

Developing innovative approaches to
worldwide environmental engineering

AECOM



Applying Research Fundamentals To Maintain Integrity of Real-World Operational Data

AECOM Water

Alex Mofidi, PE

Presentation Overview

Why Use Research Fundamentals?

Your Location at Water's "Front Line"

Data Collection

- QA/QC
- Standardizing procedures
- Discrepancies / analogous systems
- Accounting for unexpected variations
- Determining criticality

Summary

Research?

....and why does it involve me?

| Do you....

- Plan work?
- Take action (work)?
- Observe
- Evaluate
- Reflect / improve



| 'Action' Research *(McNiff 2002)*

- What if I do not conduct research?
- Why should this be important to me?

Research?

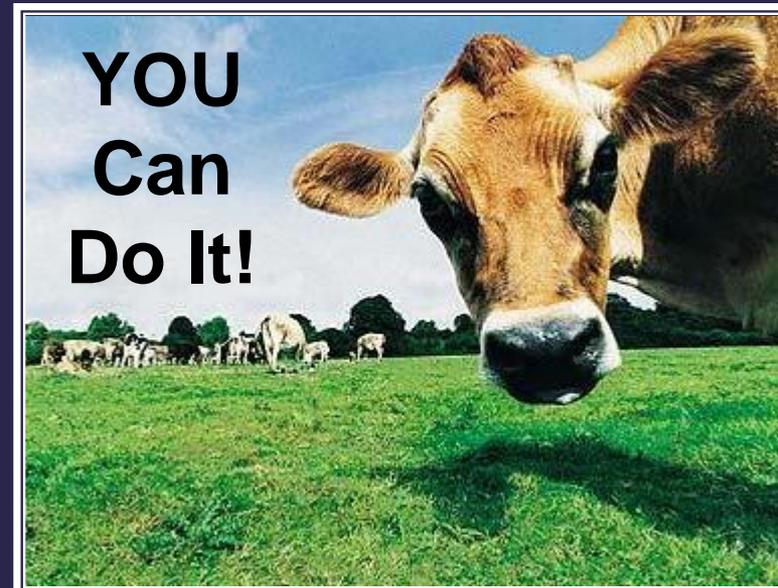
....involves you because YOU can:

Protect Public Health

Save Your Company Money

Reduce Operating Cost

- Improve water quality
- Sustainability
- Process operation
- Disinfection practices
- DBP formation & control
- Safety factors from design
- Many other issues....



Why Use 'Research Fundamentals'?

