2013 Water Management Workshop Series

Metropolitan Planning Council

Chicago Metropolitan Agency for Planning

Utility Planning and Asset Management – May 29, 2013

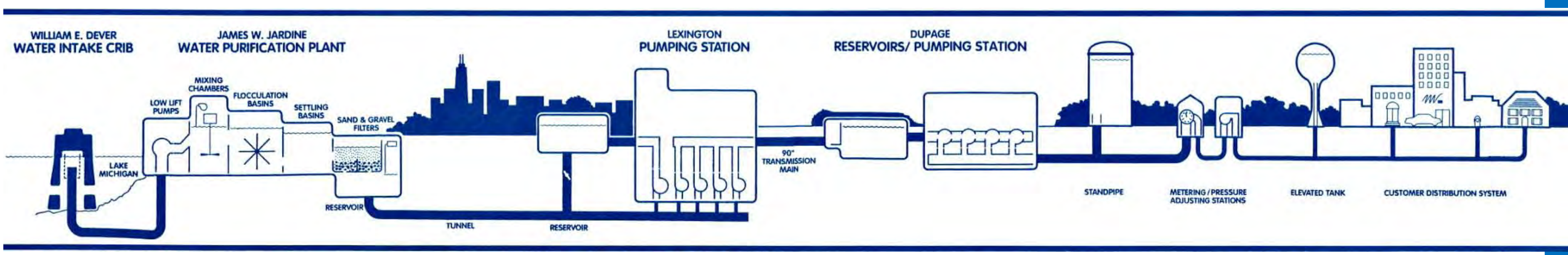
Course ID 7253

DuPage Water Commission is Preserving Every Drop

Commission Background

- **Second largest water system in the State of Illinois**
- **Sole source of Lake Michigan water inside DuPage County**
- **The Commission purchases finished water from the City of Chicago and wholesales it to the communities located inside DuPage County**
- **Operates under the authority of the Water Commission Act of 1985**

Lake Michigan to DuPage County



System Background

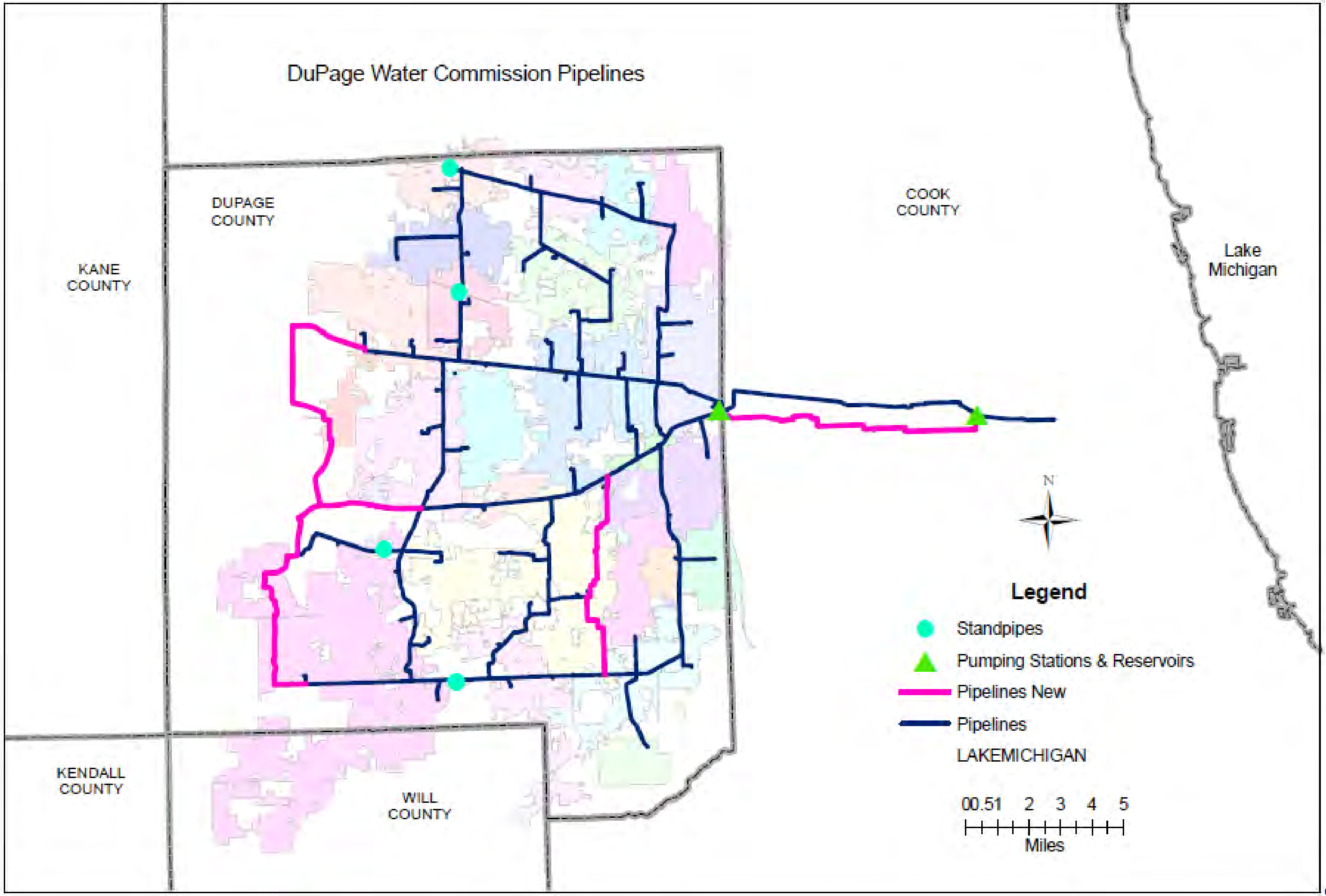
- Responsible for water to ≈ 800,000 people
- 28 Customers (Charter + Subsequent)
- DuPage Pumping Station has a capacity of 185 MGD with an average day demand of 86 MGD
- Site covers ≈ 10 acres
- Two 15 MG reservoirs
- Disinfection facilities
- Back-up generation facilities

System Background

- 202 miles of pipelines ranging in size from 12” to 90”
- 78 Metering Stations
- 249 Turbine meters
- 34 Remotely Operated Valves
- 5 Standpipes (37.5 MG of storage)
- 1 Remote Pump Station with an emergency interconnection to the Village of Schaumburg



System Map



DuPage Water Commission is Preserving Every Drop

LEED Information

- 13,000 Gallon Rainwater Collection System
- 6,200 Square Foot Green Roof
- Detention Pond, Bioswale, and Native Plantings
- Solar Wall

Workshop series overview

Give conservation coordinators tools to educate and encourage customers to conserve water by emphasizing the importance of conservation and the role it plays in utility management, regulations and ordinances, water and revenues.

1. **May 29: Utility planning and asset management**
2. **June 26: Regulations and ordinances**
3. **July 31: Indoor and outdoor water use**
4. **August 28: Water rates and revenue**

Key takeaways

1. **Understand the region's water supply and demand issues and how they relate to local water supply management.**

2. **Recognize the importance of asset management for making informed decisions, improving efficiency of operations and maximizing limited financial resources.**

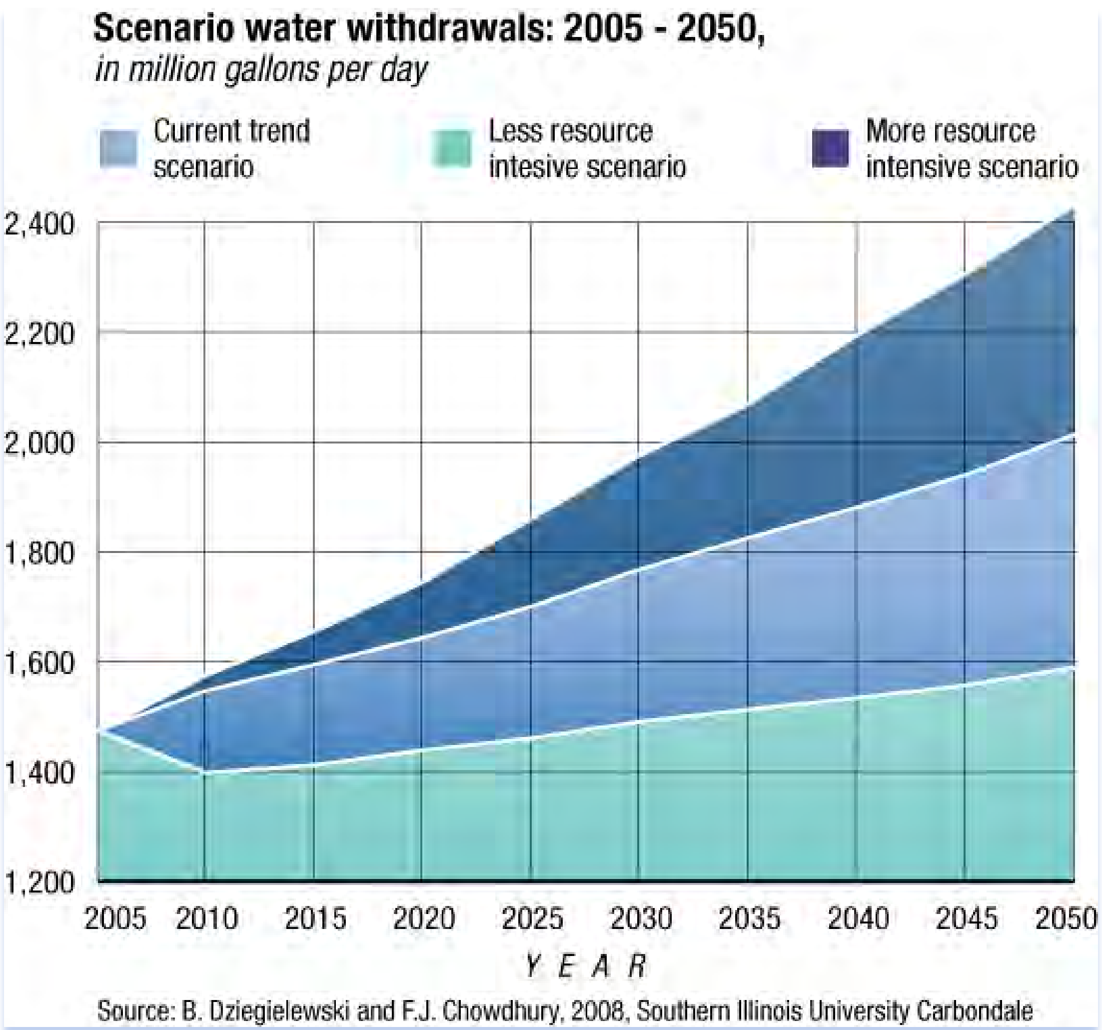
3. **Become familiar with water supply operations as integrated with other water resource planning and energy use.**

Current Water Supply & Demand Issues in NE Illinois

Josh Ellis, Metropolitan Planning Council

Scott Meyer, Illinois State Water Survey

Water 2050



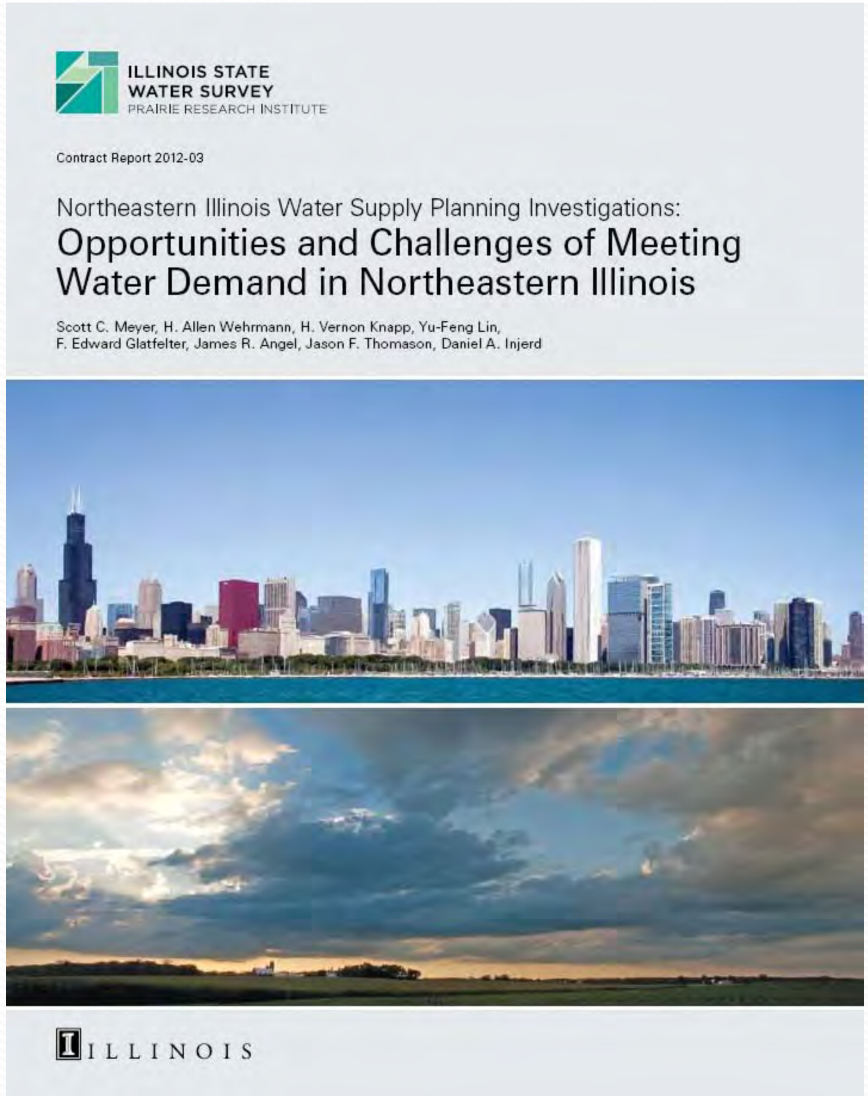
Metropolitan Planning Council

@metroplanners @MPCJosh

Analysis of Lake Michigan Water Availability in Illinois

Scott C. Meyer, P.G.
Illinois State Water Survey
Prairie Research Institute
University of Illinois at Urbana-Champaign

I L L I N O I S



ILLINOIS STATE WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

Contract Report 2012-03

Northeastern Illinois Water Supply Planning Investigations:

Opportunities and Challenges of Meeting Water Demand in Northeastern Illinois

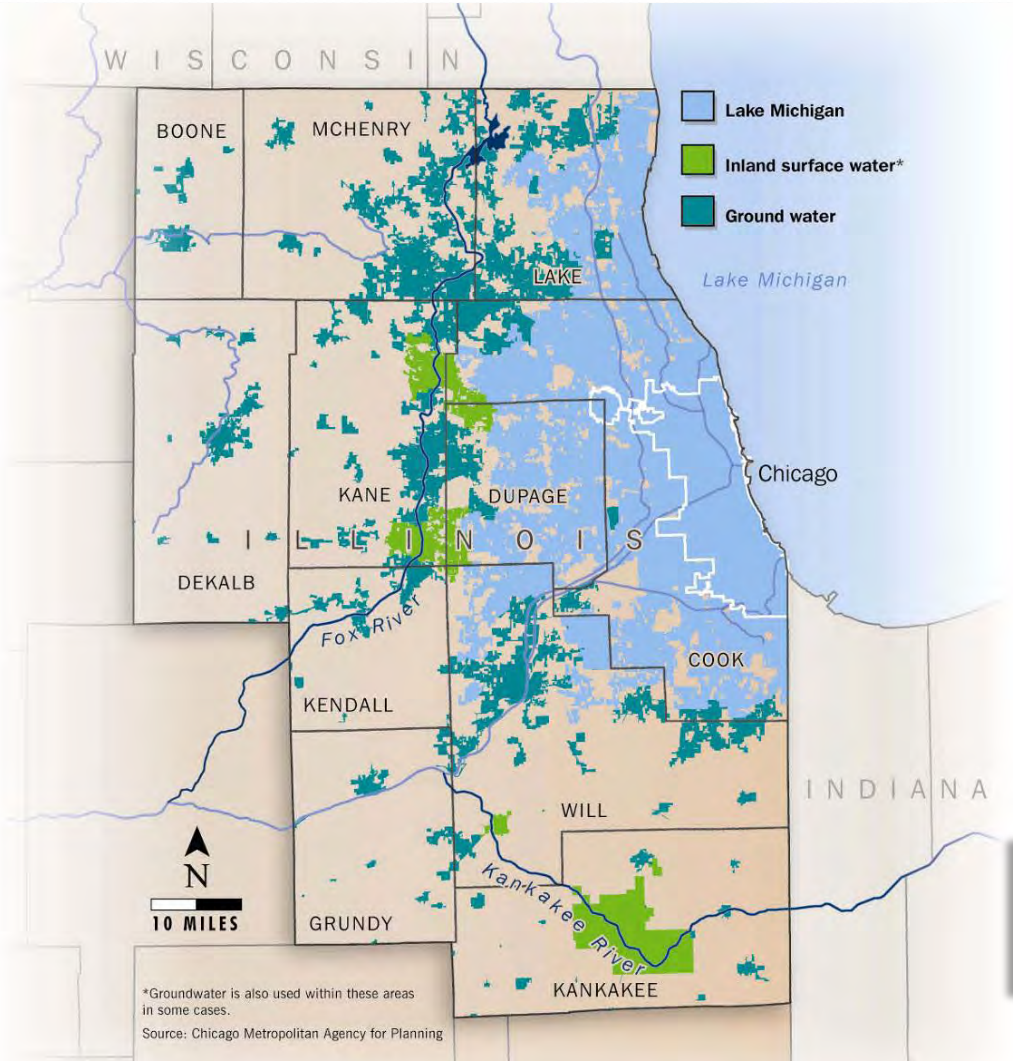
Scott C. Meyer, H. Allen Wehrmann, H. Vernon Knapp, Yu-Feng Lin,
F. Edward Glatfelter, James R. Angel, Jason F. Thomason, Daniel A. Injerd

