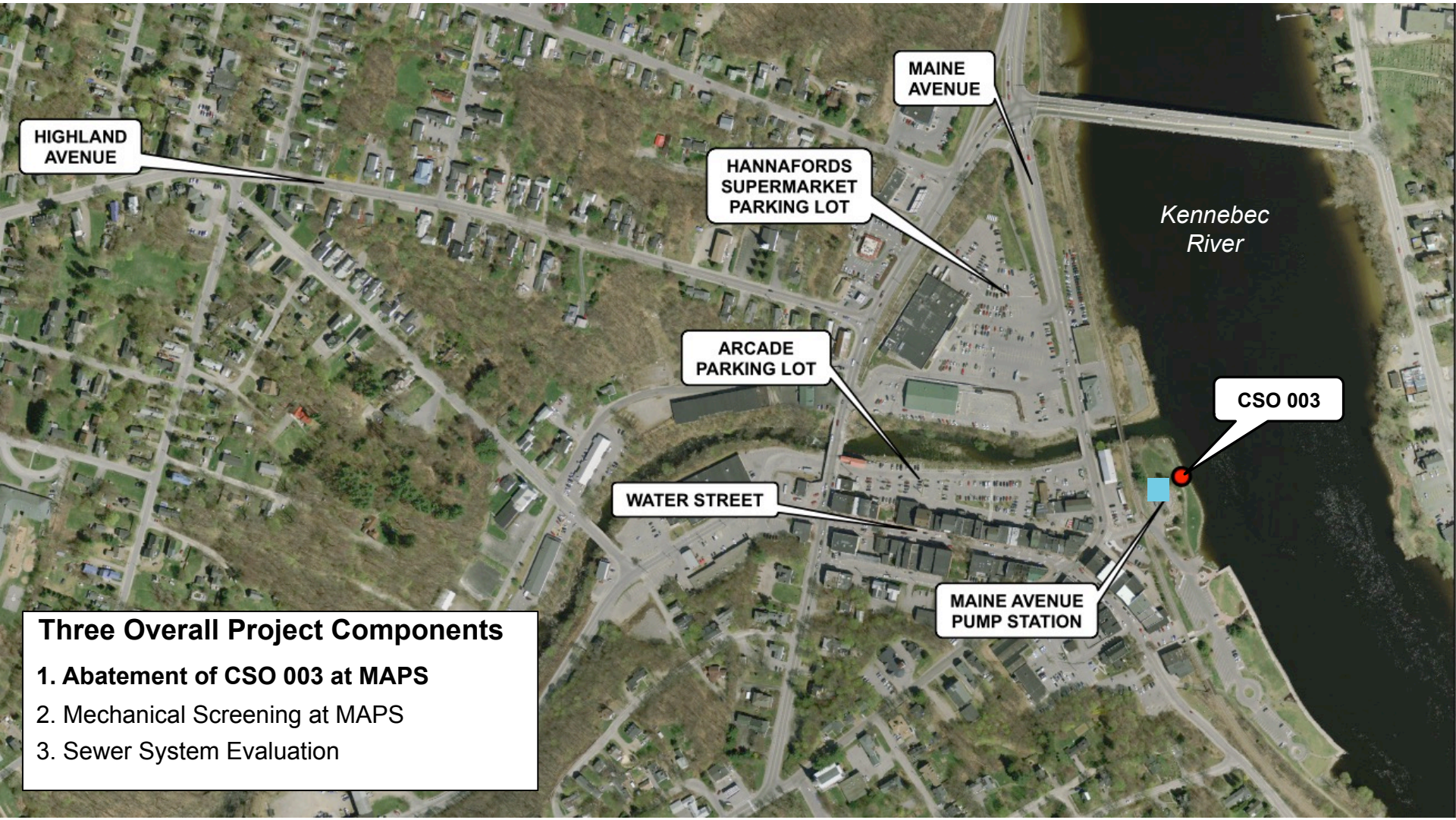
Location Map



Three Overall Project Components

1. **Abatement of CSO 003 at MAPS**
2. Mechanical Screening at MAPS
3. Sewer System Evaluation

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Gardiner Wastewater Collection and Treatment System

- Regional system serving City of Gardiner and Towns of Farmingdale and Randolph
  - Farmingdale via gravity
  - Randolph via pumping across the Kennebec River
- WWTF located in South Gardiner
  - 4.5 MGD design flow (secondary using RBC)
  - Up to 9.5 MGD in wet weather (flows above 4.5 MGD receive primary treatment/seasonal disinfection)
- 7.0 MGD Maine Ave. PS conveys flow from Farmingdale and downtown Gardiner to the WWTF

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History of CSO Abatement

- City's initial CSO plan was prepared in 1995
- Plan was updated in 2002, 2008 and 2013
- Abatement program was based on an adaptive "build and measure" approach
- Two licensed outfalls: CSO 002 at Rolling Dam Brook and CSO 003 at Cobbossee Stream
- CSO 002 has been eliminated and in full compliance (primary treatment/seasonal disinfection)

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CSO Abatement Status

- Estimated **20 MGY** of untreated overflow in 1995
- Current CSO Discharges:
  - 33 activations between 2008 and 2013 averaging **4.61 MGY**
  - 14 activations within the May 15-September 30 disinfection season averaging **0.83 MGY**
  - The **4.61 MGY** of remaining untreated overflow at CSO 003 represents a **77%** systemwide reduction from 1995

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CSO Abatement Objectives

- Bring CSO 003 at the MAPS into compliance (relocated from Cobbossee Stream as part of an earlier abatement project)
- Determine the optimal size, location and shape of the tank
- Coordinate with the installation of the mechanical screen at the MAPS

Earlier plan had suggested off-line storage to capture 100% of discharge volume and became the "placeholder" for the 2013 plan update

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What is Compliance?

- Meets the goals of EPA and DEP CSO policies and guidelines
- CSOs are eliminated (as was the case with CSO 002)
- If they can't be eliminated, the remaining CSOs:
  - Are stored for later treatment at the WWTF
  - Receive a minimum of primary treatment plus disinfection between May 15 - September 30

By switching from purely storage to storage/treatment, Gardiner could achieve these abatement criteria and a high degree of compliance at lower costs

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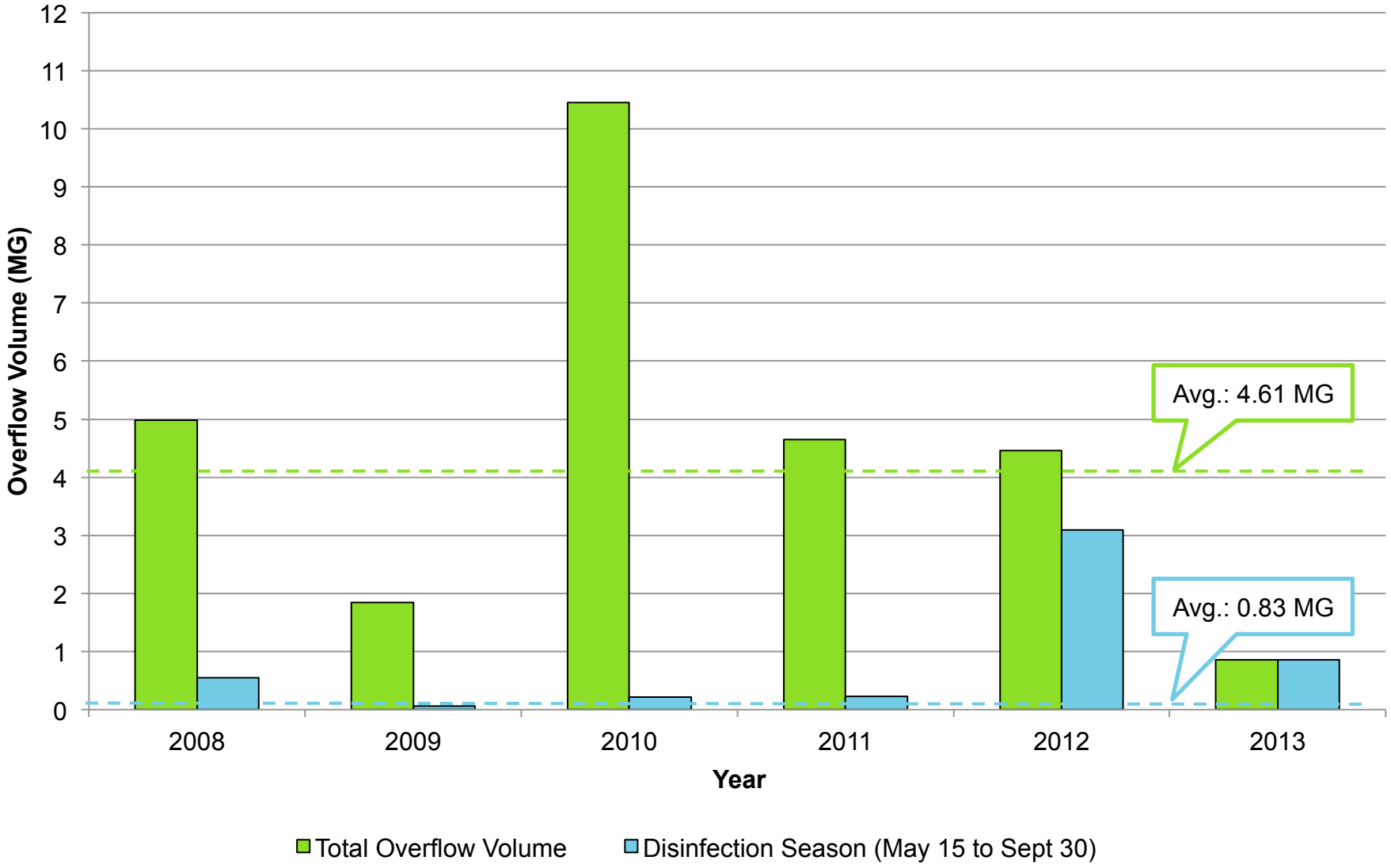
Annual Overflow Volumes at CSO 003