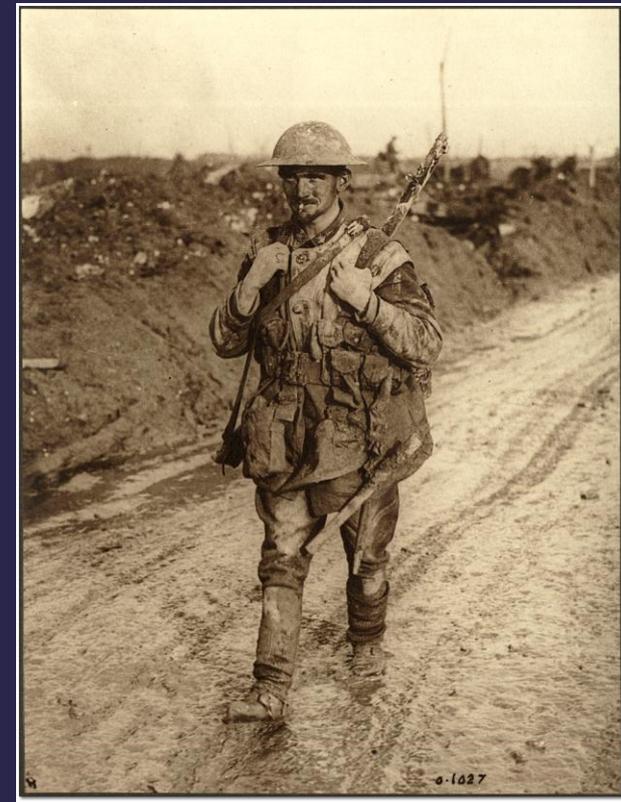
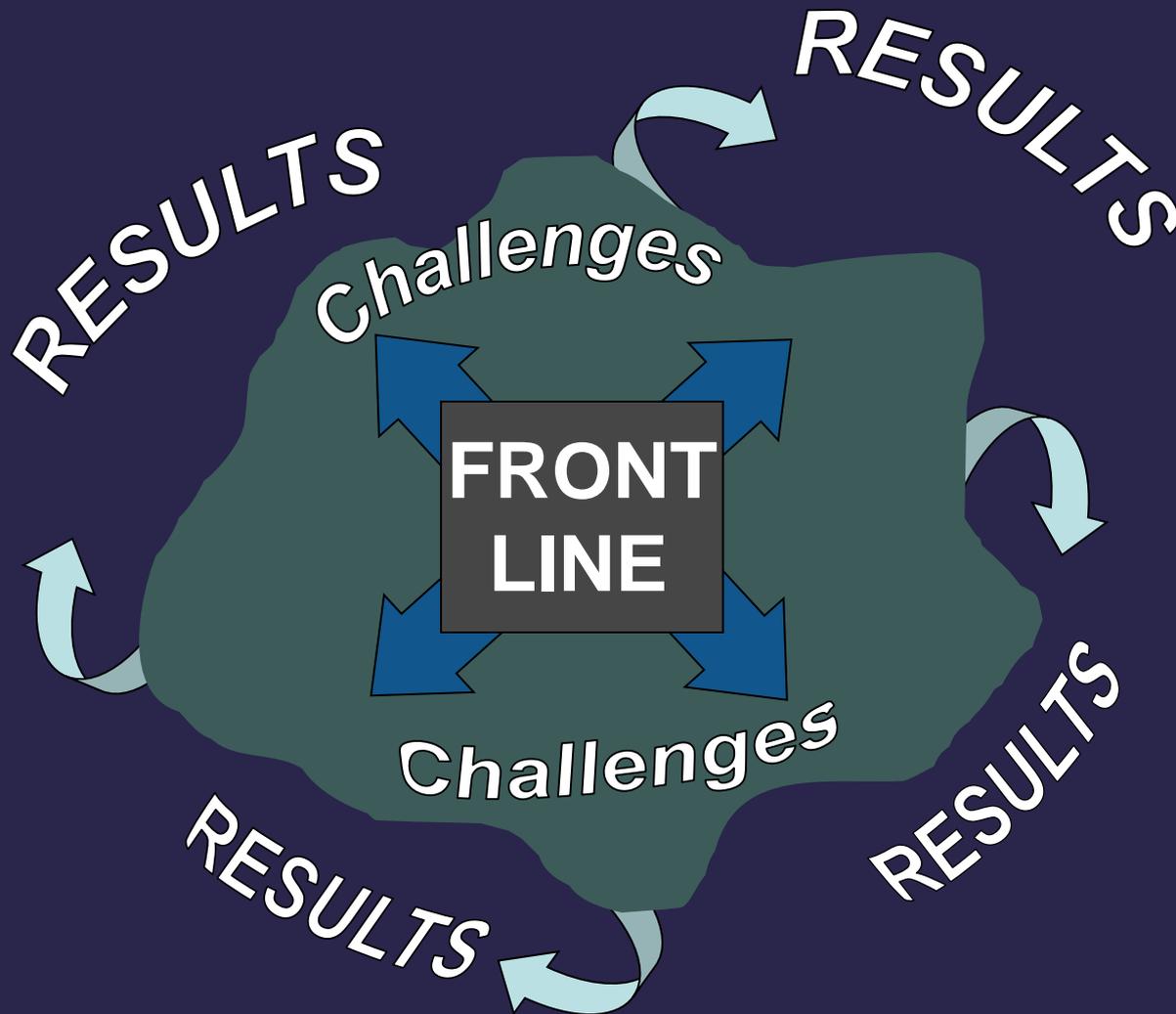
Your Location at Water's "Front Line"

