



Evaluation of the Water Efficiency of zHome

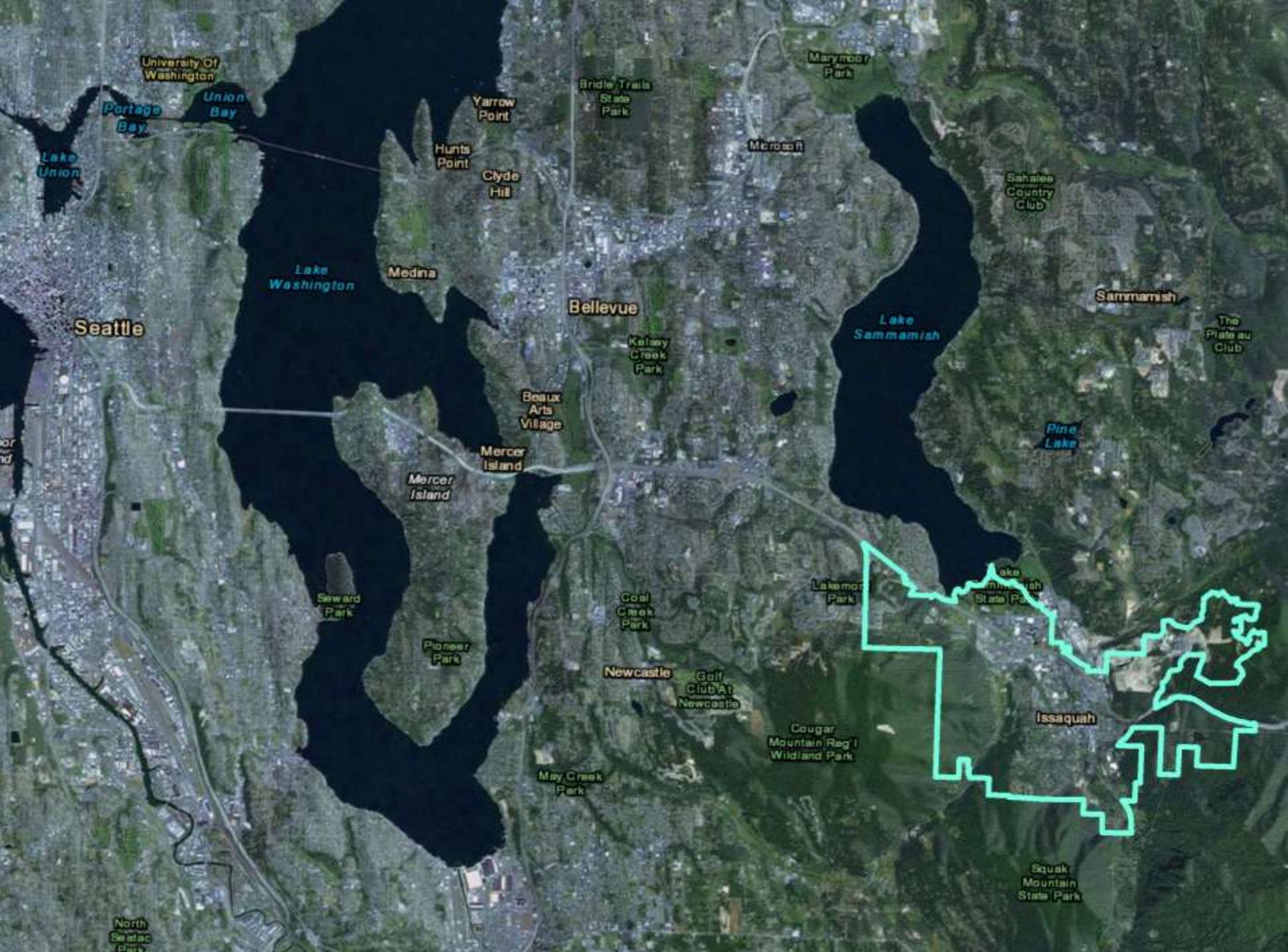
May 1, 2015
PNWS – AWWA Conference
Michael Brent

Introduction

Cascade Water Alliance

- ▶ Suburban Seattle
- ▶ Serving 350,000 residents
- ▶ Provide water efficiency programs
- ▶ Municipal corporation – seven cities and water districts (Bellevue, Issaquah, Kirkland, Redmond, Sammamish Plateau and Skyway Water and Sewer Districts, Tukwila)





Seattle

Bellevue

Sammamish

Issaquah

Microsoft

University Of Washington

Lake Washington

Lake Sammamish

Pine Lake

Newcastle

Lake Sammamish State Park

Seward Park

Pioneer Park

Coal Creek Park

May Creek Park

Cougar Mountain Reg'l Wildland Park

Squak Mountain State Park

Lakemont Park

Golf Club At Newcastle

Mercer Island

Mercer Island

Boaux Arts Village

Kalnay Creek Park

Hunts Point

Clyde Hill

Yarrow Point

Bridle Trails State Park

Marymoor Park

Sahalee Country Club

The Polo Club

North Seattle Park

Lake Union

Portage Bay

Union Bay

The zHome Project

- ▶ Ten-unit condominium in the Issaquah Highlands
- ▶ Ultra sustainable homes
- ▶ Constructed in 2010 – 11
- ▶ Occupancy in 2012 – 13
- ▶ Stakeholders
 - Ichijo Homes
 - City of Issaquah
 - Matt Howeland Development
 - Built Green
 - King County
 - Port Blakely Development
 - Puget Sound Energy
 - Cascade Water Alliance



What Makes A zHome?

- ▶ Energy – Zero net energy use
- ▶ Health – Low toxics
- ▶ Materials – Deep green construction
- ▶ Water – Goal of 71% reduction



Water Efficiency

- ▶ Rain water harvesting
- ▶ HE toilets, showerheads, faucets
- ▶ HE clothes washer, dishwasher
- ▶ Compost amended soils
- ▶ Native plants
- ▶ No lawn



zHome Fixtures and Appliances

- ▶ Caroma Sydney toilets (dual flush, WaterSense)
- ▶ Kohler Purest showerheads (1.5 gpm, WaterSense)
- ▶ Kohler Purest bathroom faucets (0.5 gpm, WaterSense)
- ▶ GE frontloading clothes washer (2.2 Cubic Feet, EnergyStar)
- ▶ Bosch Integra dishwasher (EnergyStar)
- ▶ Rainwater harvesting cistern (1,000 – 1,700 gallons)
 - Toilets
 - Clothes washer

Built Green Certification

- ▶ 5-Star rating
- ▶ First recipient of Emerald Green rating



WaterSense Certification

- ▶ All units certified



What Happened?

- ▶ Are the homeowners pleased with their WaterSense New Homes?
- ▶ Did the project achieve 71% reduction in municipal water use?