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Data Analysis (2008 to 2013)

- Year-round:
  - 33 total events
  - 27.7 MG total
  - Mean: 0.84 MG
  - Median: 0.43 MG
  - Max: 3.51 MG
- Disinfection season:
  - 14 CSO events
  - 5.01 MG total
  - Mean: 0.36 MG
  - Median: 0.12 MG
  - Max: 2.90 MG
    - Next highest: 0.73 MG

Event End	Total Rainfall	Total CSO
	in	gal
11/27/2013	2.96	430,000
9/2/2013	2.50	133,000
8/9/2013	2.72	728,000
12/21/2012	1.28	471,600
8/16/2012	4.05	194,200
6/4/2012	5.02	2,897,500
4/24/2012	4.12	892,100
9/5/2011	1.54	135,000
6/10/2011	1.45	95,000
4/17/2011	1.52	915,000
3/7/2011	3.45	3,510,000
12/13/2010	3.05	1,519,000
11/7/2010	2.42	881,000
10/15/2010	1.06	142,883
7/21/2010	1.46	118,000
7/10/2010	1.00	95,578
3/30/2010	3.63	3,381,800
2/25/2010	4.00	2,819,000
1/28/2010	0.12	300
1/25/2010	1.40	1,496,200
11/14/2009	4.30	1,321,000
10/24/2009	1.70	9,000
10/9/2009	0.35	447,000
9/25/2009		5,000
8/11/2009	0.79	59,000
6/19/2009	0.48	800
11/25/2008	3.41	1,550,000
10/26/2008	2.02	505,000
9/27/2008	3.57	129,000
9/6/2008	4.15	408,000
7/1/2008	1.16	10,000
4/30/2008	4.48	2,051,000
3/8/2008	1.95	327,000
Total	**33**	**27,676,961**

Data Analysis: May 15 to Sept. 30

Outlier Removed from Data

- From 2008 to 2013 data:
  - 13 CSO events
  - 2.11 MG total
  - Mean: 0.16 MG
  - Median: 0.12 MG
  - Max: 0.73 MG

Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.

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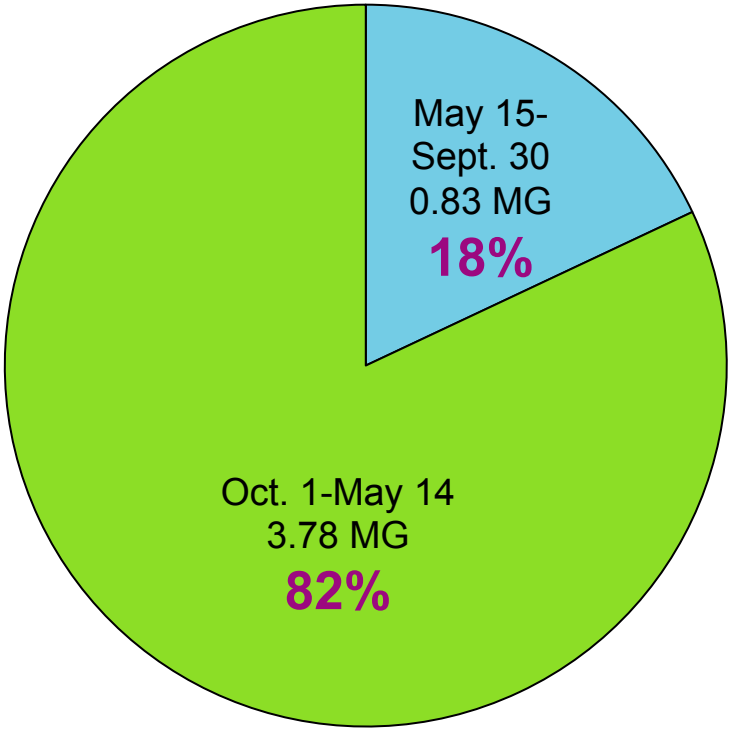
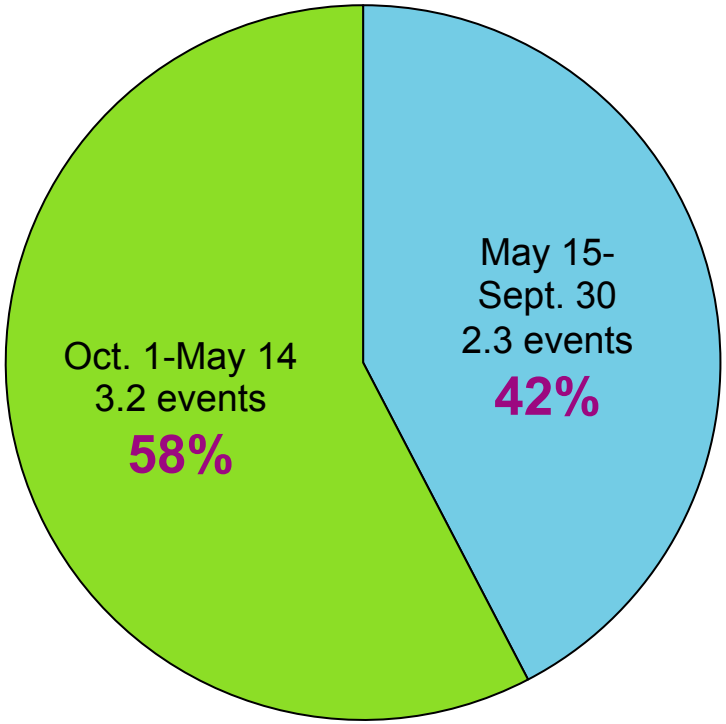
CSO 003 Annual Seasonal Averages
2008 to 2013

Volume – 4.61 MGY



Events – 5.5 per Year



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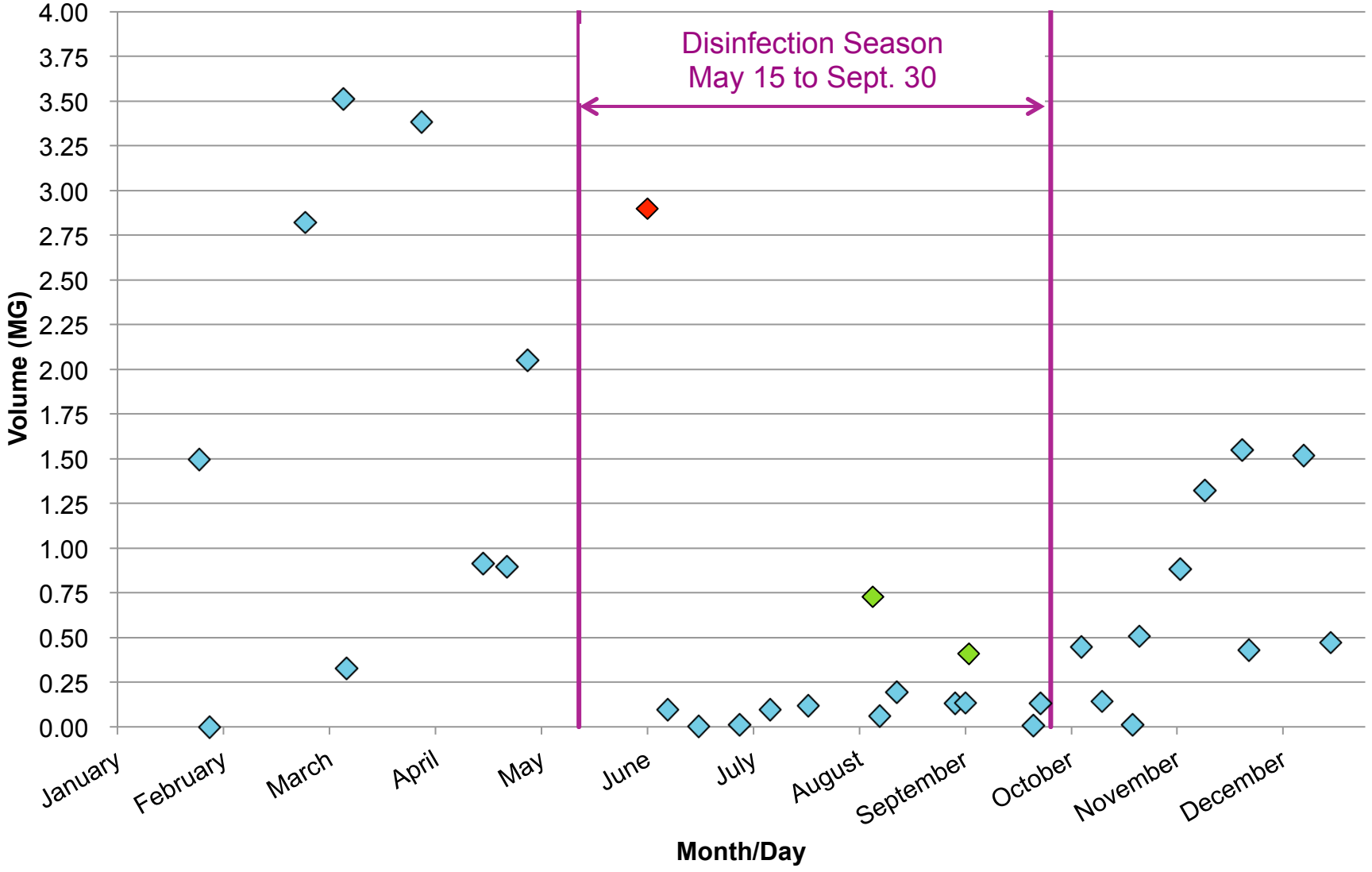
CSO 003 Overflow Events by Month (2008-2013)



