



**National Water and Wastewater
Benchmarking Initiative**

Winner of the 2003
APWA Management
Innovation Award



Canadian National Water and Wastewater Benchmarking Initiative: Using Process to Drive Improvement

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Meet our Typical Water/Wastewater Utility Manager in Canada



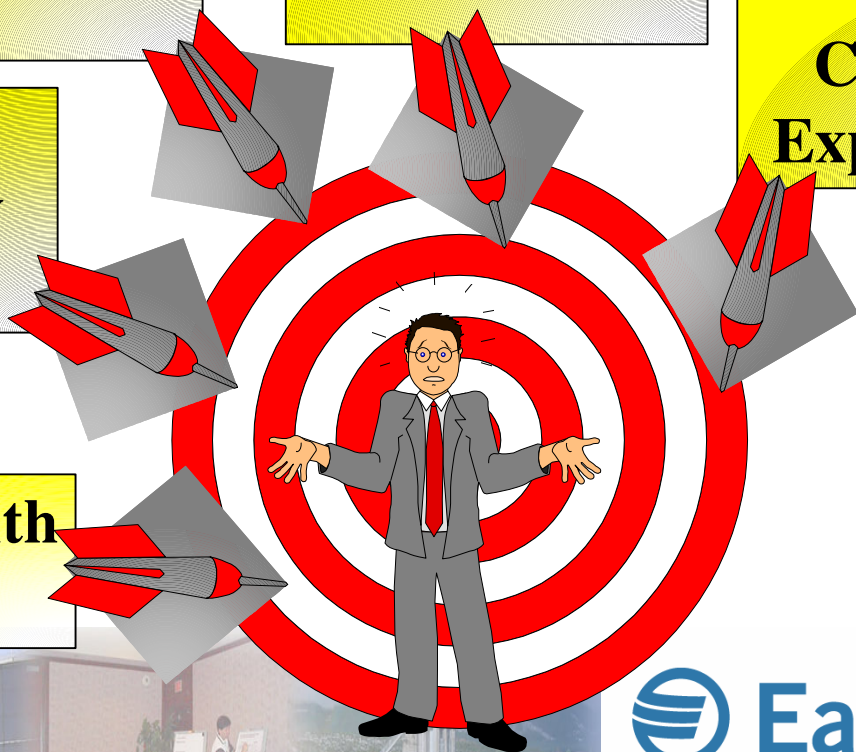
Financial Constraints

Aging Infrastructure

Rising Customer Expectations

Stringent Regulatory Standards

Do More with Less!



The Challenge in 1997:

- There are no common industry wide performance metrics.
- Public expectations for quality and service are increasing, but willingness to pay is actually decreasing.
- Understanding that improvement is possible and necessary, but where to begin?



Canadian Wastewater Utility Pilot Scale Benchmarking: 1998

- Start very simply, and test only key high level metrics;
- Resist the temptation to drill into too much detail;
- Stay focused on the high level for now;
- Prove the methodology, before jumping to performance-based conclusions.



What is Benchmarking?

- Provides a comparison of performance against other utilities, norms or standards
- Provide and information base to make strategic decisions to improve your utility



- How well are we doing?
 - How well do we compare?
 - Are we getting value for money?
- AND**
- How can we improve?



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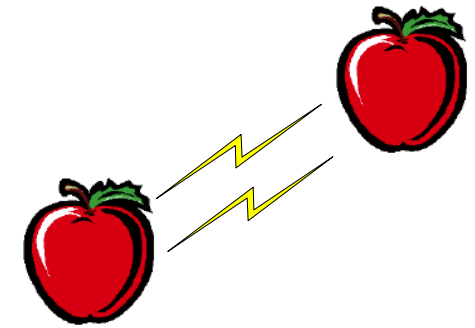
Why Benchmarking and Performance Measurement?

- “You cannot improve what you do not measure”
- It is the starting point for all performance improvement programs
- It allows you to make valid comparisons
- It is the scoreboard where all strategies are ultimately evaluated



Benefits of Benchmarking

- “Apples-to-Apples” comparisons
- Peer-to-peer relationships
- Excellent networking opportunities
- Improved annual reporting
- Identify performance improvement opportunities
- Sharing of Best Practices
- Valuable communication tool to Council



Early Key Success Factors

- Very high level of cooperation amongst founding partners (4 municipalities, consultant, and NRC);
- Open sharing of information and ideas;
- Willingness to experiment, and pilot new ideas. Change on the fly if necessary;
- Patience: Prepared to make investment of time and energy.



Key Early Project Milestones

- 1998: Pilot scale involving 4 major Canadian municipalities;
- 2001: Major expansion to include 35 Canadian cities in water, wastewater and stormwater benchmarking;
- 2003: Awarded American Public Works Association (APWA) Management Innovation Award;

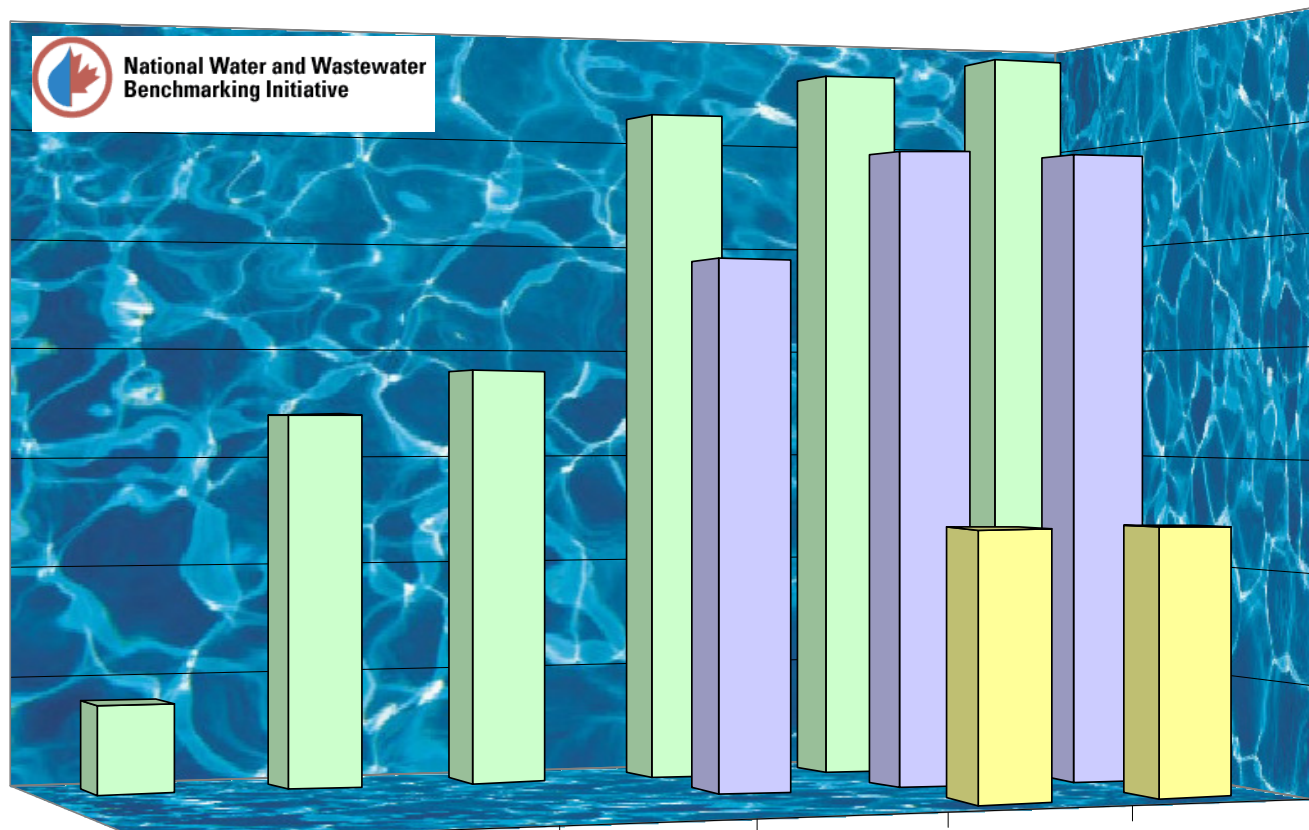


Key Recent Project Milestones

- 2005: Commencement of process benchmarking (in asset management);
- 2005: NWWBI Methodology piloted in South Africa;
- 2006: NWWBI Methodology piloted in Malaysia ;
- 2006: NWWBI Methodology adopted in South Africa (SALGA);
- 2006: Commencement of International Comparator Benchmarking.



Leveraging from the Canadian Benchmarking Initiative



34 Wastewater Utilities

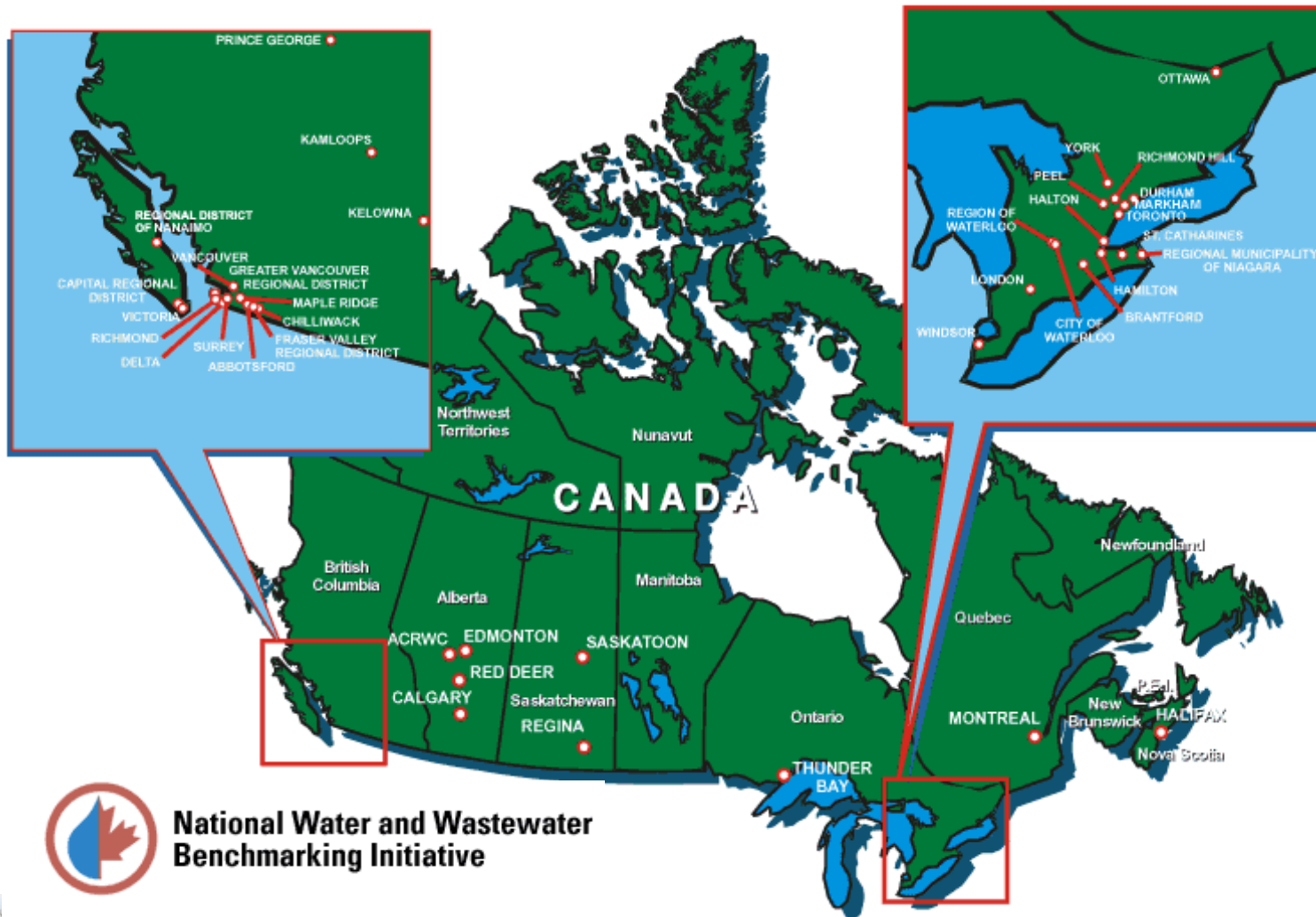
29 Water Utilities

12 Stormwater Utilities



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Canadian Benchmarking Initiative