Survey of Residents

- ▶ In–Person Interviews
 - ▶ Categories
 - Energy
 - Home Health
 - Green Materials
 - Water Efficiency
 - General Comments
- 

Fixtures and Appliances

Q1	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The toilet works well.	√√√√	√√	√√√		
Q2	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The bathroom faucets work well.	√√√√	√√√√	√		
Q3	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The showerhead works well.	√√√√√√	√√	√		
Q4	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The clothes washer works well.	√√√√	√√√√	√		
Q5	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The dishwasher works well.	√√√√√√	√√√			

Positive Responses = 87%

Rainwater Harvesting

Q6	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The cistern that supplies the toilet and clothes washer works well.	√√√	√√√√	√√		
Q7	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The rainwater that comes from the cistern is relatively clean and odorless.	√√√√√√			√√	√
Q8	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The cistern's water supply lasts through the summer.	√√√	√√	√	√√	

Positive Responses = 69%

Landscaping

Q9	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I don't miss having a traditional grass lawn.	√√√√√√ √	√	√		
Q10	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I enjoy the native landscaping.	√√√√√√	√√	√		
Q11	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The rain gardens absorb and manage storm water runoff effectively .	√√√√√√	√√			

Positive Responses = 92%

Values

Q12	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Conserving water is important to me.	√√√√√	√√√		√	
Q13	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Knowing that my zHome uses less water, less energy, and was built with low toxicity/green building materials is important to me.	√√√√√	√√√√			
Q14	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I enjoy living in my zHome.	√√√√√√ √	√√			

Positive Responses = 96%

General Comments

Fixtures

- Love the showerheads, plenty of flow.
 - Bathroom faucets don't always have enough pressure.
 - Kitchen faucet is great.
 - Water pressure for toilet refill seems low.
 - The toilets work very well; like the dual flush features.
 - Toilets don't always clear the bowl, but no double flushes or clogs.
 - Toilet stuck open once and drained the cistern.
 - Like the central placement of the hot water heater.
- 

General Comments

Rainwater Harvesting – 1

- Cistern water was discolored because resident failed to clean cistern screen.
- The cistern ran out once due to the toilet fill valve being stuck open.
- Cistern capacity is adequate, but during the winter the pump in the cistern stopped the automatic function. Otherwise works well.
- The only complaint about the system here is that the pipe inside the cistern tank that supplies water to the house is uninsulated and it will freeze if there is sustained temperatures below freezing for a few days.
- Controller problem caused cistern water pump to run continuously.
- Birds were resting under Solar Panels, bird droppings may have contributed to poor quality cistern water.

General Comments

Rainwater Harvesting – 2

- Used municipal water to supplement cistern in July.
 - Used municipal water to supplement cistern in August, 2013 and again in July, 2014.
 - Had to use municipal water to supplement the cistern during summer of 2013.
 - Water in clothes washer and toilet was a little dirty. Changed the filters (which was easy) and cleaned leaf screen and the water is better.
 - Maintaining filters inside is sometimes an issue.
- 

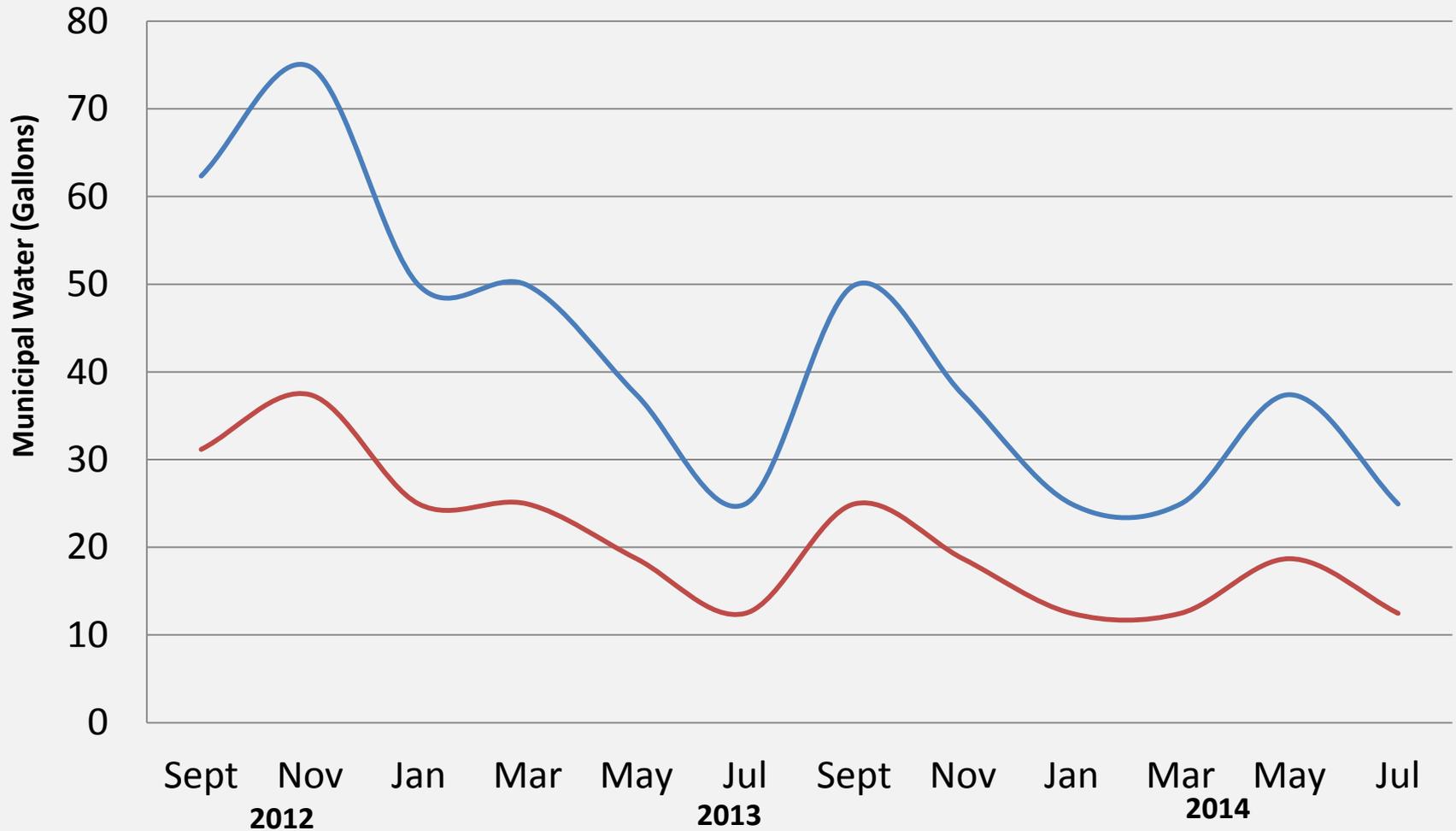
General Comments

Billing, Cost-Effectiveness

- Little connection between conservation and what I pay because of fixed cost.
- Little difference between the water bill from my zHome and my previous home, which had non-conserving fixtures and a large lawn.
- Water bills are not reduced because utility connection charge is the same.
- Being green doesn't necessarily mean a financial advantage.
- Very little incentive to use less water since the cost per ccf is only a couple dollars. Very little financial incentive to install, use, and maintain a rainwater system when the base utility bill is over \$150 and using less water only saves a couple dollars per ccf. Maintenance of the system alone costs much more than what could ever be saved