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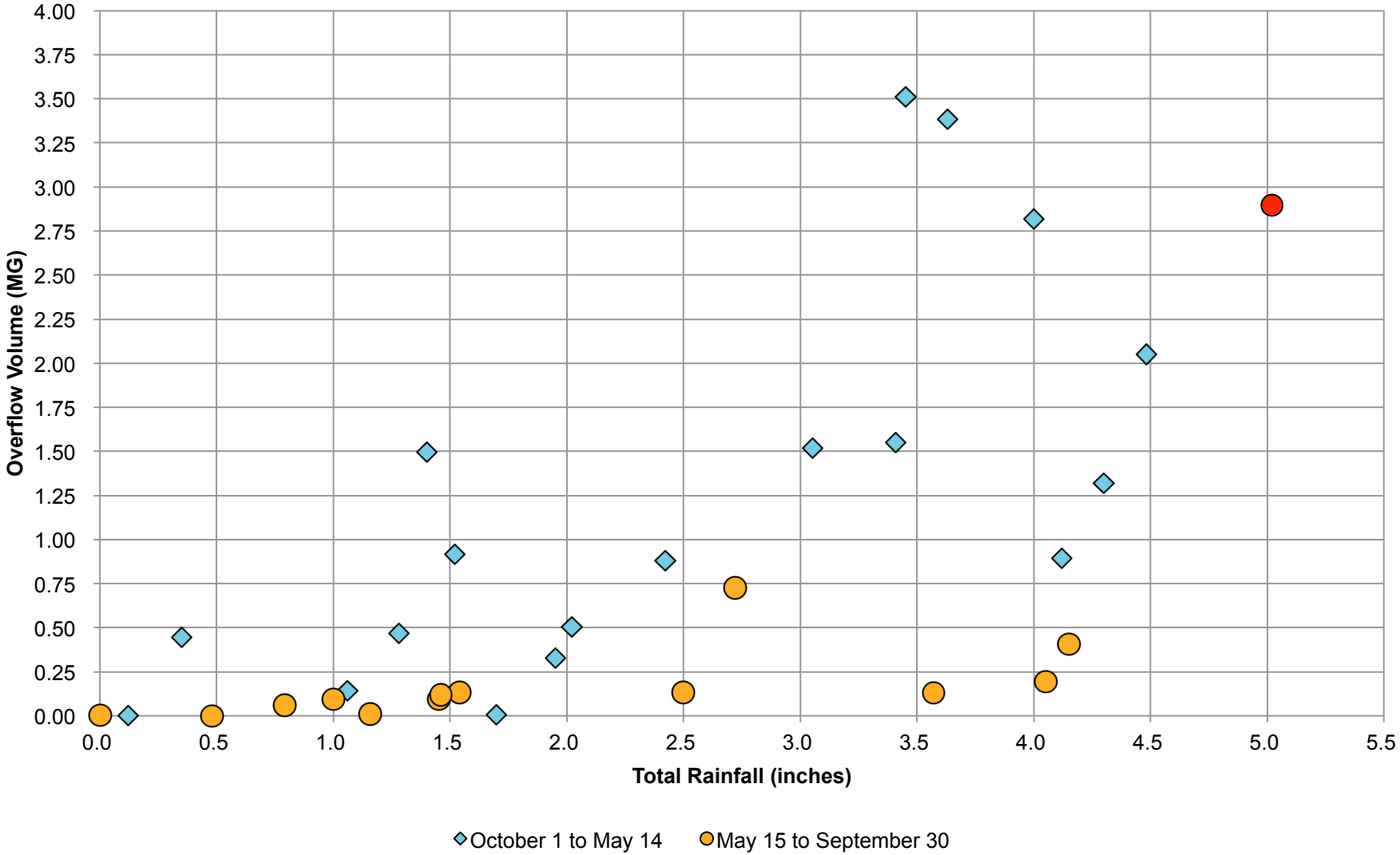
Total Rainfall vs. CSO 003 Overflow Volume (2008-2013)



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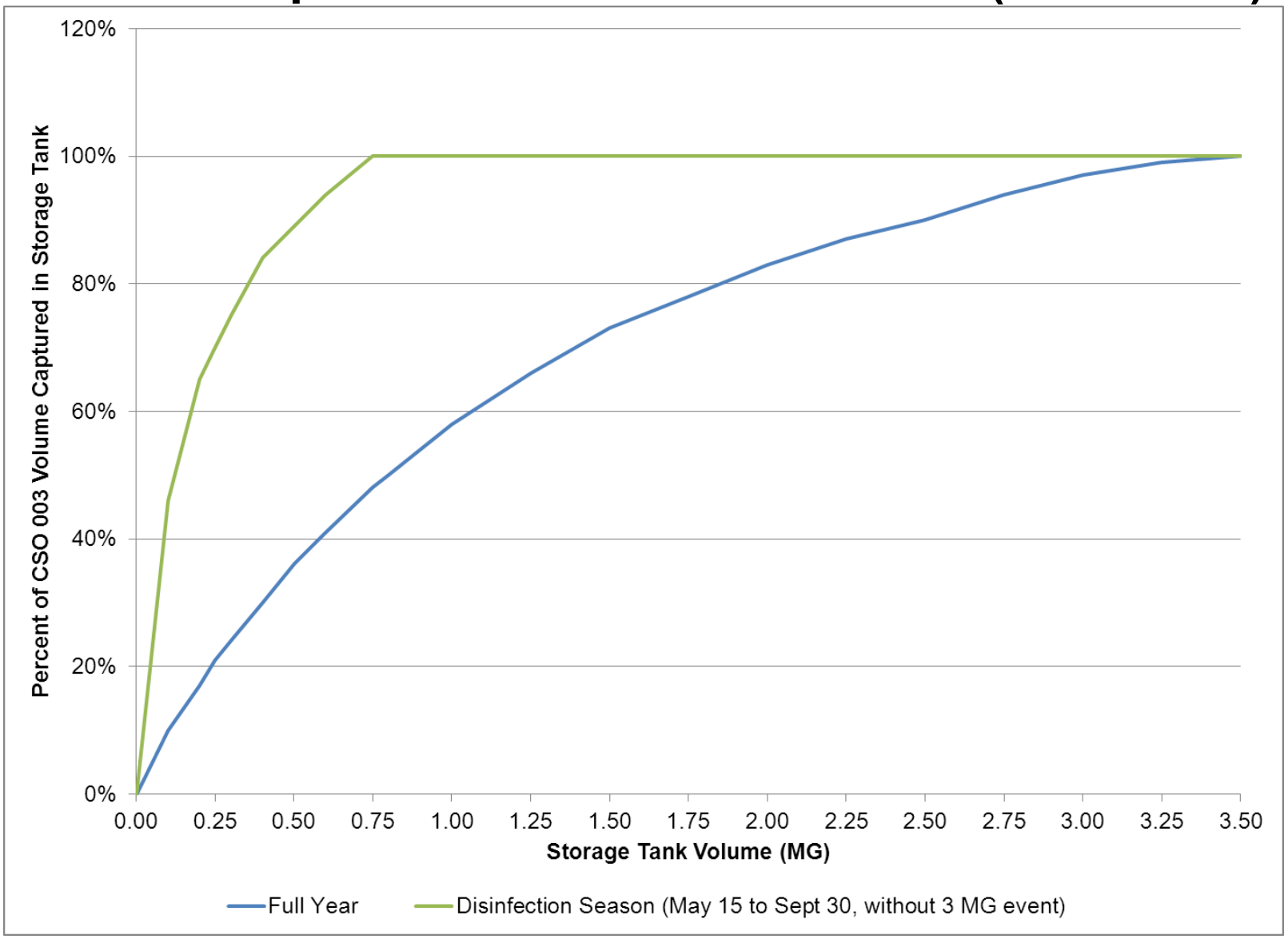
Percent Capture for Various Tank Sizes (2008-2013)