ILLINOIS

Overview

- Sources of water in northeastern Illinois
- Water withdrawals in northeastern Illinois
- Lake Michigan

Sources of Public Water Supply in Northeastern Illinois



***Elgin and Aurora use groundwater as well as surface water**

CMAP

Withdrawals in Northeastern Illinois, by Water Source (Excludes Through Flow for Power Generation)

Source	2005*		2050 (LRI)		2050 (BL)		2050 (MRI)	
	Mgd	%	Mgd	%	Mgd	%	Mgd	%
Lake Michigan	1,018.0	69	952.9	60	1,222.7	61	1,396.9	57
Inland surface waters	212.2	14	275.3	17	327.1	16	445.0	18
Groundwater	250.1	17	359.1	23	461.0	23	587.6	24
TOTAL	**1,480.3**		**1,587.5**		**2010.7**		**2,429.4**	

*adjusted to average 1971-2000 climate

+107.2 Mgd
+7.2%

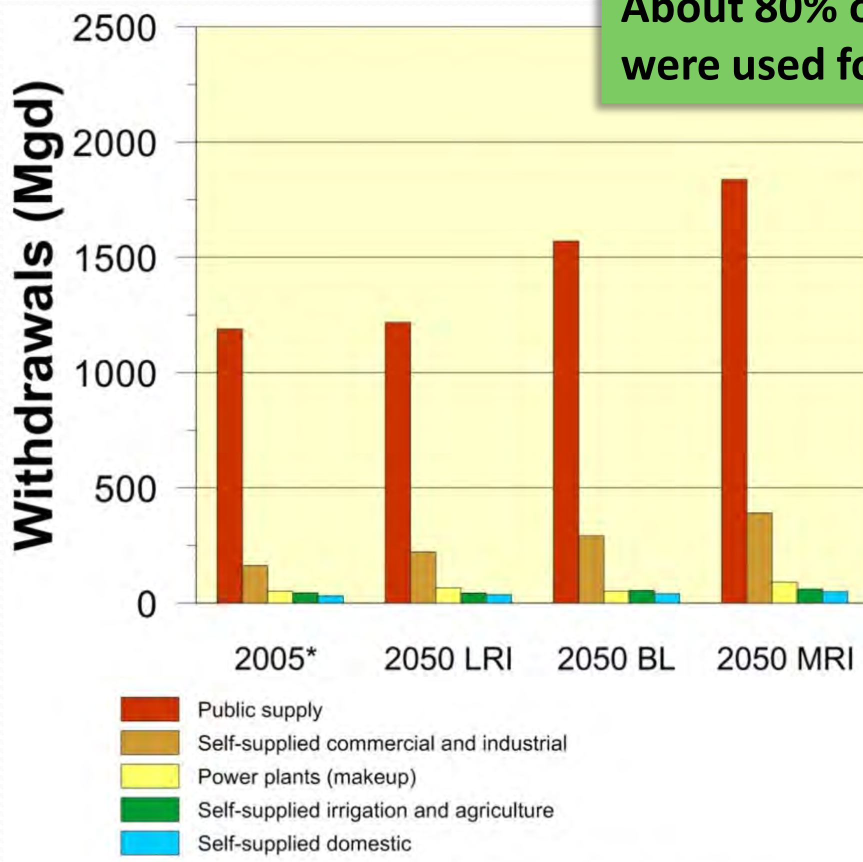
+530.4 Mgd
+35.8%

+949.1 Mgd
+64.1%

Dziegielewski and Chowdhury, 2008

Projected Withdrawals
(Excludes Through Flow for Power Generation)

About 80% of 2005* withdrawals were used for public supply



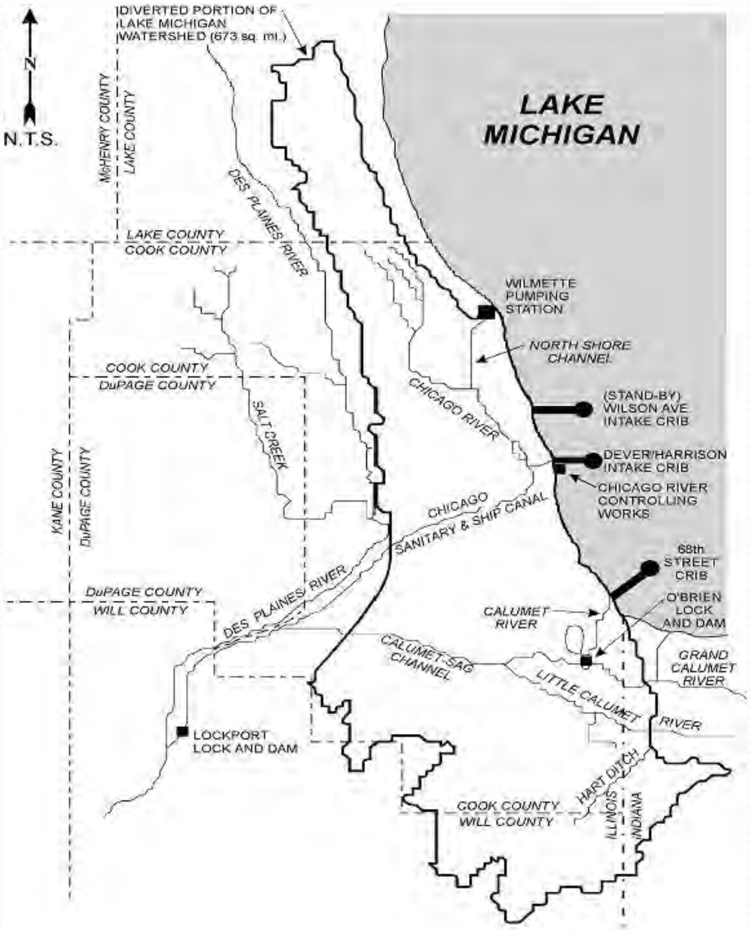
*Reported 2005 withdrawals are adjusted to 1971-2000 average annual precipitation and average daily temperature

Dziegielewski and Chowdhury, 2008

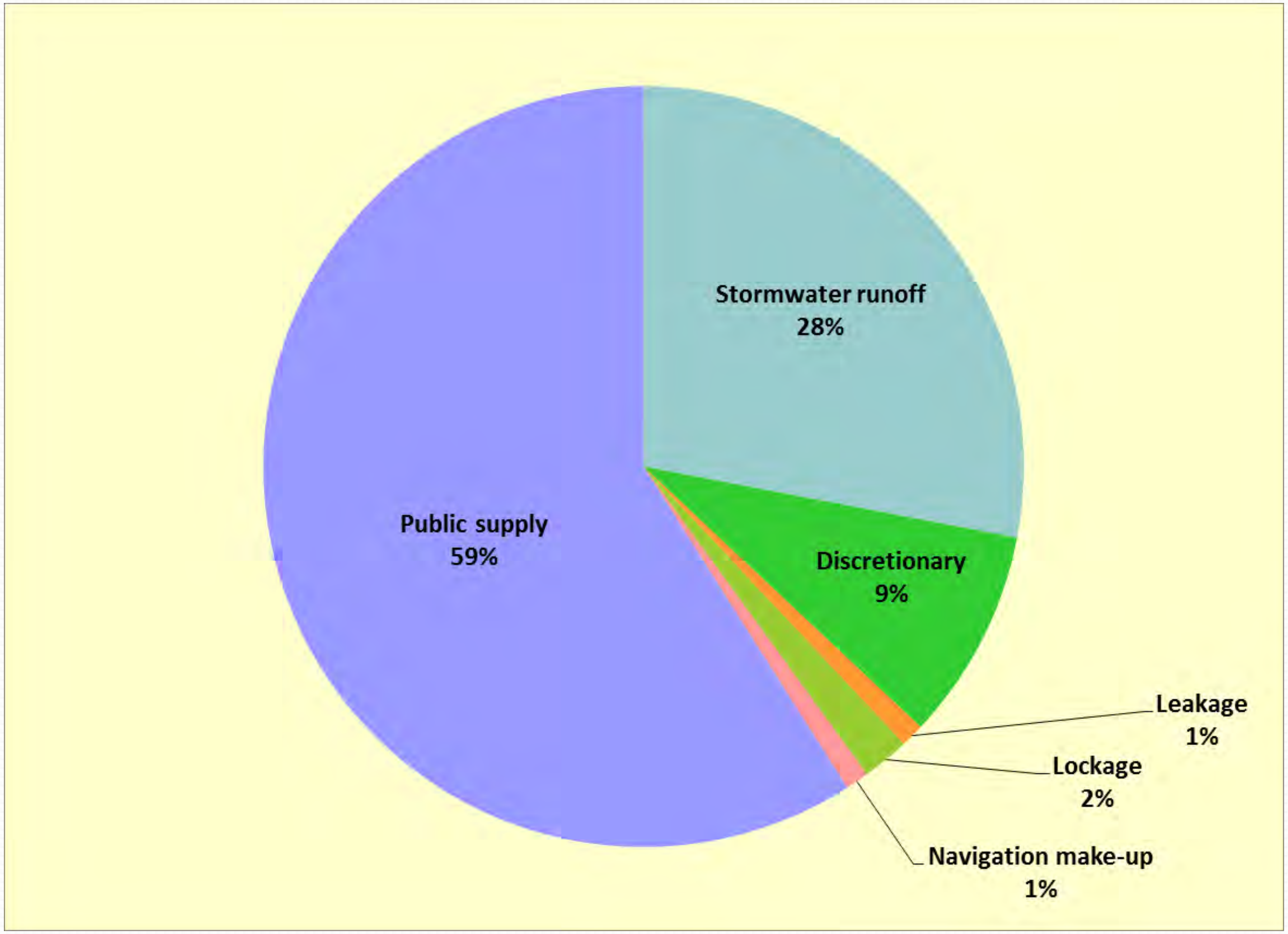
Lake Michigan Diversion

Components

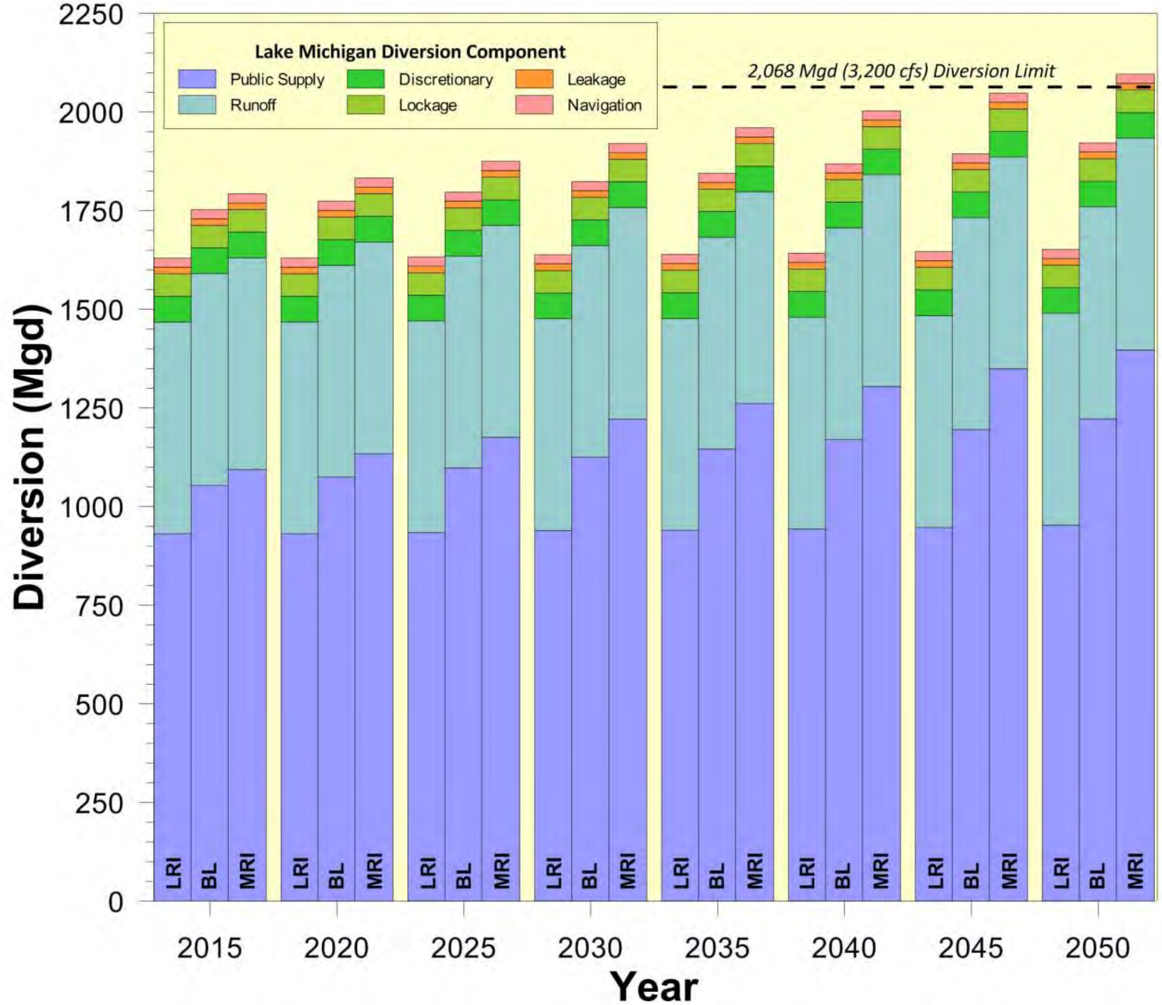
- Direct diversion
    - Lockage
    - Leakage
    - Navigation make-up
    - Discretionary diversion
- Stormwater runoff
- Public supply



Lake Michigan Diversion, 2005



Lake Michigan Diversion, 2015-2050

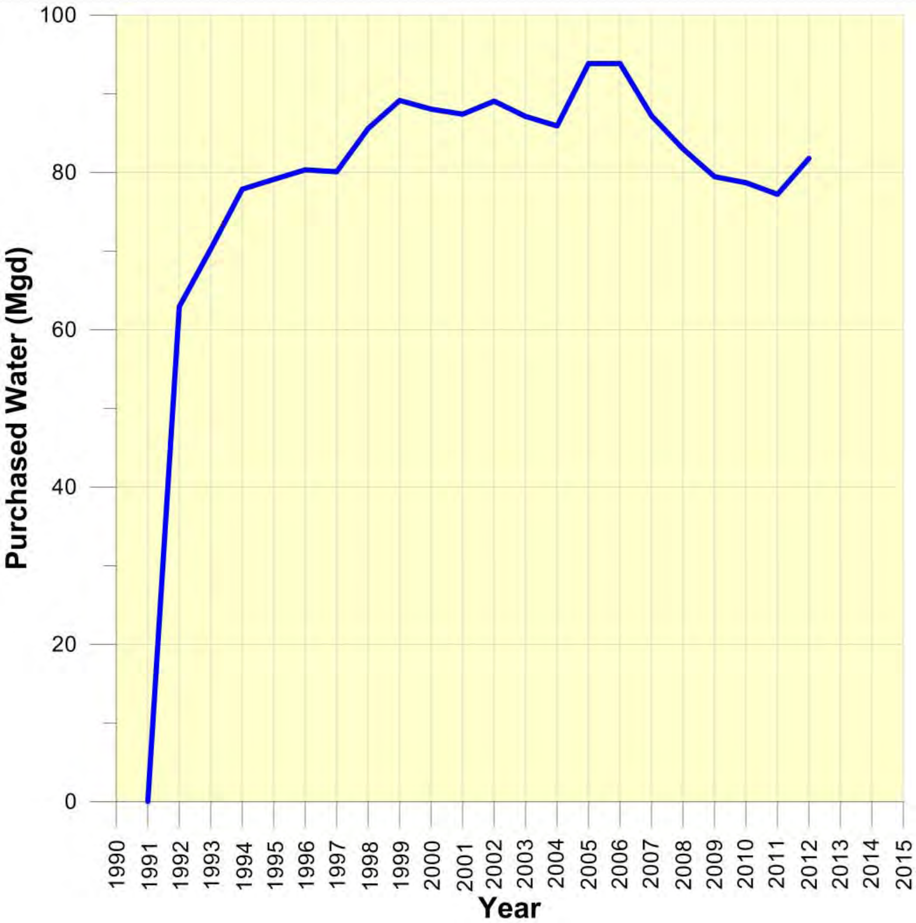


Lake Michigan Water Availability

- Limitations of analysis
  - Assumed magnitude of diversion components
    - **Stormwater runoff** = 1984-2003 average
    - **Discretionary diversion** specified at IDNR constraint (effective 2015) that assumes TARP fully operational in 2025
    - **Lockage** = 25-year average
    - **Leakage** = 1997-2007 average
    - **Navigation make-up** = 1997-2007 average
  - Climate change
- Conclusion
  - Illinois can remain in compliance with the Court decree and still accommodate an increase of 50 to 75 Mgd in public supply demand(while continuing to accommodate growing water demand within the current Lake Michigan service area).