National Water and Wastewater Benchmarking Initiative



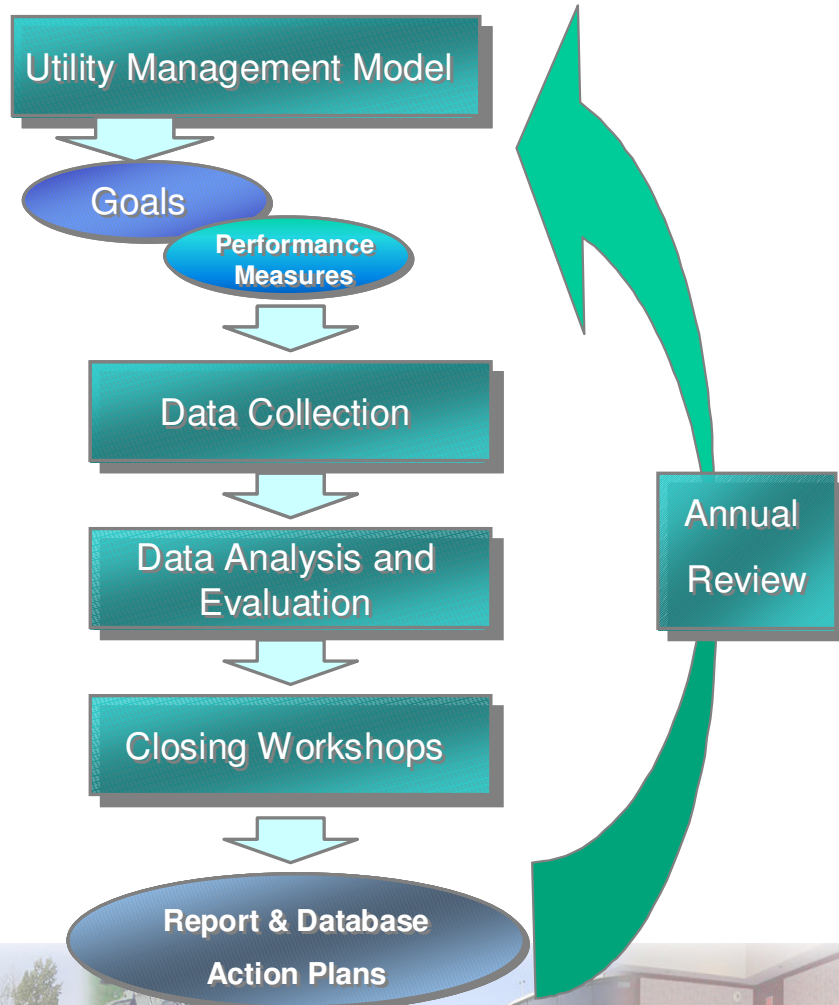
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Our Benchmarking Challenges

- “Coast to coast” spans 5 time zones
- Climate range: Mediterranean to Sub Arctic.
- Temperate rainforest (1,219 mm annual precipitation) to arid (336 mm).
- Utility Service populations range from 35,000 to 3 Million people.
- Mostly urban and suburban regions



Annual Benchmarking Cycle



- Conventional methodology
- Annual cycle
- Great care taken to ensure each task is completed thoroughly
- Key milestone checkpoints



Benchmarking Module Structure

WATER

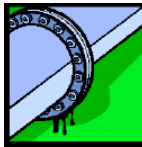
➤ Water treatment

- Filtered
- Unfiltered



➤ Water distribution

- Transmission
- Distribution



WASTEWATER

➤ Wastewater collection

- Trunk
- Collection



➤ Wastewater treatment

- Primary
- Secondary



STORMWATER & DRAINAGE

- Stormwater Drainage
- Stormwater Retention & Treatment



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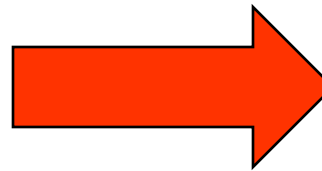
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Utility Management Model

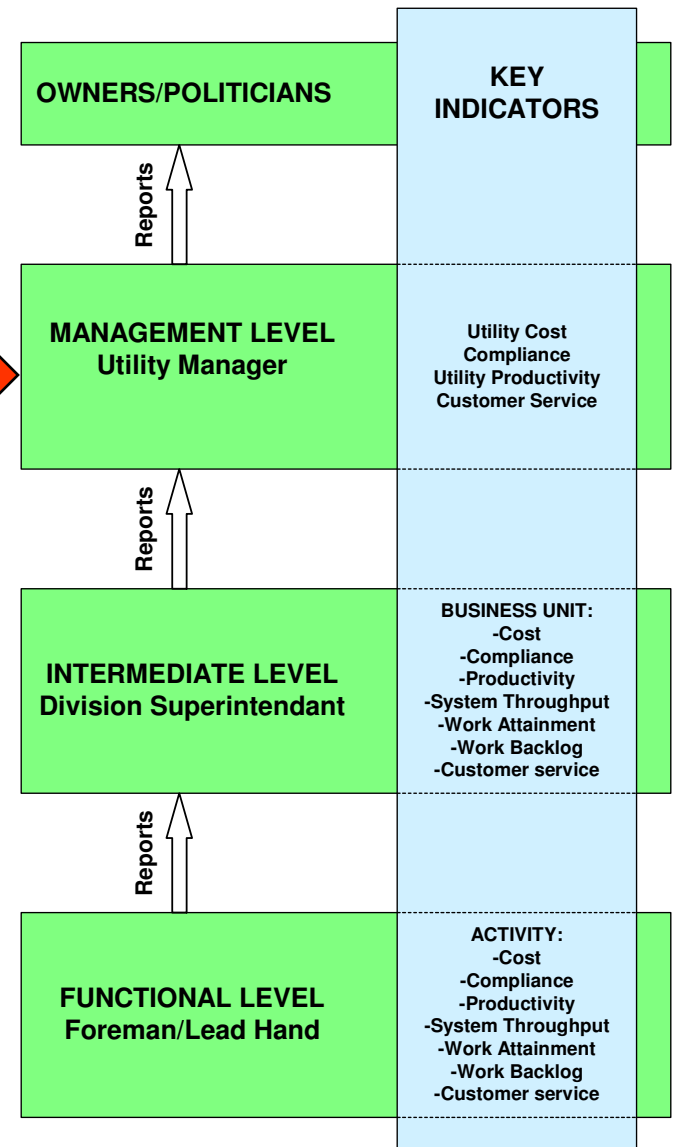
- Critical Utility Reporting Levels: Most utilities have 4 including “Owners”



National Water and Wastewater Benchmarking Initiative



- We focus on the “Managers Level”
- This allows us to drill into lower levels for Process Benchmarking



Water/ Wastewater Utility “Goals”

1. Reliable and sustainable infrastructure
2. Provide sufficient capacity
3. Meet service requirements at sustainable cost
4. Protect public health and safety
5. Provide a safe and productive workplace
6. Have satisfied and informed customers
7. Protect the environment and minimize environmental impacts



Good Performance Measures:

- Focus on a result: The result of the PM should provide you with information
- Must measure attainment of one or more of the utility goals
- Must be practical and data must be obtainable
- Accuracy must be tested over time
- Scalable to utilities of different sizes and/or local conditions
- Resistant to misrepresentation (cheating!)



Example PM: Definition Detail

Total Operations &
Maintenance Cost /
km Length of
Distribution system

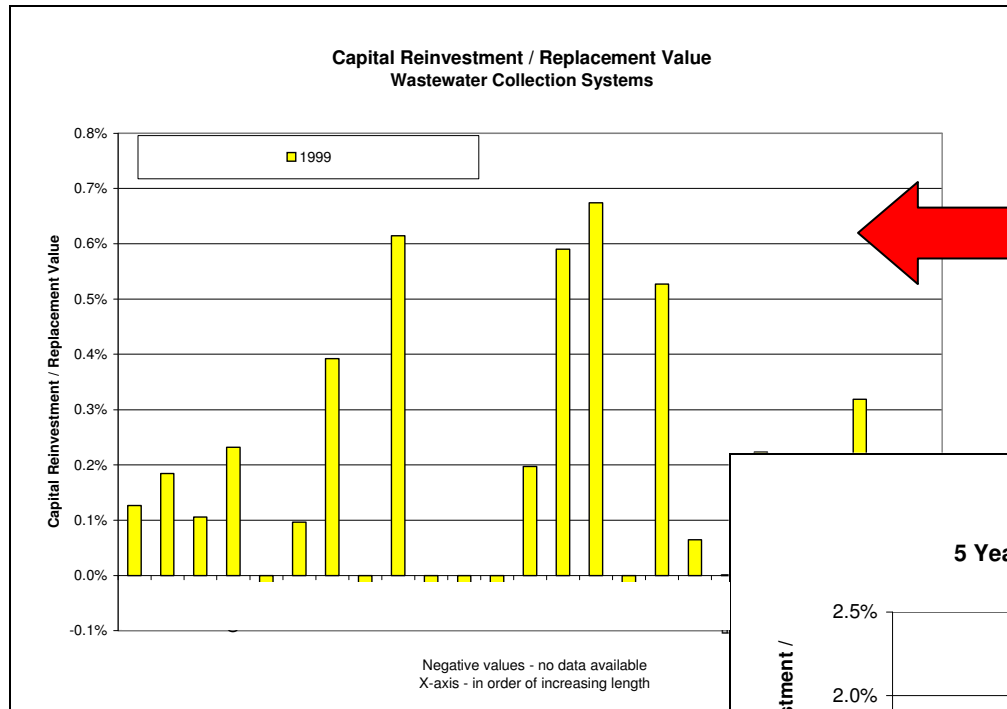
- **Sum of the actual O&M costs** incurred in the operation of the distribution/transmission/ integrated system (excludes capital costs, indirect costs, transfers to reserves and debt/interest charges). Includes O&M costs for both linear (pipes, meters etc) and non-linear (pump stations, reservoirs etc) infrastructure. Revenues are only included where they are recoveries for work done by water distribution staff that is extraneous to the utility (for example, lab tests for other utilities).

- **Total length of mains** in the distribution system (i.e. excluding length of service connections). For the distribution system length include all connecting pipes between pump stations, rechlorination facilities and storage facilities if these are located within the distribution system. For the transmission system length include all connecting pipes between pump stations, rechlorination facilities and storage facilities when located between the source and the treatment plant or between the treatment plant and the distribution system.