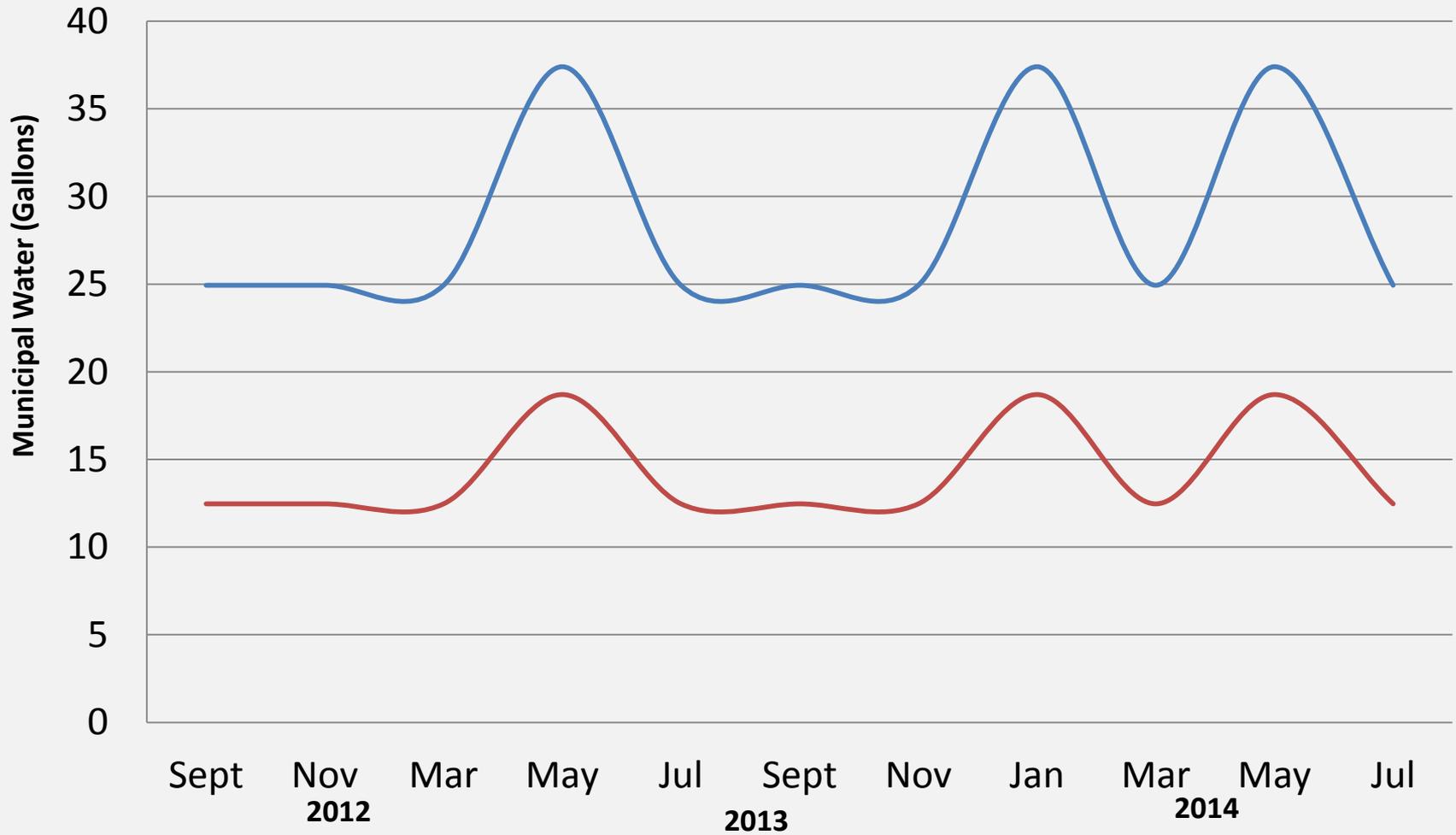
Average Daily / Per Capita Water Use

Unit #1



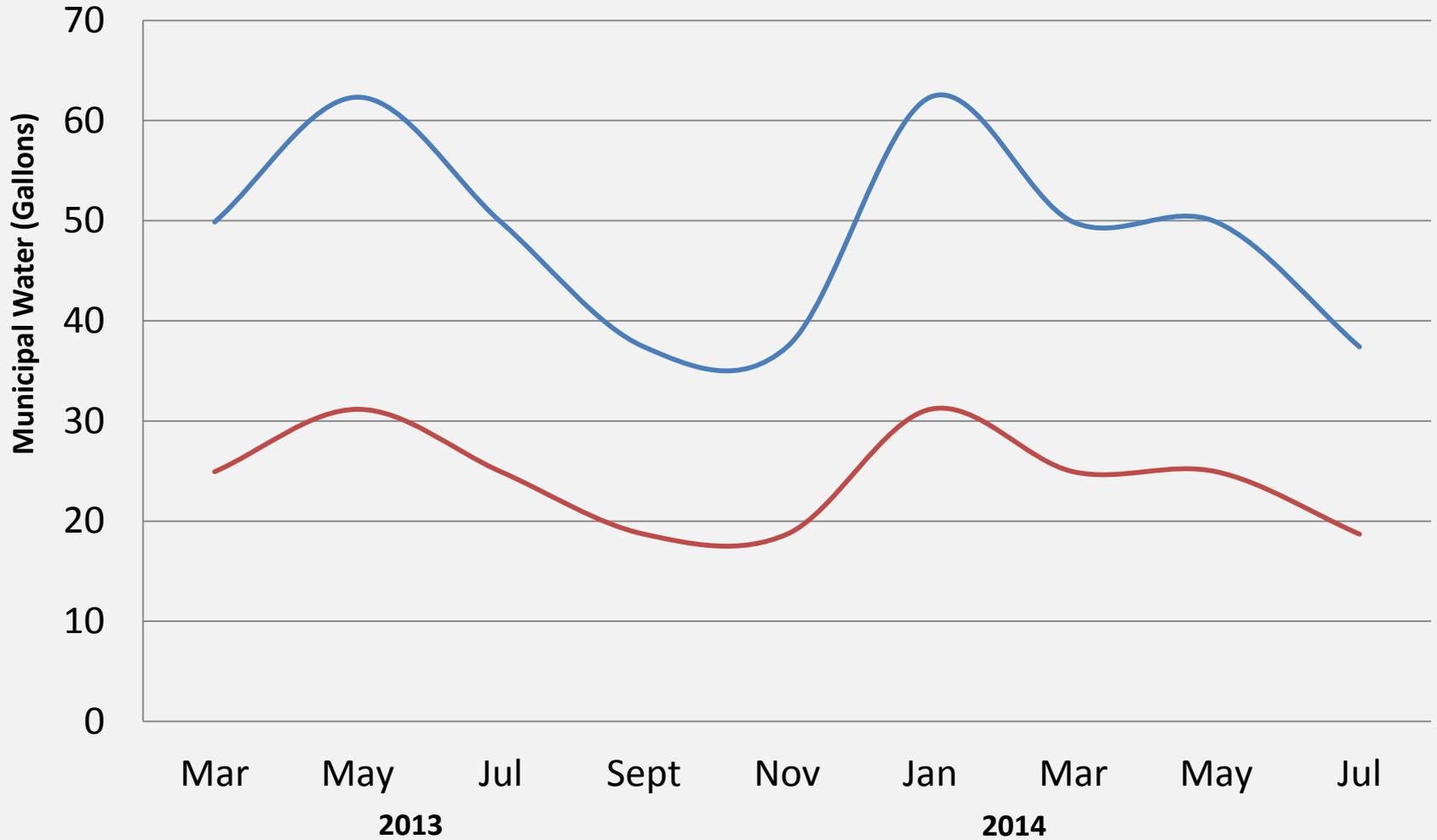
Average Daily / Per Capita Water Use

Unit #2



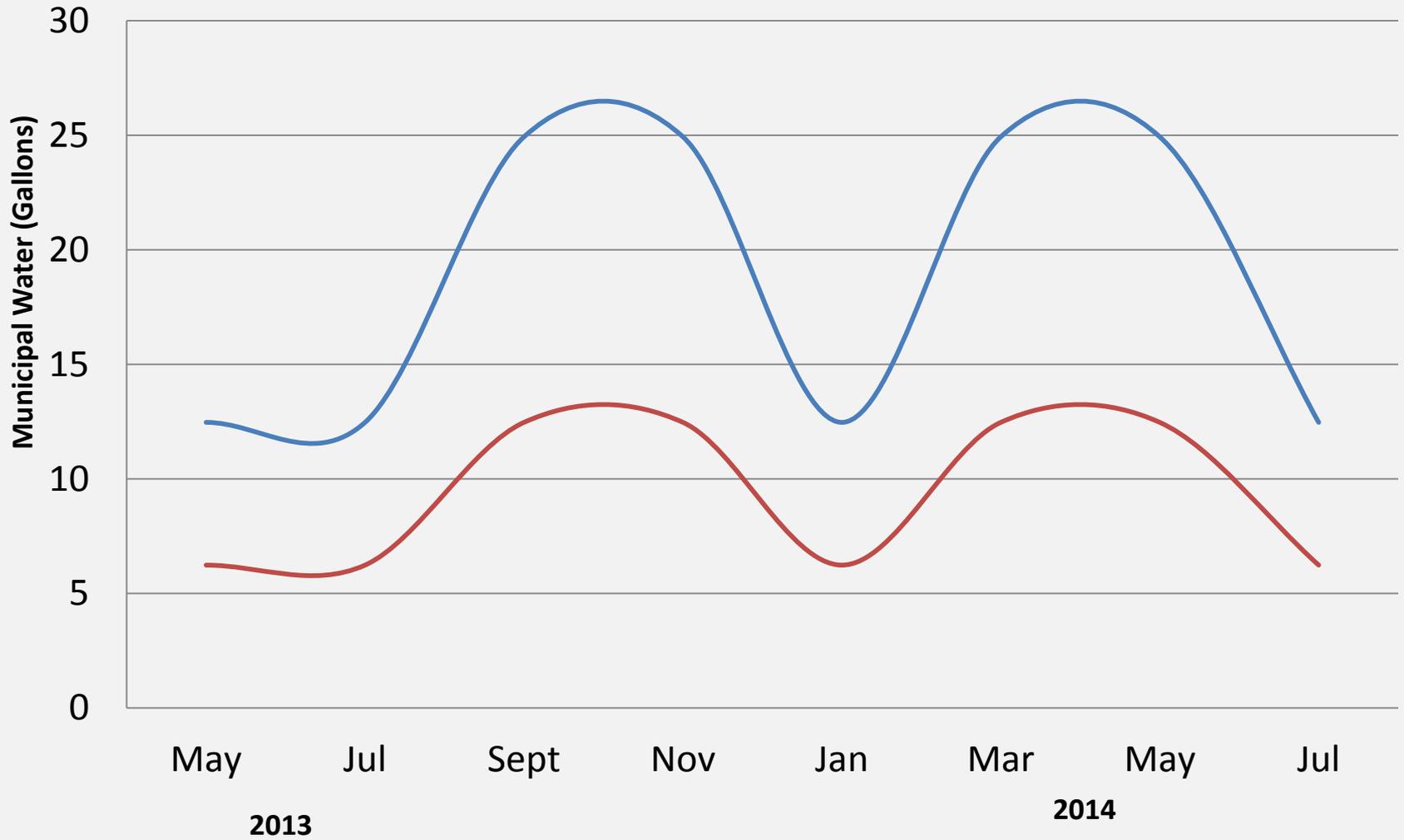
Average Daily / Per Capita Water Use

Unit #3



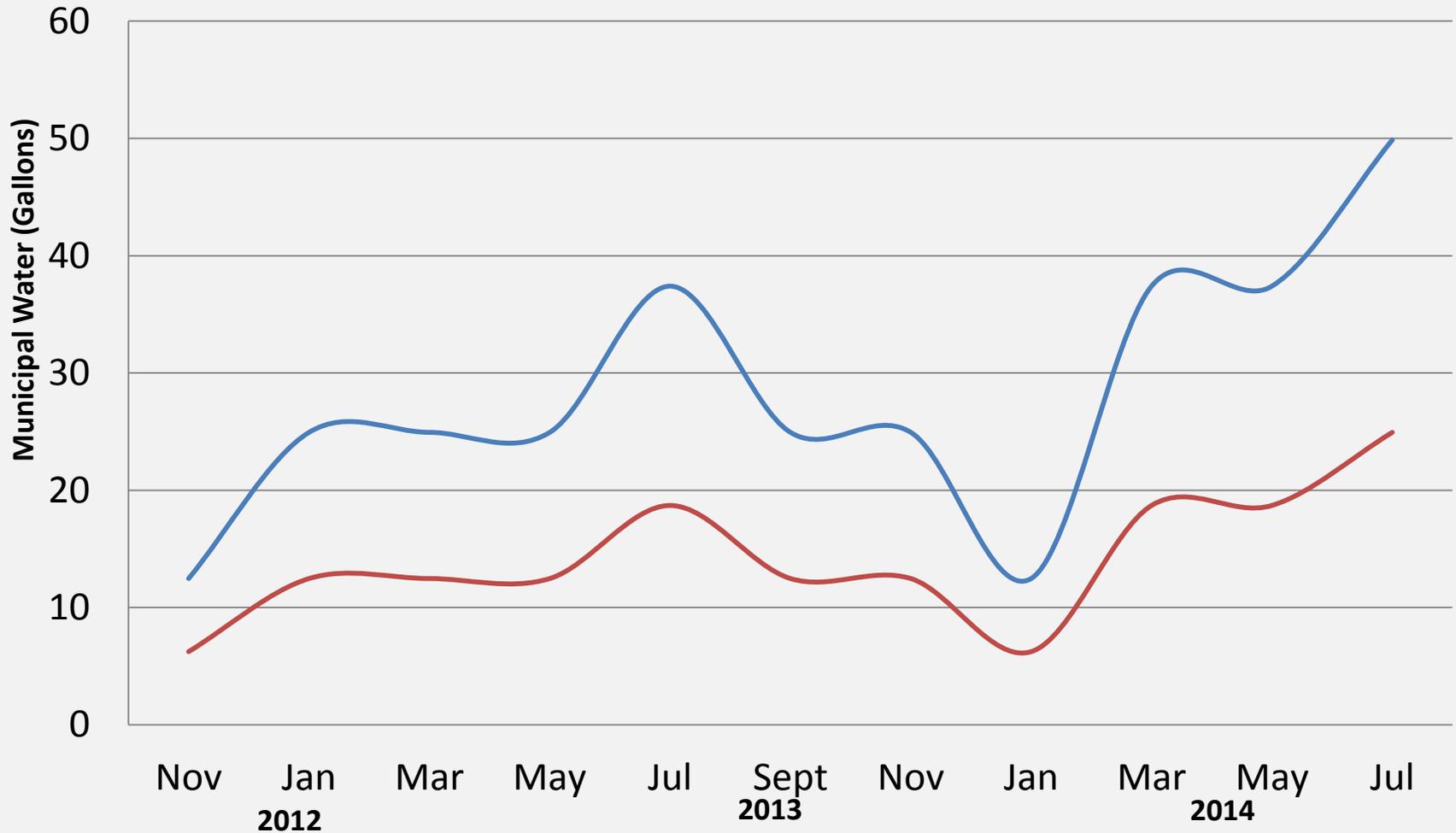
Average Daily / Per Capita Water Use