Du Page Water Commission

Purchased Lake Michigan Water, 1991-2012



Contact Information

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Utility Planning & Asset Management

Margaret Schneemann, Illinois-Indiana Sea Grant/Chicago Metropolitan Agency for Planning

John Wiemhoff, U.S. Environmental Protection Agency

Sustainable Water Utility Planning & Management

DuPage Water Commission Water Management Series: Utility Planning and Asset Management

May 29, 2013, 8:30 am–12 pm

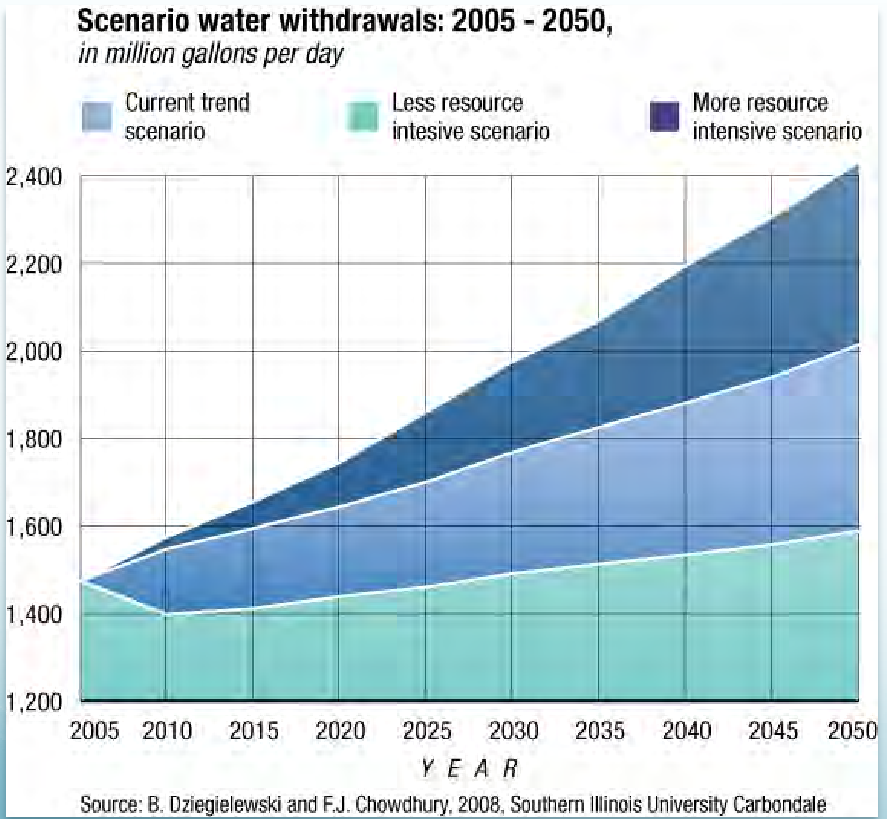
Presented by Margaret Schneemann

Illinois-Indiana Sea Grant

University of Illinois Extension

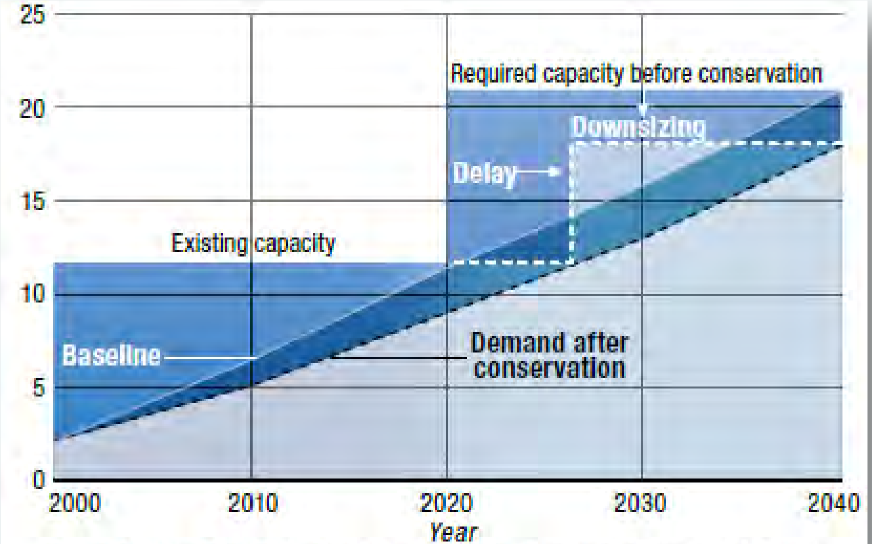
Chicago Metropolitan Agency for Planning

Regional Importance of Planning in Northeastern Illinois



- **Demand Growth**
  - NE IL demand may increase up to 64% by 2050 (Dziegielewski and Chowdhury, 2008)
  - Climate Change = more water demand
- **Surface Water Supply Limits**
  - Lake Michigan Supreme Court Decree
    - 96% allocated for domestic pumpage
  - Inland Surface Water
    - Minimum Flow requirements
    - Contamination Vulnerability
- **Deep Bedrock Aquifer**
  - Falling water table
  - Cannot meet future demand scenarios (Illinois State Water Survey, 2009).
- **Shallow Aquifer**
  - Contamination vulnerability
  - Interference drawdown, including stream flow capture

Economics of Regional Water Supply Planning



Source: American Water Works Association, 2006. Water Conservation Programs – A Planning Manual. AWWA Manual M52, First Edition, page 75.

Benefits

- Deferral and/or downsizing of planned capital facilities
- Reduced operation and maintenance expenses
- Enhanced reputation and customer relations
- Avoided wastewater treatment costs as well as reduced energy costs.
- Environmental and ecosystem services

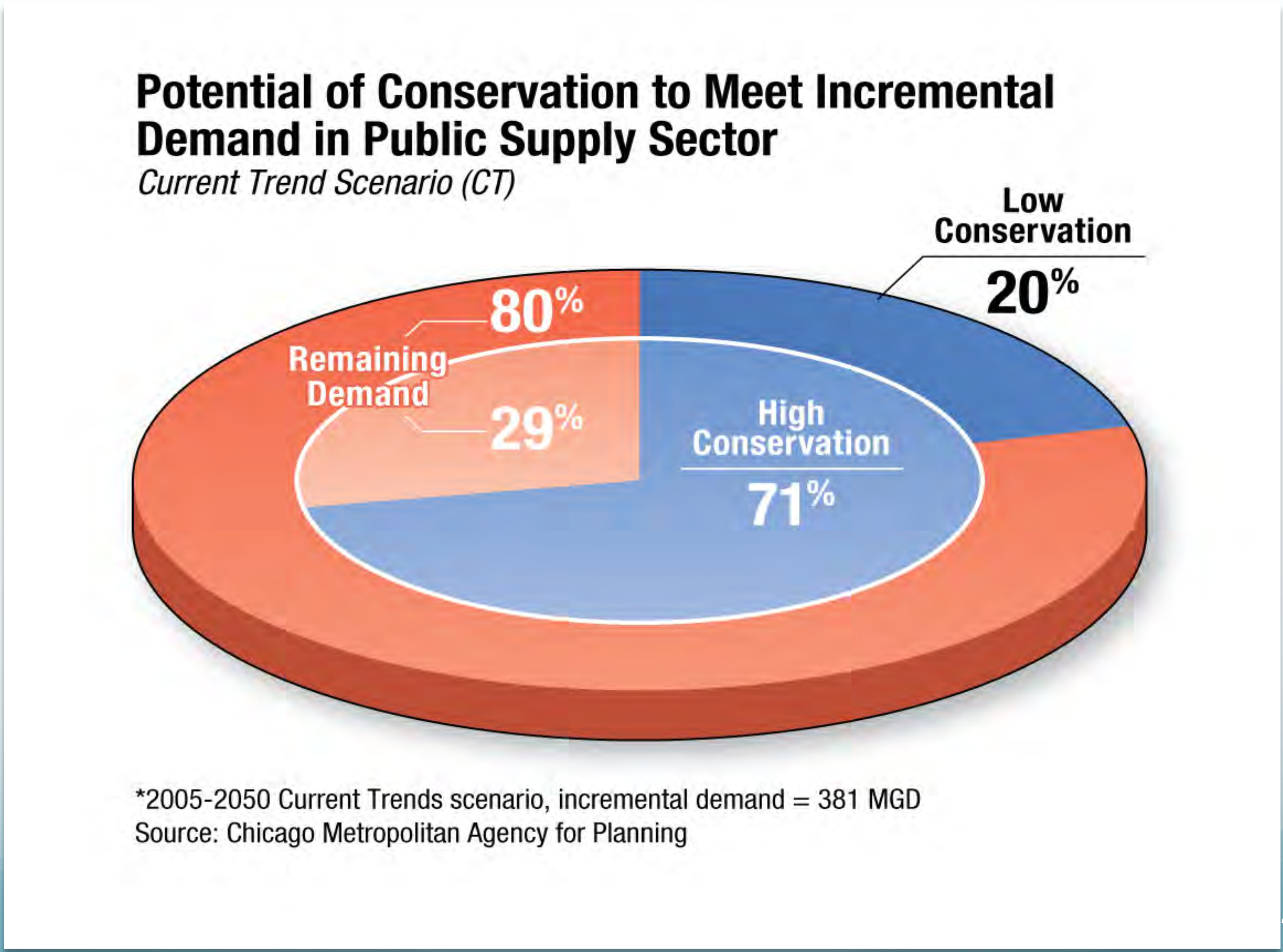
Costs

- Planning
- Implementation
- Revenue adjustments

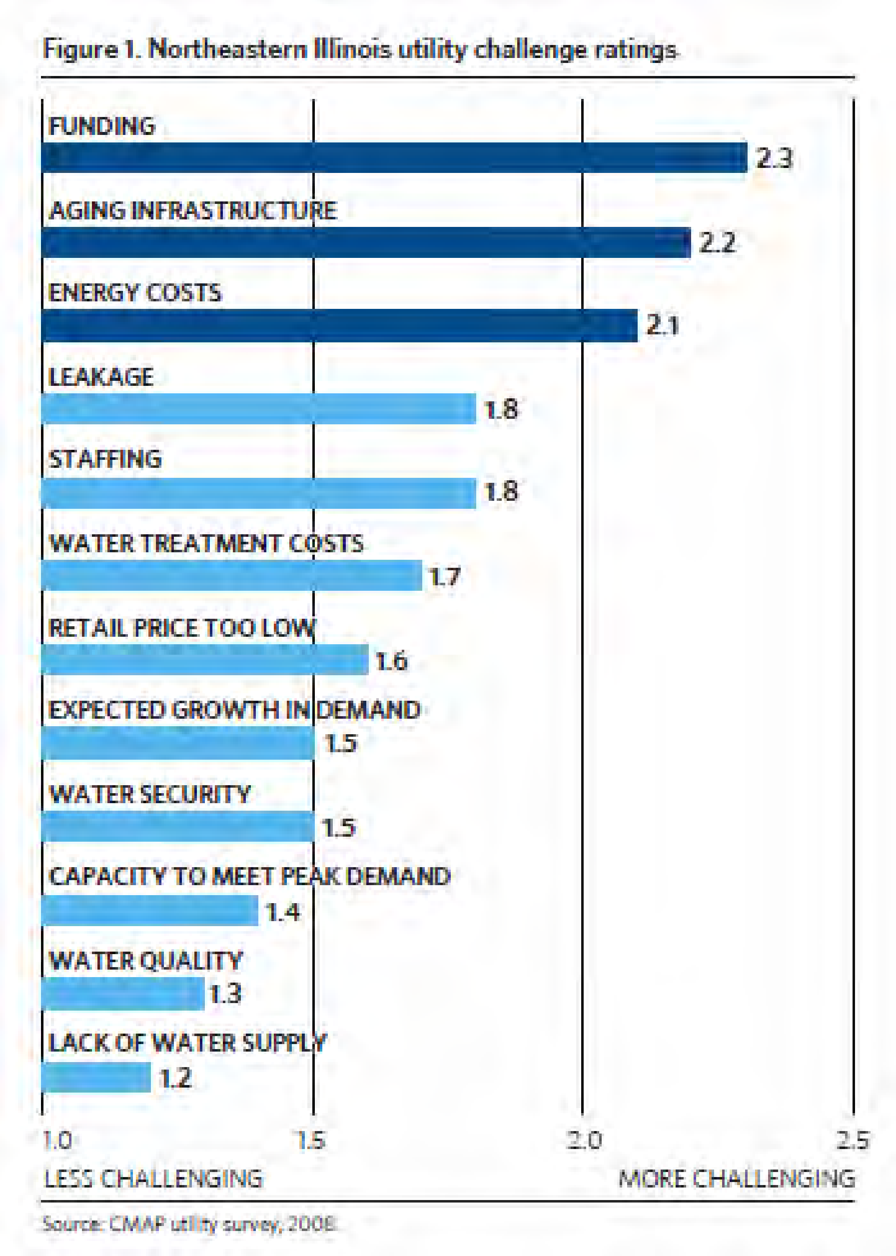
Average Benefit-Cost Ratio of 2.0

Source: Schneemann, 2008 *Economic Value of Regional Water Supply Planning.* Presentation to the NEILRWSPG.

NEIL Regional Water Conservation Goals



From Regional to Community Goals



- Across North America, water systems represent a vast legacy of public investment entrusted to our care.

Elected and appointed leaders have a choice to make about how to manage water assets

Avoid the issue and risk…

- emergency repairs
- business interruption
- public health impacts
- regulatory problems
- higher long-term costs

OR…

Invest proactively in sustainable management of water infrastructure assets to continue providing high-quality, reliable service. (at a Lower long-term Cost)

Why it is difficult to adopt a more proactive approach

From Sustainability Planning to Utility Management

- Make the business case to the community for asset management (and non-asset solutions).
  - Can you demonstrate that this is the best investment solution of the solutions considered?
  - Have you considered non-asset solutions (such as water conservation)?
  - Can you demonstrate that this is the right time to make the investment?
  - Can you effectively tell the story behind rate-increases?

WATER 2050 PROJECT DEVELOPMENT & SUSTAINABLE INFRASTRUCTURE PLANNING

Energy Efficiency for Wastewater Systems

Presented by

College of Lake County

IACAA RCAP

IGEN

Chicago Metropolitan Agency for Planning

Sea Grant ILLINOIS · INDIANA

WATER 2050 PROJECT DEVELOPMENT & SUSTAINABLE INFRASTRUCTURE PLANNING

Energy Efficiency for Wastewater Systems

Improving energy efficiency is an ongoing challenge for water-sector utilities. While energy costs often represent 25 to 30 percent of a plant's total operation and maintenance costs, they also represent the largest controllable cost of providing water and wastewater services. This training will discuss energy efficiency issues and cover energy auditing methods, providing case studies to illustrate energy efficiency at a wastewater plant.

Speaker: Bud Mason, Rural Community Assistance Program (RCAP)
Bud Mason is the Illinois RCAP State Coordinator. He is a certified water and wastewater operator in the State of Illinois who began his career in the Summer Youth Employment Program pulling weeds around sewer lagoons and has gone on to spend over 25 years operating and managing water and wastewater systems throughout Illinois.

IEPA #7155: *Earn up to four Illinois Environmental Protection Agency Operator Certification Training Hours.*

Tuesday,
June 25, 2013
9:00 a.m. to 3:00 p.m.

Continental breakfast and lunch provided.

College of Lake County,
Grayslake Campus
Room TEC T323
19351 W. Washington St.
Grayslake, IL 60030

COST: $20

MAPS & DIRECTIONS:
The event will be held in the Technology Building (T), connected to the A Wing and the LRC Atrium wings via indoor walkways. Parking is available for free in adjacent lots 4, 5 and 6. View campus maps at http://www.clcillinois.edu/aboutclc/grayslake.asp.

REGISTRATION AND MORE INFORMATION:
Visit www.iaccaa.org/event/06-25-2013 to register.
For more information, contact Cassandra McKinney (847-543-2645 or CMcKinney@clcillinois.edu).

FY13-0106

Questions?

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312.676.7456

UNIVERSITY OF ILLINOIS EXTENSION

Sea Grant ILLINOIS - INDIANA

United States Environmental Protection Agency

Sustainable Water Utility Management and Planning

Asset Management 101

DuPage County Water Commission

05/29/13

Short Version – Expanded

John Wiemhoff, USPA Region 5

Assets are…

- All the equipment, buildings, land, people, and other components needed to deliver safe and clean water
  - Large, expensive, long-lived, and often buried
  - Essential to protect public health

Asset Management is…

"A process for maintaining a desired level of customer service at the best appropriate cost."

Asset Management includes….

- Building an inventory of your assets
- Scheduling and tracking maintenance tasks through work orders
- Managing your budgeted and actual annual expenses and revenue

Asset Management will…

- Give you a documented understanding of
    - the assets you have,
    - how long they are going to last, and
    - how much it's going to cost to repair, rehabilitate, or replace them
- Provide financial projections for your utility and allow to you see if
    - your rates and other revenue generating mechanisms are enough to stay in the business of safely providing drinking or clean water to your customers

The 5 Core Questions

- The 5 core questions of an asset management framework are
  1. What Is the Current State of the Utility's Assets?
  2. What Is the Utility's Required Sustained Level of Service?
  3. Which Assets Are Critical to Sustained Performance?
  4. What Are the Utility's Best "Minimum Life-Cycle Cost" CIP and O&M Strategies?
  5. What Is the Utility's Best Long-term Financing Strategy?

1 What Is The Current State Of The Utility's Assets?

- What does the utility own?
- Where is it?
- What is its condition?
- What is its remaining value?
- What is its remaining useful life?

Ruptured Wooden Water Tower, March 1999

Credit: Charles Myers, Rolla, MO

1

Best Practices

- ✓ Asset inventory
- ✓ System maps
- ✓ Condition assessment and rating system
- ✓ Useful life assessment
- ✓ Asset values determination

2

What Is The Utility's Required Sustained Level Of Service (LOS)?