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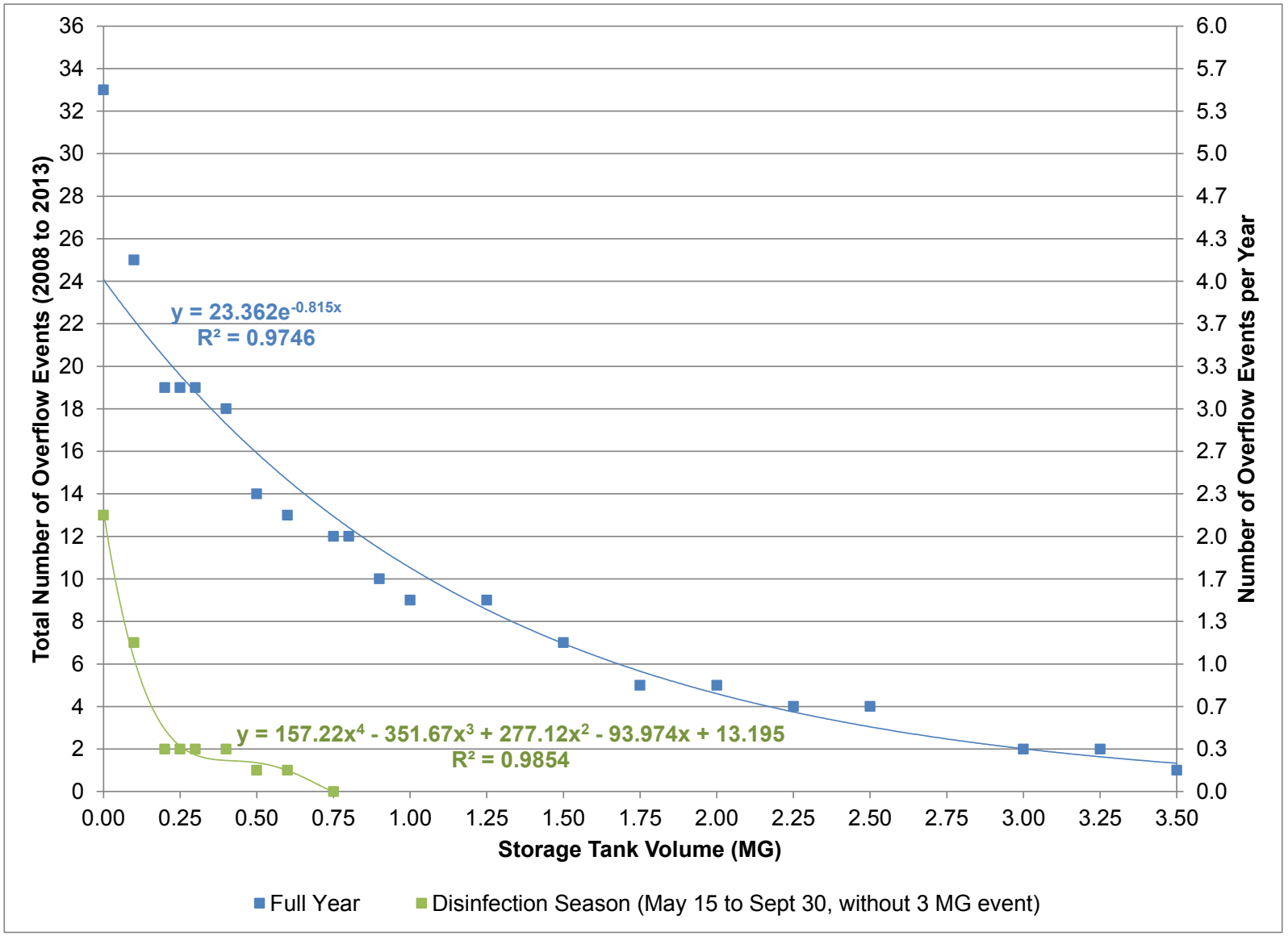
Number of Overflows for Various Tank Sizes



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Percent Compliance During Disinfection Season

	0.25 MG Tank	0.41 MG Tank	0.50 MG Tank	0.75 MG Tank
Disinfection Season (All Events Included)	21%	44%	48%	57%
Disinfection Season (2.9 MG Outlier Removed)	70%	85%	89%	100%
Overflow Event Frequency* (All Events Included)	1 event every 2 years	1 event every 3 years	1 event every 3 years	1 event every 6 years

**Note: 2.9 MG storage tank required for zero overflows.*

Annual disinfection season average volume was 0.83 MG from 2008 to 2013.

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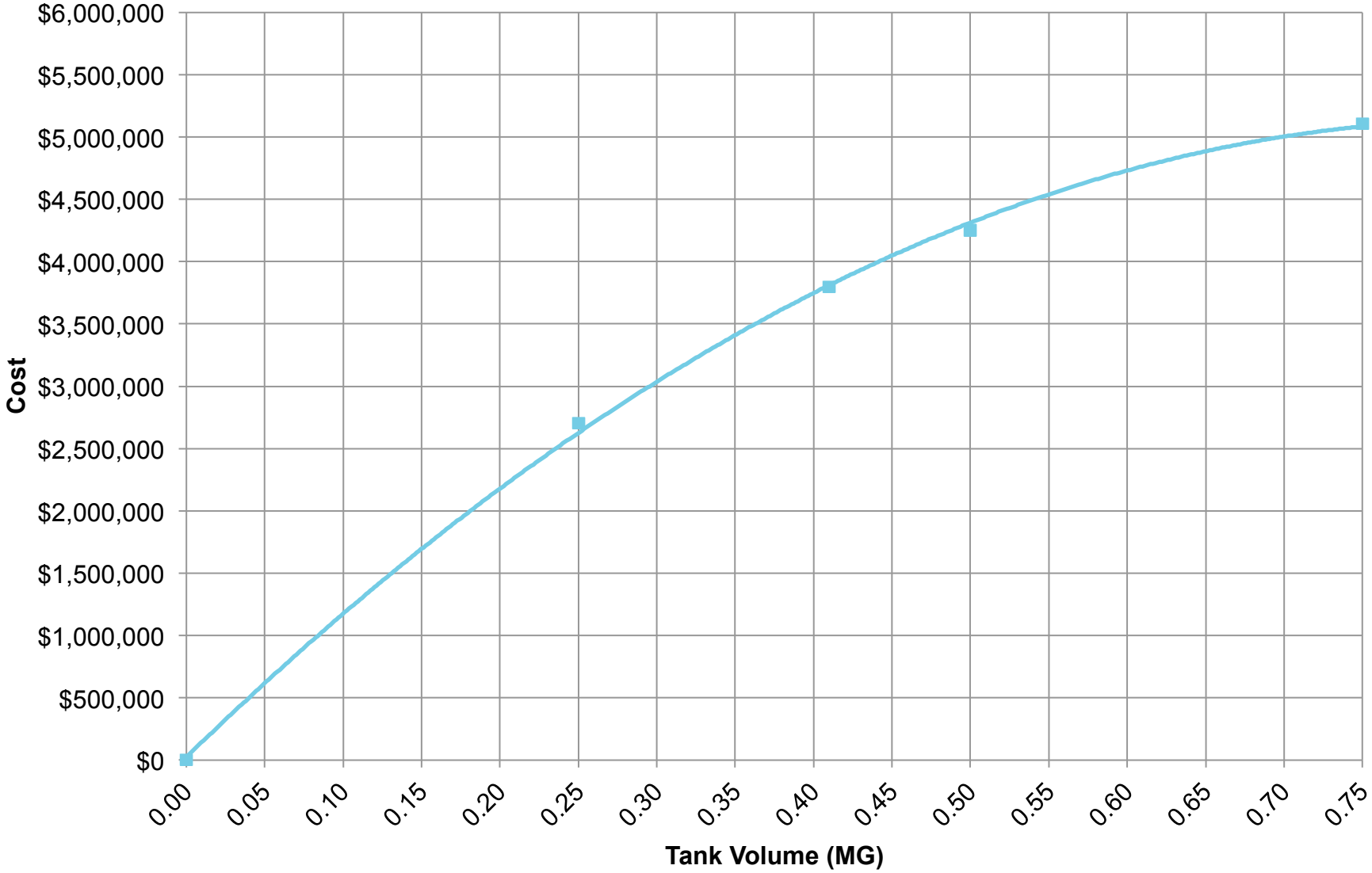
Total Cost vs. Tank Volume



