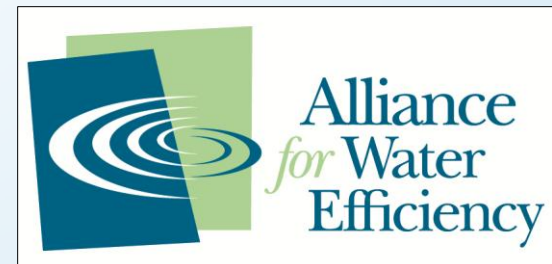




Reconnecting the Great Lakes Water Cycle

Cost-Benefit Analysis of Water Efficiency Programs

Bill Christiansen
Program Manager
Alliance for Water Efficiency



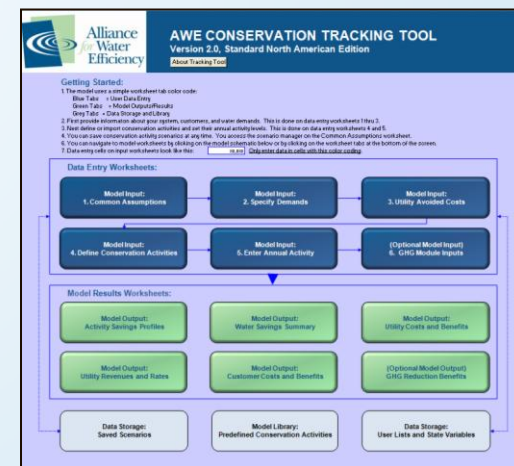
Components of AWE Tracking Tool Analysis

Inputs

- Demographic data
- Weather data
- Customer utility rates
- Water demand forecast
- Avoided costs
- Efficiency program information
- Greenhouse gas module

Outputs

- Water savings
- Costs and benefits
- Impact to revenue and rates
- Greenhouse gas and energy reductions



AWE Tracking Tool Analysis for Six Communities

Province of Ontario, Canada

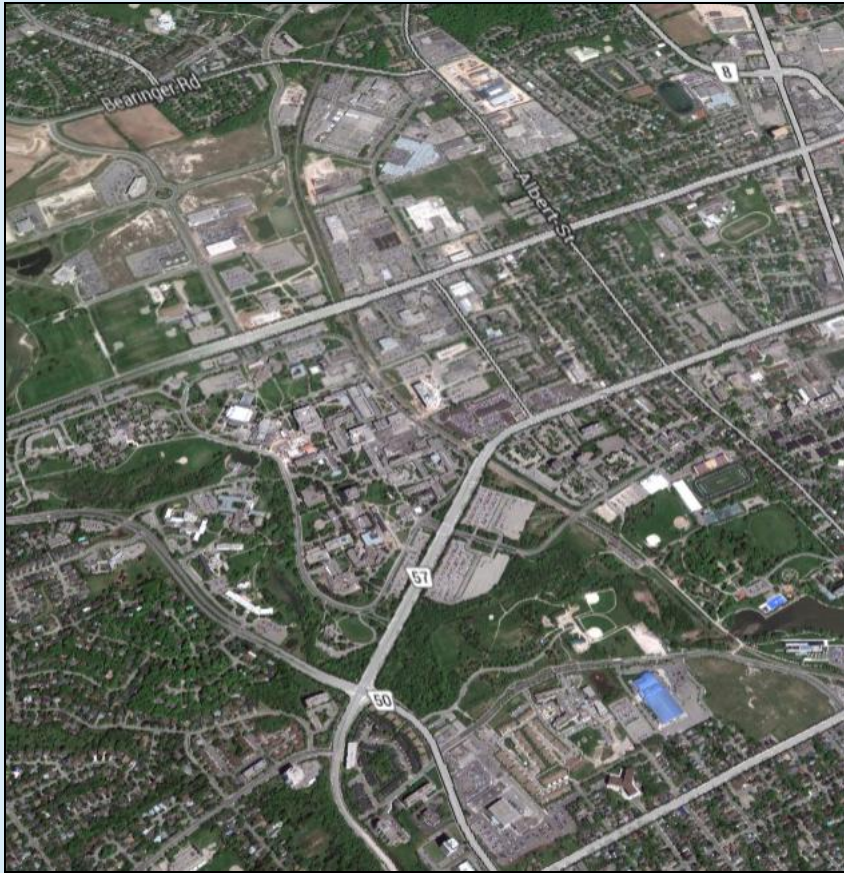
- City of Guelph
- Regional Municipality of Waterloo
- City of Waterloo