Data Collection

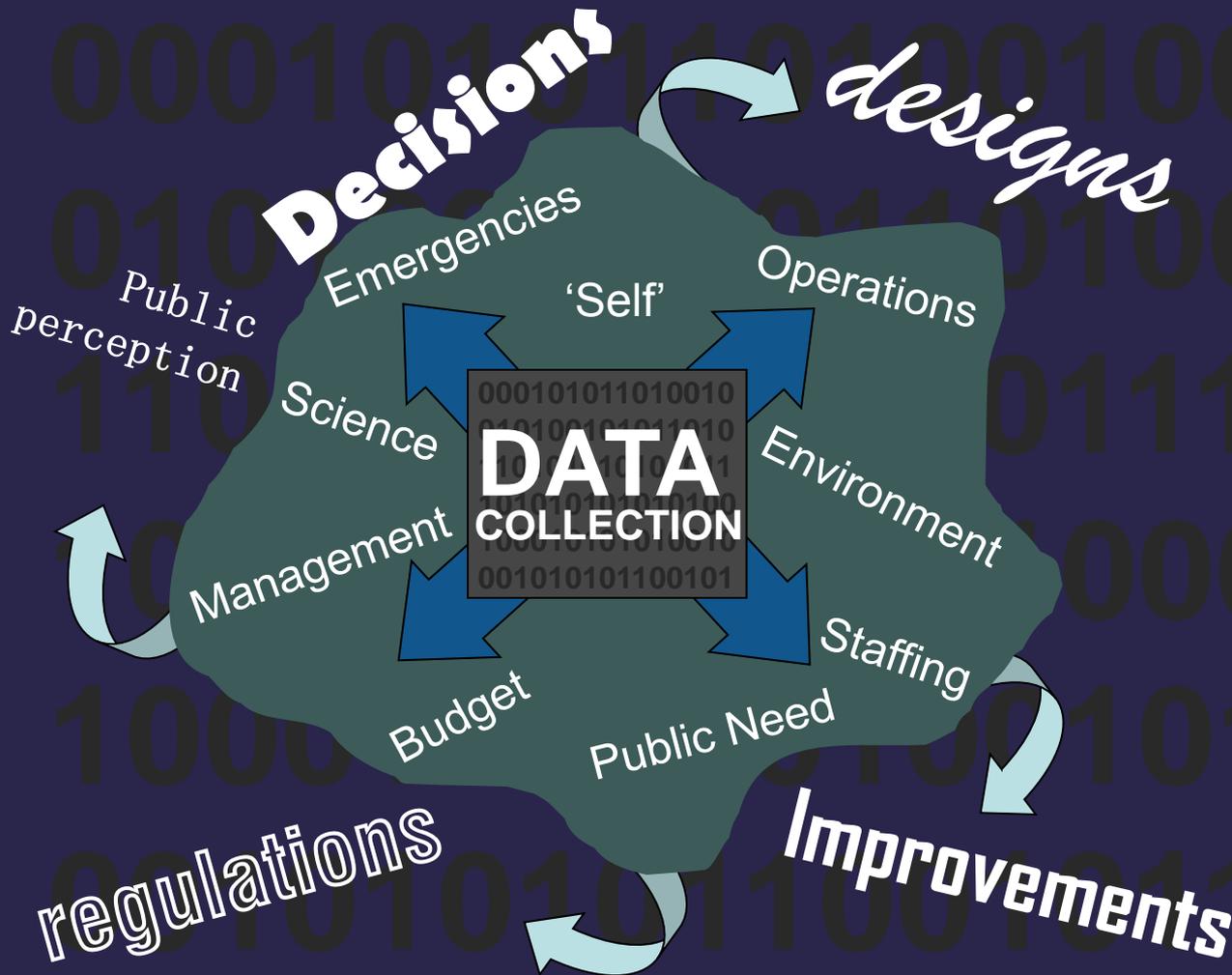
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Summary

Action at the 'Front' Impacts EVERYTHING



Your Data Collection Impacts EVERYTHING



Why Use 'Research Fundamentals'?

Your Location at Water's "Front Line"



Data Collection



- QA/QC
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Summary

The Data Collection Process

learn it, know it, live it!

Unknown 'Puzzle'

- Issues of concern?
- Important parameters?
- Variables?
- Confounding issues?
- Goals?

Guidelines

- Gather information
- Perform 'checks' and 'balances'
- Strive for accuracy and precision



*There is Never,
Never,
Never Enough!!*

The Data Collection Process

what is your business as usual?