Detailed definitions
are vital to ensure
valid comparisons

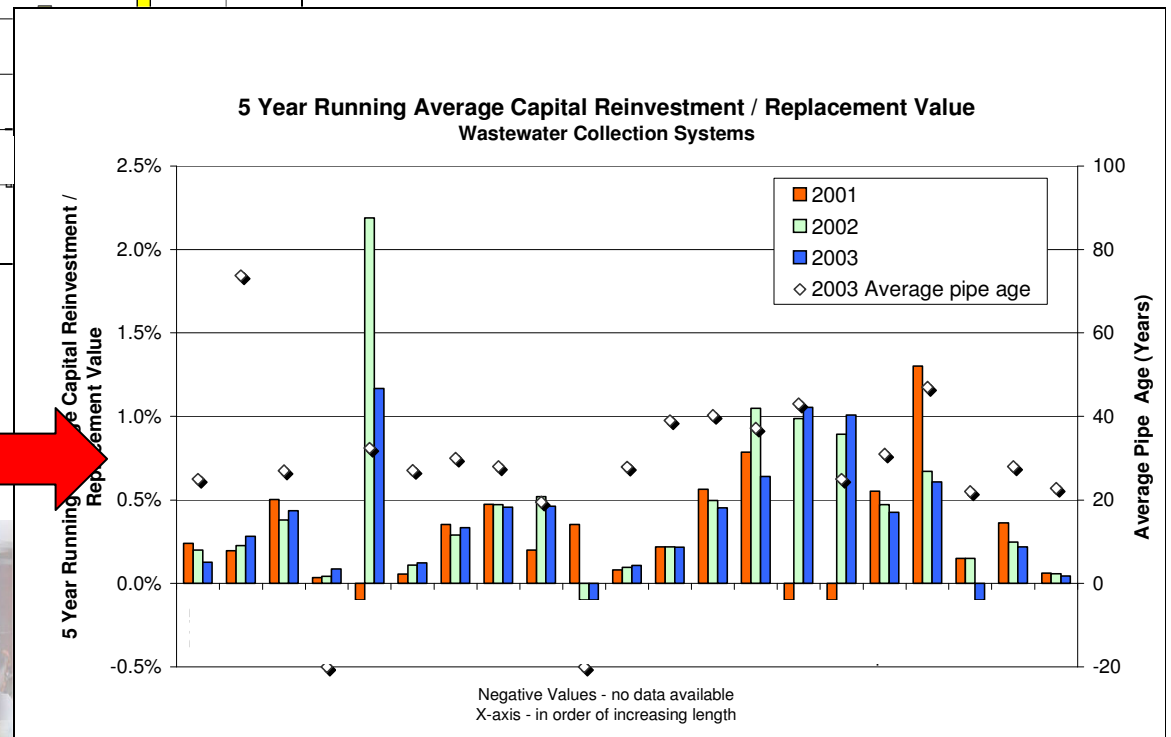


Data Quality Improves with Repetition

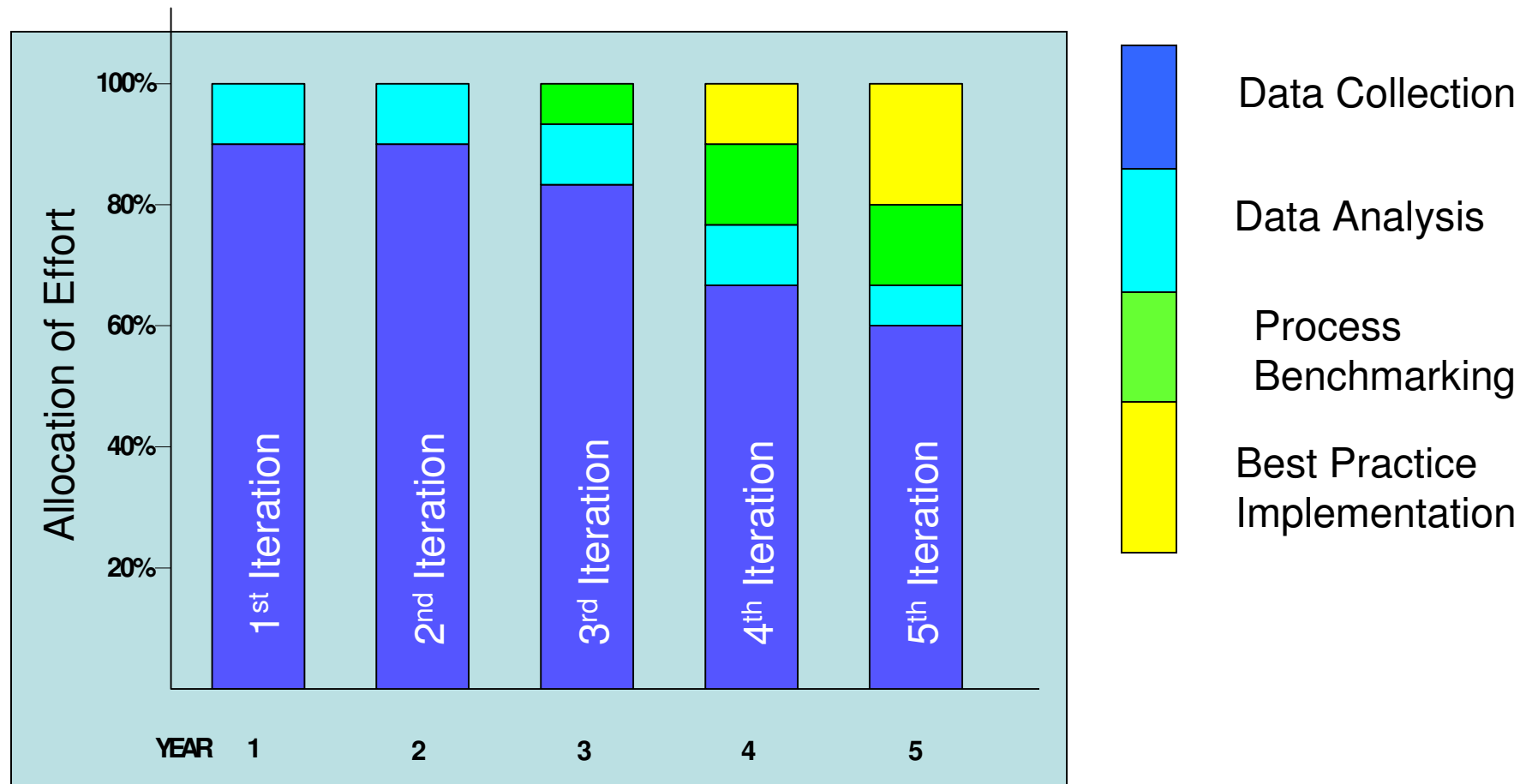


1999: Data is vague,
and incomplete

2003: Data is clear,
and accurate

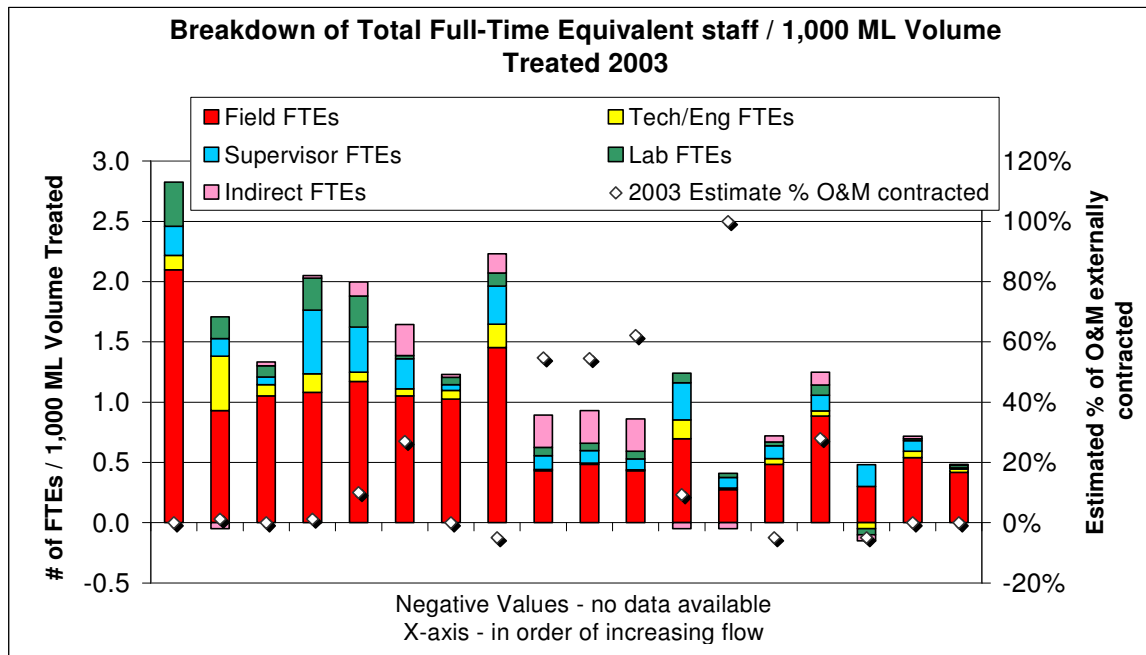


Results and Payback Takes Time

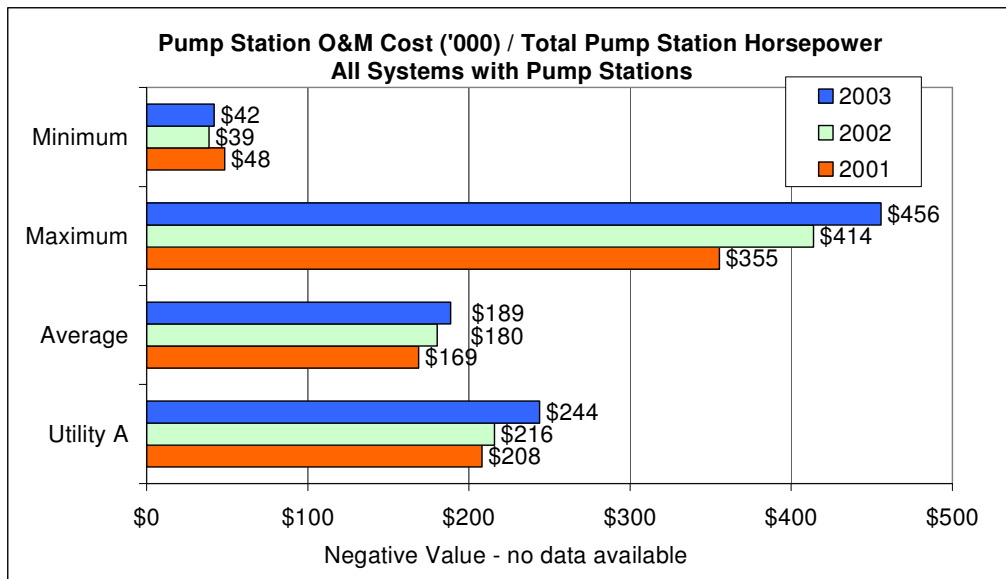


Example Output Chart: “Target Group” Graph

- Shows detail regarding the entire group
- Useful for making quick multi-agency comparisons



Example Output Chart: Min, Max, Average Graph



- Useful for examining one agency's result in more detail
- Multi-year trend line is of key importance
- Tends to grade against the "average", instead of a target.



In All Cases:

- Benchmarking “results” are only a start;
- You need to look “behind the graph”;
- NWWBI graphs are not blinded, so you can clearly see which utility is leading;
- Only by discussing the results and getting more information can you begin to identify specific process changes.



What data do we analyze?

- Approximately 5000 graphs prepared
- Water Distribution
- Water Treatment
- Wastewater Treatment
- Stormwater
- Collection Systems



How can this help?

- Determine where you are at.
- Determine where you want to be.
- Benchmarking helps you get there.
- Let's you know when you've arrived.



Water Supply Example

- Where are you?
 - Raw water storage only sufficient for 4 weeks under drought conditions.
 - Water treatment plant at peak capacity for 2 weeks during summer.
 - Frequent low pressure complaints from customers.
 - Water use restrictions common.



Where do you want to go?

- Storage capacity for 1:25 year droughts
- Plant doesn't exceed peak capacity for longer than 1 day
- 0 low pressure complaints from customers
- No user restrictions

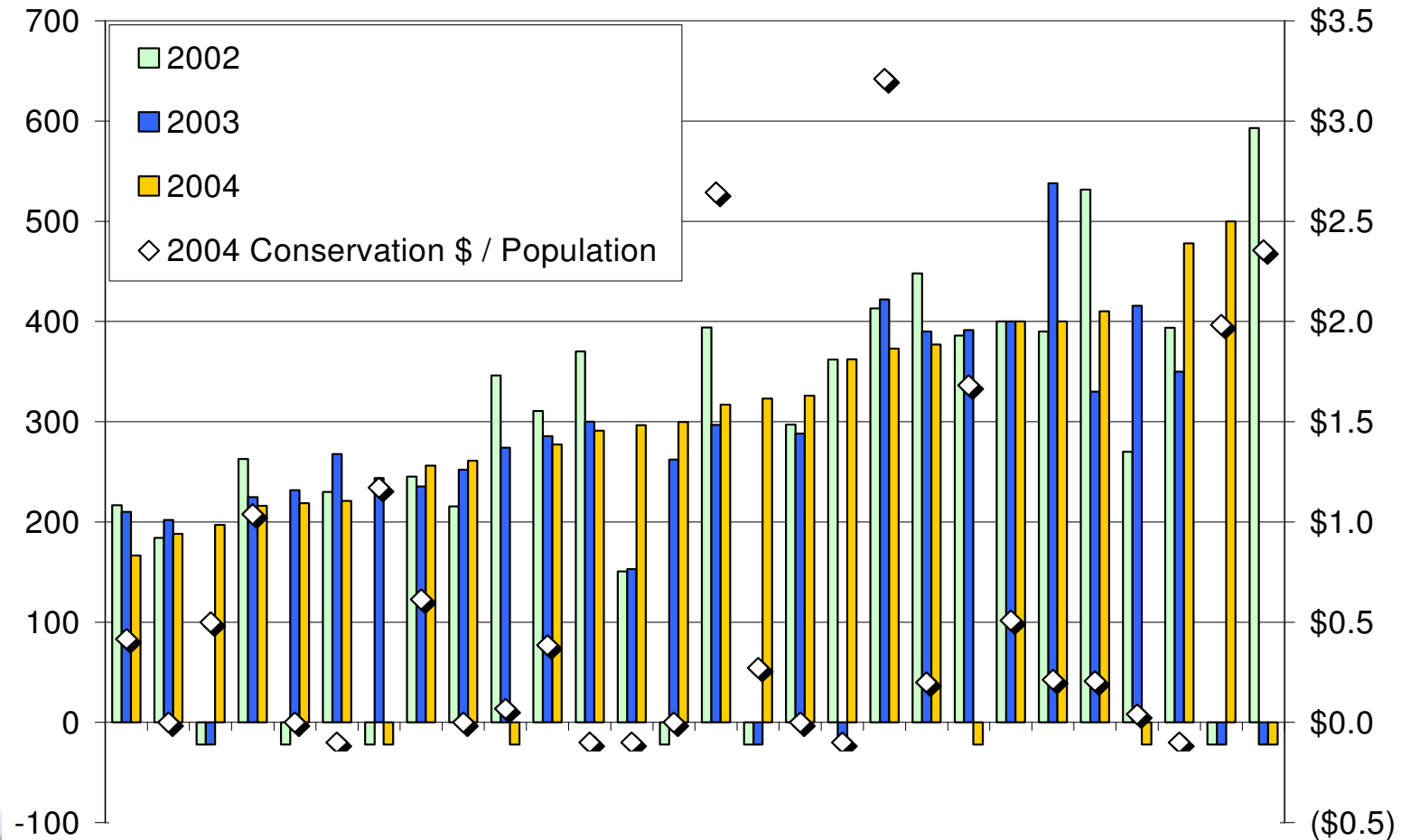


How will you get there?