Oakland County, Michigan, United States

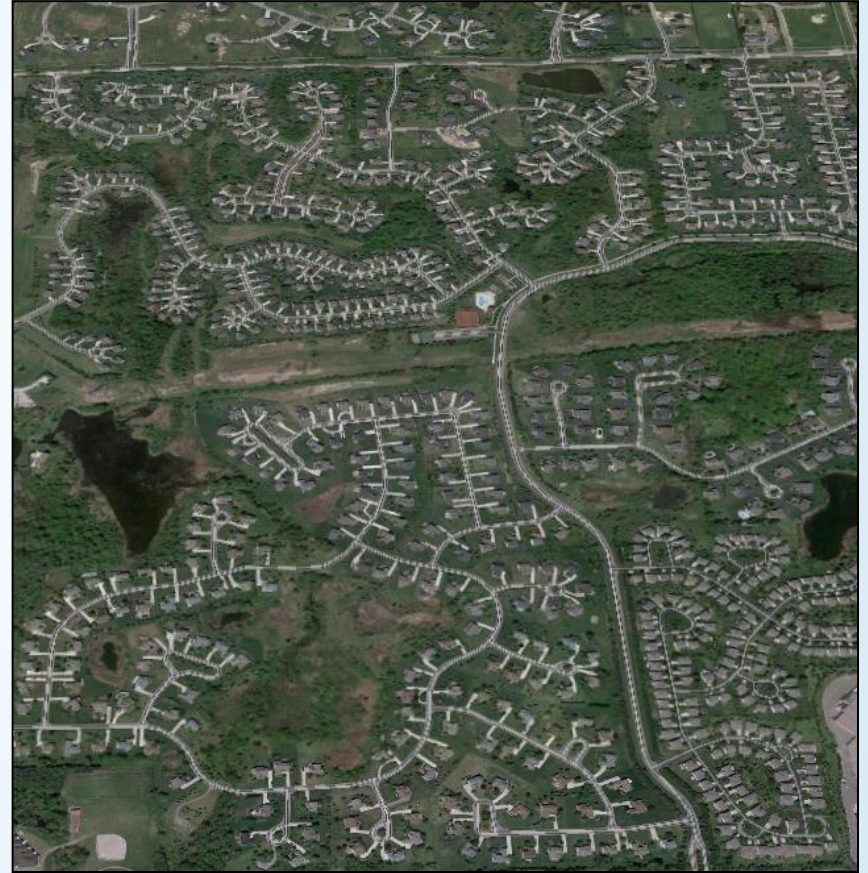
- Commerce Township
- Lyon Township
- Southwest Oakland Township

All have water systems operated by the Oakland County Water Resources Commissioner's Office

Service Area Characteristics



City of Waterloo, ON

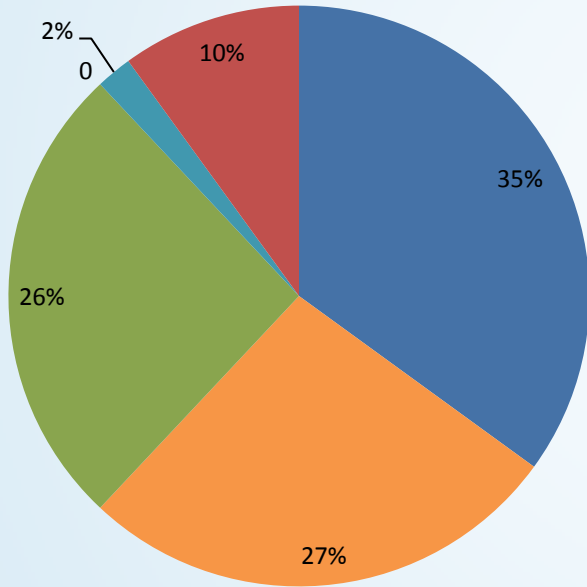


Southwest Oakland Township, MI

Source: Google Earth. 2014.