Rusted iron water pipe

Credit: Timothy Ford, Montana State University

- What do the regulators require?
- What are the utility's performance goals?
- What LOS do the utility's customers demand?
- What are the physical capabilities of the utility's assets?

2 Best Practices

- ✓ Analyze customer demand and satisfaction
- ✓ Understand regulatory requirements
- ✓ Communicate to the public a level of service "agreement"
  - Make your service objectives meaningful to the customers
- ✓ Use level of service standards

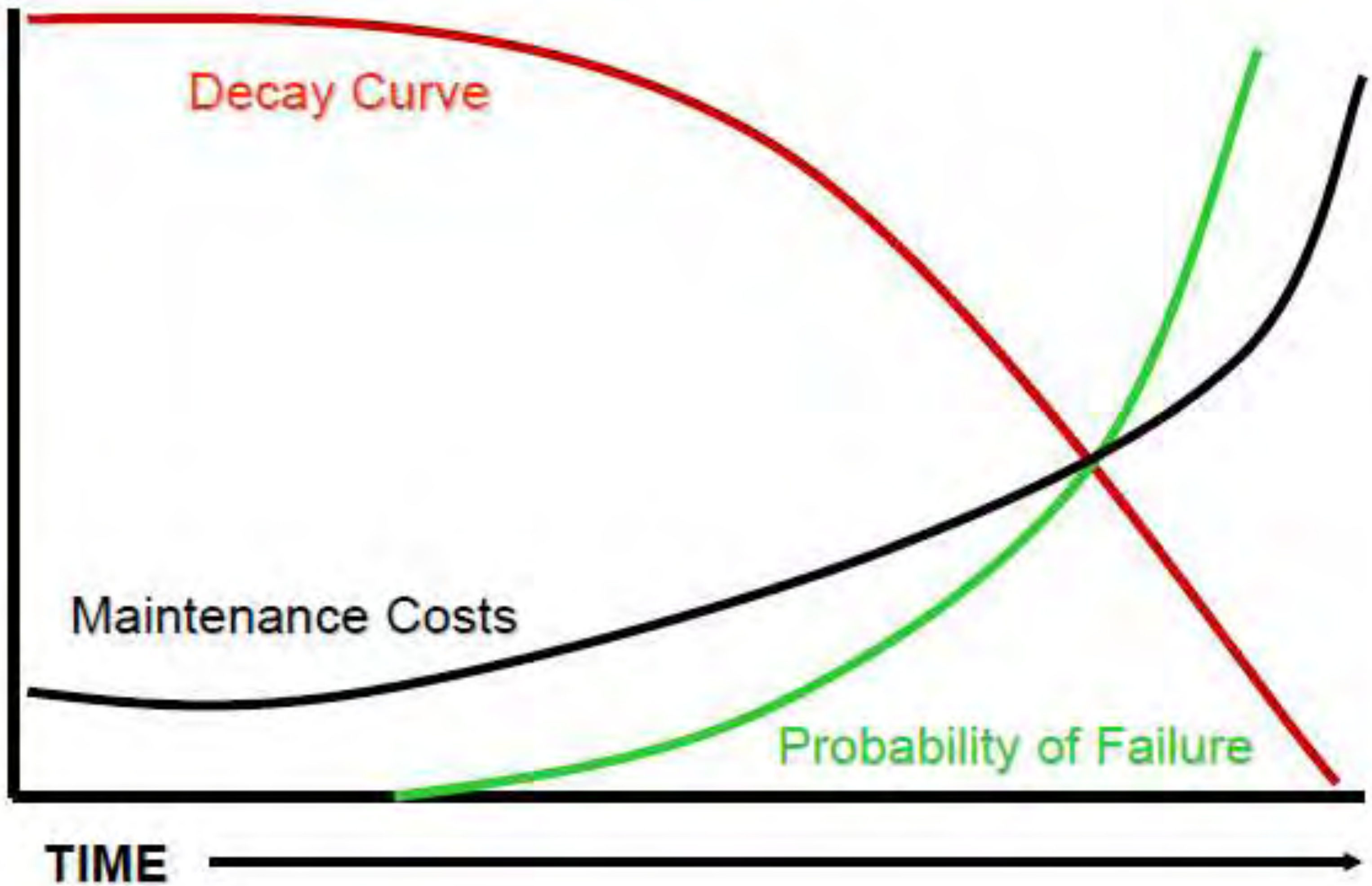
3 Which Assets Are Critical To Sustained Performance?

- How can assets fail?
- How do assets fail?
- What are the likelihoods and consequences of asset failure?
- What does it cost to repair the asset?
- What are other costs that are associated with asset failure?

Leaking valve

Credit: Rural Community Assistance Corporation

Minimize Life Cycle Cost



Car Example

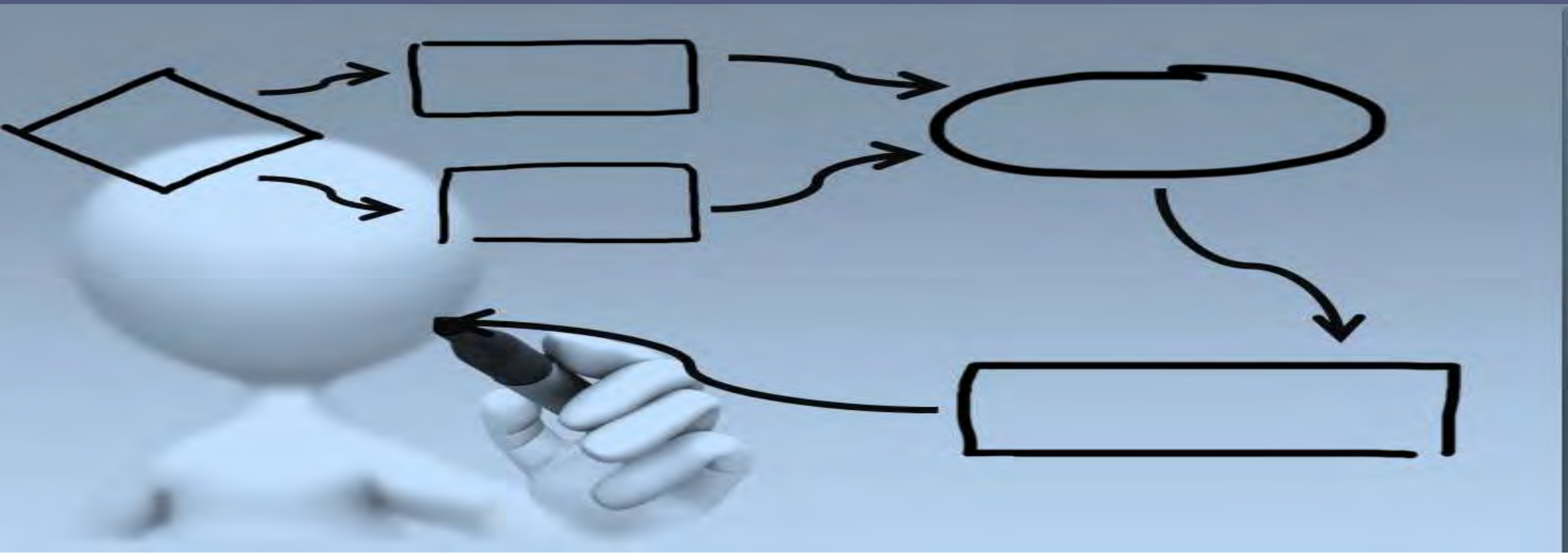
Maintenance Plan	Useful Life	
Run until failure	60,000 miles	4 yrs
Preventative Maintenance	180,000 miles	12 yrs
Predictive Maintenance	300,000 miles	20 yrs

3

Best Practices

- ✓ List assets based on criticality
- ✓ Conduct a failure analysis
- ✓ Determine probability of failure
- ✓ Analyze failure risk and consequences

4 What Are The Utility's Best CIP and O&M Strategies?



- What alternative management strategies exist?
- What strategies are the most feasible for my organization?

4

Best Practices

- ✓ Move from reactive to proactive maintenance
- ✓ Know the costs and benefits of rehabilitation vs replacement
- ✓ Look at lifecycle costs for critical assets
- ✓ Deploy resources based on asset conditions
- ✓ Develop and validate CIP

5

What Is The Utility's Best Long-Term Financing Strategy?

- Do we have enough funding to maintain our assets for our required level of service?
- Is our rate structure sustainable for our system's long-term needs?

5 Best Practices

- ✓ Routinely review and revise the rate structure
- ✓ Fund a dedicated reserve from current revenues
- ✓ Finance asset renewal and replacement through borrowing

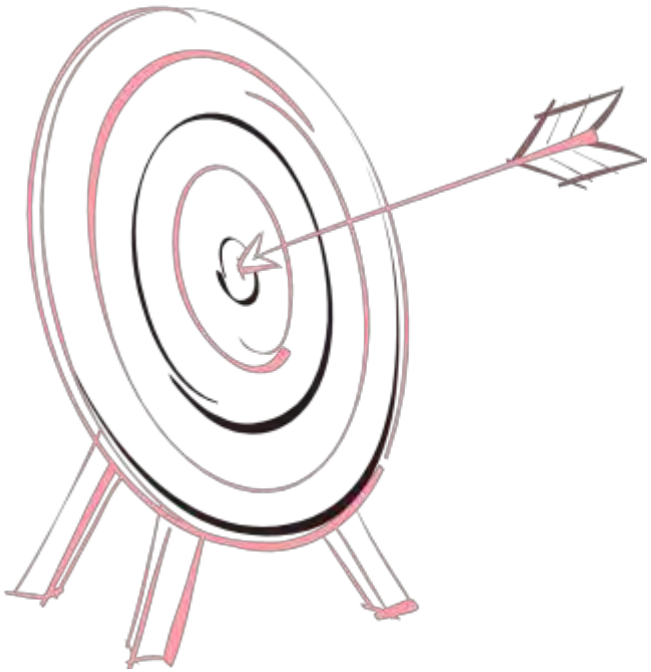
Asset Management Plan

Develop basic Asset Management plans based on:

- Best available current information
  - Existing levels of service
  - Existing management strategies and opportunities for improvement
- Cash flow projection – five to ten years
- Establish financial and performance benchmarks

The End Result

- Ultimately, implementing an asset management plan will help:
  - Identify the costs of operating the utility
  - Set the stage for sustainable level of service discussions
  - Address high-priority asset needs critical to a utility's performance



A Word about Asset Management & CMOM

Subject Matter	Capacity Management, Operation and Maintenance (CMOM)	Asset Management (AM)
Goal	**Ensure collection systems have adequate collection system capacity& maintenance, no SSOs and non-excessive I/I**	**Optimize the value and level of service from each capital asset in your system**
Applicability	**Wastewater Collection System**	**Collection System (sewers) & WWTP or Drinking Water System**
Identifies Defined Level of Service Goals & Current Performance (service gap)	Not listed specifically	YES
Equipment Inventory: location, condition, current performance, remaining useful life, & remaining economic value	Likely equipment names and locations; may list other information, but likely qualitatively	YES; All information at least some form of quantitative information to be able to rank criticality
Equipment Failure Analyses: quantitative ranking of combined risks (frequency and severity) for each equipment	Not listed specifically	YES
Identification of Best Operation and Maintenance (O&M) and Capital Improvement Program Strategies	Not listed specifically	YES
Identification of Best Long Term Funding Strategy	Not listed specifically	YES
Collection System Management: organizational structure, training, communication, customer service, notifications, & legal authority.	YES	Service to customers specifically; not limited to collection system management; e.g., includes WWTP
Collection System Operation: budgeting, monitoring; H_2S control, safety, emergency response, mapping, construction, & pump stations.	YES	Partially (system mapping; scope and frequencies of monitoring; assets of new construction and pump stations)
Equipment & Collection System Maintenance: maintenance budgeting, planned and unplanned maintenance, cleaning schedules, & parts & equipment inventory.	YES	YES; plus add WWTP maintenance
Sewer System Capacity Evaluation: testing & inspection & flow monitoring.	YES	Partially (scope and frequencies of testing and inspections)
Sewer System Rehabilitation: SSO elimination & I/I reduction.	YES	Partially (as asset modification)

A Highly Recommended Presentation Available

TOOLS for Small Utilities

- STEP Guides *
- CUPSS Software *
- Other Commercially Available OTS
- Customer Specific Asset Management Software

* we will discuss today

STEP Guides

- <u>Manual</u> Entry of Data Similar to what is to be entered into a software program such as CUPSS software
- Does not offer quick “what if” capability to update your financial outlook with the click of a keystroke (as in CUPSS)

USEPA’s S T E P Guides

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Asset Management: A Handbook for Small Water Systems

One of the Simple Tools for Effective Performance (STEP) Guide Series

http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_asset_mgmnt.pdf

Step Guides – Example 1

EXAMPLE Prioritization Worksheet				
Date Worksheet Completed/Updated: 8/14/02				
Asset	**Remaining Useful Life**	**Importance**	**Redundancy**	**Priority (1 is high)**
Well 1 (1993)	21	Needed for service	Other well, but need backup	6
Well 1 pump	1	Needed for service	Other well, but need backup	3
Well 2 (1993)	21	Needed for service	Other well, but need backup	6
Well 2 pump	1	Needed for service	Other well, but need backup	3
Pumphouse (1993)	21	Needed for service	Other well, but need backup	6
Electrical components	1	Needed for control	No redundancy - corrosion	2
Chlorinator (1993)	2	Mandatory	No redundancy - need backup	1
Storage tank 1 (1993)	31	Need for fire flow and demand	Other tanks	6
Storage tank 2 (1993)	31	Need for fire flow and demand	Other tanks	6
Storage tank 3 (2000)	38	Need for fire flow and demand	Other tanks	6
Distribution System:				
Hydrants (15)	11	Needed for public safety	Other hydrants	5
Valves (45)	11	Needed for isolation	Other valves, but some are out of service	4
6-inch (PVC)	51	Needed for delivery	No redundancy	6
4-inch (PVC)	51	Needed for delivery	No redundancy	6
2-inch (PVC)	51	Needed for delivery	No redundancy	6

STEP Guides – Example 2

EXAMPLE Required Reserve Worksheet[1]

Date Worksheet Completed/Updated: 8/15/02

Asset (list from highest to lowest priority)	Activity	Years until action needed	Cost ($)	Reserve required current year
1. Chlorinator	Replace	2	$2,000	$1,000
	Purchase redundant unit	1	$2,000	$2,000
2. Pumphouse - Electrical	Replace with controller	1	$2,000	$2,000
3. Well Pumps	Replace Well 1 pump	1	$5,000	$5,000
	Replace Well 2 pump	1	$5,000	$5,000
	Next Replacements (2 well pumps at $5000 each)	10	$10,000	$1,000
4. Valves	Replacement	31	$22,500	$726
	(45 valves at $500 each)			
5. Hydrants	Replacement	31	$60,000	$1,935
	(30 hydrants at $2,000 each)			
6. Pipe	6-inch (3600 ft. at $20/ft.)	51	$302,000	$5,922
	4-inch (9500 ft. at $20/ft. - replace 4-inch with 6 inch)			
	2-inch (2000 ft. at $20/ft. - replace 2-inch with 6 inch)			
	(Total is 15,100 ft. at $20/ft.)			
7. Storage	Rehabilitate 3 tanks	5	$50,000	$10,000
	(1 every 8 years: 1993 and 2000 tanks)			
	Replace - 2 tanks (1993 tanks)	31	$40,000	$1,290
	1 tank (2000 tank)	38	$20,000	$526
			Total reserve in the current year	**$36,399**

[1] Note: The Required Reserve Worksheet only helps you account for the additional funds you will require to rehabilitate or replace your asset. Standard O&M costs are not included in this calculation.

Step Guides – Example 3

EXAMPLE Budgeting Worksheet

Date Worksheet Completed/Updated: *8/14/02*

Revenues

Service Fees:	$249,971
Fees and Service Charges (late fee, connection fee, fire fee, etc.):	$5,284
Impact Fees (demand fee, system development fee, etc.):	$175
Secured Funding:	
Interest:	
Other:	
Total Revenues:	$255,430

Expenses

Maintenance:	$54,320
Utilities (power, telephone):	$3,992
Salaries and Benefits:	$76,689
Equipment Cost:	$1,371
Chemicals:	$40,512
Monitoring and Testing:	$8,096
Rent or Mortgage:	
Insurance:	$1,453
Professional Services (legal, accounting, engineering, etc.):	$400
Training Costs:	$1,000
Billing Costs:	$2,500
Fees (state PWS fee, franchise fee, conservation fee, etc.):	$500
Security:	$609
Other (debt payments, taxes, miscellaneous, etc.):	$53,630
Total Expenses:	$245,072

Net Income

Total Revenues:	$255,430
Total Expenses:	$245,072
Net Income (Revenue - Expenses):	$10,358

Additional Reserves Needed

Total Required Reserves:	$34,625
Net Income:	$10,358
Additional Reserves Needed (Income - Required Reserves):	-$24,267

Check Up Program for Small Systems (CUPSS)

- CUPSS is a desktop software for small to medium water and wastewater utilities to use as a tool to implement asset management practices
  - Includes free download, technical support, and training opportunities
- Using CUPSS will allow utilities to:
  - Create an asset inventory list
  - Create an asset schematic
  - Be aware of capital improvement projects
  - Track tasks and work orders
  - View a 10-year financial projection
  - Create a customized asset management plan

Visit the CUPSS website:
www.epa.gov/cupss

Email questions/comments:
cupss@epa.gov

Who Should Use CUPSS?