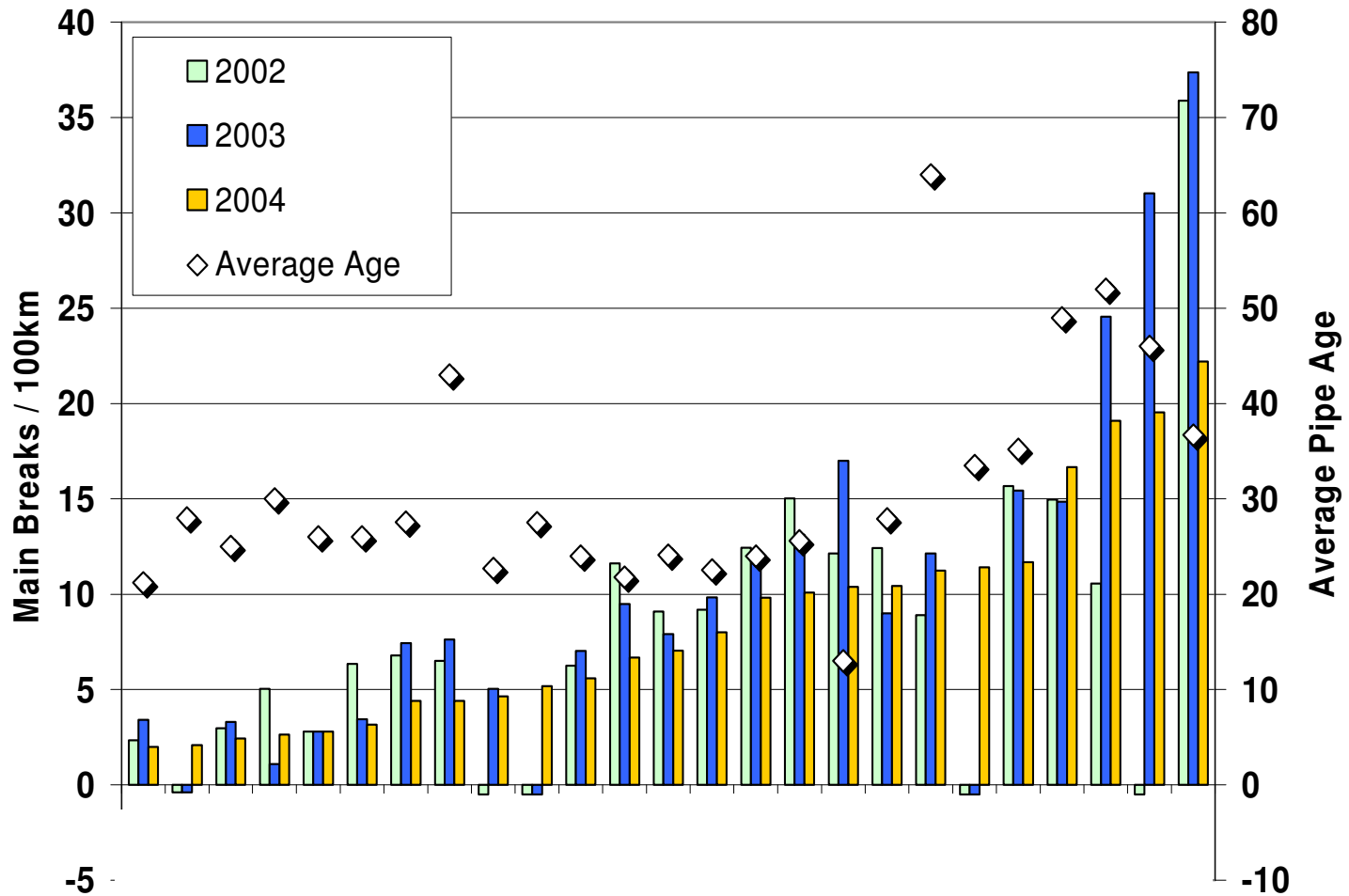
- What are others doing?
- What is “Normal”?
- Strategies to consider:
 - Water loss management
 - Water conservation
 - Asset management
 - Source planning
 - Hydraulic modeling



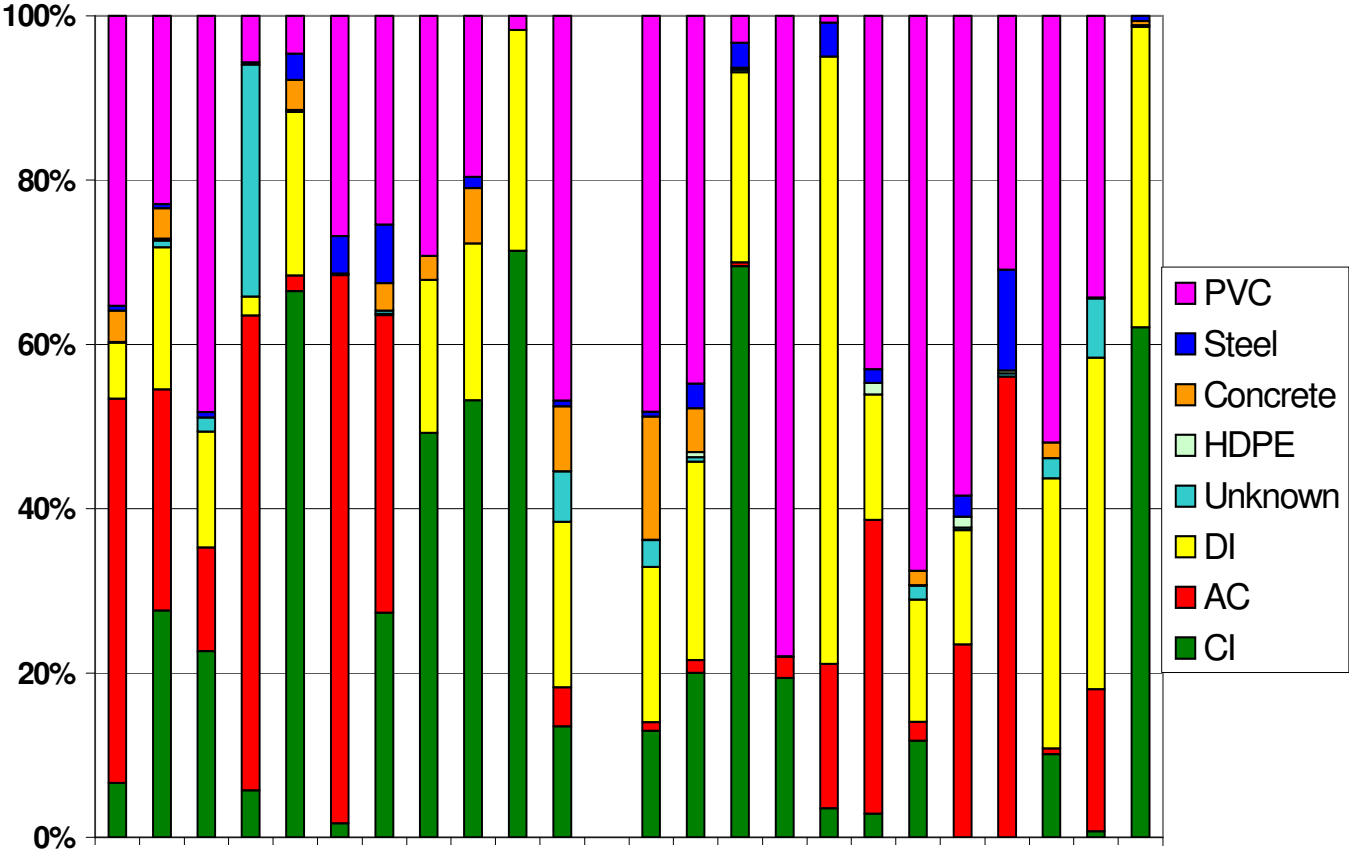
Per Capita Average Day Residential Consumption for Residential Customers - Distribution & Integrated System Utilities



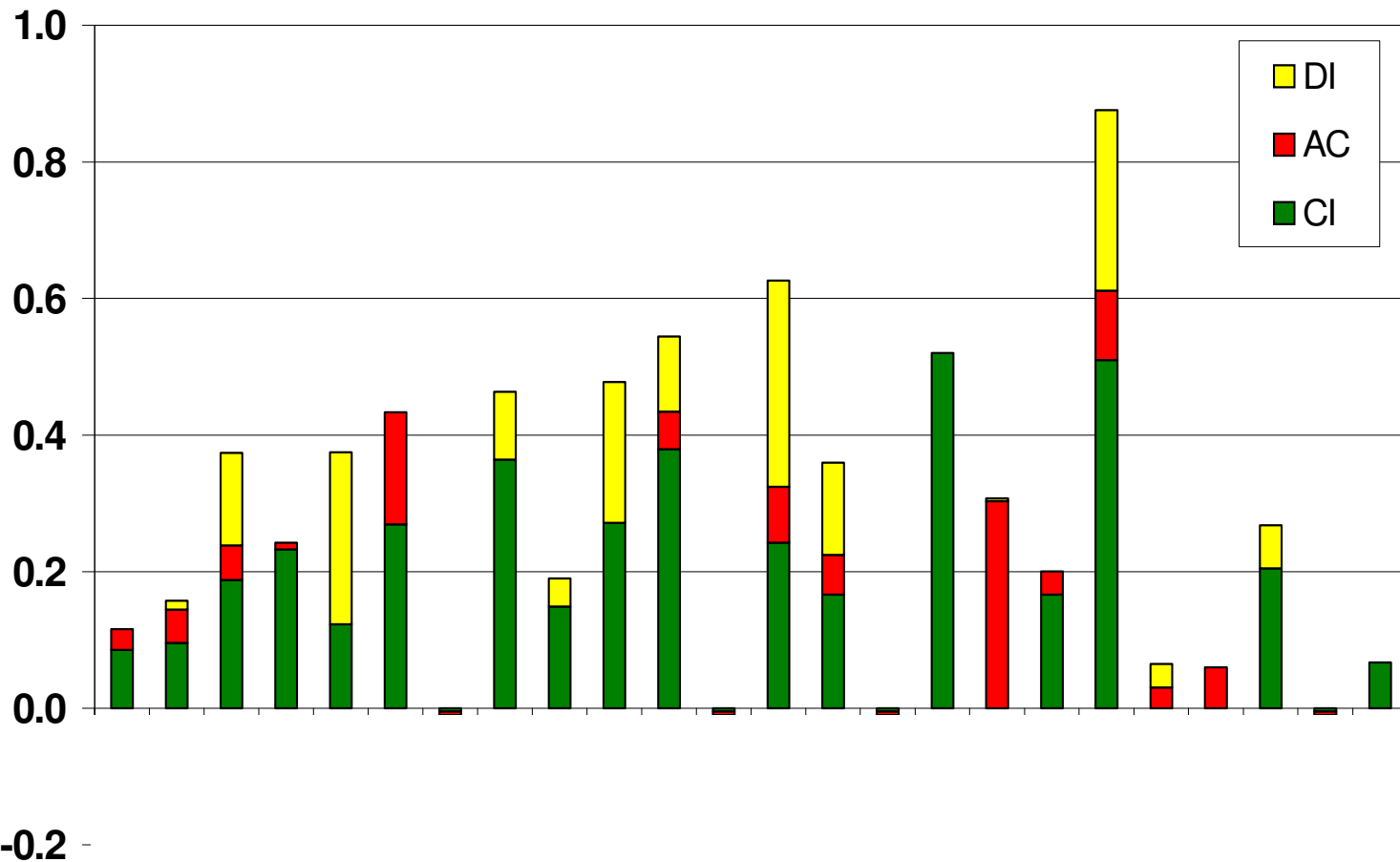
of Main Breaks /100 km



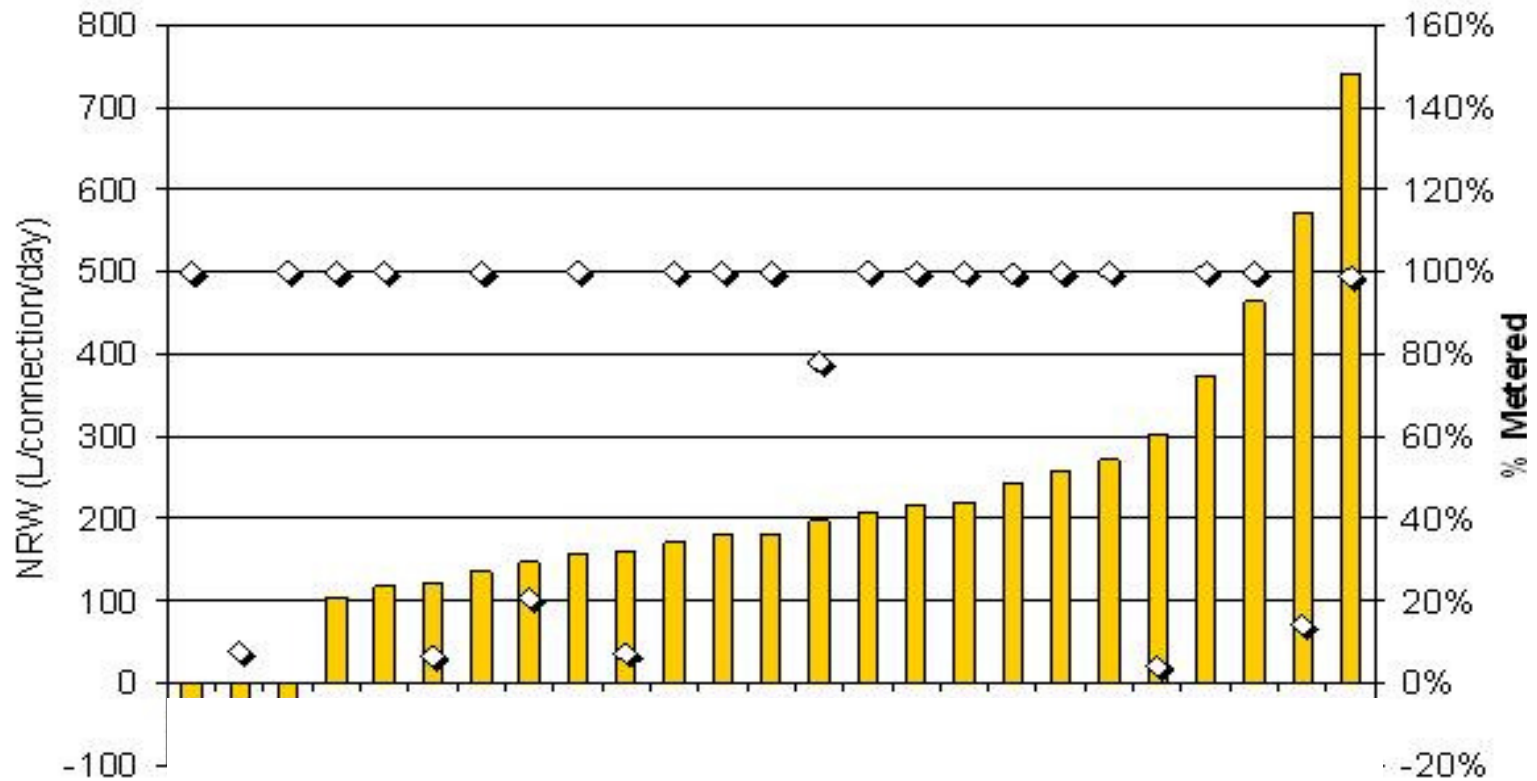
Pipe Materials as a % of Total System Length



Main Breaks by Material / km of Material Length (Only DI, AC and CI)



Non-Revenue Water (L / connection / day) for Integrated & Distribution Systems 2004



How will you know when you've arrived?