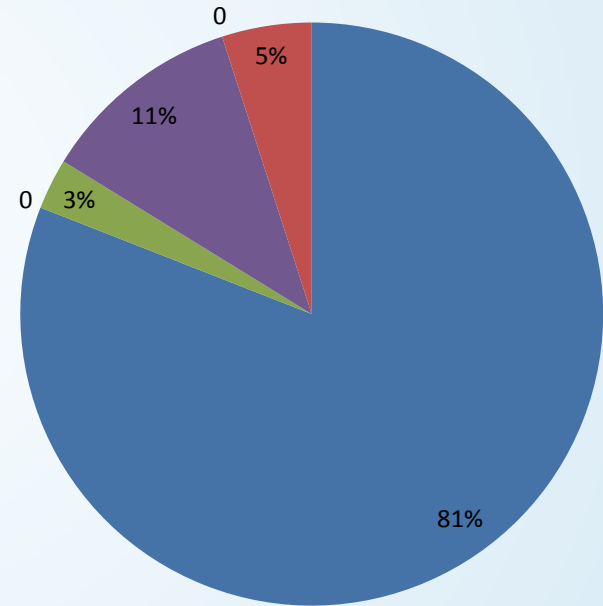
Customer Class Demands

Region of Waterloo, ON



- Single-family
- CII
- Non-revenue Water
- Multifamily
- Other

Southwest Oakland Township, MI



- Residential
- Irrigation
- Commercial
- Non-revenue Water

Indoor Water Efficiency Programs Analyzed

- Toilet Replacements
- Toilet Flapper Replacements
- Clothes Washers
- Hot Water Recirculation Systems
- Voluntary New Home Specifications
- Residential Package Graywater Systems
- Pre-rinse Spray Valves
- Restaurant Certification
- Capacity Buyback Program
- Cooling Towers
- Site Visits
- Education



Outdoor Water Efficiency Programs Analyzed

- Landscape Surveys
- Weather Based Irrigation Controllers
- Soil Moisture Sensors
- Efficient Sprinkler Nozzles
- Rainwater Harvesting