Learn From/With Others

- Is there missing information?
- Utility's future goals
- Discuss with peers

Remove Your 'Blinders'

- Know practice vs. reality
- Use initiative and teamwork
- Check analogous systems
- Document procedures AND problems



The Data Collection Process

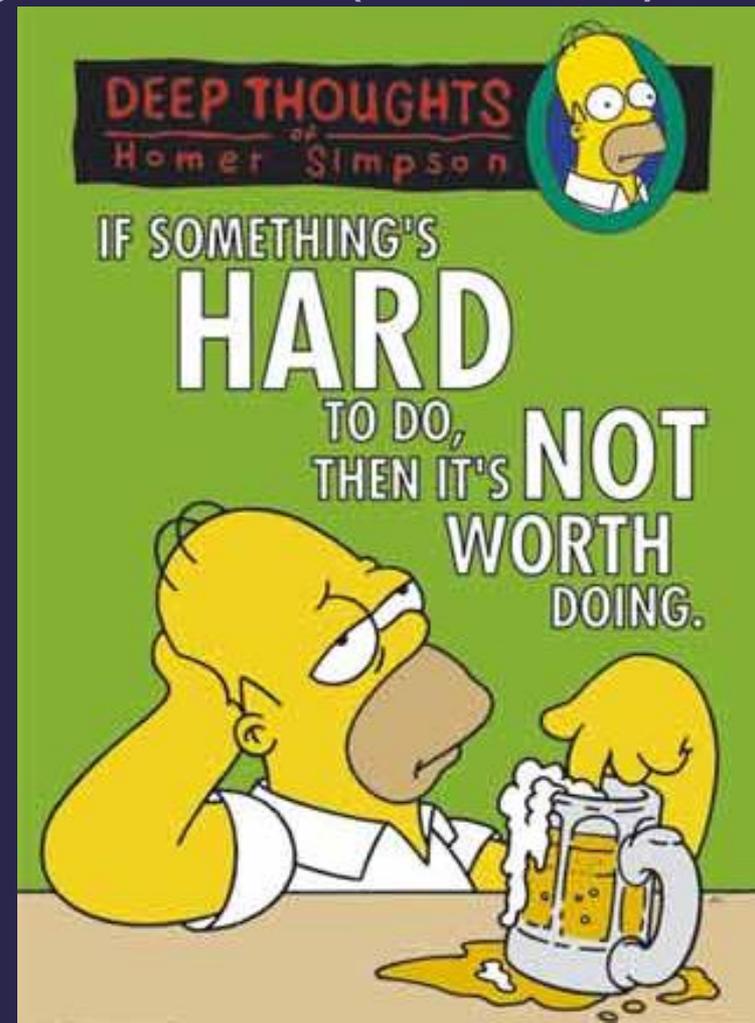
quality assurance and quality control (QA/QC)

Ignorance

- Is NOT bliss
- Is costly and can be unsafe
- Effects public perception

Practical QA/QC

- Note problems
- Describe success
- Accuracy vs. precision
- Garner trust in your product
- Methods DO matter
- Replication is good!



The Data Collection Process

procedures overview

What is the Question?

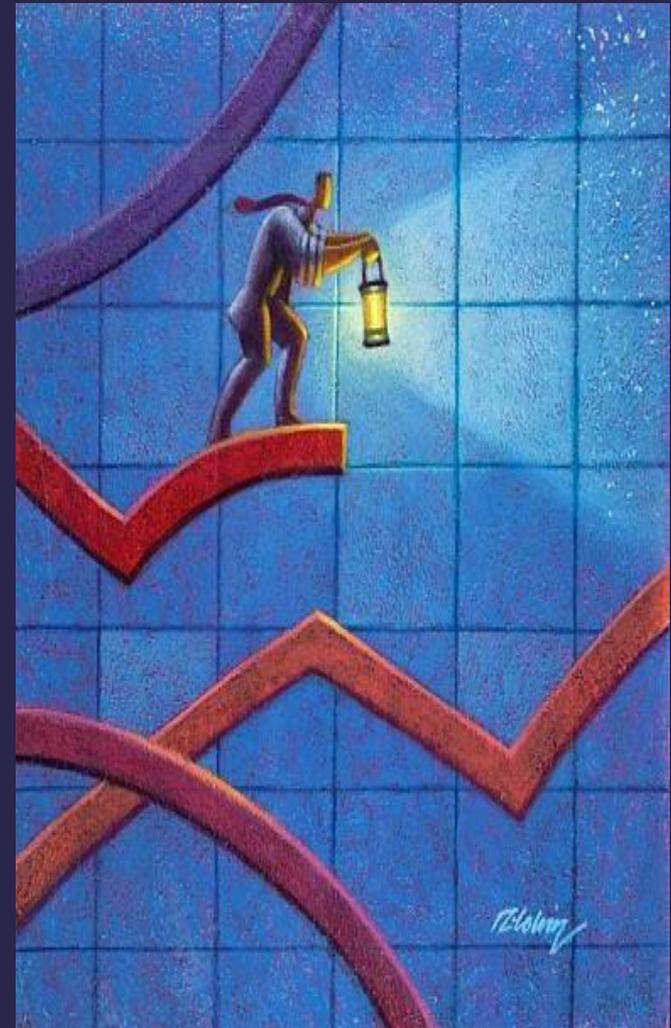
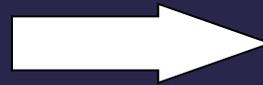