- Set up metrics to monitor change
- Measure your progress against goals
- Measure if your strategies are working
- Not just performance measures, but benchmarking.
- Let's you know if there is a better way



Water Distribution:

- Linear Field FTEs / 100 km Length
- Unit Cost of Flushing (\$/km flushed)
- Cost of Main Break Repairs as % of Total O&M Cost
- % of Problem Area Cleaned
- Target % of Problem Area Cleaned
- % of Non-Problem Area Cleaned
- Target % of Non-Problem Area Cleaned



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Examples

- Actual examples from the NWWBI.
- Names across X axis blocked out for confidentiality.
- Benchmarking participants see all of the actual results, not just their own, including municipality names.
- Provides an opportunity to discuss what is being done differently to identify how to improve.

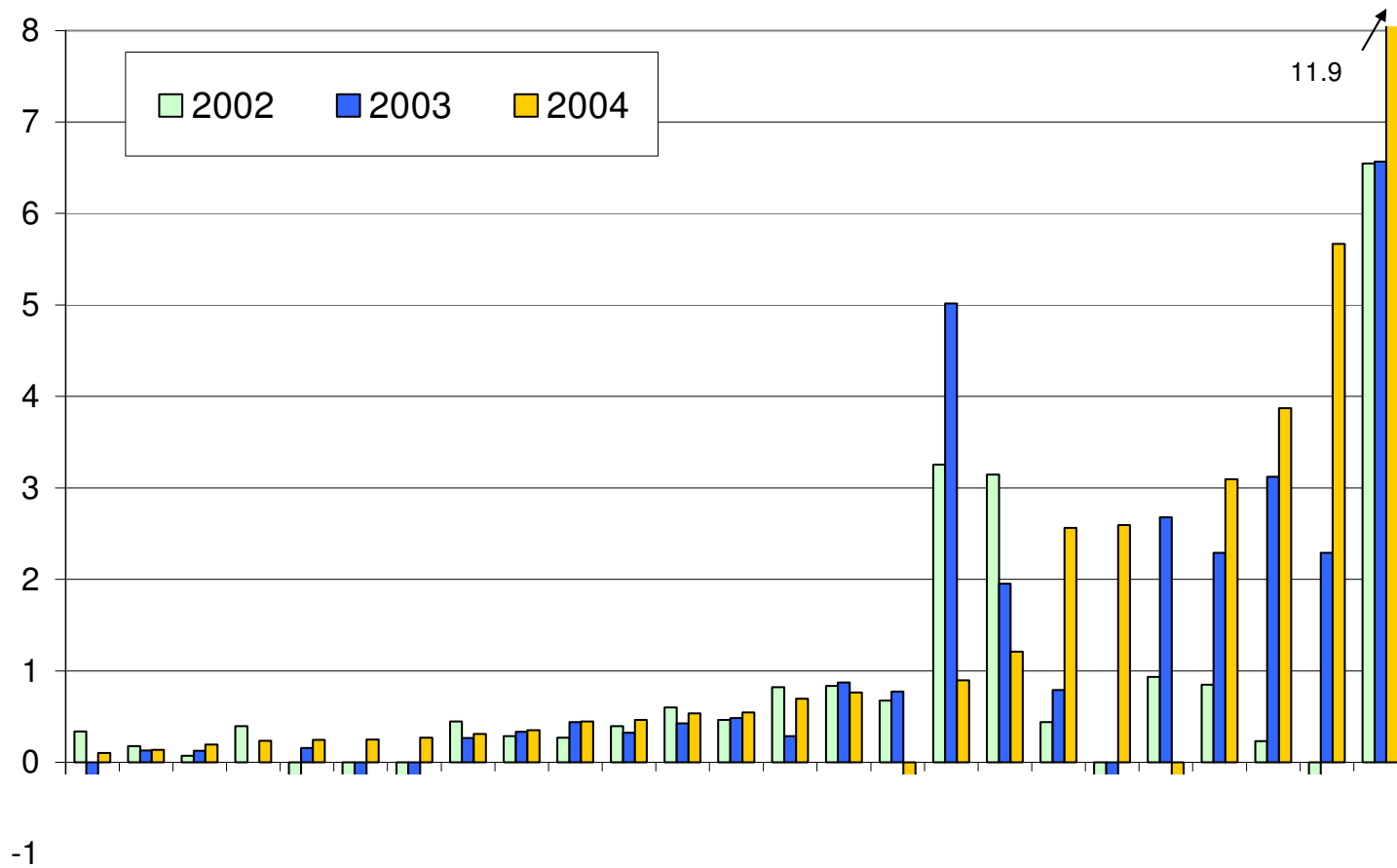


Water Treatment Plant Performance Improvement

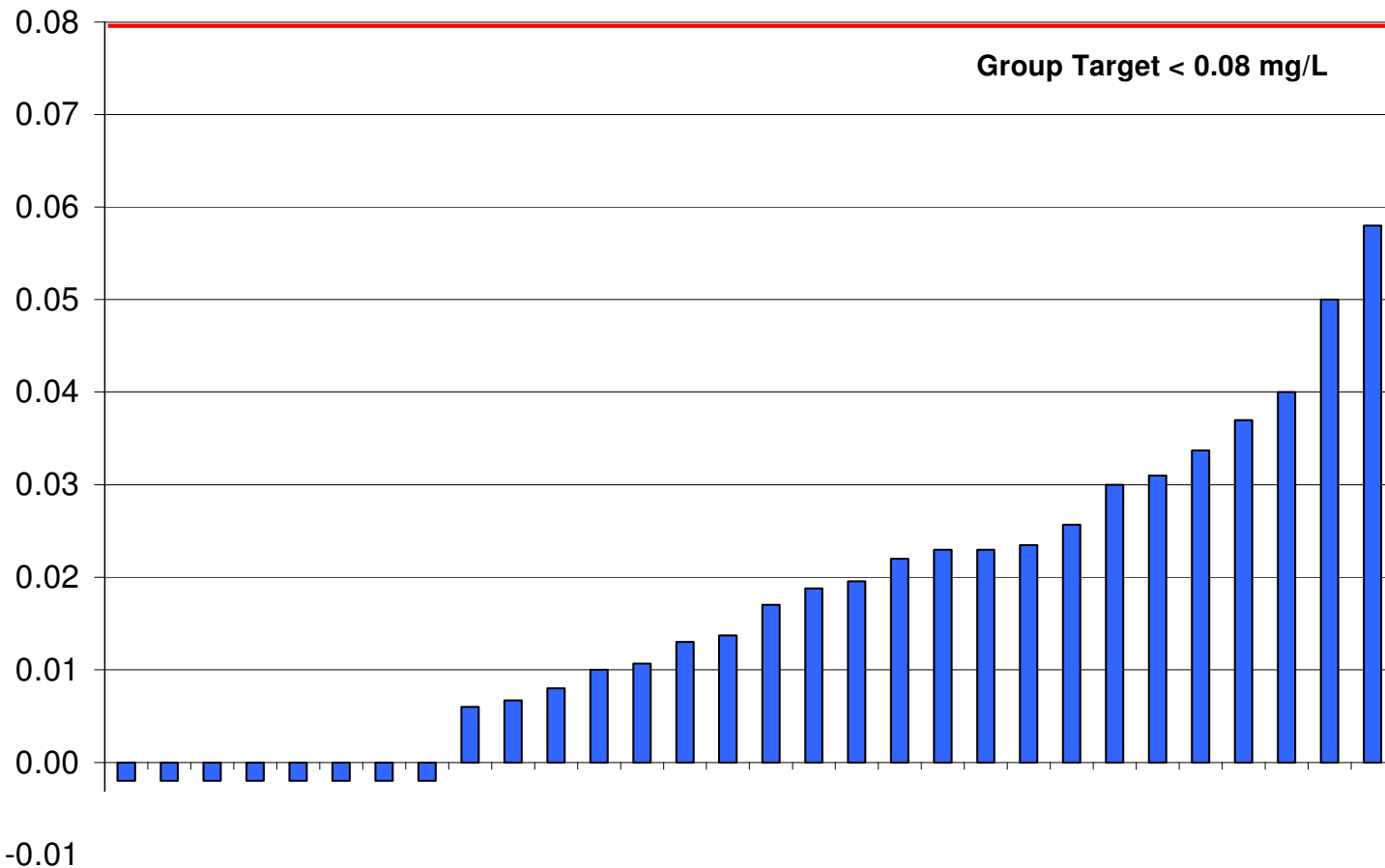
- Water Quality
- Operation & Optimization
 - Chemicals
 - Filter Operation



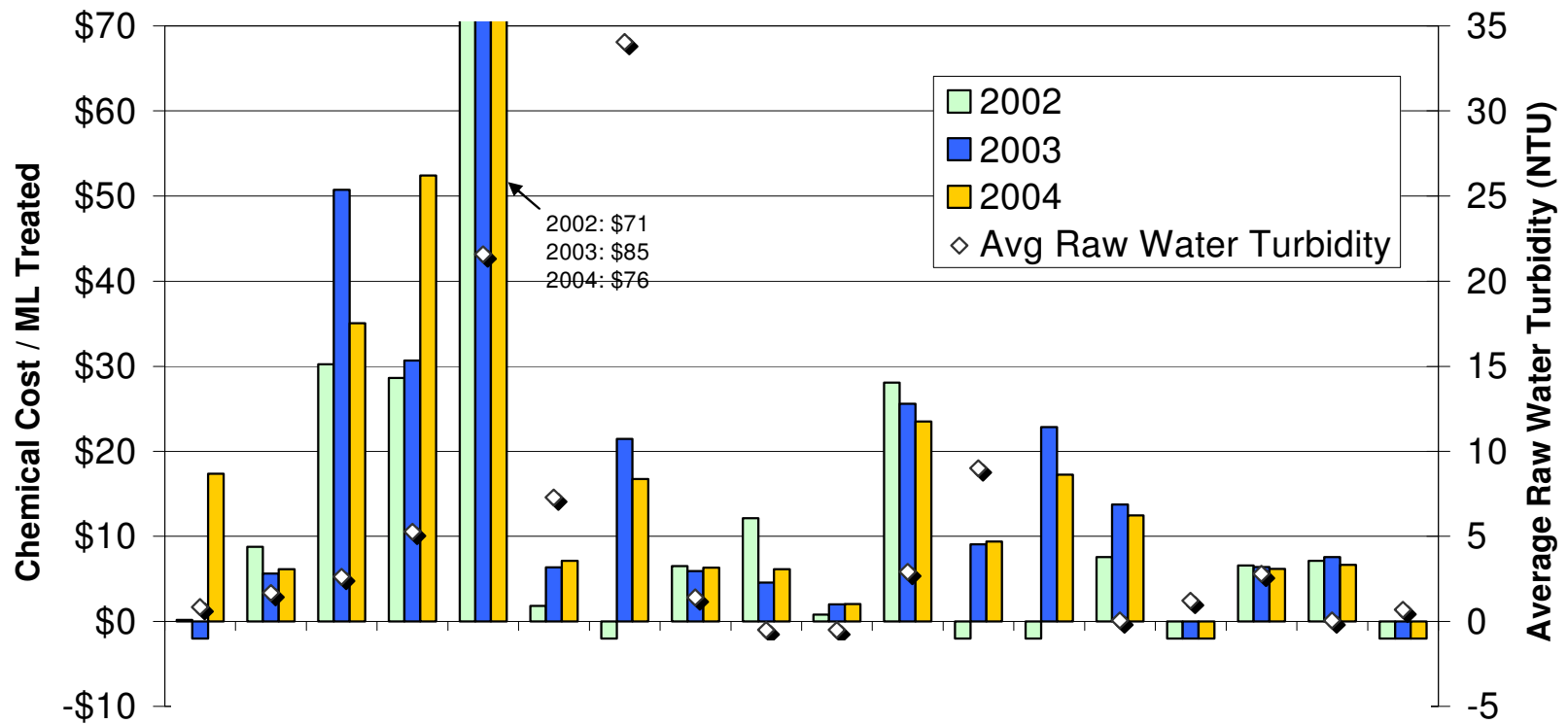
of Water Quality Complaints / 1,000 People Served (in order of increasing 2004 per unit complaints)