Region of Waterloo, ON Costs and Benefits

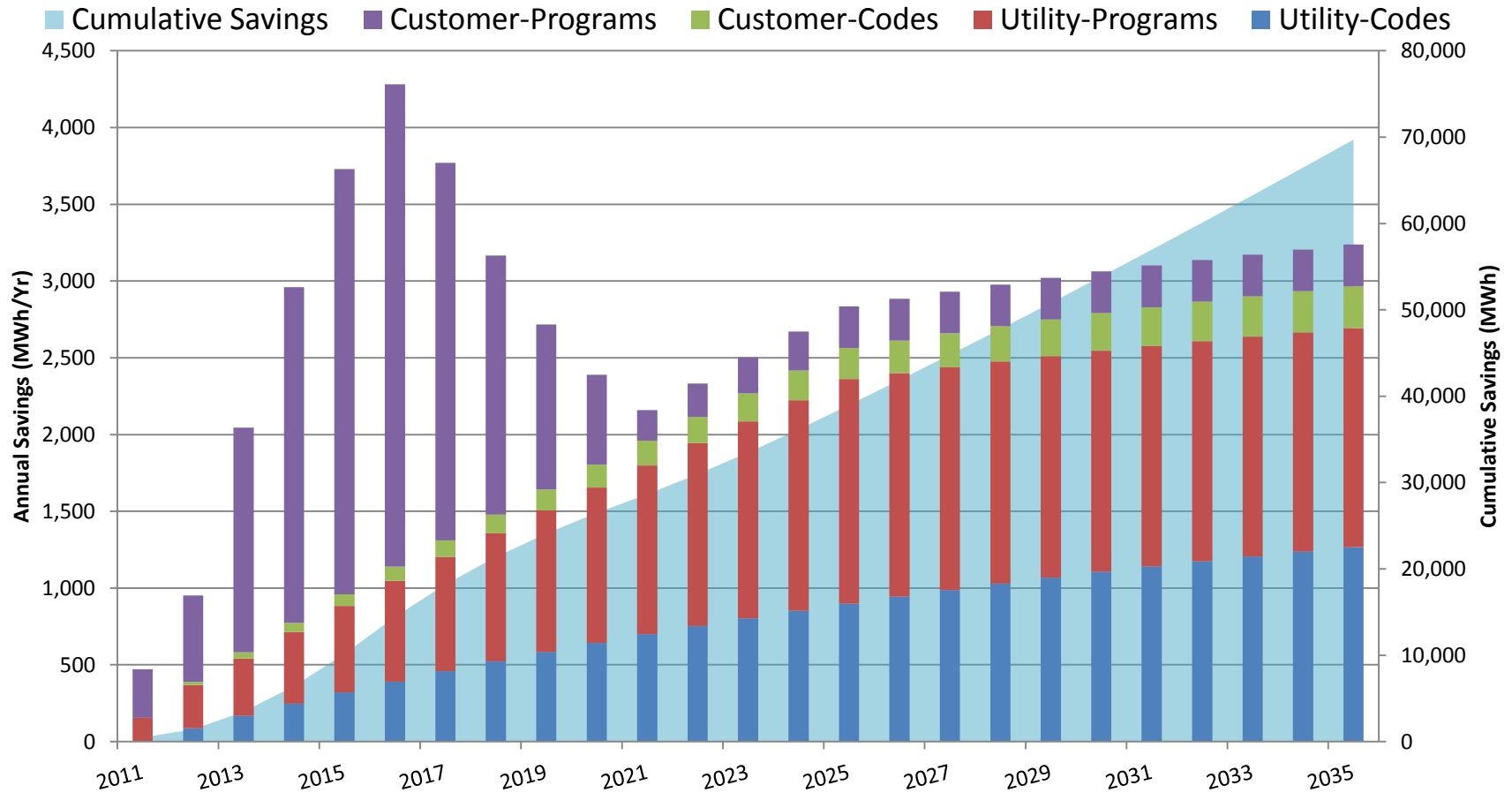
Activity Name	PV Cost (\$)	PV (\$) Benefit	NPV (\$)	B/C Ratio
CII Tank-Type HE Toilet	\$ 8,791	\$ 124,655	\$ 115,864	14.18
CII Valve-Type HE Toilet	\$ 50,168	\$ 94,846	\$ 44,678	1.89
CII Laundromat	\$ 12,900	\$ 27,250	\$ 14,350	2.11
CII Pre-Rinse Spray Valve	\$ 22,170	\$ 334,930	\$ 312,761	15.11
Community Education	\$ 1,290,042	\$ 370,051	\$ (919,991)	0.29
School Curriculum	\$ 143,338	\$ 32,530	\$ (110,808)	0.23
Developer Incent: Hot W. Recirc System	\$ 57,335	\$ 61,771	\$ 4,436	1.08
Developer Incent: RainW Harv. System Plumbed	\$ 334,455	\$ 38,147	\$ (296,309)	0.11
Targeted User Prog: Education	\$ 1,146,704	\$ 1,390,991	\$ 244,287	1.21
Targeted User Prog: Audit	\$ 365,512	\$ 495,456	\$ 129,944	1.36
Targeted User Prog: Rebate	\$ 401,346	\$ 2,644,591	\$ 2,243,245	6.59
CII Cooling Tower	\$ 267,564	\$ 168,968	\$ (98,596)	0.63
Restaurant Certification Program	\$ 121,837	\$ 636,457	\$ 514,619	5.22
CII Audit/Recommendations	\$ 1,469,215	\$ 3,498,394	\$ 2,029,179	2.38
Developer Incent: GreyW. Recyc. System	\$ 86,003	\$ 4,496	\$ (81,507)	0.05
Residential Rainwater Harvesting Rebate Outdoor Only	\$ 157,672	\$ 19,958	\$ (137,714)	0.13
Toilet Flapper Replacement	\$ 86,003	\$ 158,866	\$ 72,864	1.85
Total	\$ 6,021,057	\$ 10,102,358	\$ 4,081,302	1.68