- Smaller drinking water and wastewater systems will find CUPSS useful in implementing Asset Management practices
  - Helps in understanding the asset management process
  - Establish and keep track of goals and milestones
  - Become more organized by keeping all information in one place

CUPSS for the first time

1. Enter utility general information
2. Enter existing and potential O&M information "Daily, weekly…etc
   - i.e. existing work orders, inspection reports, sampling / monitoring requirements along with their locations,
3. Enter DW utility team
4. Review all input entered from above


Check Up Program for Small Systems (CUPSS)
Check Up Program for Small Systems
Set-up | Switch Utility | Create User | Help | Training | Exit
My Home
My Inventory
My O & M
My Finances
My Check Up
My CUPSS Plan
Welcome Back Example, Beauty View Acres Subdivision - DW
What would you like to do today?
Do Some Training
Enter a New Task or Work Order
Create or Update My Schematic
Search Asset and Maintenance
Create or Update My Inventory
Enter My Finances
Print My Check Up Reports
Work on My CUPSS Plan
Version 1.3.5 February 1, 2010
My Calendar
May 2010
Sun Mon Tue Wed Thu Fri Sat
25 26 27 28 29 30 1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31 1 2 3 4 5
My Messages and Alerts
Popup Messages Are On. Click To Turn Off.
Reminder - Today's Tasks 8
Tasks Currently Past Due 6724
Assets Needing Update 0
Number of High Risk Assets 3

Example 1
(a very small system)

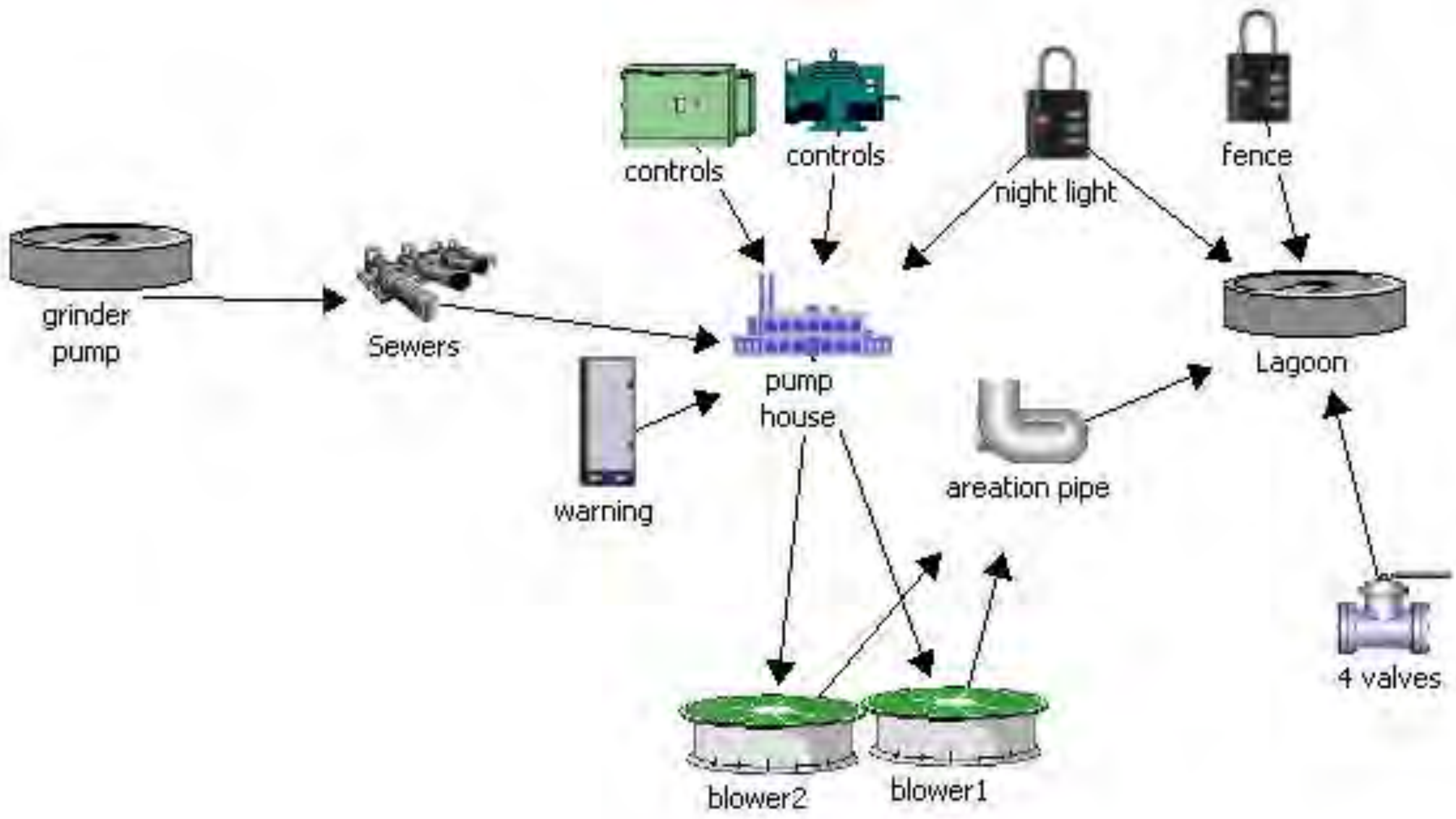
CUPSS can be used for ANY asset

e.g., your car, equipment in your house,

or a water treatment or wastewater treatment plant utility (why you are probably involved in this webinar)

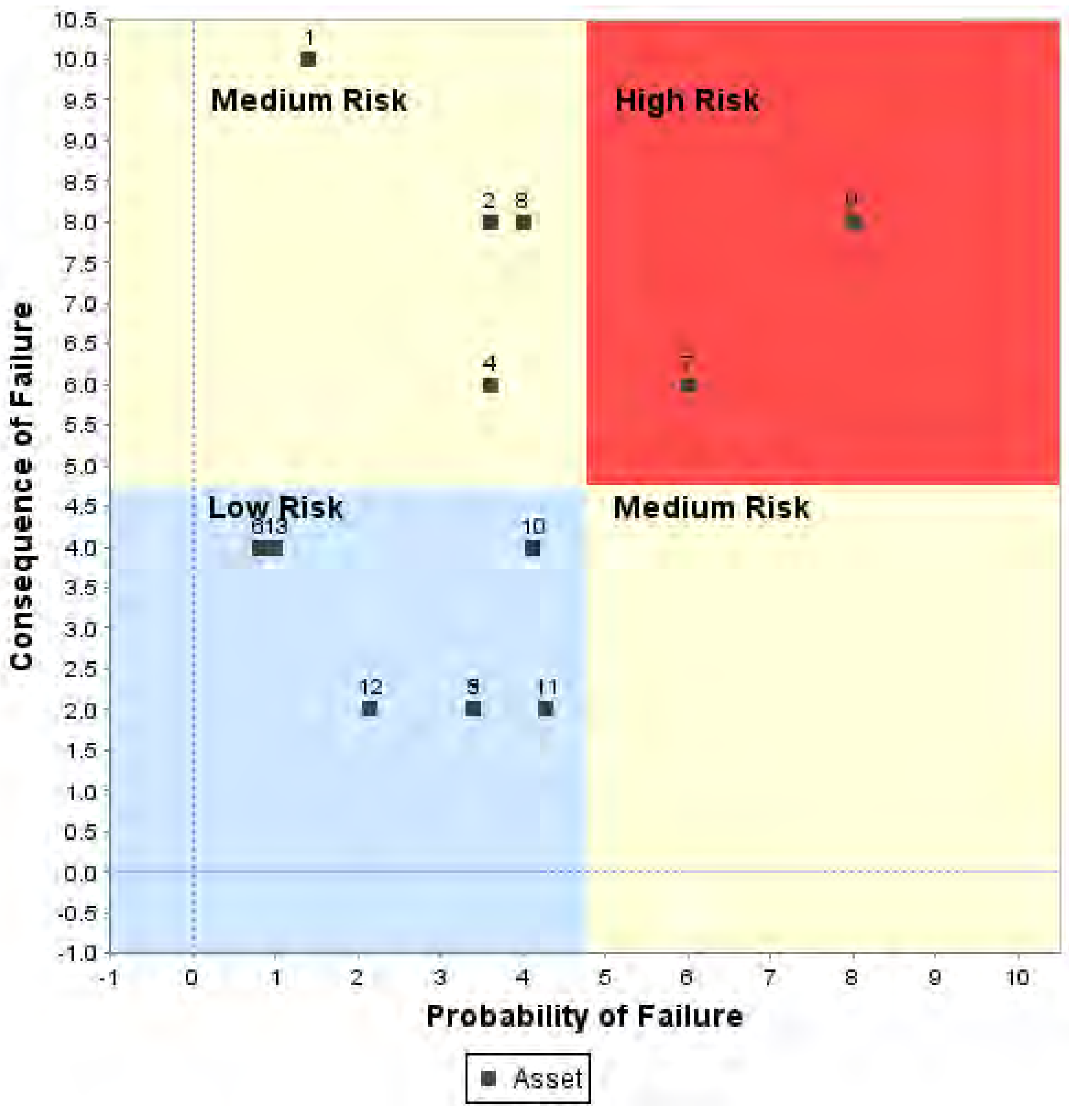
How About we use a home sump pump example for starters?

Sample Report's Schematic Small Wastewater System



Asset Inventory Summary

Asset Risk Matrix - *NOTE REFER TO TABLE (following slide) USING PRIORITY NUMBERS WITHIN THE ASSET RISK MATRIX BELOW



Assets listed by Risk – High to Low

Priority	Asset	Category	Asset Type	Risk	Replacement Date
1	controls	Pumping Facility	Motor Controls / Drives	High Risk – Immediate Attention	02/01/2010
2	4 valves	Pumping Facility	Valves	High Risk – Immediate Attention	02/01/2020
3	controls	Pumping Facility	Transformers / Switchgears / Wiring	Medium Risk – Aggressive Monitoring	02/01/2020
4	Sewers	Collection	Transmission Mains	Medium Risk – Aggressive Monitoring	02/01/2032
5	pump house	Pumping Facility	Buildings	Medium Risk – Aggressive Monitoring	02/01/2032
6	warning	Pumping Facility	Sensors	Low Risk – Routine Maintenance	02/01/2013
7	Lagoon	Treatment	Sewers	Medium Risk – Aggressive Monitoring	02/01/2094
8	fence	Treatment	Security Equipment	Low Risk – Routine Maintenance	02/01/2012
9	blower2	Treatment	Treatment Equipment	Low Risk – Routine Maintenance	02/01/2012
10	blower1	Treatment	Treatment Equipment	Low Risk – Routine Maintenance	02/01/2012
11	night light	Pumping Facility	Security Equipment	Low Risk – Routine Maintenance	02/01/2012
12	areation pipe	Pumping Facility	Pressure Pipework	Low Risk – Routine Maintenance	02/01/2062
13	grinder pump	Collection	Sewers	Low Risk – Routine Maintenance	02/01/2100

Asset Maintenance Detail; Highest Risk Asset listed below

Asset Priority: 1

Asset Name: controls

Associated Asset: pump house

Location: pump house

Associated Location: lagoon

Latitude: 0.0

Longitude: 0.0

Storage Capacity Days: None

LF: None

Acre: None

Asset Category: Pumping Facility

Asset Type: Motor Controls / Drives

ID: None

Size: None

Asset Status: Active

Condition: Good

Probability of Failure: High

Consequence of Failure: Major

Capacity: Fullsized

Installation Date: 06/30/2000

Original Cost: 3000

Replacement Costs: 4500

Maintenance Cost: 200

Asset Maintenance Detail; Lowest Risk Asset listed below

Asset Priority: 13

Asset Name: grinder pump

Associated Asset: grinder pump

Location: sewer

Associated Location: sewer

Latitude: 0.0

Longitude: 0.0

Storage Capacity Days: None

LF: None

Acre: None

Asset Category: Collection

Asset Type: Sewers

ID: None

Size: None

Asset Status: Active

Condition: Fair (Average)

Probability of Failure: Low

Consequence of Failure: Minor

Capacity: Fullsized

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  - Asset Management factsheets
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  - Web site epa.gov/cupss
- Other communication methods
  - Email cupss@epa.gov
  - cupss-users listserve
  - Cupss-trainers listserve

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CUPSS Region 5 Contacts

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      - Email: noureldin.mostafa@epa.gov
  - **Wastewater Treatment Systems**
    - **John Wiemhoff (Chicago)**
      - Phone: 312-353-8546
      - Email: wiemhoff.john@epa.gov
- **IL RCAP (Springfield, IL)**
    - **Bud Mason**
      - Phone: 217-789-0125
      - Email: bmason@iacaanet.org

The Following is an Example of Fairly Rigorous Approach to Asset Management

Source: from USEPA's Steve Allbee's 2 day Advanced Asset Management Course

What is the "State of My Asset?"

- Name of Asset (and where it fits in the system heigherchy)
- Date Installed
- Original cost
- Estimated effective life
- Calculated Residual Life
- Condition (rating)
- Current Performance (rating)
- Current Reliability (rating)
- Annual Depreciations
- Accumulated Depreciation (to date)

What is the “Requested Level of Service?”

- Current Level of Service
- Minimum Condition

Which are "Most Critical Assets?"

- Backup (Redundancy)
- Probability of Failure
- Consequence of Failure
- BRE Rating (calculated)

What Strategies

- Renewal Strategies
- Maintenance Strategies
- Future Maintenance % Changes
- Cost of Renewal Option
- Recommended Renewal Date
- Present Value of Renewal Cost

What is the State of My Assets

Asset Register and Hierarchy					What is the State of My Assets?													
					Installed Date	Asset Class	Original Cost	Estimated Effective Life	Condition Rating	Current Performance	Current Reliability	Effect Life Adjust Factor	Calc Residual Physical Life	Judgment Resid Life	% Asset Consumed (Physical)	O&M Trends	Annual Dep	Accum Dep
Curre	2008				Year		$	Years	1 to 10						%		$	$
evel 1	Level 2	Level 3	Level 4	Level 5	Act or Est	Tab A	Act or Est	Calculated	Tab A	Tab A	Tab A	Tab B	Calculated		Calculated		Calculated	Calculated
Sanitation System																		
	Disposal System																	
	Treatment Plants																	
	Collection Systems																	
		Sewer Mains																
		Pump Station																
			Incoming Sewer															
				Pipes	1963	3	$ 1,725	100	6	1	1	0%	55		45%		$ 17	$ 776
				Manhole	1963	3	$ 340	100	5	1	1	0%	55		45%		$ 3	$ 153
				Influent Gate Valve	1986	5	$ 442	30	8	1	1	0%	8		73%		$ 15	$ 324
			Incoming Power															
				Pole & Transformer	2008	4	$ -	40	1	4	2	0%	40		0%		$ -	$ -
				Connection	2008	7	$ -	35	1	1	1	0%	35		0%		$ -	$ -
			Control system															
				Incoming Telephone	1985	8	$ 85	25	7	1	1	0%	2		92%		$ 3	$ 78
				PLC	1983	8	$ 8,600	25	8	1	1	0%	0		100%		$ 344	$ 8,600
				Manual controls	1978	8	$ 425	25	7	1	1	20%	0		100%		$ 17	$ 510
			Land & Improvemnts.															
				Land	1950	10	$ 630	300	1	1	1	0%	242		19%		$ 2	$ 122
				Access Road	1963	1	$ 12,500	75	5	1	1	0%	30		60%		$ 167	$ 7,500
				Landscaping	2000	1	$ 595	75	6	1	1	0%	67		11%		$ 8	$ 63
				Security fence	1963	1	$ 1,360	75	7	1	1	0%	30		60%		$ 18	$ 816
			Sub Structure															
				Cassion Outer	1963	1	$ 30,600	75	6	1	1	0%	30		60%		$ 408	$ 18,360
				Upper Floor	1963	1	$ 4,250	75	6	1	1	0%	30		60%		$ 57	$ 2,550
				Dry well	1963	1	$ 6,800	75	6	1	1	0%	30		60%		$ 91	$ 4,080
				Landings and Stairs	1963	9	$ 4,250	60	7	2	2	0%	15		75%		$ 71	$ 3,188
				Wet Well	1963	1	$ 5,100	75	6	1	1	0%	30		60%		$ 68	$ 3,060
				Shaped floor	1963	1	$ 850	75	6	1	1	0%	30		60%		$ 11	$ 510
				Sump pump	1963	4	$ 595	40	6	3	3	0%	-5	1	98%	Medium	$ 15	$ 669
			Pumps															
				Drive shafts	1963	6	$ 12,560	35	10	2	1	0%	-10		129%		$ 359	$ 16,149
				Pumps	1963	4	$ 29,750	40	10	3	3	0%	-5		113%	High	$ 744	$ 33,469
				Motors	1963	6	$ 32,500	35	10	4	5	0%	-10		129%	High	$ 929	$ 41,786
			Electrics															
				Meters & Breakers	1963	7	$ 1,275	35	8	2	2	0%	-10	1	97%		$ 36	$ 1,639
				Switchboard	1963	7	$ 2,705	35	8	2	2	0%	-10	1	97%		$ 77	$ 3,478
				Pump Starters	1963	7	$ 1,445	35	9	2	2	0%	-10	1	97%	Medium	$ 41	$ 1,858
				Emergency connect.	2006	7	$ 765	35	0	2	2	0%	33		6%		$ 22	$ 44
				Alarms / General L& P.	1963	7	$ 595	35	7	2	2	0%	-10	1	97%		$ 17	$ 765
			Force Main															
				Pipes	1963	2	$ 2,380	60	8	1	1	0%	15		75%	Medium	$ 40	$ 1,785
				Valves(check& gate)	1978	5	$ 1,105	30	9	1	1	-10%	-3	1	97%		$ 37	$ 1,105
			Superstructure															
				Walls	1963	9	$ 3,400	60	5	2	2	0%	15		75%		$ 57	$ 2,550
				Roof	1963	9	$ 1,445	60	7	2	2	0%	15		75%		$ 24	$ 1,084
				Roller door	1963	9	$ 408	60	8	2	2	0%	15		75%		$ 7	$ 306
				Gantry Crane	1963	9	$ 2,040	60	7	2	2	0%	15		75%		$ 34	$ 1,530