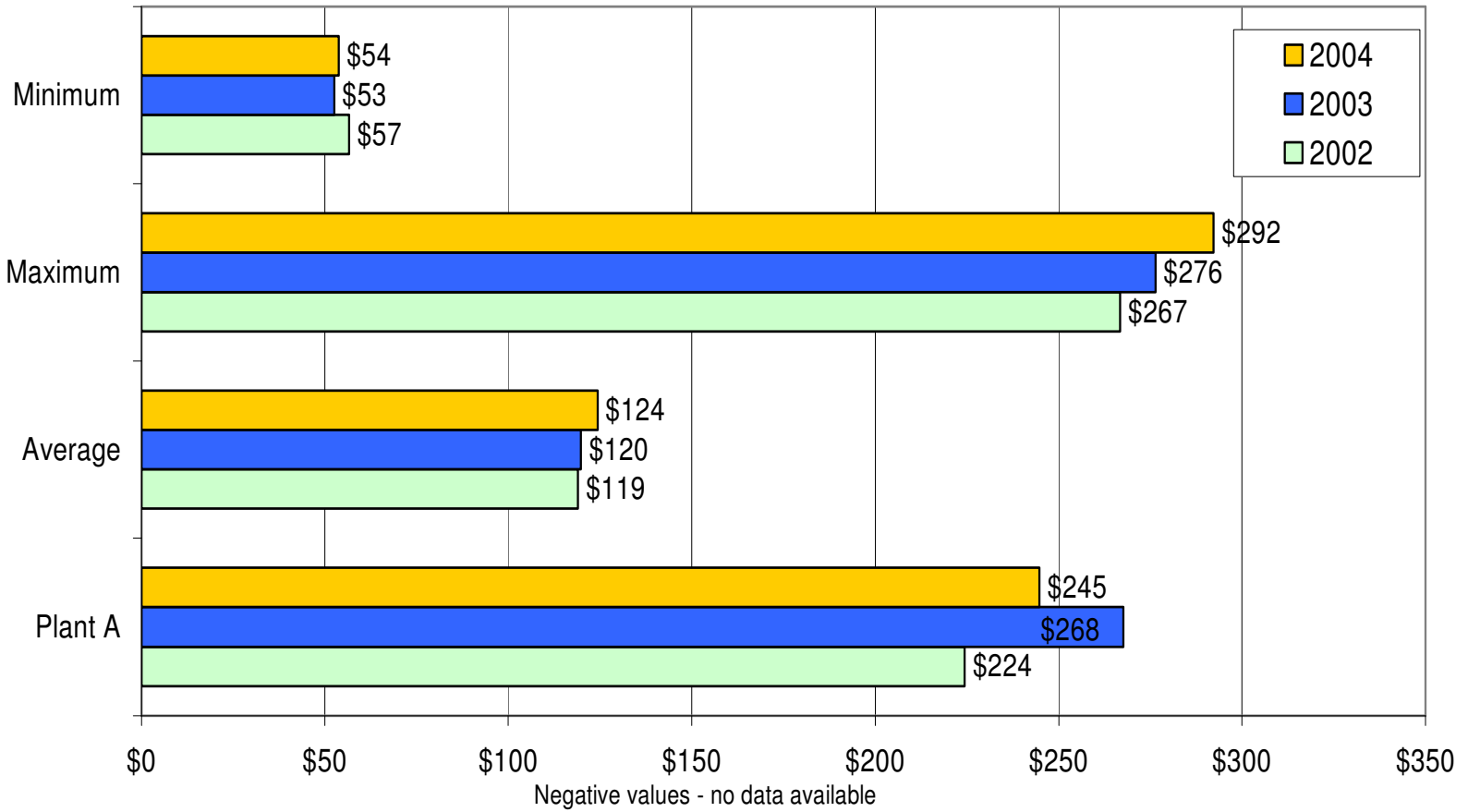
2004 Average THMs (mg/L) – All Transmission, Distribution and Integrated Systems



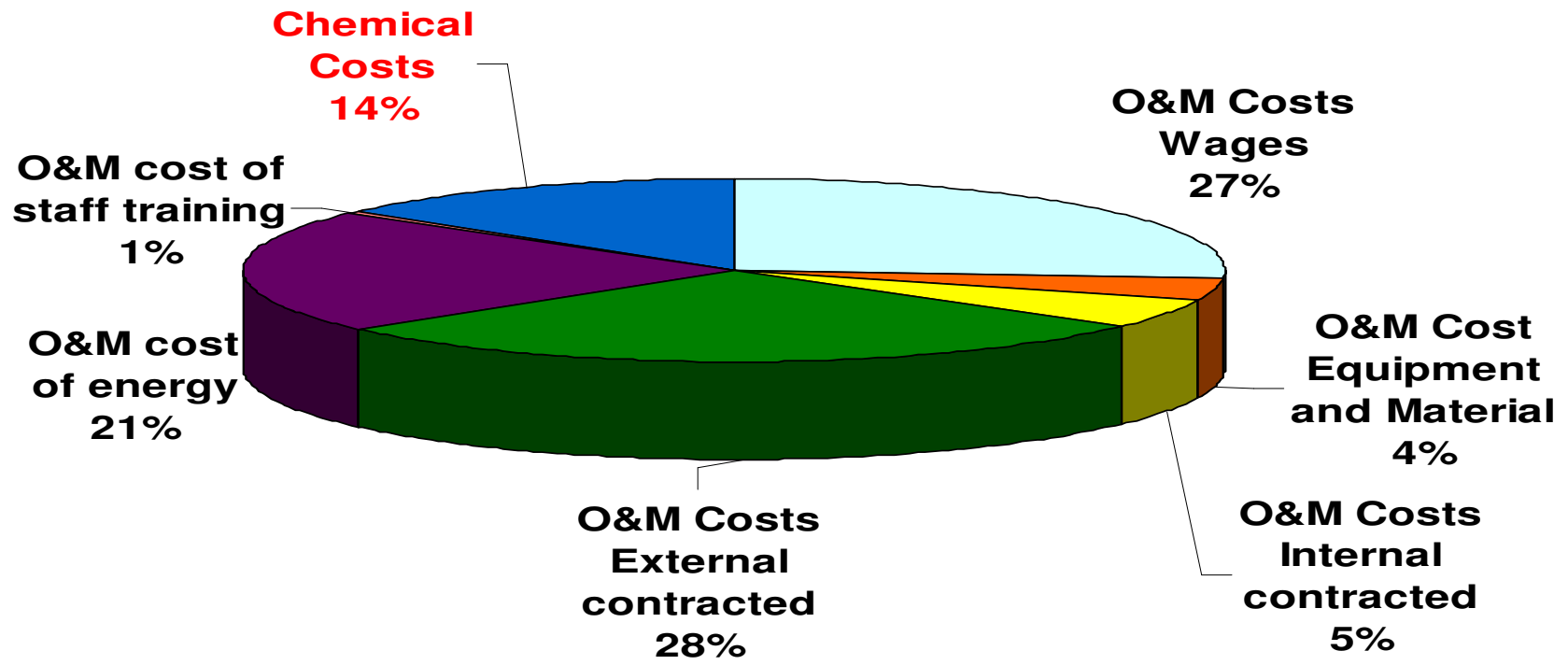
Chemical Cost / ML Treated 2004 – Conventional Filtration Plants



O&M Cost / ML Treated Conventional Water Filtration Plants



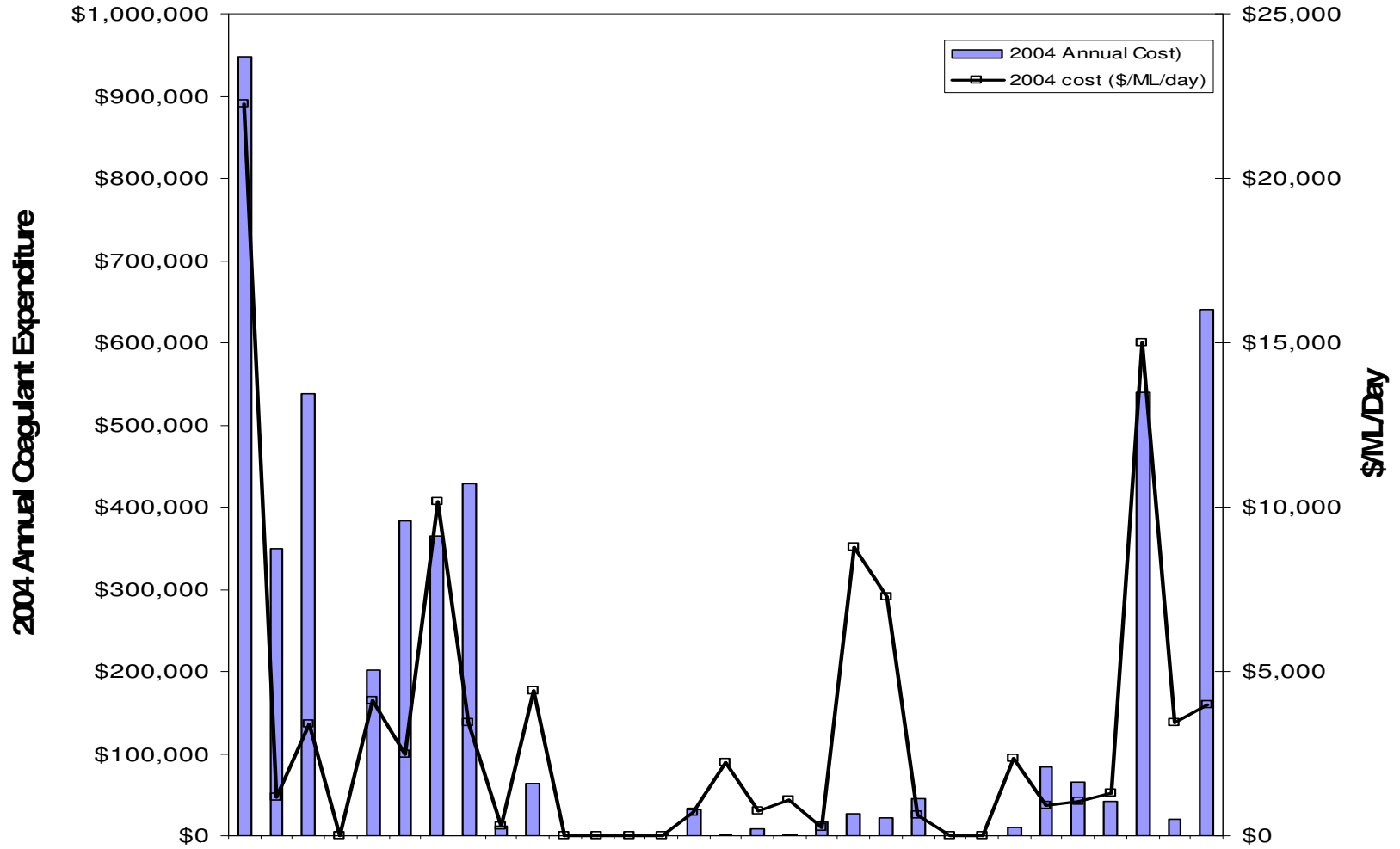
Breakdown of O&M Costs Conventional WTPs



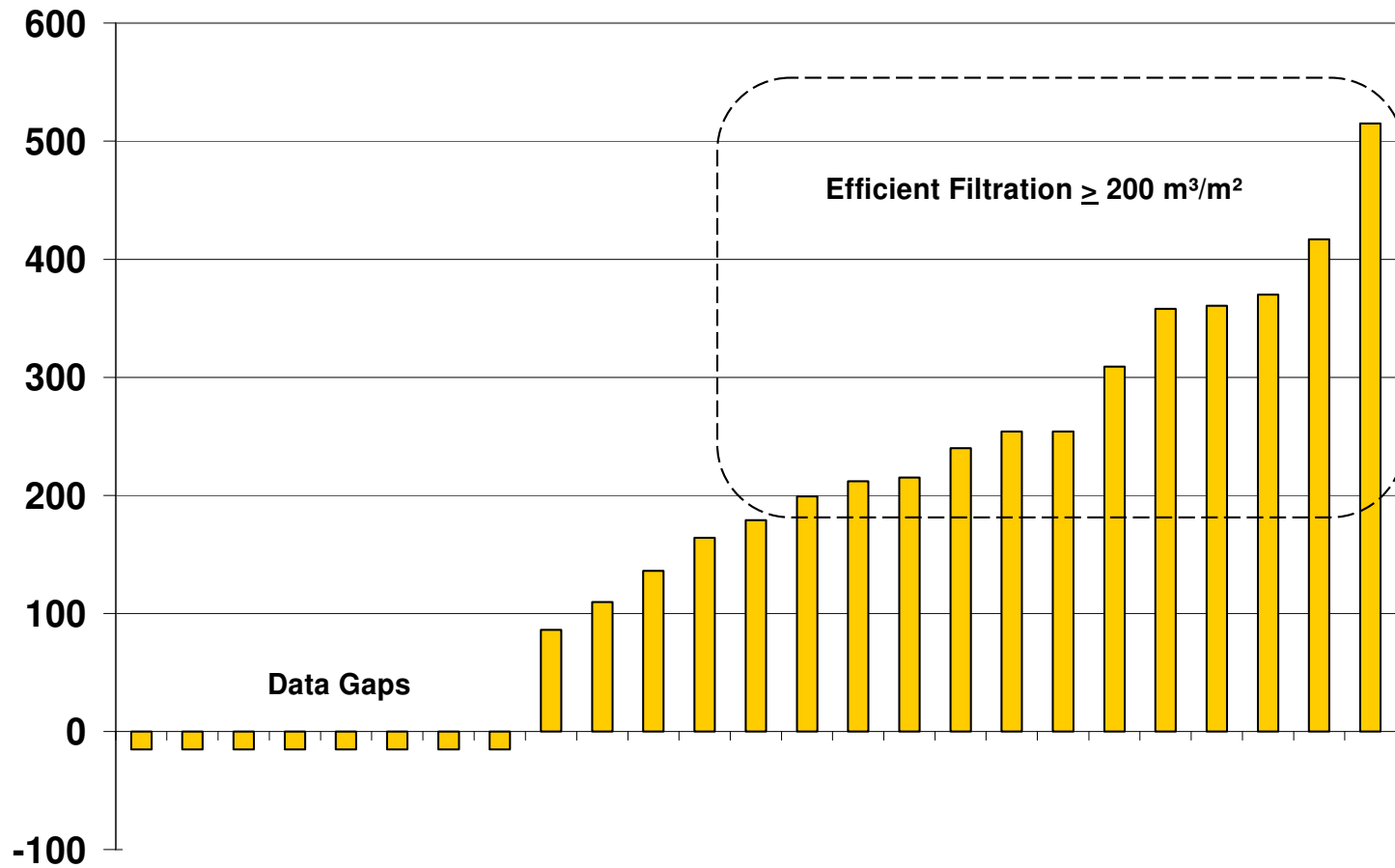
Average O&M Cost for Conventional Filtration WTPs \$ 109 / ML