Guelph, ON Costs and Benefits

Activity Name	PV Cost (\$)	PV (\$) Benefit	NPV (\$)	B/C Ratio
Royal Flush Toilet Rebate, SF	\$ 1,676,300	\$ 12,068,155	\$ 10,391,855	7.20
Royal Flush Toilet Rebate, MF	\$ 525,400	\$ 2,534,944	\$ 2,009,544	4.82
Royal Flush Toilet Rebate, ICI	\$ 55,800	\$ 441,405	\$ 385,605	7.91
Smart Wash Washing Machine Rebate	\$ 1,333,250	\$ 4,806,374	\$ 3,473,124	3.61
Blue Built Home - Bronze	\$ 329,280	\$ 545,126	\$ 215,846	1.66
Blue Built Home - Silver	\$ 15,900	\$ 21,487	\$ 5,587	1.35
Greywater Reuse Systems	\$ 21,000	\$ 3,157	\$ (17,843)	0.15
ICI Audit and Capacity Buyback Program	\$ 967,395	\$ 12,323,719	\$ 11,356,324	12.74
Rainwater Harvesting System	\$ 50,000	\$ 7,264	\$ (42,736)	0.15
Healthy Landscape Visit	\$ 368,970	\$ 36,022	\$ (332,948)	0.10
Efficient Home Visit Surveys (GEL/NetZero City)	\$ 229,505	\$ 24,127	\$ (205,378)	0.11
Total	\$ 5,572,800	\$ 32,811,780	\$ 27,238,980	5.89