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Cost Estimates

Alternative	Total Project Cost	Cost per Gallon
0.25 MG Rectangular Tank	$ 2,703,000	$ 10.80
0.41 MG Rectangular Tank	$ 3,544,000	$ 8.64
0.50 MG Rectangular Tank	$ 4,250,000	$ 8.50
0.75 MG Rectangular Tank	$ 5,583,000	$ 7.44
0.41 MG Circular Tank	$ 3,666,000	$ 8.94
0.75 MG Circular Tank	$ 4,995,000	$ 6.66

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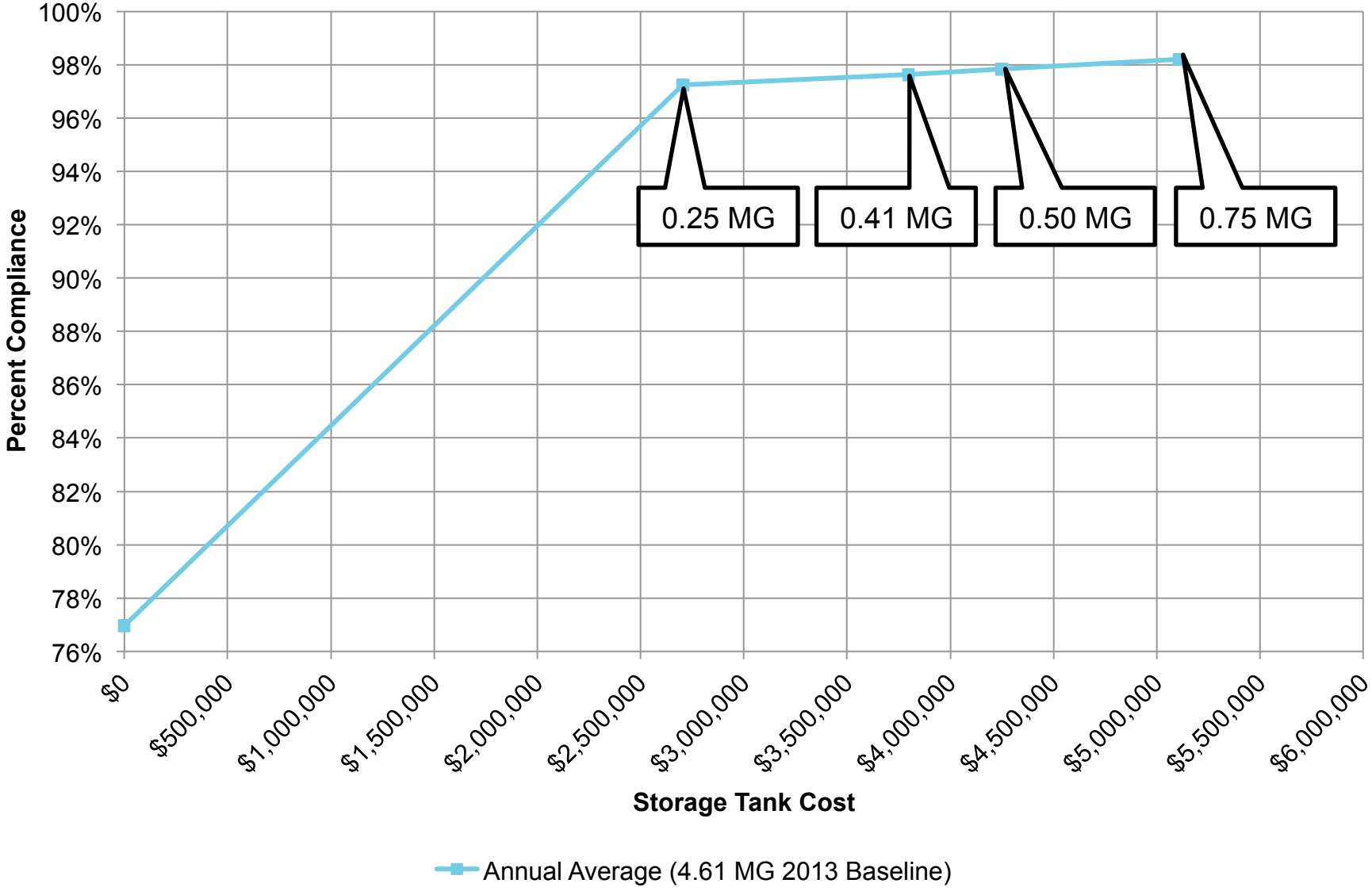
Total Cost vs. Percent Compliance



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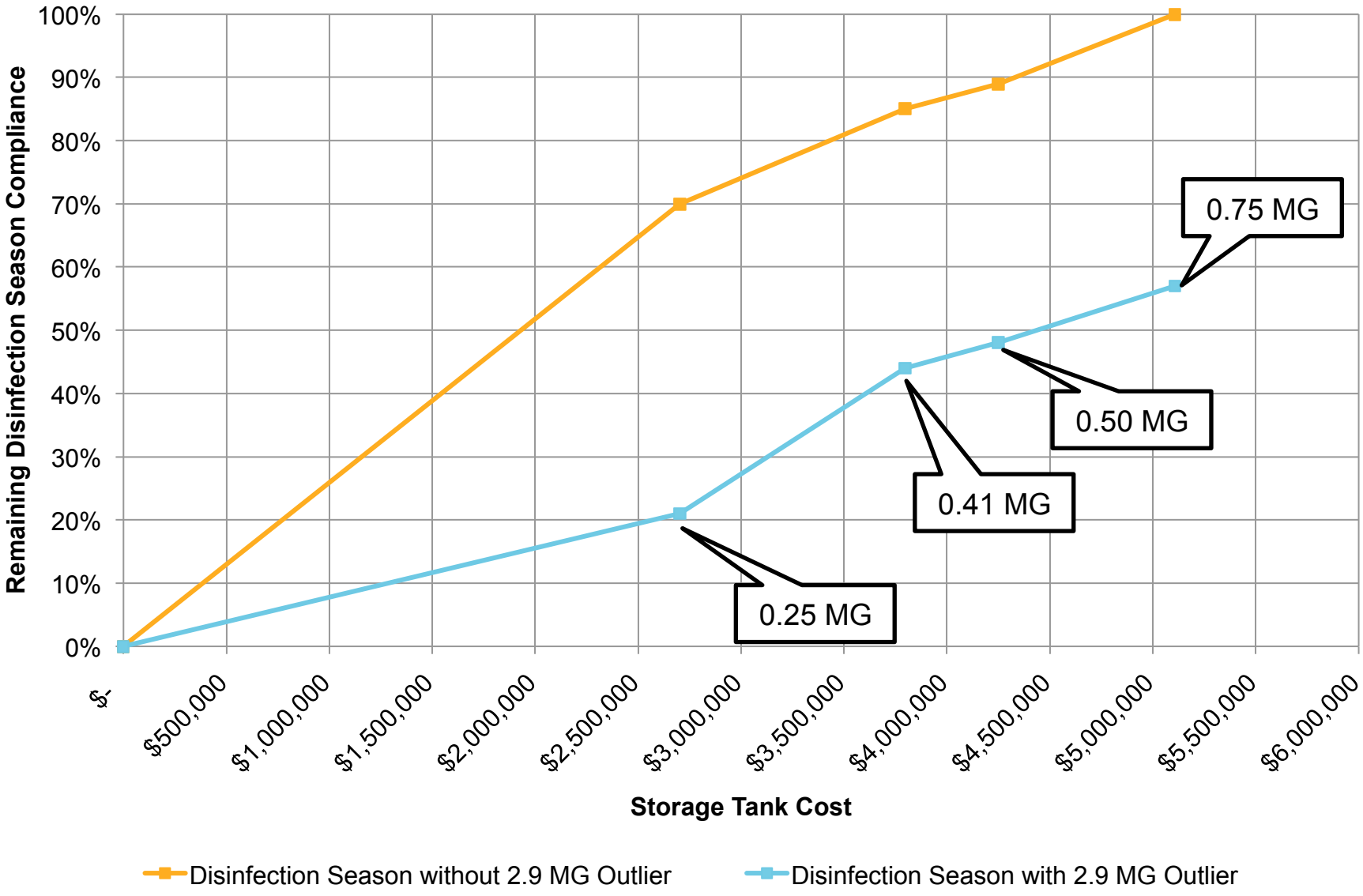
Percent Compliance During Disinfection Season