Unit #4



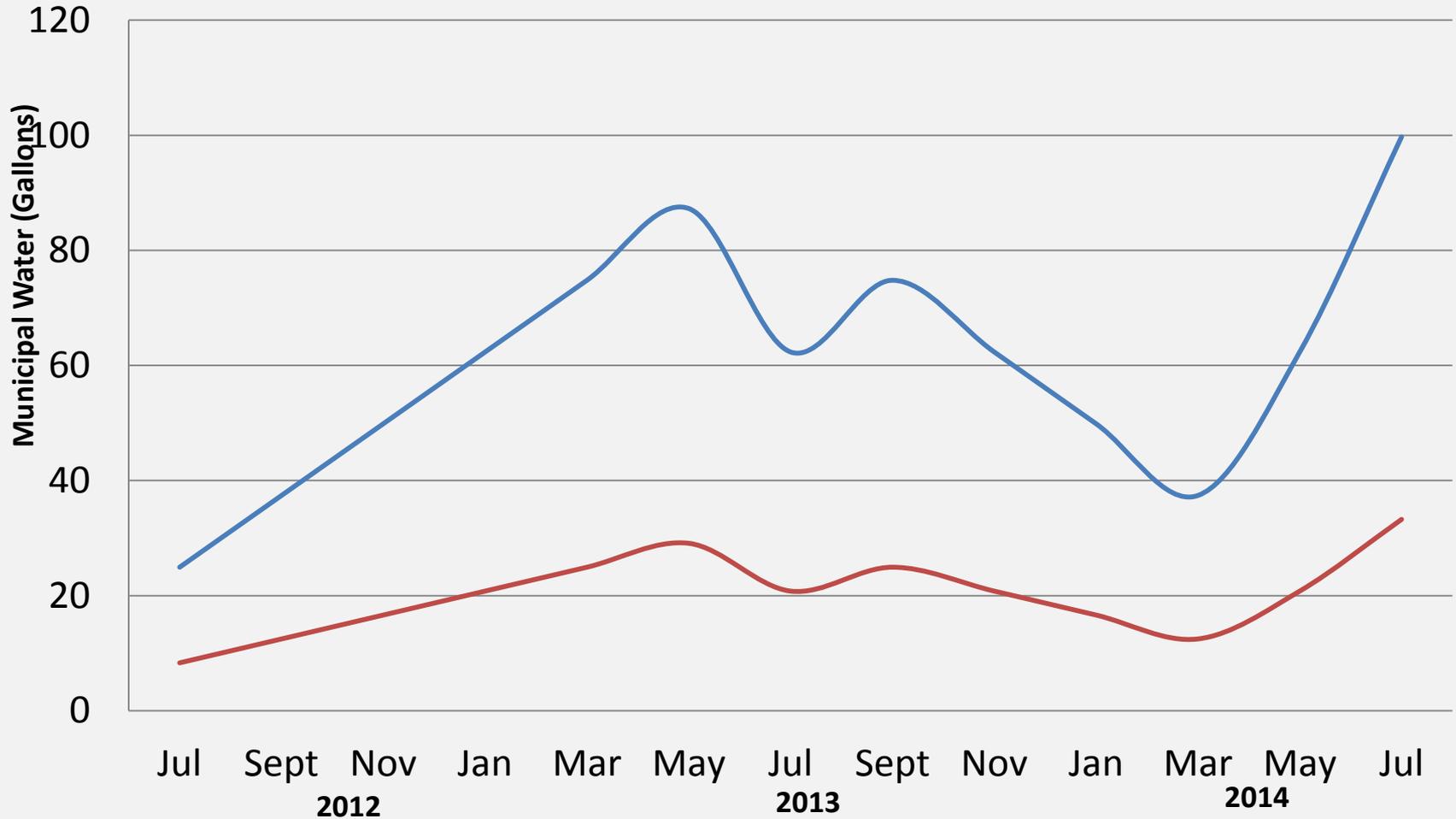
Average Daily / Per Capita Water Use

Unit #5



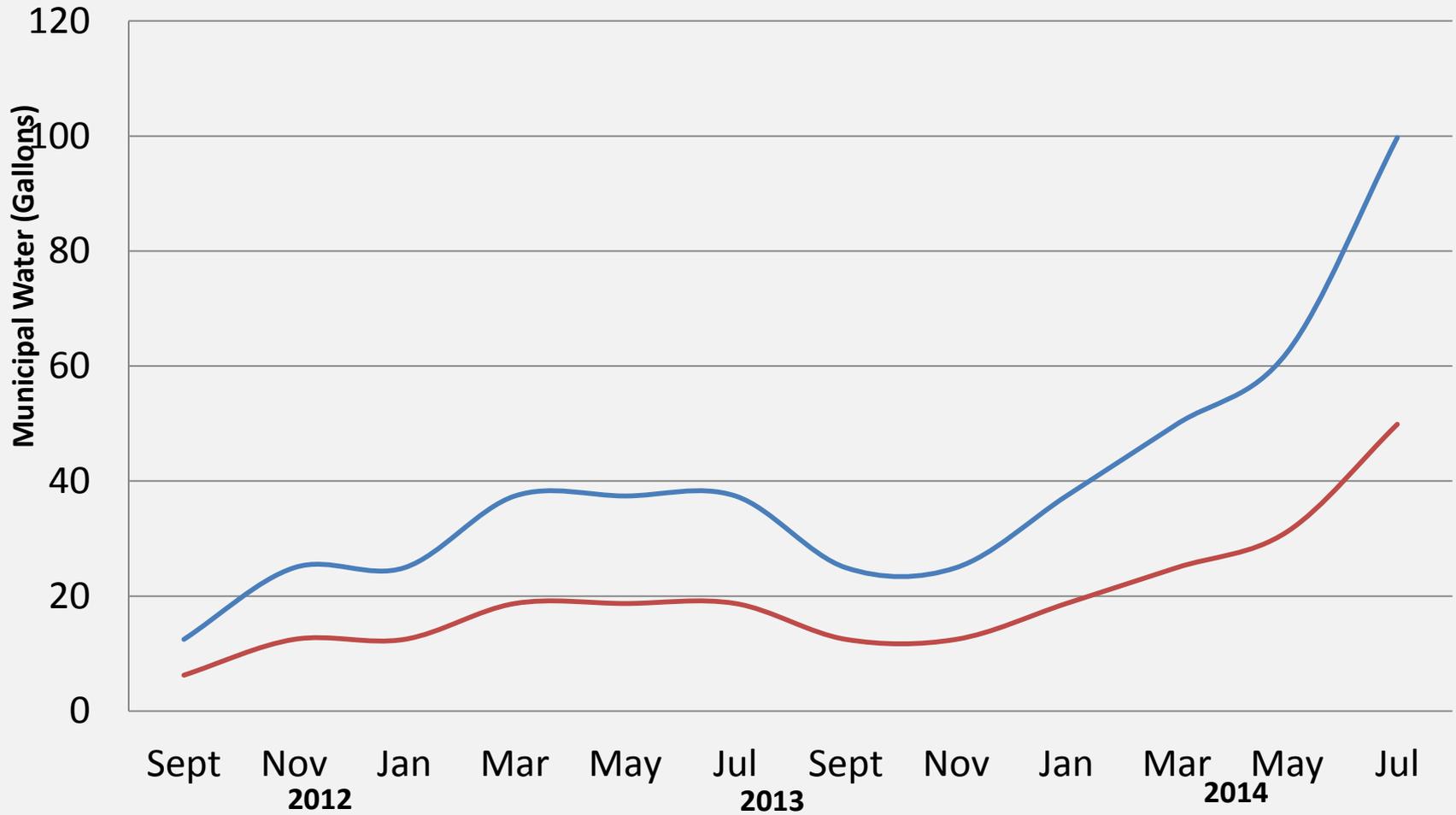
Average Daily / Per Capita Water Use

Unit #6



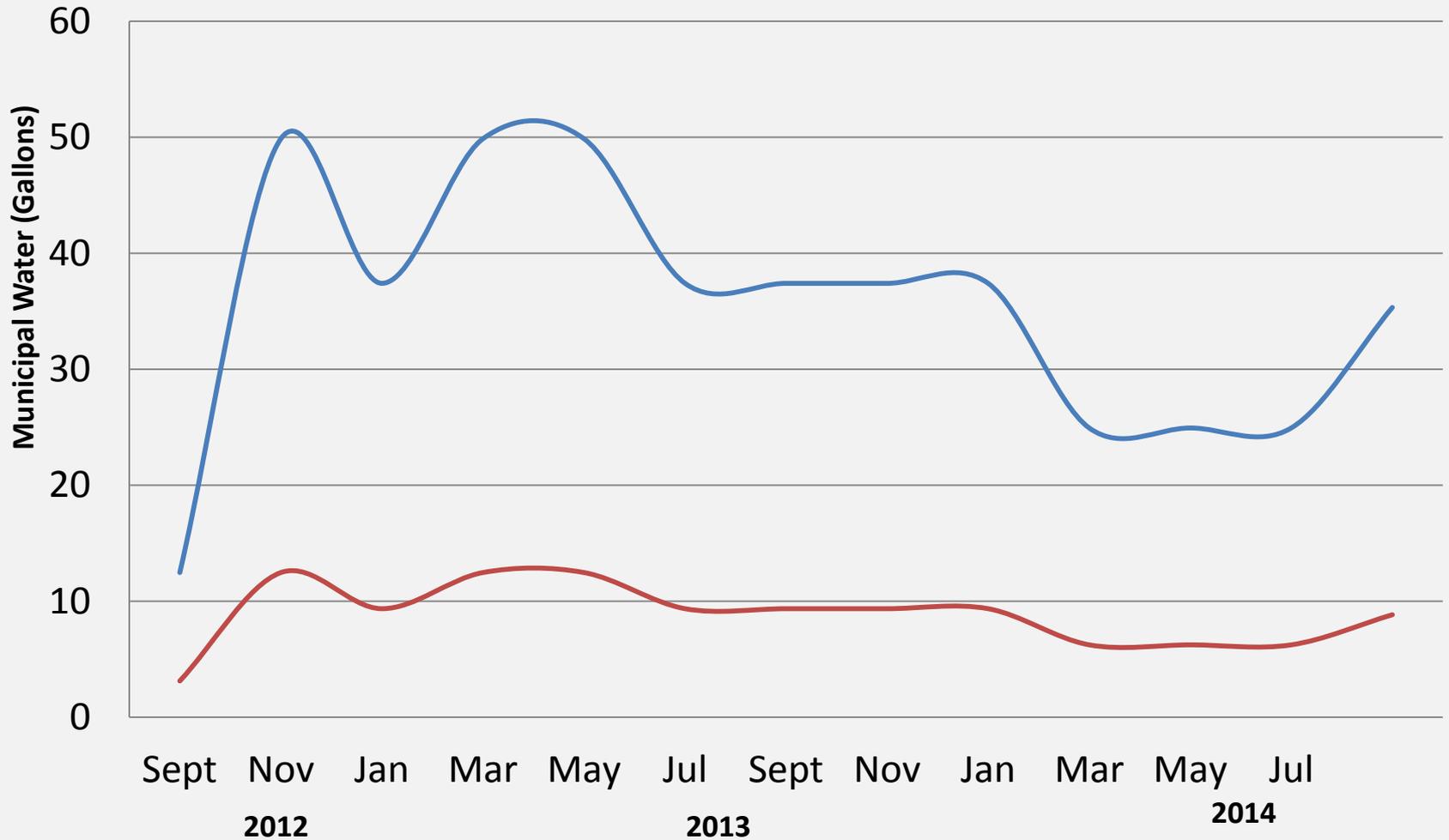
Average Daily / Per Capita Water Use

Unit #7



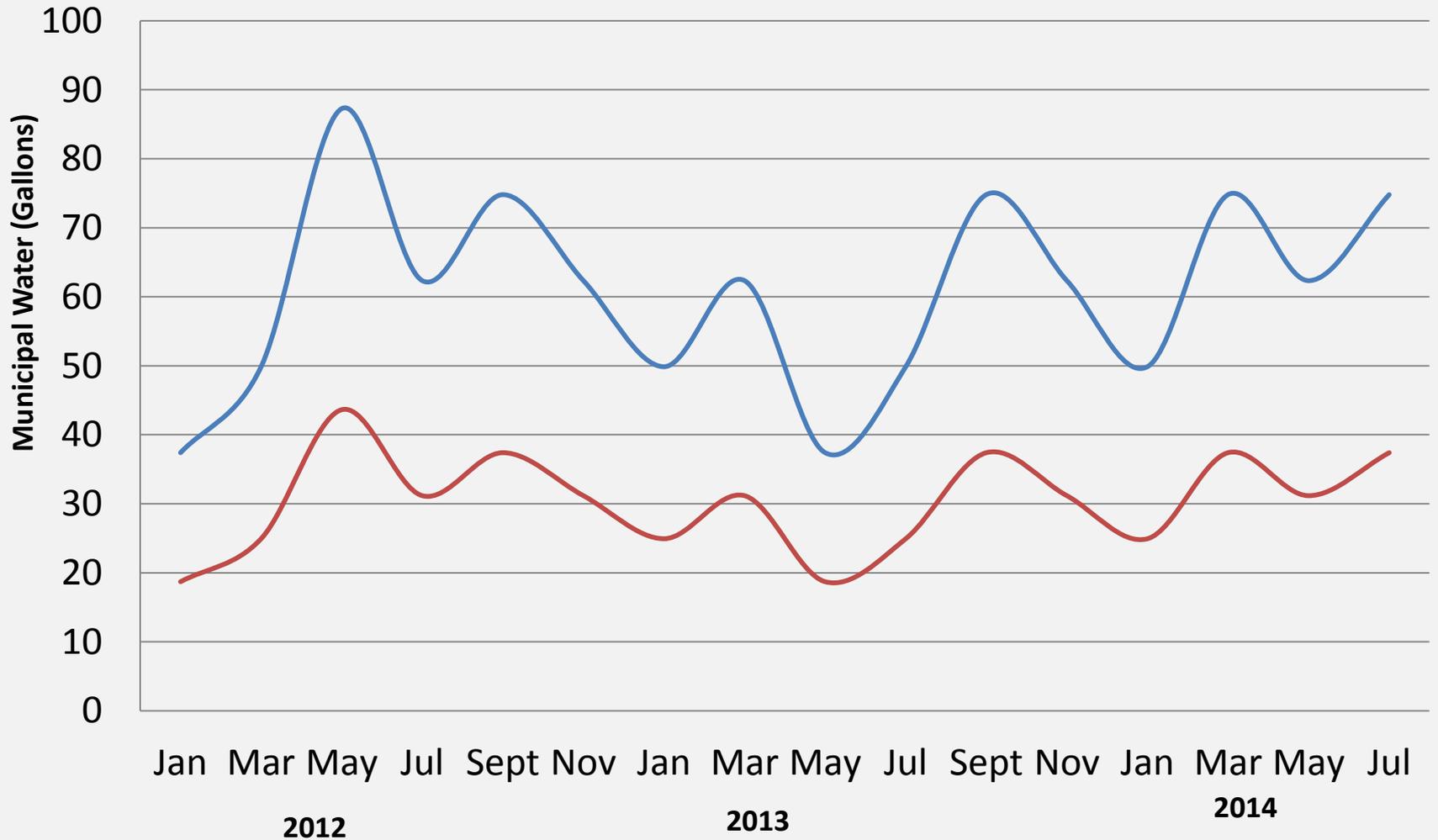