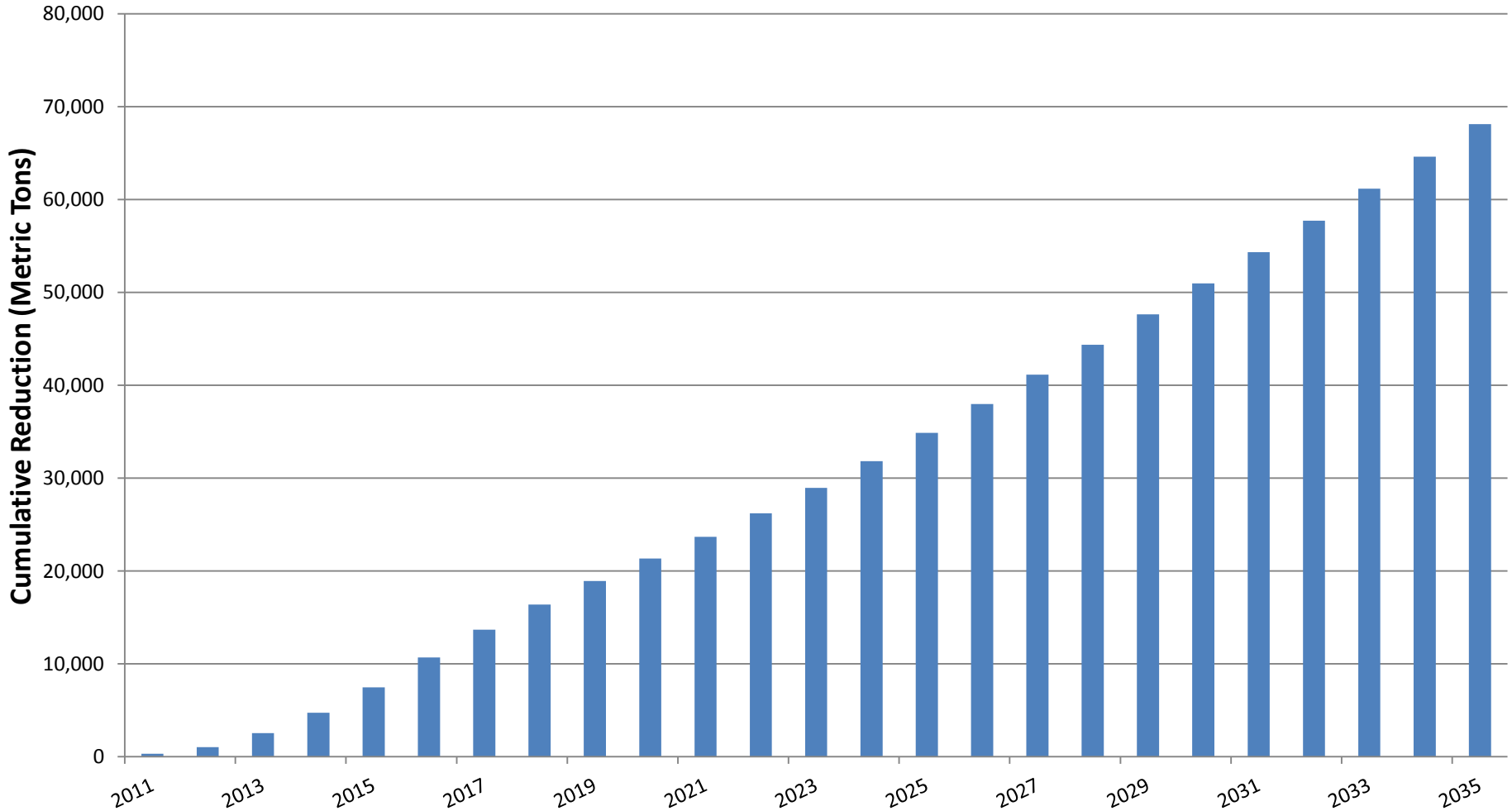
Energy Reduction Benefit Example

Annual and Cumulative Electricity Savings



Greenhouse Gas Reduction Benefit Example

Cumulative CO₂ Emission Reductions

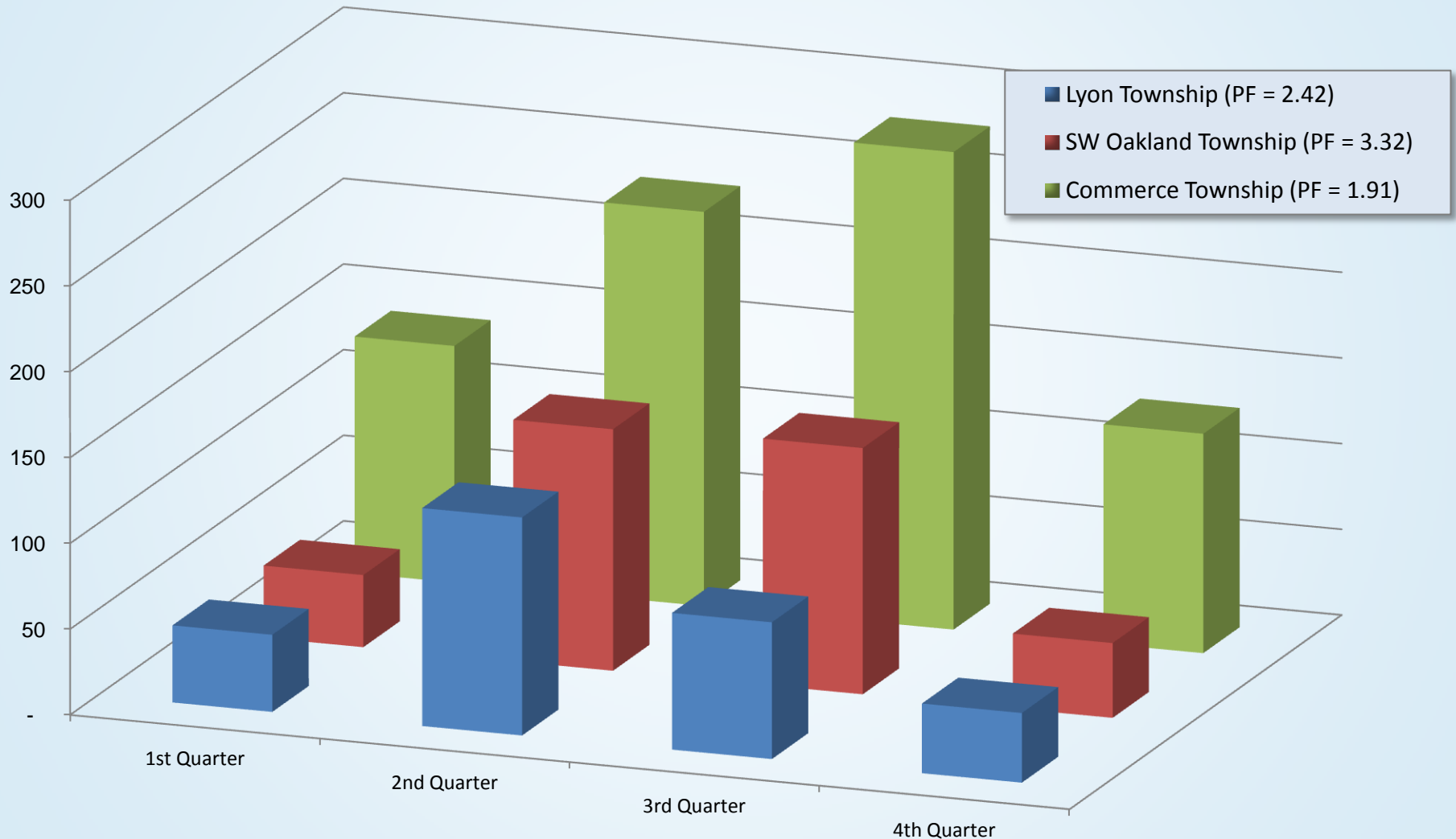


Oakland County, Michigan Costs and Benefits

Activity Name	<u>Commerce</u>	<u>Lyon</u>	<u>SW Oakland</u>
	B/C Ratio	B/C Ratio	B/C Ratio
Residential High-Efficiency Toilet Rebates	13.57	1.42	2.29
Residential High-Efficiency Clothes Washer Rebates	2.84	0.45	0.71
Residential Efficient Irrigation Nozzle Replacements	0.51	0.09	0.09
Residential Irrigation ET Controller Rebates	1.22	0.20	0.21
Residential Soil Moisture Sensor – Targets High Water Users	3.08	0.69	0.83
Large Landscape Surveys	4.27	0.74	0.77
Large Landscape Irrigation Controller Rebates	3.94	0.64	0.66
Total	7.22	0.75	0.97

High Peak Water Use Example

Oakland County, MI 2010 Total Water Consumption by Quarter (MG)



Components of Successful Landscape Water Efficiency Programs

- Target high irrigation users
- Educate contractors and customers
- Follow-up to assess water savings
- Follow-up to ensure equipment is programmed and functioning properly
- For turf that is not replaced with native plants or other options, maintain turf quality
- Piloting small scale programs may be a good option to deal with uncertainty associated with planning outdoor efficiency programs



Beyond Water Efficiency Incentive Programs

- Rates
 - Inclining Block
 - Seasonal
- Requirements for New Construction
 - Efficient fixtures
 - Irrigation controllers
 - Other landscape requirements
- Watering Restrictions
- Education and Outreach
- Water Loss Control
- Professional Training and Development
 - Qualified Water Efficient Landscaper Training (QWEL)
 - Irrigation Association Certification

Lessons Learned

- Each service area is unique. What works in one community may not work elsewhere, and vice versa.
- Water providers with a long history of water conservation programs are still able to find cost-effective opportunities for savings.
- High peak water use can be an issue (and an opportunity for savings), even in the Great Lakes Region.
- Graywater and rainwater harvesting programs were not predicted to be cost-effective in Ontario.
- Communities with a predominance of new housing (i.e., built after 1994 in the U.S.) have less opportunity for residential indoor water efficiency programs.

Lessons Learned (continued)

- Low avoided costs make planning cost-effective water efficiency programs challenging. Those costs may change over time.
- Strategies such as ordinances, educational programs, professional training, or water rate design can also be employed to reduce demand.
- Water conservation programs will become increasingly cost-effective if a community can reduce demands to avoid expensive infrastructure expansion.
- Water conservation programs will become increasingly cost-effective in Lyon Township and Southwest Oakland Township if those communities are faced with purchasing water from Detroit Water and Sewerage Department (DWSD).
- Water conservation programs provide meaningful energy savings and greenhouse gas emission reductions.