Source: GHD's Asset Management Workbook

Supporting Codes for Quantification Methods (A)

A-1 *Effective Lives (Years)*

Class	Asset Type	Exp Life
1	Civil	75
2	Pressure Pipework	60
3	Sewers	100
4	Pumps	40
5	Valves	30
6	Motors	35
7	Electrical	35
8	Controls	25
9	Building Assets	60
10	Land	300

A-2 *Condition Assessment*

Condition Rating	Description	Maintenance Level	Description
1	New or Excellent Condition	Normal PM	
2			
3	Minor Defects Only	Normal PM, Minor CM	
4			
5	Moderate Deterioration	Normal PM, Major CM	
6			
7	Significant Deterioration	Major repair, rehabilitate	
8			
9	Virtually Unserviceable	Rehab unlikely	
10	Unserviceable	Replace	

A-3 *Performance*

Performance Rating	Description
1	Exceeds / Meets all Performance Targets
2	Minor Performance Deficiencies
3	Considerable Performance Deficiencies
4	Major Performance Deficiencies
5	Does not meet any Performance Targets

A-4 *Reliability*

Reliability Rating	Description	Failure Timing
1	As Specified by Manufacturer	Never
2	Random Breakdown	Every 20 Years
3	Occasional Breakdown	Every 5 Years
4	Periodic Breakdown	Every 2 Years
5	Continuous Breakdown	= 1 year

Source: GHD's Asset Management Workbook

Supporting Codes for Quantification Methods (B)

B-1 Conditon - Residual Life Factors

	Condition/Residual Life									
Effective Lives	1	2	3	4	5	6	7	8	9	10
Civil	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Pressure Pipework	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Sewers	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Pumps	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Valves	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Motors	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Electrical	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Controls	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Building Assets	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
Land	1	1	1	1	1	1	1	1	1	1

B-2 Condition Based Effective Lives

	Condition/Residual Life									
Effective Lives	1	2	3	4	5	6	7	8	9	10
Civil	67.5	60	52.5	45	37.5	30	22.5	15	7.5	0
Pressure Pipework	54	48	42	36	30	24	18	12	6	0
Sewers	90	80	70	60	50	40	30	20	10	0
Pumps	36	32	28	24	20	16	12	8	4	0
Valves	27	24	21	18	15	12	9	6	3	0
Motors	31.5	28	24.5	21	17.5	14	10.5	7	3.5	0
Electrical	31.5	28	24.5	21	17.5	14	10.5	7	3.5	0
Controls	22.5	20	17.5	15	12.5	10	7.5	5	2.5	0
Building Assets	54	48	42	36	30	24	18	12	6	0
Land	300	300	300	300	300	300	300	300	300	300

B-3 Design LifeAdjustment Factors

	IMPACT RATING FACTORS				
Factor	1	2	3	4	5
DESIGN STANDARDS	10%	5%	0%	-5%	-10%
CONSTRUCTION QUALITY	10%	5%	0%	-5%	-10%
MATERIAL QUALITY	10%	5%	0%	-5%	-10%
OPERATIONAL HISTORY	10%	5%	0%	-5%	-10%
MAINTENANCE HISTORY	10%	5%	0%	-5%	-10%
OPERATING ENVIRONMENT	10%	5%	0%	-5%	-10%
EXTERNAL STRESSES	10%	5%	0%	-5%	-10%

Source: GHD's Asset Management Workbook

Asset Register and Hierarchy					Required LOS?		Which Are Most "Critical"?			
					Current LOS?	Minimum Condition	Backup Reduction (Redundancy)	Probability of Failure	Consequence of Failure	BRE Rating
Curre	2008						%	Rating	1 to 10	
Level 1	Level 2	Level 3	Level 4	Level 5		Tab A	Tab D	Calculated	Tab C	Calculated
Sanitation System										
	Disposal System									
	Treatment Plants									
	Collection Systems									
		Sewer Mains								
		Pump Station								
			Incoming Sewer		Avg 1500 cfm; peak 2100cfm					
				Pipes		2	0%	5	5	25
				Manhole		2	0%	5	5	25
				Influent Gate Valve		2	0%	7	5	35
			Incoming Power		20 kw peak					
				Pole & Transformer		2	0%	0	5	0
				Connection		2	0%	0	5	0
			Control system							
				Incoming Telephone		2	0%	9	2	18
				PLC		2	0%	10	2	20
				Manual controls		2	50%	5	2	5
			Land & Improvemnts.							
				Land		4	0%	2	1	2
				Access Road		4	0%	6	1	6
				Landscaping		3	0%	1	1	1
				Securty fence		2	0%	6	3	18
			Sub Structure							
				Cassion Outer		3	0%	6	4	24
				Upper Floor		3	0%	6	4	24
				Dry well		3	0%	6	4	24
				Landings and Stairs		2	0%	8	4	32
				Wet Well		3	0%	6	4	24
				Shaped floor		3	0%	6	3	18
				Sump pump		2	0%	10	4	40
			Pumps		peak 2100cfm					
				Drive shafts		2	50%	10	5	25
				Pumps		2	50%	10	5	25
				Motors		2	50%	10	5	25
			Electrics							
				Meters & Breakers		2	0%	10	5	50
				Switchboard		2	0%	10	5	50
				Pump Starters		2	0%	10	3	30
				Emergency connect.		2	0%	1	3	3
				Alarms / General L& P.		2	0%	10	3	30
			Force Main							
				Pipes		2	0%	8	5	40
				Valves(check& gate)		2	0%	10	4	40
			Superstructure							
				Walls		3	0%	8	2	16
				Roof		3	0%	8	3	24
				Roller door		2	0%	8	2	16
				Gantry Crane		2	0%	8	2	16

Source: GHD's Asset Management Workbook

(2) Requested Level of Service

(3) Critical Equipment

Source: GHD's Asset Management Workbook

Supporting Codes for Quantification Methods (D)

D-1 Probability of Failure

% of Effective Life Consumed	PoF Rating
0%	1
10%	2
20%	3
30%	4
40%	5
50%	6
60%	7
70%	8
80%	9
90%	10

D-2 Don't Forget Redundancy!

Level of Redundancy	Reduce PoF by:
50% Backup	50%
100% Backup	90%
200% Secondary Backup	98%

Source: GHD's Asset Management Workbook

Supporting Codes for Quantification Methods (C)

C-1 Consequence of Failure

CoF Rating	Description	% Affected	Level
1	Minor Component Failure	0-25%	Asset
2	Major Component Failure	25-50%	Asset
3	Major Asset	0-25%	Asset
4	Multiple Asset Failure	25-50%	Facility / Sub-System
5	Major Facilty Failure	50-100%	Facility
6	Minor Sanitary System Failure	20-40%	Total System
7	Medium	40-60%	Total System
8	Intermediate	60-80%	Total System
9	Significant	80-90%	Total System
10	Total	90-100%	Total System

Source: GHD's Asset Management Workbook

Identify Best Strategies

Source: GHD's Asset Management Workbook

Asset Register and Hierarchy					What Strategies? Renewal Strategy	Maint Strategy	Future Maintenance % Change	Cost of Renewal Option	Recommended Renewal Date	Present Value of Renewal Cost
Curre	2008						%	$		
Level 1	Level 2	Level 3	Level 4	Level 5	Tab E		Tab E	Estimate	Calculated	2.50%
Sanitation System										
	Disposal System									
	Treatment Plants									
	Collection Systems									
		Sewer Mains								
		Pump Station								
			Incoming Sewer							
				Pipes	2		25%	$ -	2063	$ -
				Manhole	5	CBM	0%	$ 2,200	2063	$ 566
				Influent Gate Valve	7	CBM	50%	$ 2,600	2016	$ 2,134
			Incoming Power							
				Pole & Transformer	1		-25%	$ -	2048	$ -
				Connection	1		0%	$ -	2043	$ -
			Control system							
				Incoming Telephone	1	RTF/CM	-25%	$ 500	2010	$ 476
				PLC	8	RTF/CM	-25%	$ 5,000	2008	$ 5,000
				Manual controls	7	CBM	0%	$ 2,500	2008	$ 2,500
			Land & Improvemnts.							
				Land	1	CBM	0%	$ -	2250	$ -
				Access Road	2	CBM	0%	$ 8,500	2038	$ 4,052
				Landscaping	7	CBM	0%	$ 3,500	2075	$ 669
				Security fence	5	CBM	25%	$ 8,000	2038	$ 3,814
			Sub Structure							
				Cassion Outer	2	CBM	0%	$ 180,000	2038	$ 85,814
				Upper Floor	2	CBM	0%	$ 25,000	2038	$ 11,919
				Dry well	2	CBM	0%	$ 40,000	2038	$ 19,070
				Landings and Stairs	2	CBM	0%	$ 25,000	2023	$ 17,262
				Wet Well	2	CBM	0%	$ 30,000	2038	$ 14,302
				Shaped floor	2	CBM	0%	$ 5,000	2038	$ 2,384
				Sump pump	8	CBM	25%	$ 3,500	2009	$ 3,415
			Pumps							
				Drive shafts	6	CBM	25%	$ 35,000	2008	$ 35,000
				Pumps	6	CBM	25%	$ 35,000	2008	$ 35,000
				Motors	6	CBM	25%	$ 35,000	2008	$ 35,000
			Electrics							
				Meters & Breakers	8	CBM	25%	$ 7,500	2009	$ 7,317
				Switchboard	8	CBM	25%	$ 34,000	2009	$ 33,171
				Pump Starters	7	CBM	25%	$ 8,500	2009	$ 8,293
				Emergency connect.	8	CBM	0%	$ 4,500	2041	$ 1,992
				Alarms / General L& P.	8	CBM	25%	$ 3,500	2009	$ 3,415
			Force Main							
				Pipes	5	PM	50%	$ 14,000	2023	$ 9,667
				Valves(check& gate)	7	CBM	50%	$ 6,500	2009	$ 6,341
			Superstructure							
				Walls	5	CBM	0%	$ 20,000	2023	$ 13,809
				Roof	6	CBM	0%	$ 8,500	2023	$ 5,869
				Roller door	7	CBM	0%	$ 2,400	2023	$ 1,657
				Gantry Crane	5	CBM	0%	$ 12,000	2023	$ 8,286
							Renewal	$ 567,700		$ 378,192
							Replace	$ 510,000		

(4)
O&M and Capital Improvement Plan (CIP) Strategies

(5)
Funding Strategies

Supporting Codes for Quantification Methods (E)

E-1 Renewal Strategies

Option	Description	Type
1	Do nothing	Non-Capital
2	Continue with Status Quo	Non-Capital
3	Maintain differently	Non-Capital
4	Operate differently	Non-Capital
5	Repair	Capital
6	Refurbish/rehabilitate	Capital
7	Replace asset with similar	Capital
8	Replace with improved asset	Capital
9	Reduce Levels of Service	Non-Asset

Source: GHD's Asset Management Workbook

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      - Phone: 312-353-8546
      - Email: wiemhoff.john@epa.gov
- **IL RCAP (Springfield, IL)**
    - **Bud Mason**
      - Phone: 217-789-0125
      - Email: bmason@iacaanet.org

First State to formally require Asset Management program into NPDES Permits

- **Michigan Department of Environmental Quality (MDEQ)**
  - View
    - Detroit NPDES Permit (draft permit completed)
    - General language ultimately for others
      - All permits to contain asset management requirements within 5 years from today

Thanks for your Attention!

EPA United States Environmental Protection Agency

Integrated Water Resource Planning in NE Illinois

Josh Ellis, Metropolitan Planning Council

Hilary Holmes and Karl Johnson, MWH Global

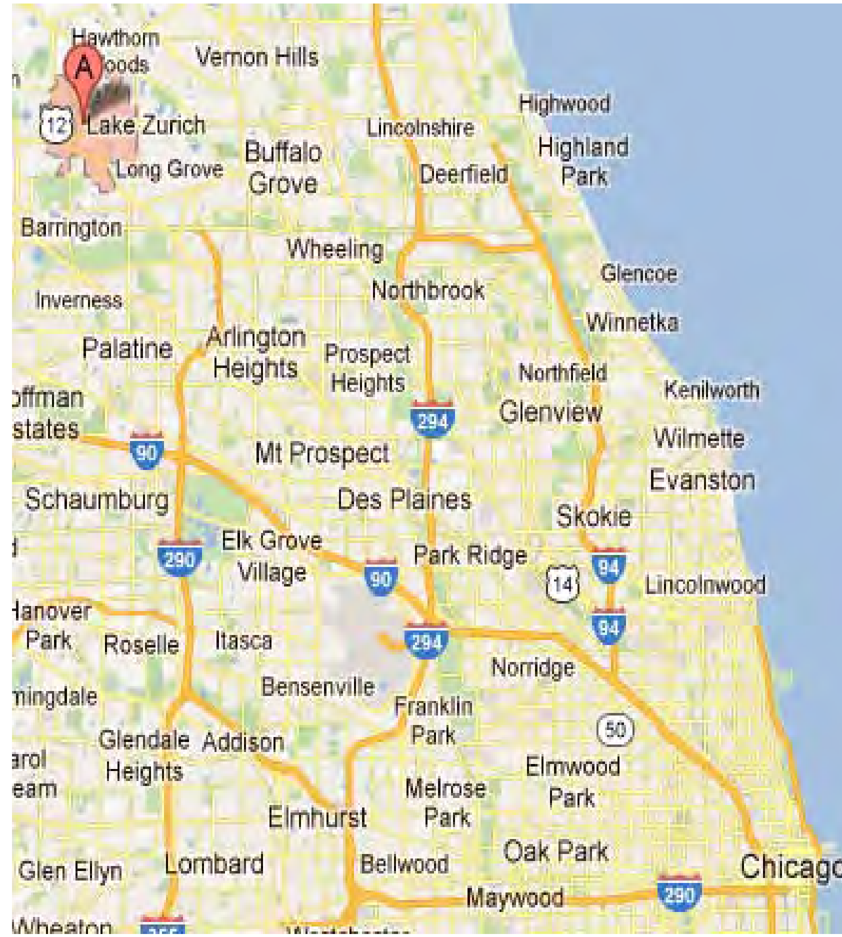
Recommendations For Integrated Water Resources Planning In Lake Zurich

Background

- Project partners wanted to:
  - Test a local IRP pilot
  - Identify a champion community who could benefit from this type of planning
  - Assist municipality in integrating water supply, wastewater & stormwater management
  - Embed this work within the municipality's broader strategic plan

Lake Zurich, Ill.

- Small enough to be manageable
- Large enough to resonate with other communities
- IRP interest at Village Board level
- Facing an interesting range of natural resource, infrastructure, economic development, and finance issues



Integrated Water Resources project and team overview

Process

- Memorandum of Understanding
- Collection of data, maps, reports, etc.
- Community survey
- Stakeholder interviews
- Current conditions report
- Community meeting
- Interim presentations to Village Board
- Analysis and SWOT
- Draft recommendations
- Report presentation to Village Board
- Final recommendations report

Stakeholder interviews

- Current and former Village officials and staff
- Homeowners Associations
- Chamber of Commerce and businesses
- School District
- Lake County Stormwater Mgmt.
- Lake County Wastewater Mgmt.
- Lake County Forest Preserve
- Watershed groups
- Parks Dept., Fire Dept.