Average Daily / Per Capita Water Use

Unit #8

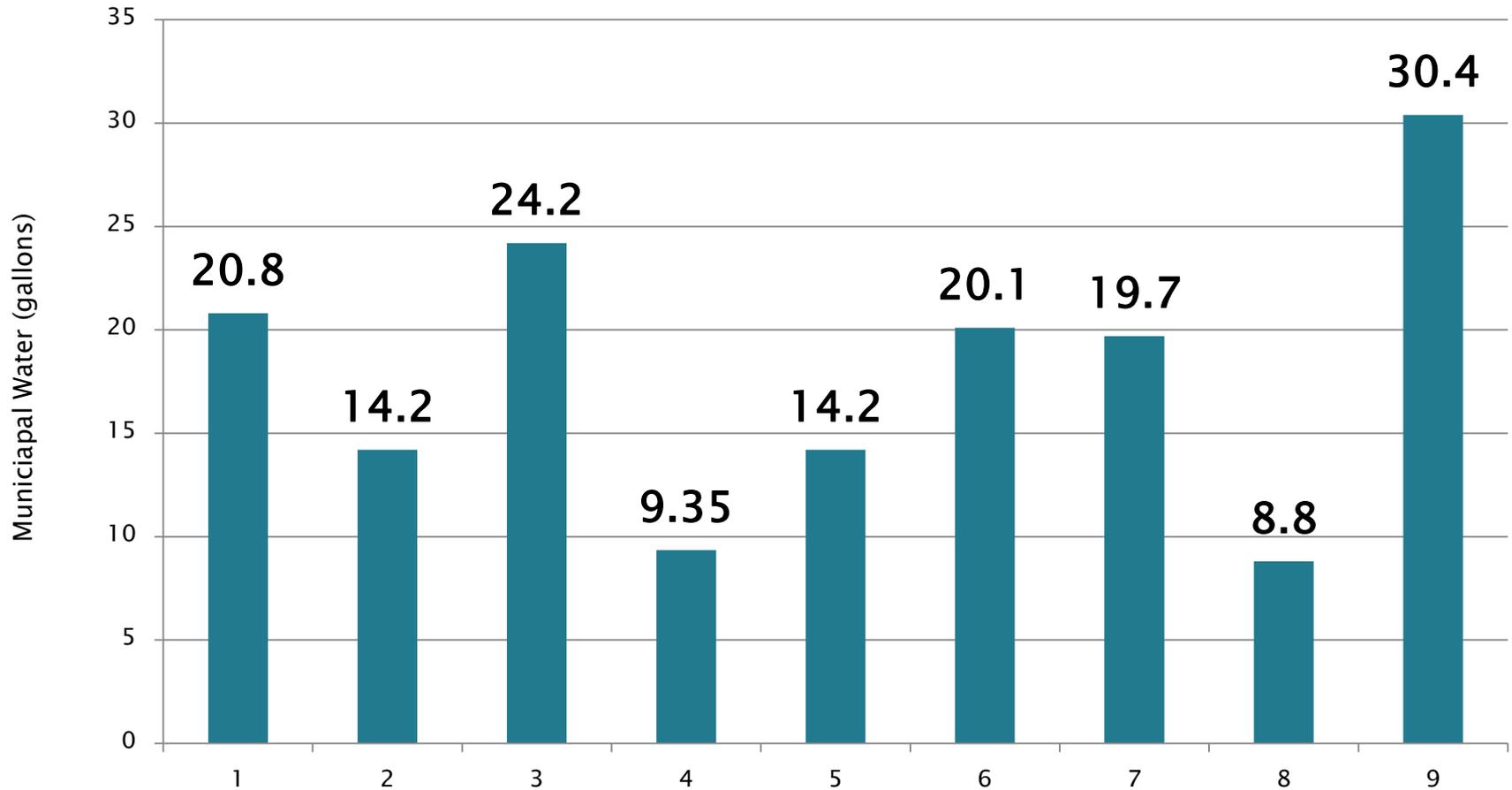


Average Daily / Per Capita Water Use

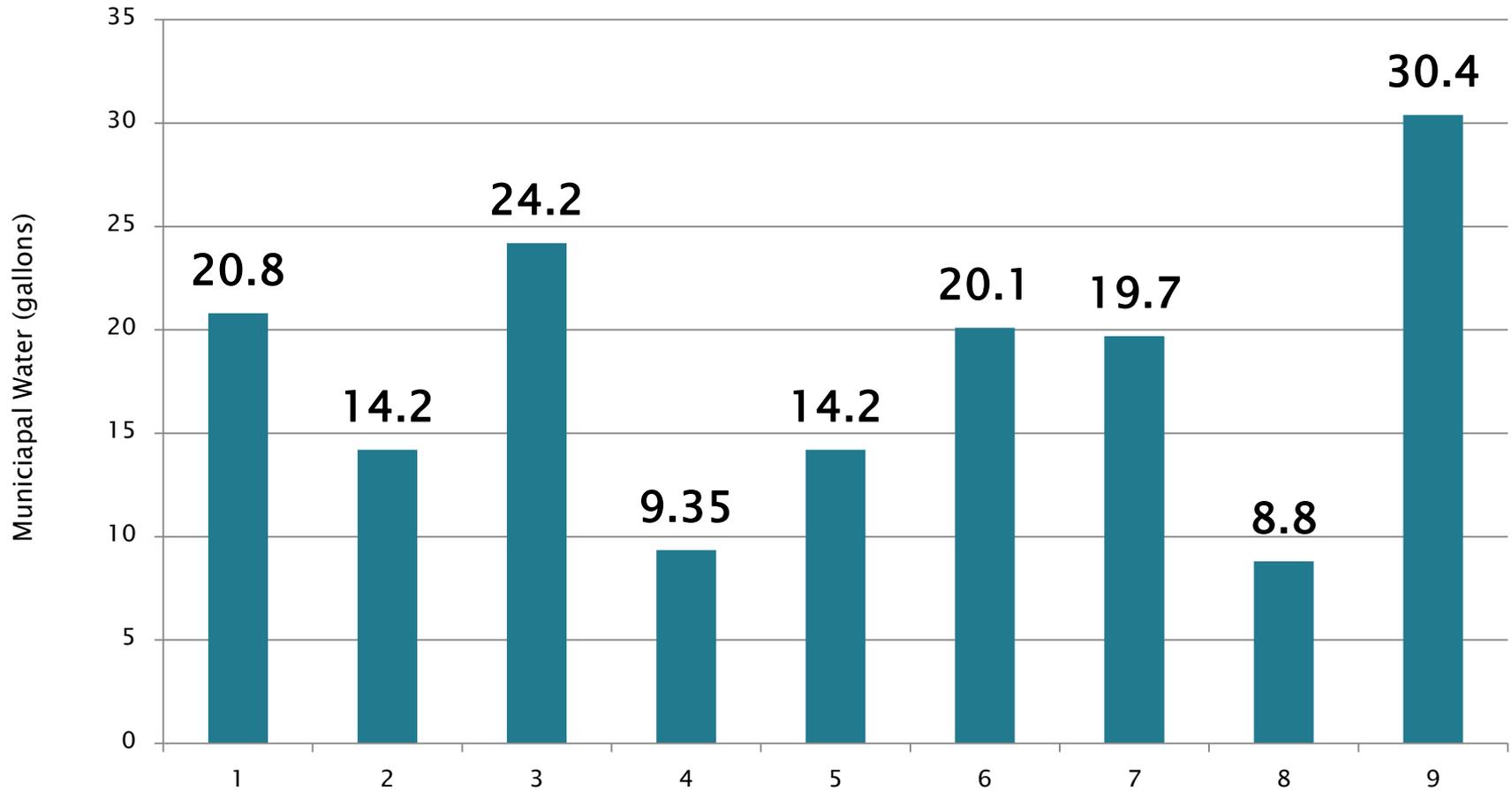
Unit #9



All Units – GPCD



All Units – GPCD



Average = 18

What's Good?

- ▶ Water efficiency is exceeding project goal
 - ▶ Residents value water efficiency
 - ▶ WaterSense New Homes recognition
 - ▶ Fixtures and appliances working well
 - ▶ No perception of sacrifice
 - ▶ Extreme water efficiency is possible and practical
 - ▶ Additional opportunities with green building
- 

Not So Good

- ▶ Rainwater harvesting savings are less reliable than others.
 - ▶ Rainwater harvesting requires more maintenance, education
 - ▶ Fixed connection charges are a disincentive to the success of WaterSense New Homes
- 

Next Steps

- ▶ Continue monitoring zHome
- ▶ Promote the success
- ▶ Pursue opportunities to promote WaterSense
 - Built Green
 - Habitat for Humanity
 - King County Housing Authority

High Five Award

For your dedication to “doing things right the first time.”
Conservation today, not incentives for retrofits tomorrow.

Cascade Water Alliance

May 2015



A handwritten signature in black ink, appearing to read "Clark Halvorson".

Clark Halvorson, Director
Office of Drinking Water



Thank You!

Michael Brent

mbrent@cascadewater.org

425.453.1810

Cascade Water Alliance

Water for today... and tomorrow