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Conceptual Layouts

0.75 MG
70’ x 80’ x 18’

0.41 MG
50’ x 61’x 18’

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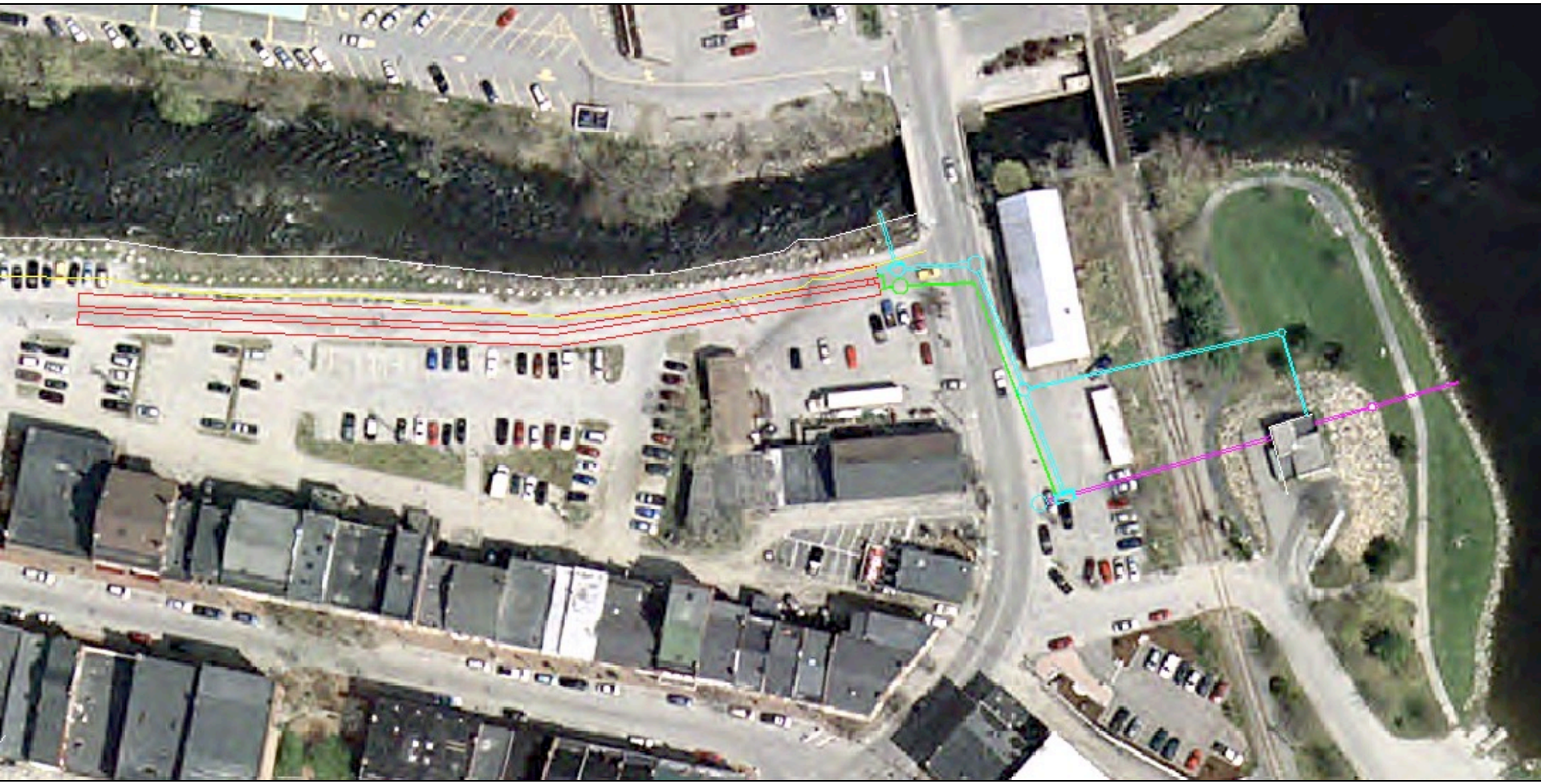
Preliminary Linear Storage Conduit Concept



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Findings of the 2014 LTCP Update

- Abatement of CSO 003 adjacent to the MAPS is highly feasible
- Open space enhancement opportunities exist
- Full compliance with CSO policies is not feasible
- Compliances greatly increases when the tank has the dual function of storage and treatment, a RTB
- 0.41 MG rectangular tank is the preferred size and shape of the RTB
- Would be the final major capital phase of the City's CSO abatement program

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0.41 MG RTB Offers

- 100% compliance for all non-disinfection season CSOs
- 44% compliance during the disinfection season
- 85% disinfection season compliance excluding the outlier storm*
- Overall 89% year-round compliance

** Greater than half (59%) of total disinfection season volume from 2008 to 2013 from this single extreme event.*

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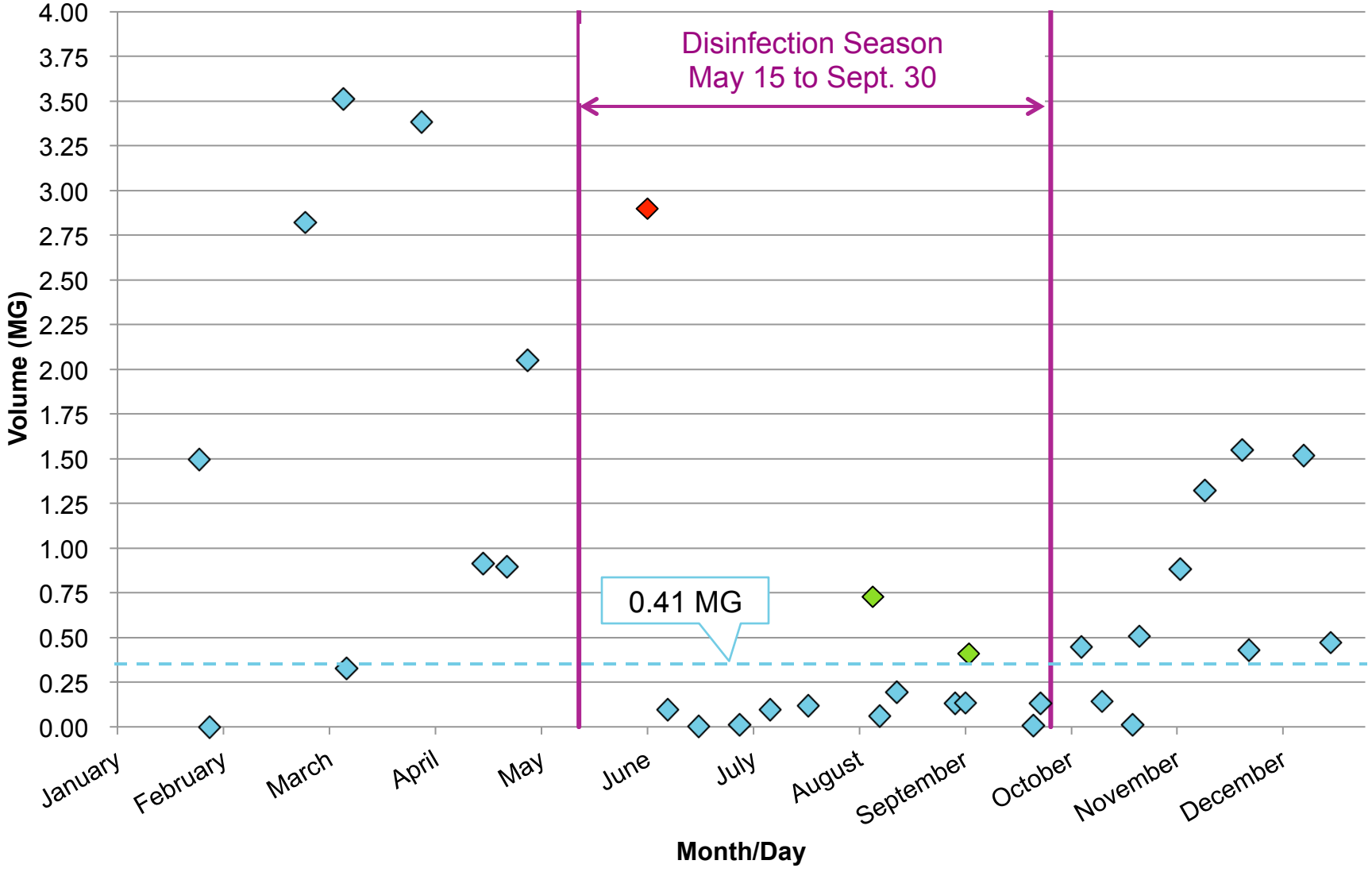
CSO 003 Overflow Events by Month (2008-2013)