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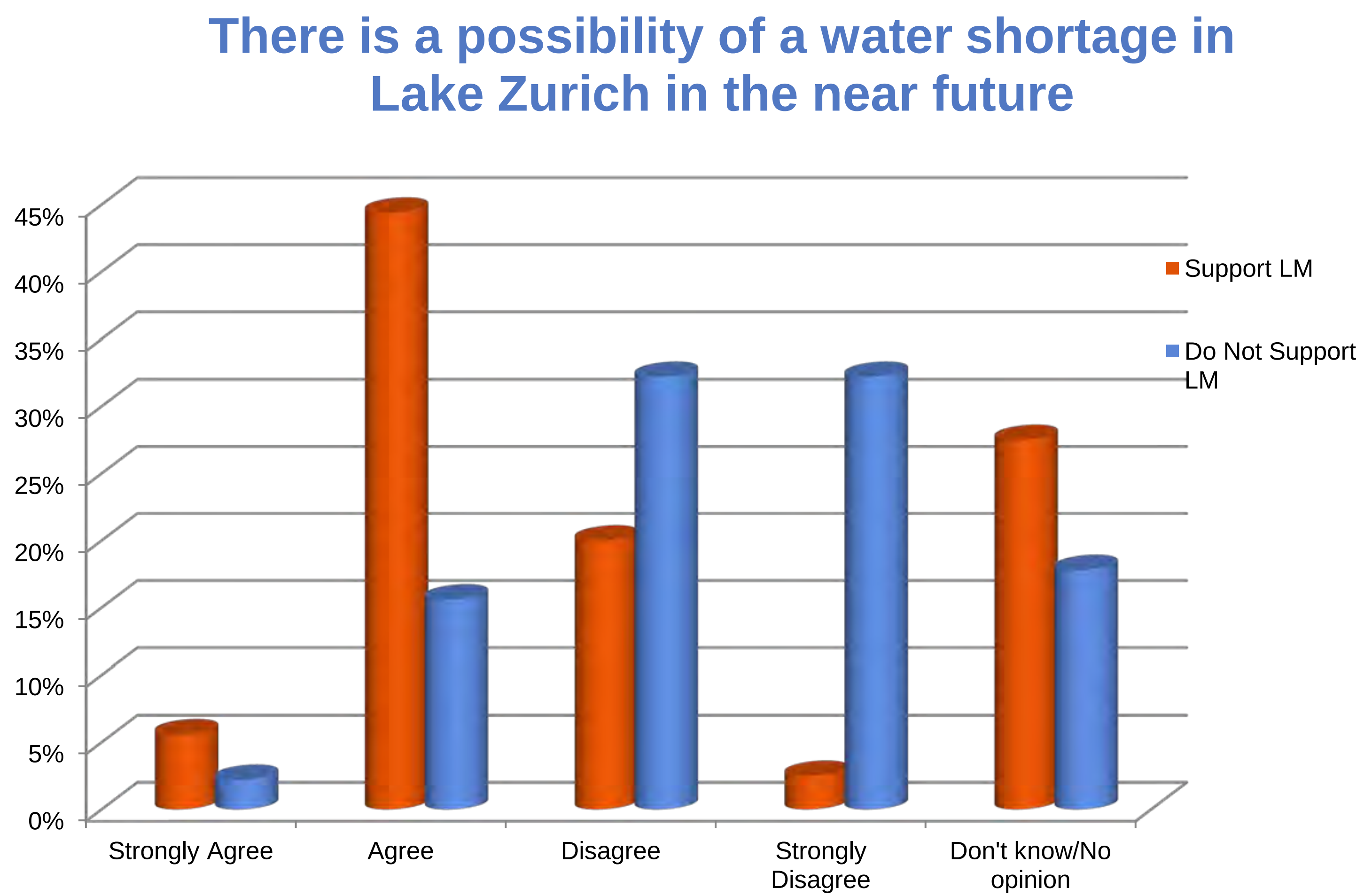
CNT Sustainable Communities Attainable Results

CMAP Chicago Metropolitan Agency for Planning

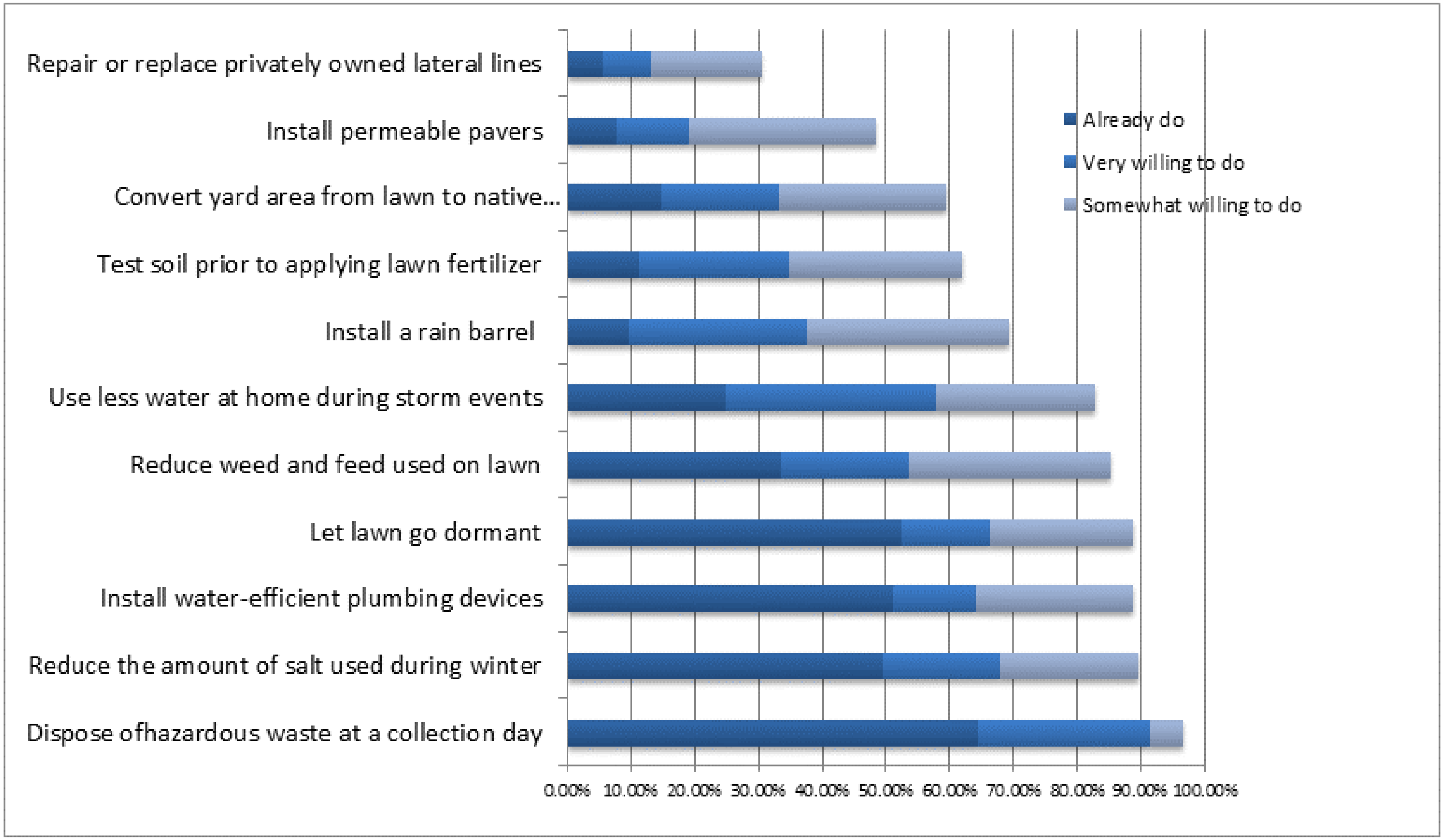
University of Illinois Extension

Sea Grant Illinois-Indiana

Community Survey results Future water choices



Community Survey results Future water choices



Positive things to build on:

- No systemic flooding issues
- No immediate threat of water supply shortage
- High concentration of industry create opportunities for high-impact green infrastructure, water reuse, etc.
- Existing desire and preliminary plans to redevelop/shape the "new" downtown with green infrastructure
- Water supply infrastructure is mostly new and in good condition
- Water quality meets all required standards
- Public Works staff and Village leadership committed to sustainable water resource management, open to external review
  - i.e., leakage monitoring, advanced metering, monthly billing

A few things to improve upon:

- Inflow & Infiltration and wastewater peaking
- Condition and management of wastewater system
- Revenues fall short of costs
- Isolated pockets of repeated, serious flooding
- Perception of flooding issues doesn't match extent of problem
- Retention pond maintenance (no funding, unclear responsibilities)
- Hilly terrain and high number of water ways increases risk of downstream water quality problems
- No defined level of service leads to varied understandings about cost of service
- Minimal communication/education by the Village about water, stormwater, and wastewater issues

Opportunities to take advantage of:

- Interest in industrial reuse of harvested rainwater for irrigation or non-potable uses
- Community survey indicates a willingness of many residents to be a part of solutions, and perhaps a willingness to pay for dependable water
- Existing templates for more informative bills, educational materials, etc.
- Parks Dept. could readily incorporate stormwater management into its property management, partner with wetlands groups, etc.
- Recent government turnover creates chance to articulate a new vision for the future
- Deep aquifer water largely protected from manmade contaminants

Things to be aware of:

- Increasing frequency of severe weather and precipitation events make flooding, downstream water quality problems more likely
- Pending stormwater management regulations (directly affect Lake Zurich) and wastewater management regulations (indirectly affect Lake Zurich) could increase costs
- Deep aquifer levels are declining
- A shift to Lake Michigan water means giving up some degree of control over costs
- Possible water treatment regulations for emerging contaminants could increase costs of Lake Michigan water
- A shift to Lake Michigan water also means incurring additional costs, on top of current debt obligation for past investments

Village Strategic Goal 1

- **Ensure the long-term sustainability of the Village**
  - 1.1. Ensure the maintenance of the Village's capital assets and infrastructure through systematic planning processes
  - 1.2. Promote the overall development/redevelopment of the community
  - 1.3. Utilize up-to-date best practices and policies
  - 1.4. Attain fiscal balance and sustainability

Water Strategic Goal 1

- Contribute to the long-term sustainability of the village through cost-effective and priority-driven water resources management – infrastructure, ecosystems, human capital, and service provision – to meet the projected need of all residents, businesses, neighboring communities, and the environment.

Water Strategic Goal 1

– Objective 1.1: Ensure the maintenance of the Village's water resources assets through systematic, integrated planning processes.

- Prepare a current and comprehensive assessment of the state of its water, sewer and stormwater infrastructure system.
- Establish water resources priorities, with short and long-term horizons, and set achievable, quantifiable goals consistent with them.
- Develop a screening process to vet potential investments.
- Explore a partnership with U.S. EPA's Region 5 to cultivate an 'asset management approach' to managing natural and built assets.

Water Strategic Goal 1

– Objective 1.2: Integrate water resources management within overall economic (re)development and land use planning.

- Integrate state-of-the-art stormwater management into expectations/ordinances for downtown redevelopment, and develop incentives as needed.

- Work with industrial stakeholders and the Chamber of Commerce to determine the actual level of interest in water reuse, and simultaneously work to educate industrial users about reuse options.

- Analyze potential role in stormwater management of underutilized park properties.

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Water Strategic Goal 1

– Objective 1.3: Utilize best management practices and context-sensitive technologies.

- Once the Village has developed its water resources management priorities, it should collect all pertinent information on the best management practices and context-sensitive technologies that will contribute to pursuing them.

- As the Village develops its comprehensive assessment of existing assets, it should include a thorough analysis of its landscape to ascertain locational differences and a valuation of its green assets. Then develop a green infrastructure plan based on infiltration opportunities and runoff hot-spots.

Water Strategic Goal 1

– Objective 1.4: Attain water resources fiscal balance, sustainability and resiliency.

- Move toward full-cost pricing for its water, sewer, and stormwater services.
- Develop indicators of fiscal health and monitor them closely.
- Explore creating a stormwater fee to fund stormwater-related services and capital investment.

Lessons learned

- Need to have full Board/Village buy-in to the initiative from the start
- Clear communication throughout and good working relationship with staff
- Spend more time:
  - Gaining contextual understanding of historical decisions
  - Analyzing financial implications of decisions
  - Engaging additional community members and diversifying audience for more well-rounded feedback and involvement

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Implementation, next steps

- Project partners ready to help, but need guidance from Lake Zurich on priorities.

- Lake Zurich downtown stormwater and real estate development selected as US EPA Building Blocks project for 2013.
- CMAP's Local Technical Assistance program
- (pending) Ill. EPA Green Infrastructure Grant

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Thank you!

Josh Ellis

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Water-Energy Nexus

Karl Johnson
Hillary Holmes

MWH®

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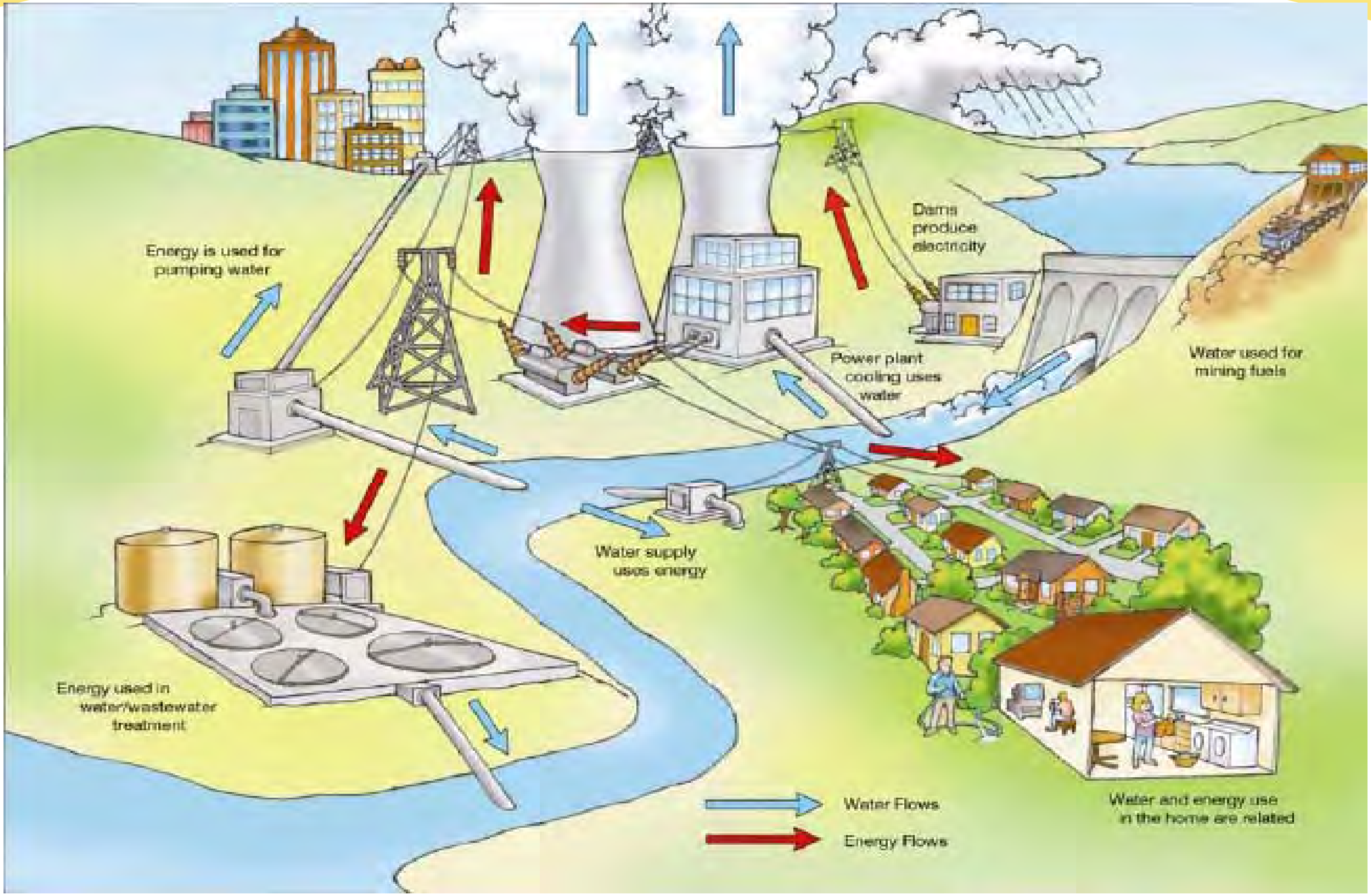
Overview

- What is the water-energy nexus
- Components of energy use
- Discussion of ISAWWA survey/benchmarking
- How to track your energy
- How to improve energy efficiency

Water-Energy Nexus



Source: NCSL

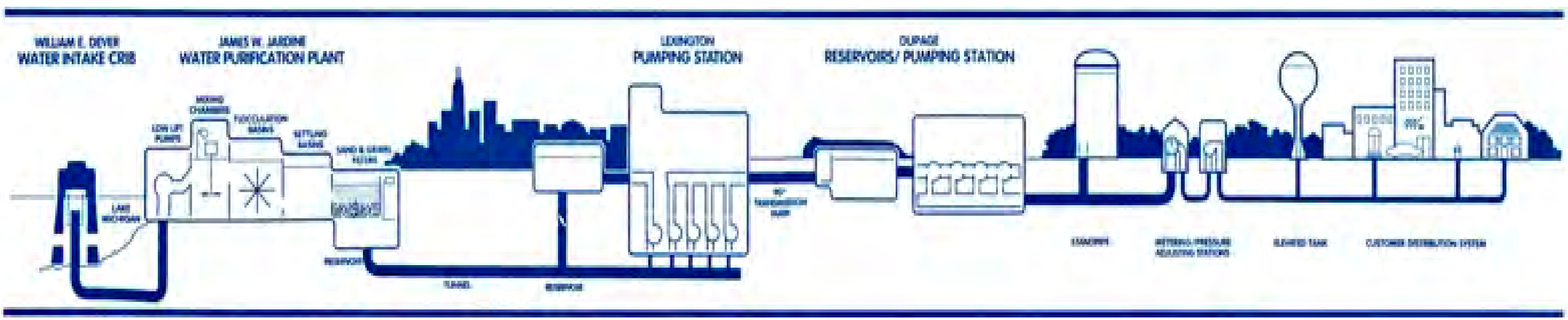
Water-Energy Nexus – Key Facts

- Water related energy consumption is 13% of the total electricity consumption in US.
- Energy production requires more water than any other sector, 49% of total water withdrawals.
- Water required for energy production:
  - Thermo-electric energy – 0.5 gal/kWh (evaporation)
  - Hydro-electric – 0.2 gal/kWh
  - Total of 2 gal/kWh

Water-Energy Nexus – Water Supply

- Includes:
  - Pumping raw water
  - Treatment of raw water
  - Pumping treated water
  - Wastewater collection pumping
  - Wastewater treatment

DuPage Water Supply



ISAWWA Water-Energy Nexus Survey

- The Illinois AWWA completed a report on the water-energy nexus in Illinois
- Goal was to better understand the energy intensity (kWh/MG) and energy cost of Illinois water supply
- A total of 44 water utilities throughout Illinois participated

ISAWWA Survey - Benchmarking

- Key findings:
  - Energy was about 10% of the total operating costs for Illinois water utilities
  - Average energy cost of $174/MG for wholesalers, for small utilities $314/MG
  - Water source average energy cost:
    - Lake Michigan $94/MG
    - Groundwater $293/MG
    - Surface water (rivers) $586/MG

Assessing Energy Use for Drinking Water Systems

US EPA Energy Use Assessment Tool

BUILDING A BETTER WORLD

Energy Use Assessment Tool

- Found at:
  http://water.epa.gov/infrastructure/sustain/energy_use.cfm

- Purpose:
  - Self-assessment
  - Baseline energy consumption and costs
  - Identify areas for improvement

"…it provides a first step in establishing a baseline of energy consumption and use by collecting energy utility data and conducting a utility bill analysis."