2004 Coagulant Expenditure



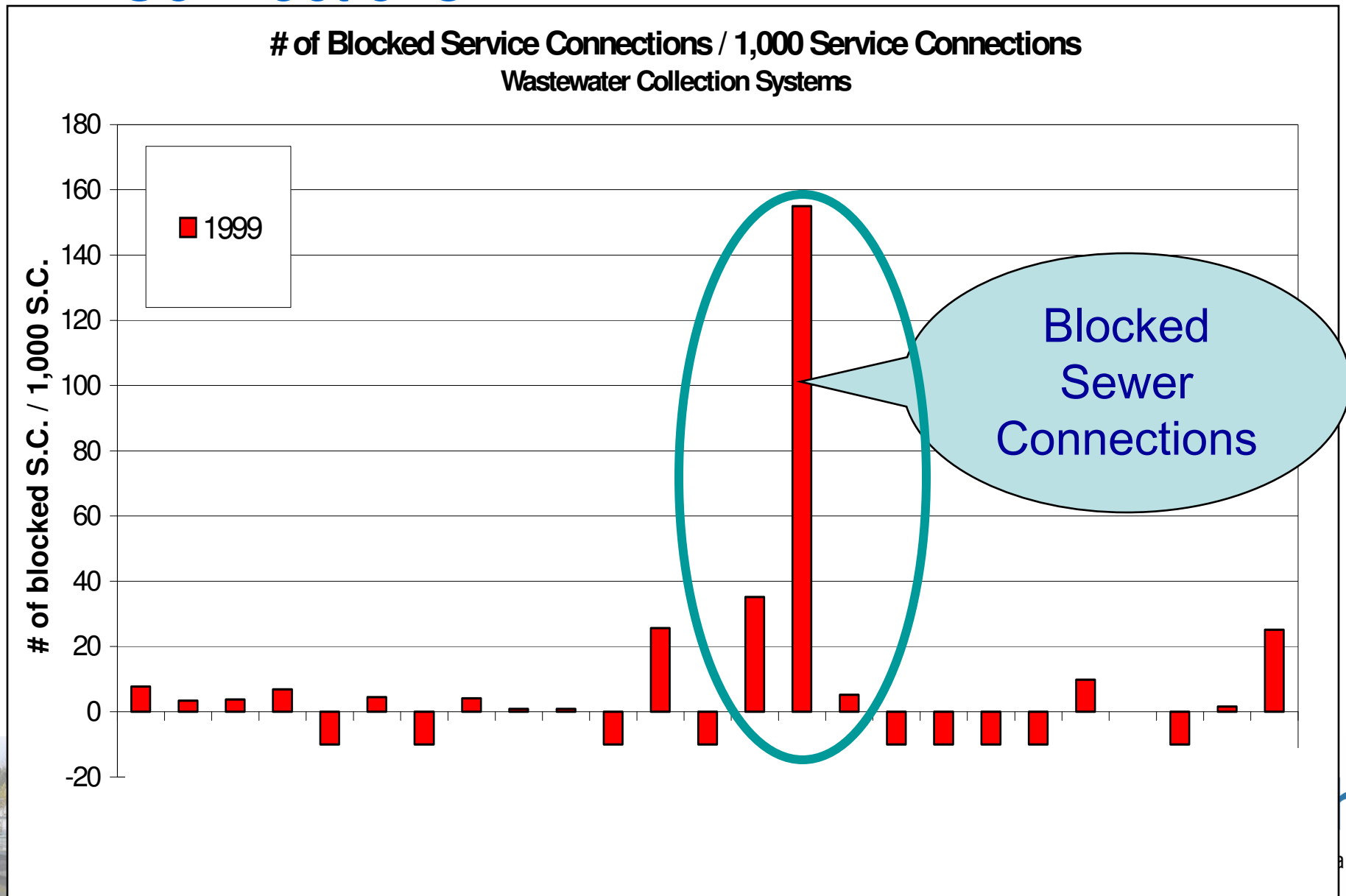
Unit Filter Run Volumes (m³/m²)



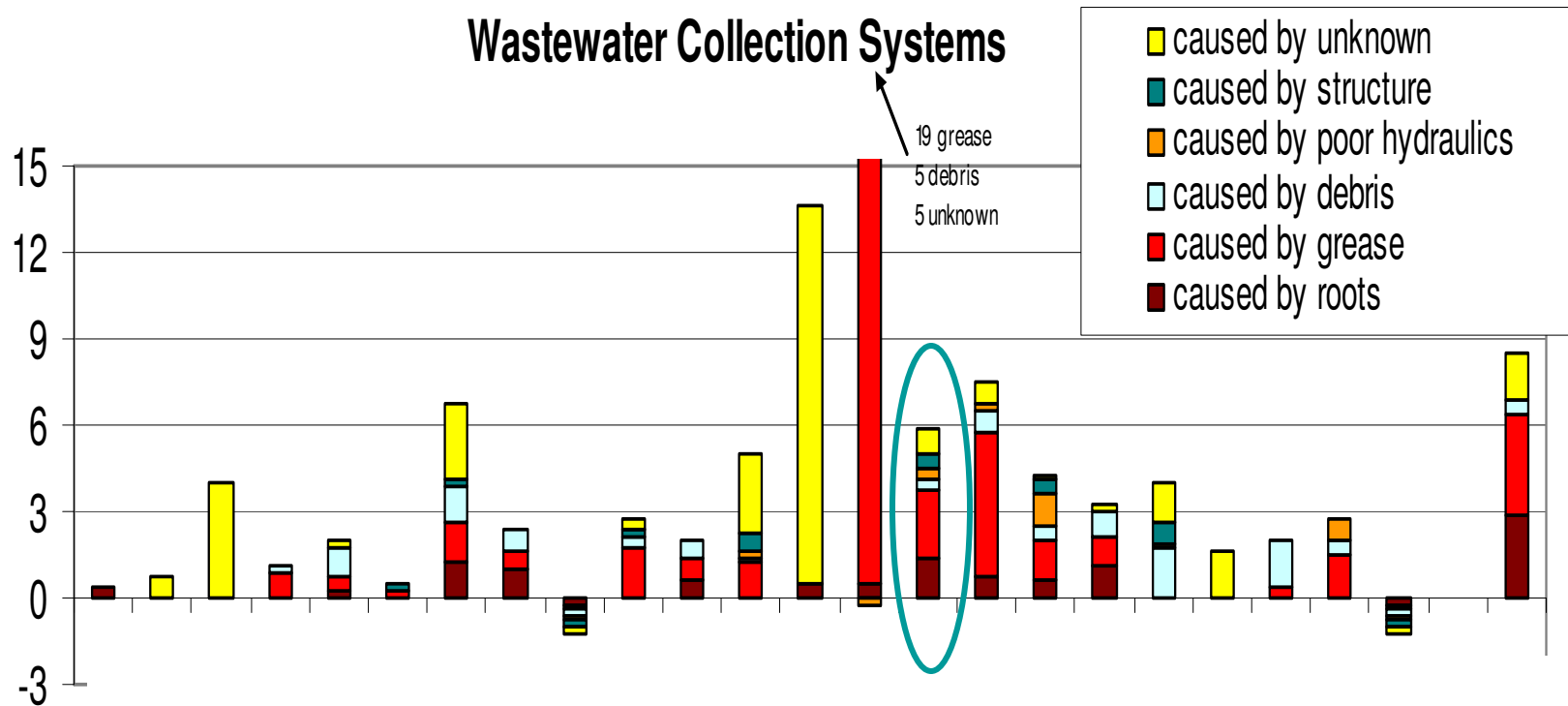
Wastewater Example: Collection system blockages