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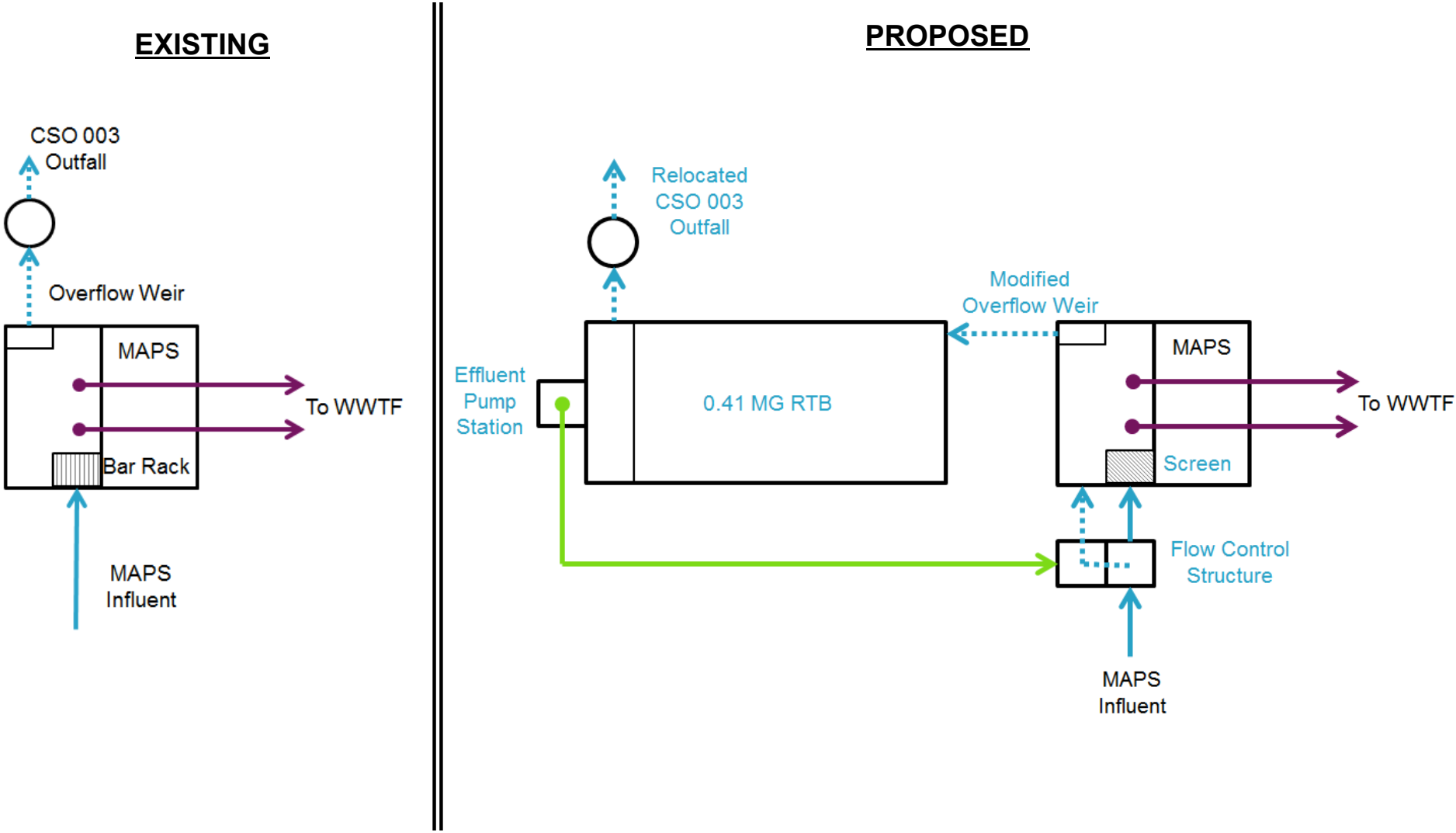
Existing and Proposed CSO 003 Flow Diagrams



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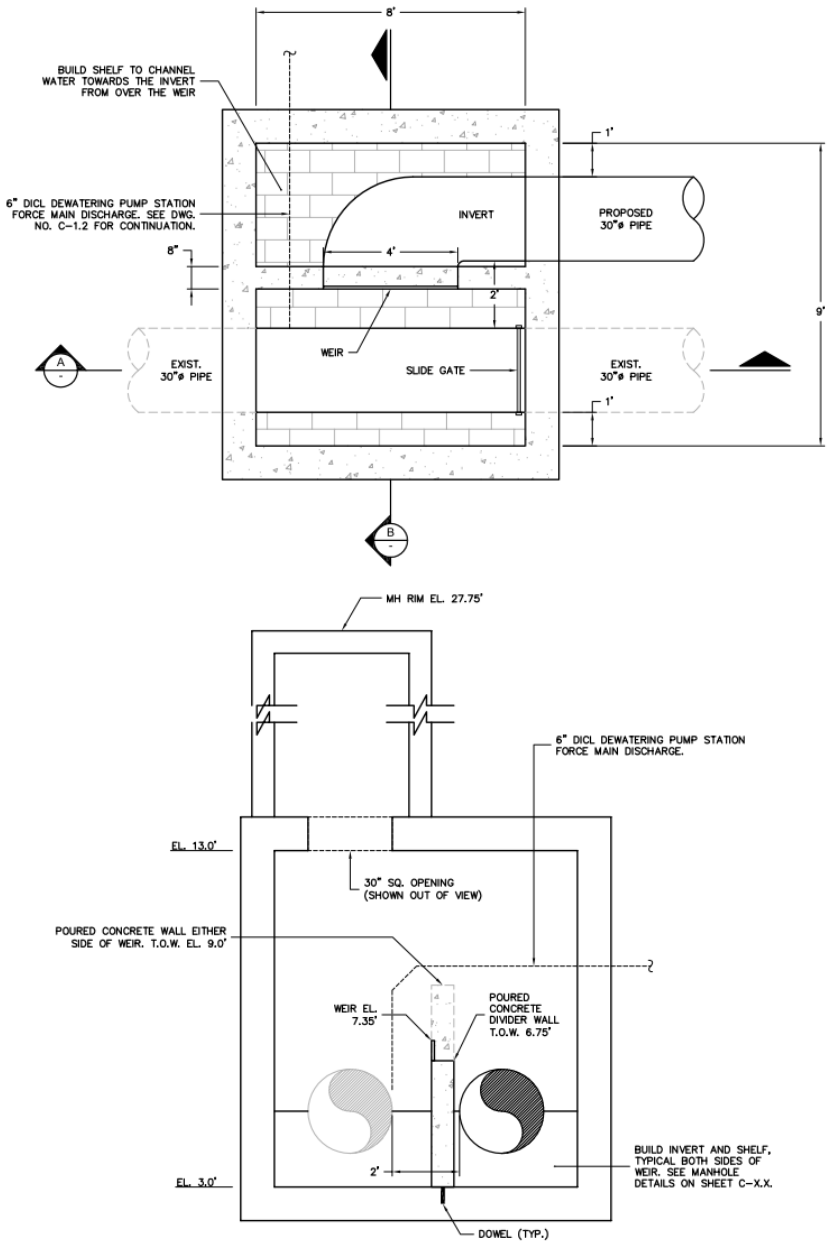
Flow Control Structure

- Mechanically-cleaned screen has limited capacity due to width of single 36-inch MAPS influent channel
  - 9-10 MGD vs. 12-13 MGD extreme wet weather peak
- FCS will “shave” the peak of rare events
- FCS will also be used during screen maintenance



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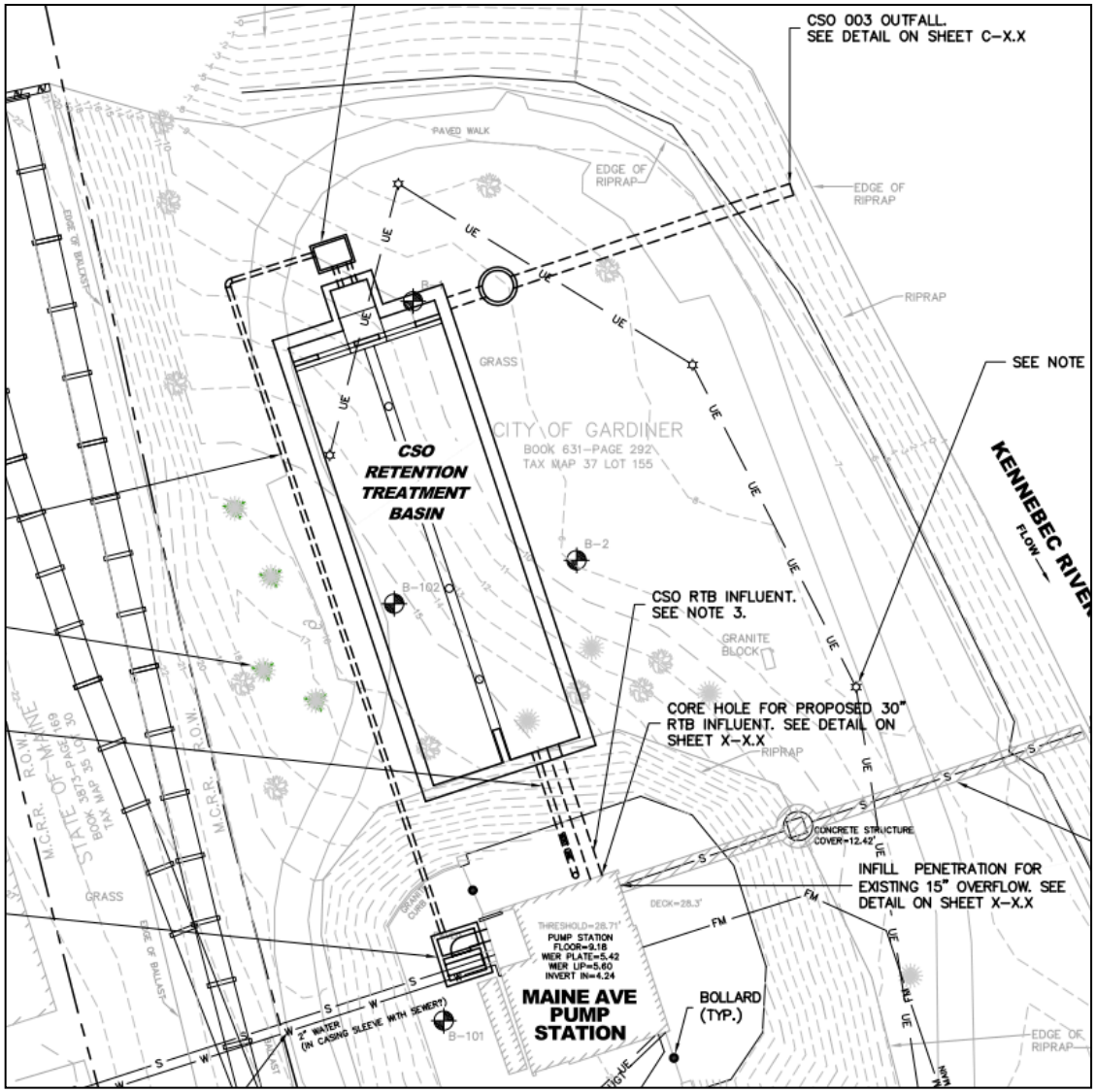
Final RTB Layout (0.41 MG, 32’ x 96’ x18’)