The Data Collection Process

procedures overview

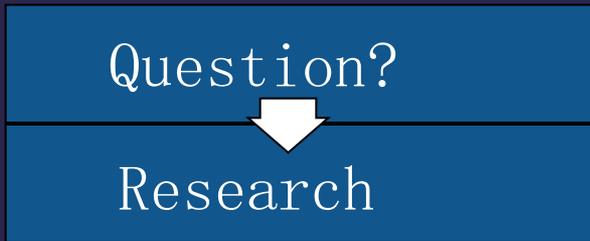
Question?

Background Research

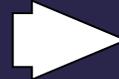


The Data Collection Process

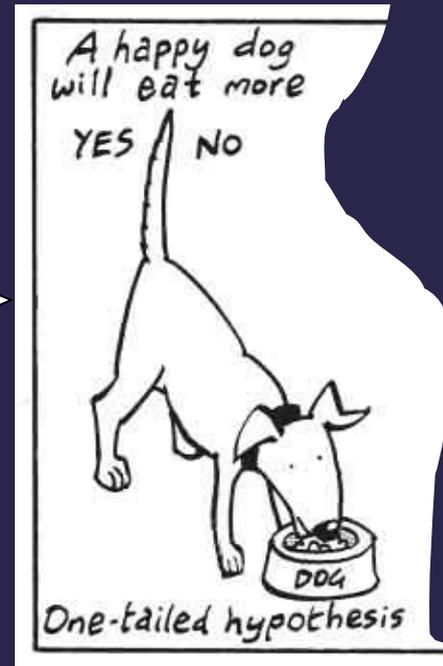
procedures overview



Your Hypothesis is...?