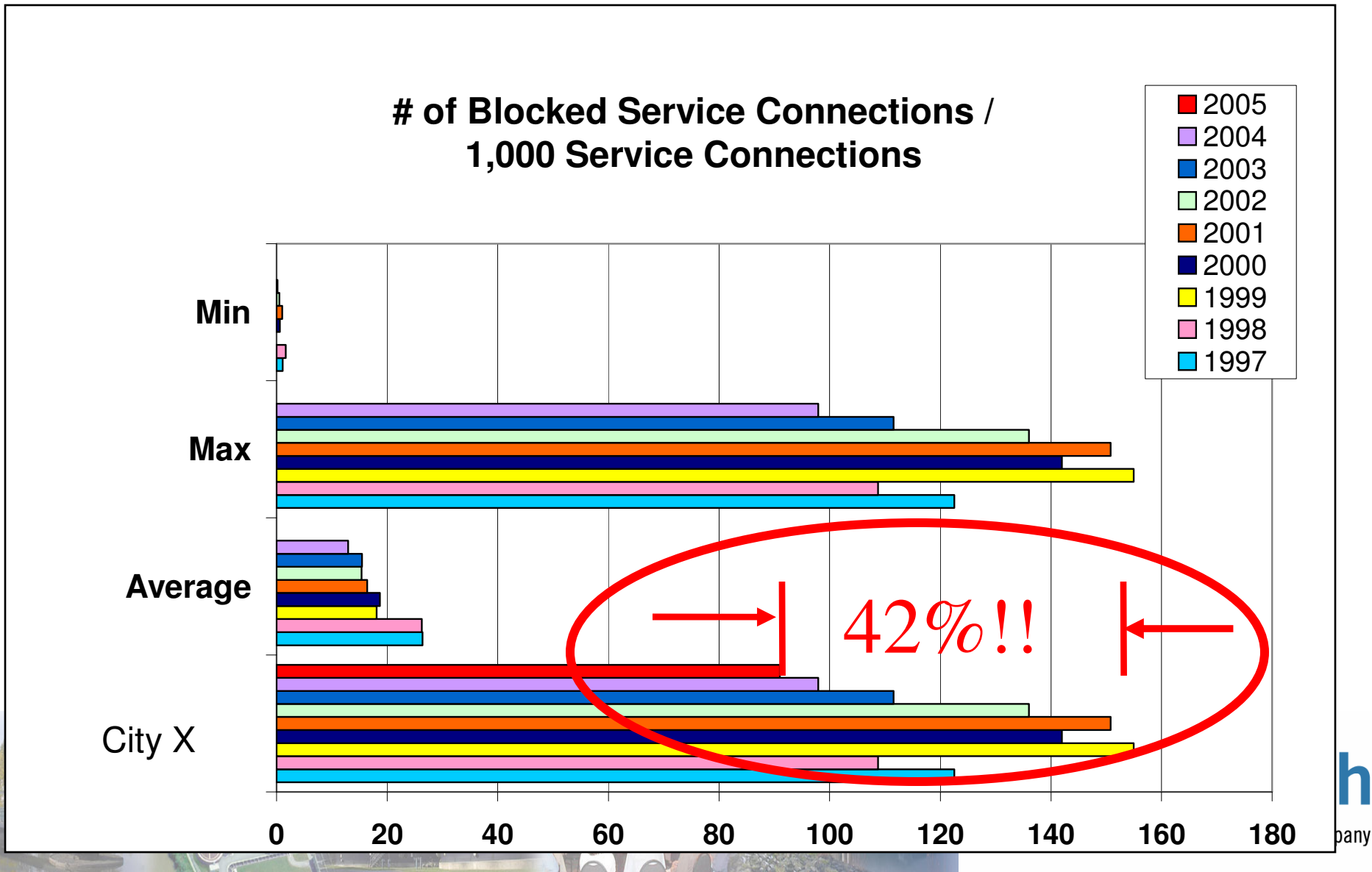
Case Study: Blocked Service Connections



of Blocked Sewers / 100 km Length Due to Different Causes 2004



Problem was identified, and City X Undertook a Major Initiative



Human Resources Issues

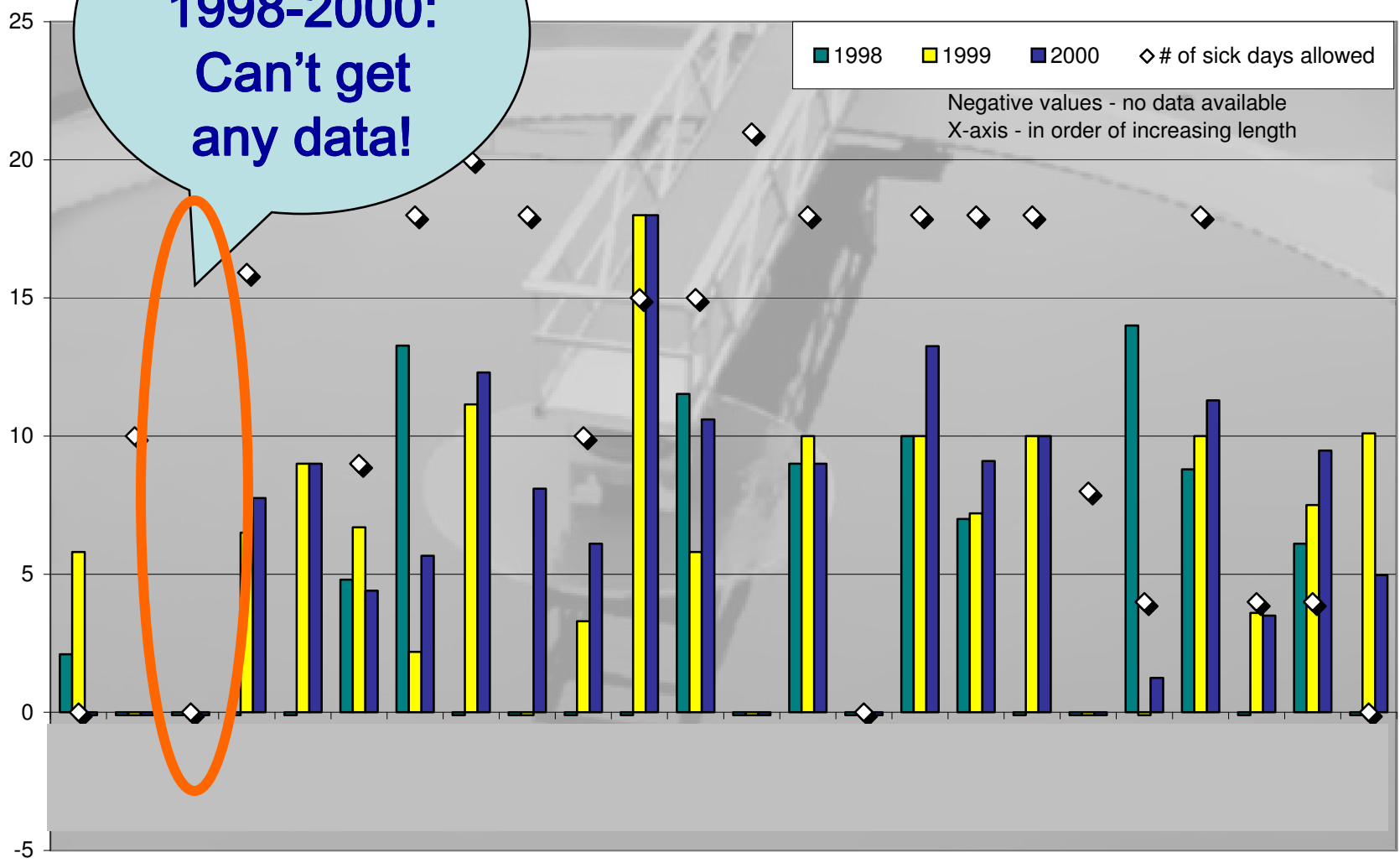
- Staffing levels: FTE's
- Sick Days
- Succession Planning



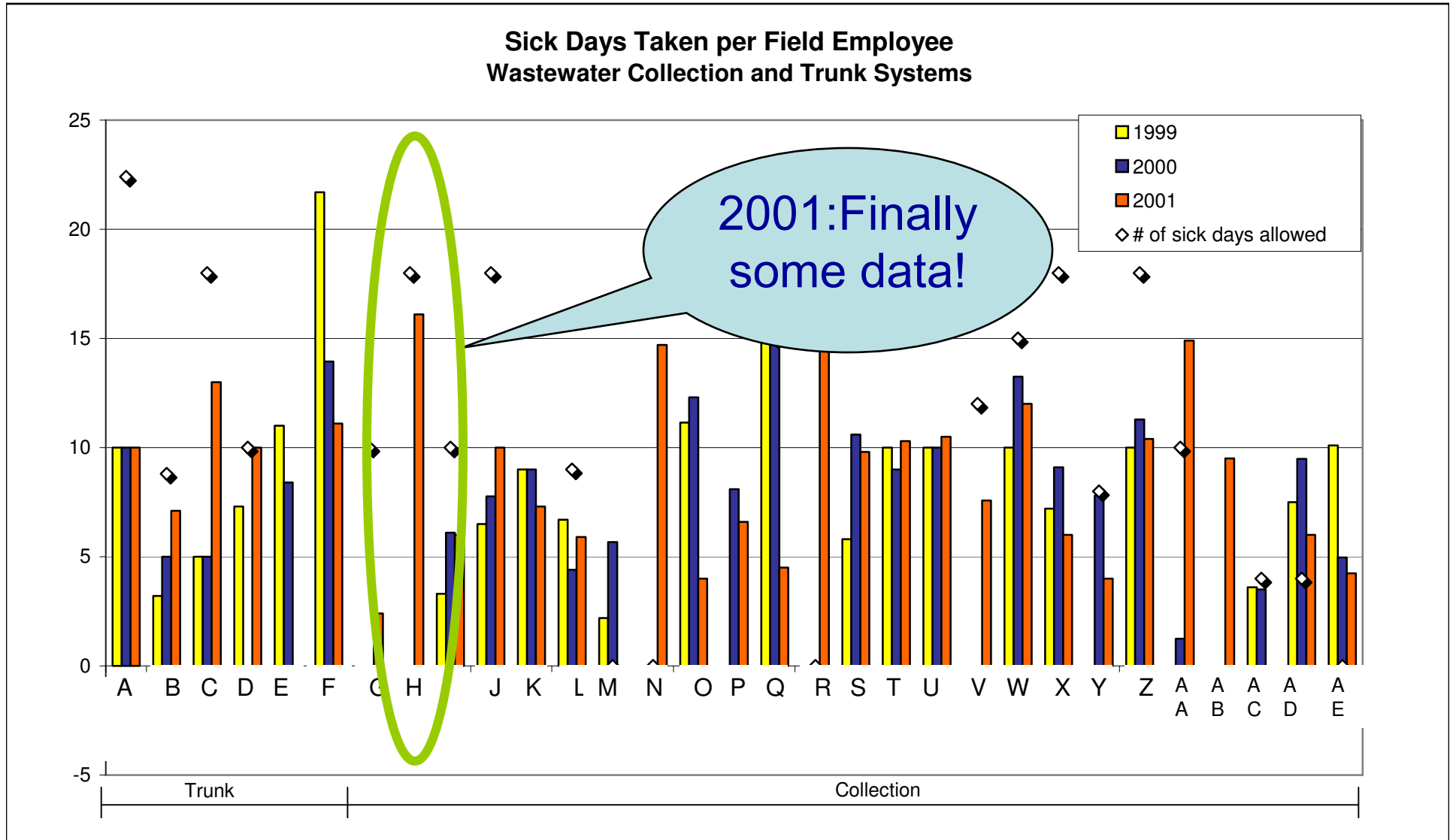
Case Study: City H, Sick Days

**Problem in 1998-2000:
Can't get any data!**

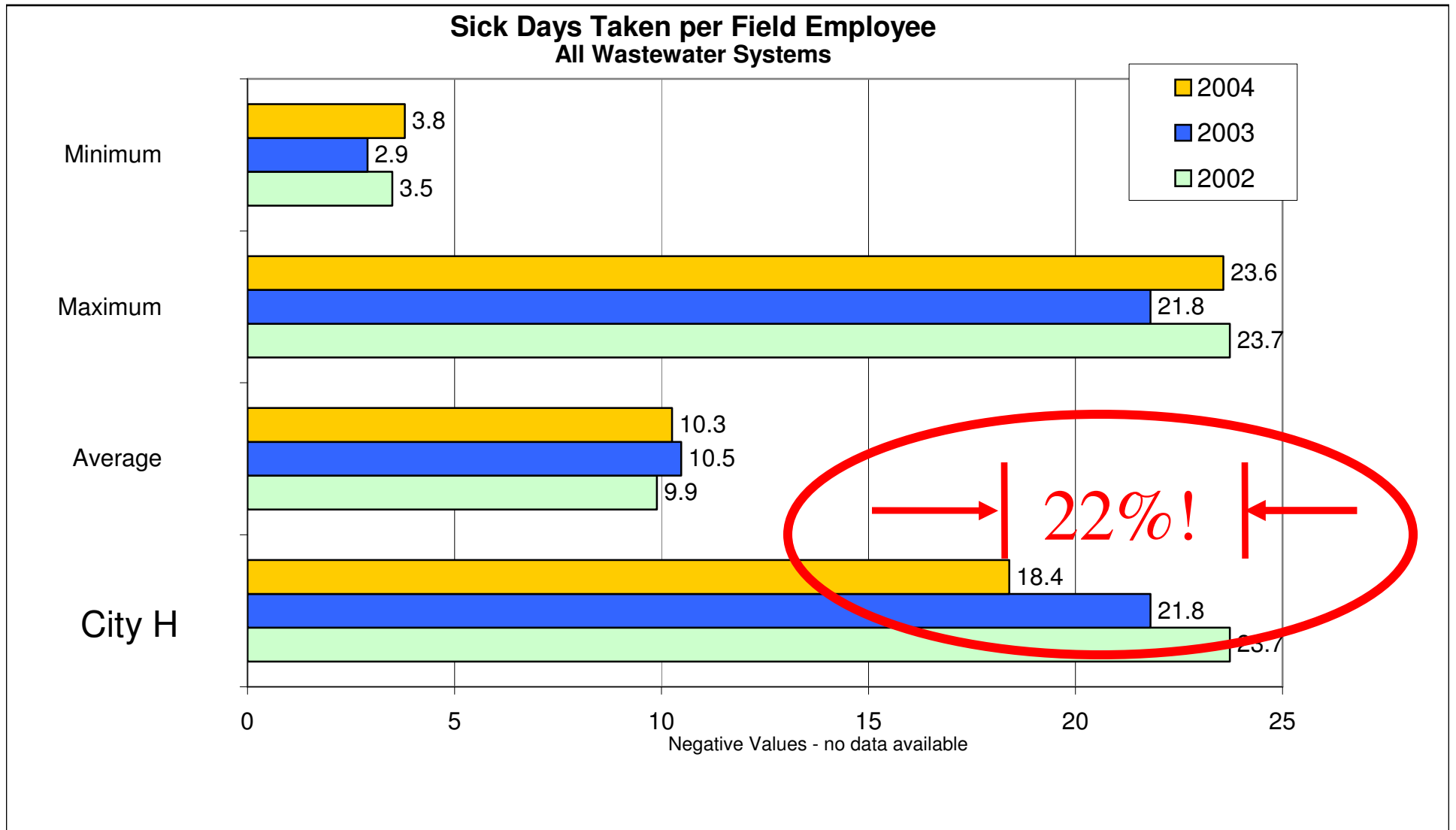
Sick days taken per field employee
Wastewater Collection Systems



Begin to quantify the problem



Design a strategy and measure the results



In other words:

- City H wastewater collection operations employs about O&M 19 FTEs
- Total absent time 2002: 450 days
- Total absent time 2004: 350 days
- **Found Productivity: 100 extra days per year (so far)**



Review:

- Areas we focus on:
 - Water Treatment Plants
 - Wastewater Treatment Plants
 - Linear systems
 - Human resources
- Performance, operation, asset management, maintenance
 - Costs and practices in each area.

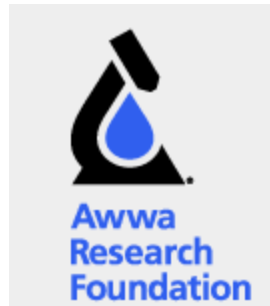


In summary:

- Many of these problems were known prior to benchmarking but couldn't quantify;
- Benchmarking adds context and tangibility;
- The problem can now be business cased against a strategy;
- How much would you be willing to spend to rectify the problem?



Collaborate with other Agencies



water & forestry
Department:
Water Affairs & Forestry
REPUBLIC OF SOUTH AFRICA

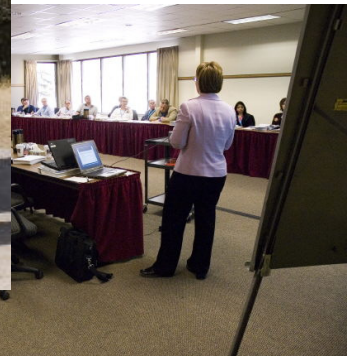
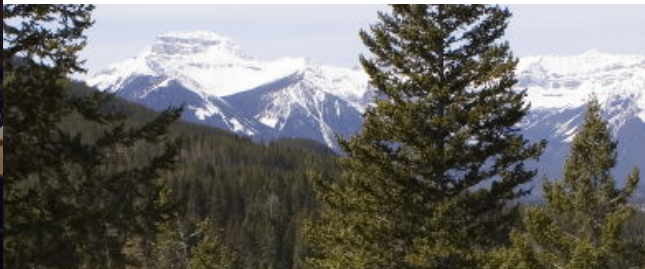


Annual Benchmarking Workshop

- Debrief results; affirm/modify methodology annually; set future project objectives;
- Critical peer to peer networking;
- Involve other Best Practice agencies;
- Not a conference: hard work, but fun;
- **CRITICAL FOR LONG TERM SUCCESS!**



2006 Workshop: Banff, Canada



Finally: Performance Improvement

- Performance Measure or Benchmarking means nothing if you don't do something with the results.
- To improve, you have to change, and change is always hard.
- Strategy: Start with some quick wins to get buy in, then move to more ambitious improvement programs.



What's Next?

- Focus on Infrastructure Reinvestment;
- Water Treatment Plant Residuals;
- Membranes in water and wastewater:
 - Capital costs
 - Life cycle costs
 - O&M
 - Chemicals



Benchmarking

*“Benchmarking is the practice of being humble enough to admit that someone else may be better at something, and wise enough to learn how to match and **EVEN SURPASS THEM AT IT”***



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Questions?

This presentation is available for downloading at:
www.nationalbenchmarking.ca