Assessing Energy Use for Drinking Water Systems – US EPA Assessment Tool

- Drinking water system includes:
  - Treatment
  - Pumping
  - Buildings
    - Lighting
    - HVAC

Information Inputs

- Information Includes:
  - Electricity Cost (from bill)
  - Total Electric Consumption (from bill)
  - Number and types of lights in each building/room
  - Motor sizes, efficiency, and annual operational time for treatment, pumping and HVAC

Energy Use Input

2011

Electric ($/kWh)	$0.1018	Natural Gas ($/CCF)	$1.1504	No 2 Fuel Oil ($/CCF)	$1.0618	Water/Sewer ($/GAL)	$0.0056	Alt. Energy: ($/CCF)	$0.0042	Other Utility: Propane ($/GAL)	$0.0011

2011	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL (Yr)	Average	% of Costs
Electricity Cost ($) 2011	$18,184.32	$19,492.46	$19,247.76	$19,704.16	$20,930.40	$19,997.44							$117,556.54	$19,592.76	38.3%
Consumption (kWh) 2011	196,800	189,800	187,600	192,800	204,000	183,800							1,154,800.00	192,466.67	
Natural Gas Cost ($) 2011	$6,146.54	$5,556.68	$5,015.30	$3,292.82	$1,525.44	$1,428.90							$22,965.68	$3,827.61	7.5%
Consumption (CCF) 2011	5,276	4,782	4,331	2,914	1,362	1,299							19,964.00	3,327.33	
No 2 Fuel Oil Cost ($) 2011	$16,231.03	$11,166.71	$8,587.05	$5,077.59	$534.92	$43.09							$41,640.39	$6,940.07	13.6%
Consumption (CCF) 2011	14,260	10,279	8,478	5,237	562	400							39,216.00	6,536.00	
Water & Sewer Cost ($) 2011	$12,320.06	$12,320.06	$11,741.82	$11,741.82	$11,741.82	$16,794.47							$76,660.05	$12,776.68	25.0%
Consumption (GAL) 2011	2,210,986	2,210,986	2,107,257	2,107,257	2,107,257	3,013,644							13,757,387.00	2,292,897.83	
Alternative Energy Cost ($) 2011	$1,914.90	$2,035.80	$2,571.40	$2,394.60	$2,012.40	$25,071.20							$36,000.30	$6,000.05	11.7%
Consumption (CCF) 2011	1,473,000	1,566,000	1,978,000	1,842,000	1,548,000	229,400							8,636,400.00	1,439,400.00	
Other - Propane Cost ($) 2011	$1,070.30	$1,535.60	$2,324.30	$3,180.10	$2,017.40	$1,923.90							$12,051.60	$2,008.60	3.9%
Consumption (GAL) 2011	973,000	1,396,000	2,113,000	2,891,000	1,834,000	1,749,000							10,956,000.00	1,826,000.00	
Total Utility Cost 2011	$55,867.15	$52,107.31	$49,487.63	$45,391.09	$38,762.38	$65,259.00							$ 306,874.56	$ 25,572.88	100.0%
Treatment Volume (MGAL) 2011	112.240	107.500	116.700	118.400	111.200	94.700							660.740	110.123	
Utility Cost/Treatment Volume ($/MGAL	$497.75	$484.72	$424.06	$383.37	$348.58	$689.11							2,827.591	$471.27	
Electric Utilization (kWh/MGAL) 2011	1,753.39	1,765.58	1,607.54	1,628.38	1,834.53	1,940.87							10,530.28	1,755.05	

Energy Use Summary

Total Utility Cost Per Million Gallons Treated ($/MGAL) 2011	$464.44
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2010	$407.67
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2009	$331.13
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2008	$279.39
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2007	$239.11

Electrical Energy Utilization (kWh/MGAL) 2011	1,747.74
Electrical Energy Utilization (kWh/MGAL) 2010	1,687.25
Electrical Energy Utilization (kWh/MGAL) 2009	1,588.91
Electrical Energy Utilization (kWh/MGAL) 2008	1,487.68
Electrical Energy Utilization (kWh/MGAL) 2007	1,506.90

Estimated Annual Electrical Energy Use (kWh)	2,248,000
Estimated Annual Electrical Energy Cost ($)	$227,497
Average Electrical Energy Rate ($/kWh)	$0.1012

Building Energy Use Input

Room 1 Name: Conference Room | Area: 600 Ft^2

Room 1 Lighting *(Main Lighting only - Do not include task lights)*

Select up to 6 Light Fixture Types

	Fixture	Watts	Fixture Qty
Light Type 1	Four F40T12 4' 40W Fluorescent La	175 Watts	16
Light Type 2	Select Light Fixture	Total Watts	
Light Type 3	Select Light Fixture	Total Watts	
Light Type 4	Select Light Fixture	Total Watts	
Light Type 5	Select Light Fixture	Total Watts	
Other Type : Name		Total Watts	
: Watts			

Total Room Wattage (W): 2,800 W

Room Lighting Power Density (LPD): 4.67 W/ft^2

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Motor Operating Hours (Hours/Year)	Average Load Factor (%)	Average HVAC Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Year)	Estimated Percent of Site Electric Use & Cost (%)
Non Process HVAC	Compressor	Air Conditioner	3	88%	4	3.5	2,500	87.50%	2.23	5,563.21	$563.00	0.25%
Non Process HVAC	Fan	HVAC	5	86%	6	4	4,400	66.67%	2.89	12,722.48	$1,287.51	0.57%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
					Total Building HVAC				5.12	18,285.69	$1,850.51	0.81%

Treatment Plant & Pumping Energy Input

EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Chemical Mix and Feed	Blower	Blower 1	7	65.0 %	660	600	880	90.91%	7.30	6,427	$650	0.29%
Chemical Mix and Feed	Blower	Blower 2	7	65.0 %	660	600	880	90.91%	7.30	6,427	$650	0.29%
Decarbonation	Mixer	Decarb Mixer 1	8	88.0 %	775	550	5,270	70.97%	4.81	25,364	$2,567	1.13%
Low Service Pumping	Pump	Pump1	7	65.0 %	660	600	8,760	90.91%	7.30	63,979	$6,475	2.85%
Low Service Pumping	Pump	Pump2	8	88.0 %	775	550	8,760	70.97%	4.81	42,161	$4,267	1.88%
Clarification	Mixer	Rapid Mixer	8	78.0 %	775	550	8,760	70.97%	5.43	47,566	$4,814	2.12%
Clarification	Mixer	Tk Mixers Summer	7.5	9.6 %	10.3	5.3	8,760	51.46%	29.99	262,707	$26,586	11.69%
Distribution Pumping	Pump	HSPS	2	1.0 %	230	102.13	8,760	44.40%	69.01	604,543	$61,180	26.89%
Distribution Pumping	Pump	HSPS	2	1.0 %	230	156.4	1,200	68.00%	105.68	126,820	$12,834	5.64%
Filtration	Pump	Backwash Pump	75	0.9 %	98	84.7	91	86.43%	5,199.65	473,169	$47,885	21.05%
Filtration	Pump	Backwash Blower	75	0.9 %	88	54.2	12	61.59%	3,665.97	43,992	$4,452	1.96%
Non Process HVAC	Other kW Load	Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Lighting	Other kW Load	Building HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%

Add Row

	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Estimated Annual WTP Electric Use & Cost	9,127.40	1,879,493	$190,205	83.61%
Actual Annual WTP Electric Use & Cost		2,248,000	$227,497	
Difference Between Billed and Identified		-368,507	-$37,293	
Percent of Site Electrical Energy Identified		83.61%		

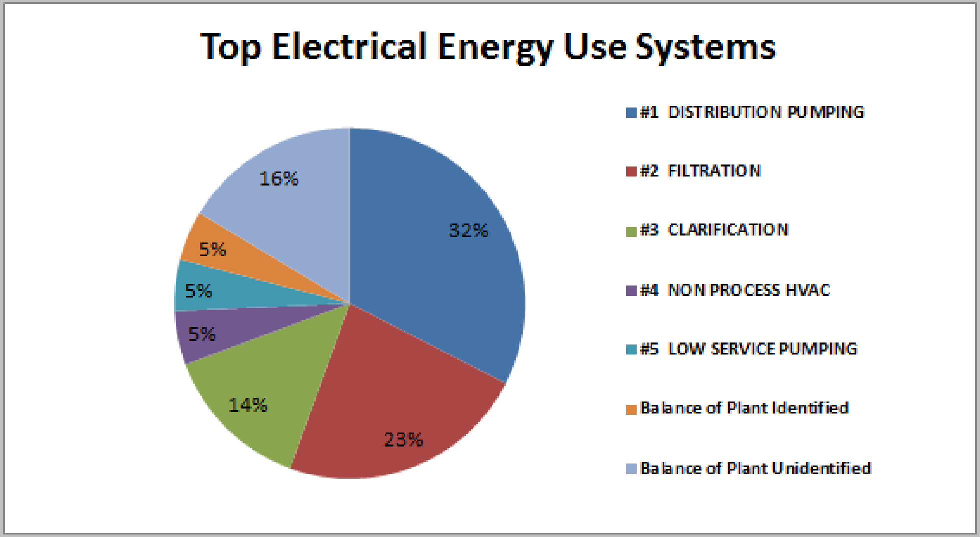
Tool Output/Summary Information

- Key Information:
  - Top Energy Use Systems
  - Cost information for different processes
  - Cost and energy usage trends

Top Energy Use Systems

Top Energy Use Systems:

#1 DISTRIBUTION PUMPING	32.53%
#2 FILTRATION	23.01%
#3 CLARIFICATION	13.80%
#4 NON PROCESS HVAC	4.98%
#5 LOW SERVICE PUMPING	4.72%
Balance of Plant Identified	4.57%
Balance of Plant Unidentified	16.39%



EQUIPMENT INVENTORY: BREAKDOWN OF ELECTRICAL ENERGY USE FOR MAJOR/ENERGY INTENSIVE EQUIPMENT

Major Process/Top Energy Use Systems	Motor Efficiency (%)	Efficiency Rating	Electric Energy Use (%)	Electric Energy Use (kWh)	Electric Energy Cost ($)
Chemical Mix and Feed					
Blower - Blower 1	65	Low	0.29%	6,427	$650.42
Blower - Blower 2	65	Low	0.29%	6,427	$650.42
Clarification					
Mixer - Rapid Mixer	78	Low	2.12%	47,566	$4,813.71
Mixer - Tk Mixers Summer	9.6	Low	11.69%	262,707	$26,585.93
Decarbonation					
Mixer - Decarb Mixer 1	88	Medium	1.13%	25,364	$2,566.84
Distribution Pumping					
Pump - HSPS	0.96	Low	26.89%	604,543	$61,179.72
Pump - HSPS	0.96	Low	5.64%	126,820	$12,834.18
Filtration					
Pump - Backwash Blower	0.94	Low	1.96%	43,992	$4,451.95
Pump - Backwash Pump	0.93	Low	21.05%	473,169	$47,884.63
Lighting					
Other kW Load - Building HVAC	N/A	N/A	2.87%	64,474	$6,524.72
Low Service Pumping					
Pump - Pump1	65	Low	2.85%	63,979	$6,474.63
Pump - Pump2	88	Medium	1.88%	42,161	$4,266.69
Non Process HVAC					
Other kW Load - Lighting	N/A	N/A	4.98%	111,865	$11,320.75

Estimated Annual Electric Use & Cost	1,879,493	$190,205
Actual Annual Electric Use & Cost	2,248,000	$227,497
Difference Between Billed and Identified	-368,507	-$37,293
Percent of Site Electrical Energy Identified		83.61%

Types of Energy Use

TABULATED UTILITY USE, COST AND WATER TREATMENT FLOW SUMMARY FOR 2011

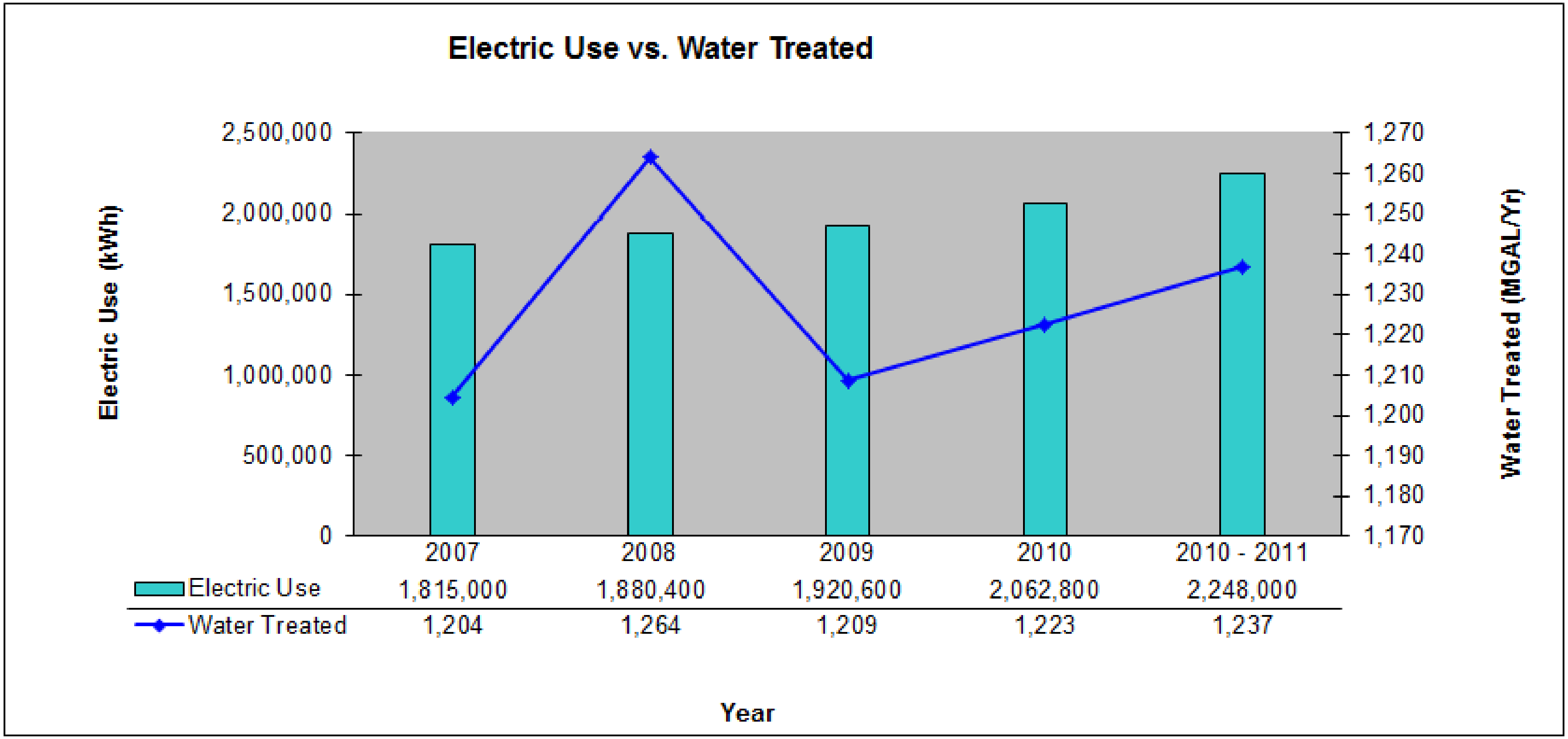
(7/2010 - 6/2011)

Utility	Site Utility Use (Common Units)	Site Utility Costs	% of Costs
Electricity	2,248,000 kWh	$227,497	42%
Natural Gas*	31,683 CCF	$36,132	7%
No 2 Fuel Oil*	50,546 CCF	$53,631	10%
Water & Sewer*	28,169,069 GAL	$156,967	29%
Alternative Energy*	18,236,400 CCF	$47,186	9%
Other - Propane*	18,618,000 GAL	$21,296	4%
Total		$542,709	100%

* The values displayed for this category may be using data from previous months other than the above specified date ranges.

Plant Annual Water Treatment Flow (MGAL/Year)	1,237
Plant Average Water Treatment Flow (MGAL/Month)	103
Plant Average Energy Cost Per Million Gallons Water Treated ($/MGAL)	$438.72

Trends



Electric Use vs. Water Treated
Electric Use (kWh)
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Water Treated (MGAL/Yr)
1,270
1,260
1,250
1,240
1,230
1,220
1,210
1,200
1,190
1,180
1,170
2007
2008
2009
2010
2010 - 2011
Electric Use
1,815,000
1,880,400
1,920,600
2,062,800
2,248,000
Water Treated
1,204
1,264
1,209
1,223
1,237
Year

Ways to reduce energy & costs

Ways to improve energy efficiency:

- Facility energy assessment
- Energy education for facility personnel
- Real-time monitoring and SCADA system
- Integrate system demand with power demand
- Computer-assisted design and operated

Ways to reduce energy & costs

System improvements to improve efficiency:

- Install high-efficiency motors on pumps
- Optimize pump system efficiency
- Electric peak reduction/Off-peak pumping
- Optimize storage capacity
- Promote water conservation

Conclusions

- Energy use is one of the largest components of operational costs
- Reduced water consumption reduces energy and operational costs associated with water supply
- Reduced energy use also reduces the water consumed to produce the energy

Questions?

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BUILDING A BETTER WORLD

Discussion: Internal & External Outreach & Communications Strategies

Abby Crisostomo, Metropolitan Planning Council

Wrap-up, Questions, Announcements

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