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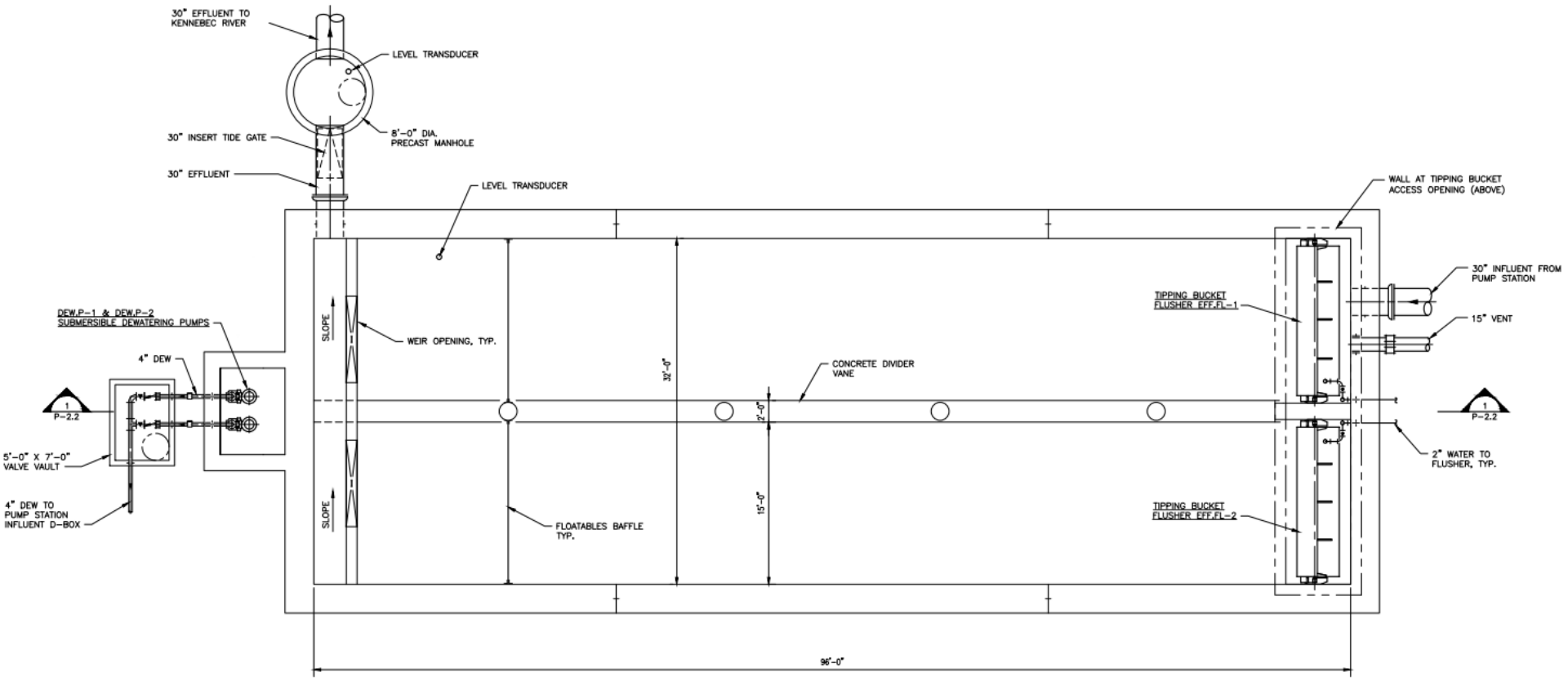
RTB Plan View



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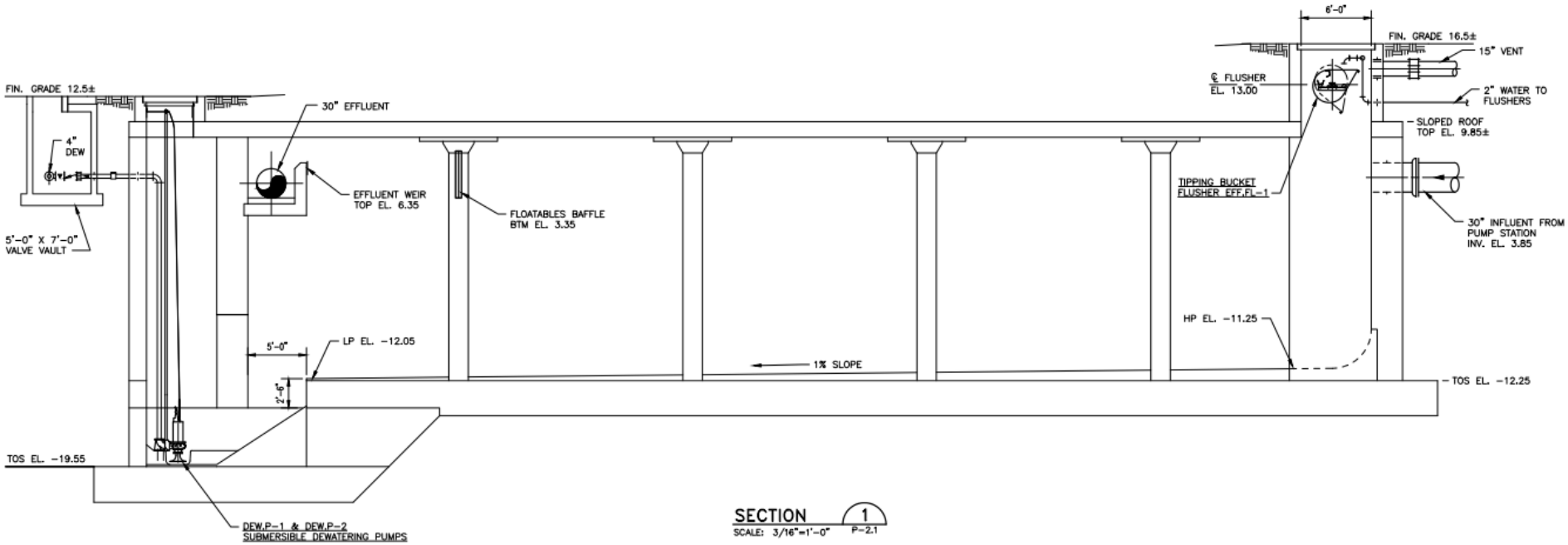
RTB Cross Section



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Concepts for Future, Longer-Term Additional CSO Compliance (as warranted)

- Continued I/I removal and infrastructure renewal
- Additional, targeted small-scale off-line storage at:
  - Hannaford parking lot upstream of Cobbossee siphon
  - Arcade parking lot
- Disinfection of tank effluent during disinfection season
  - Consider use of emerging single-chemical process

Total Project Cost

Component	Cost
0.41 MG RTB	$ 3,544,000
Mechanical Screen	$ 635,000
Total Project Costs	***$ 4,179,000***

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Schedule

DEP Approval of PDR	October 2014
Submit Substantially Complete Design Documents	March 2015
DEP Approval of Final Design	May 2015
Bid Advertisement	June 2015
Bid Opening	August 2015
Construction Begins	Fall 2015
Construction Complete	December 2016

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Conclusions

- Build and measure approach has worked well for phased CSO abatement in Gardiner
- RTB rather than simple storage allowed for decreased project costs and improved compliance
- City is committed to increased level of control of the RTB through continued I/I reductions

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Questions?