Predict Direction

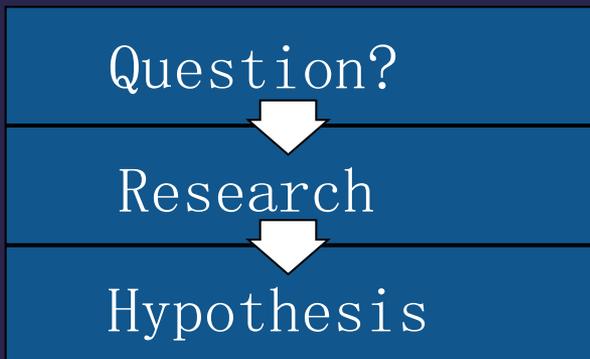


Increasing chemical dose decreases turbidity

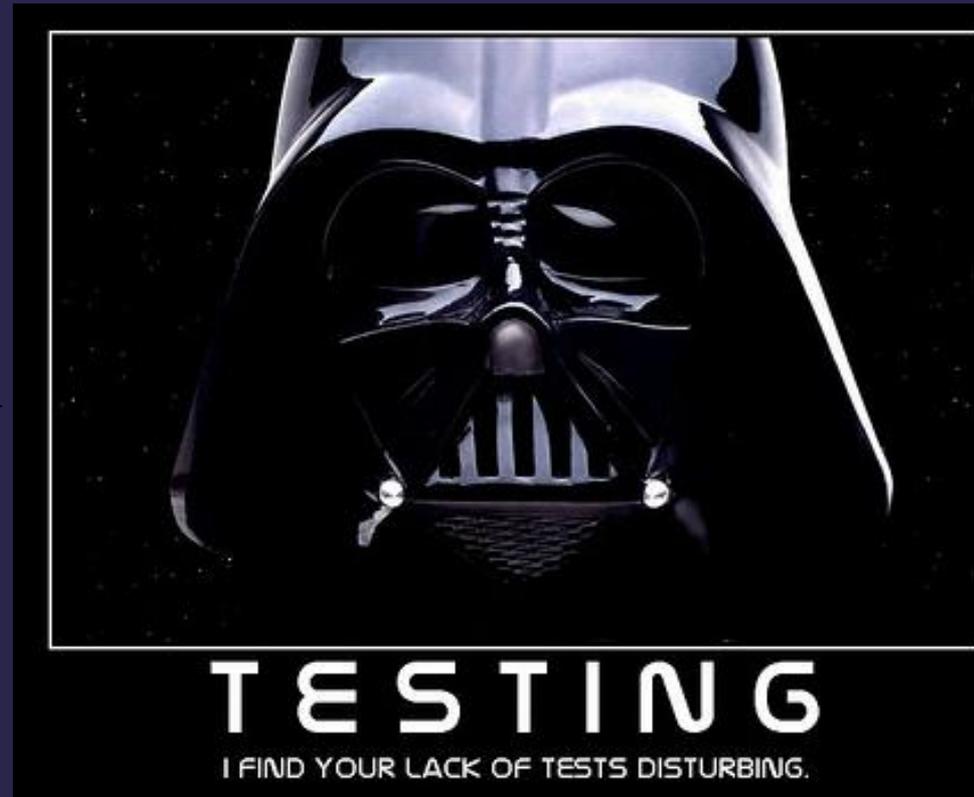
Mixer speed affects the turbidity level

The Data Collection Process

procedures overview



Test / Experiment



Mofidi & Boyd, Maintaining Data Integrity

AWWA Pacific Northwest Section 2009 Spring Conference: May 6-8, Salem, Oregon

Test / Experiment

Testing and Experimentation.....

accounting for unexpected variations

| Is it a Critical Issue?

- At first, discount nothing
- Continuous assessment
- Review events
 - Improve productivity or process
 - Improve safety concerns

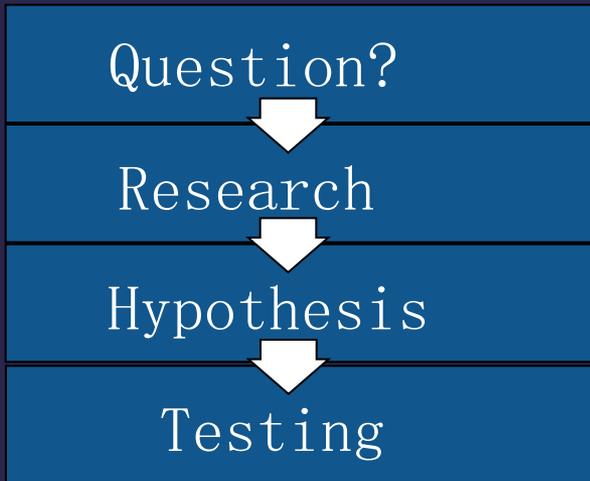


| Impact of Variation Without Documentation

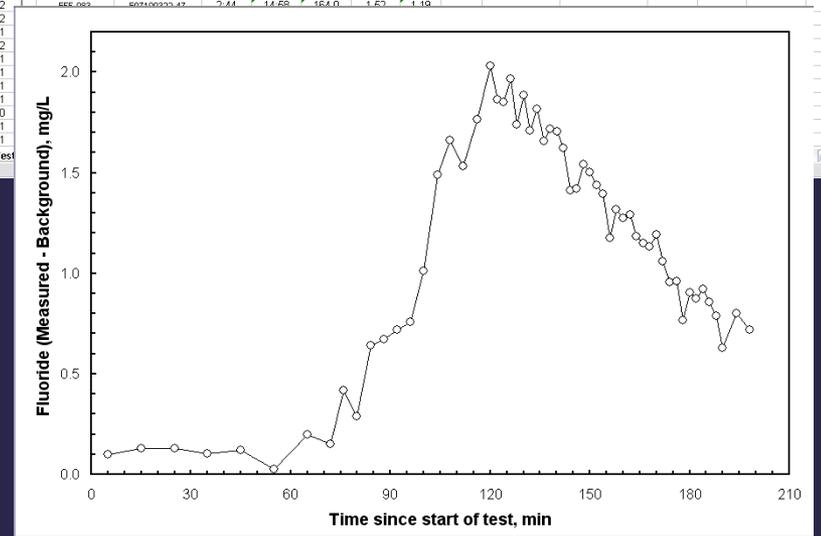
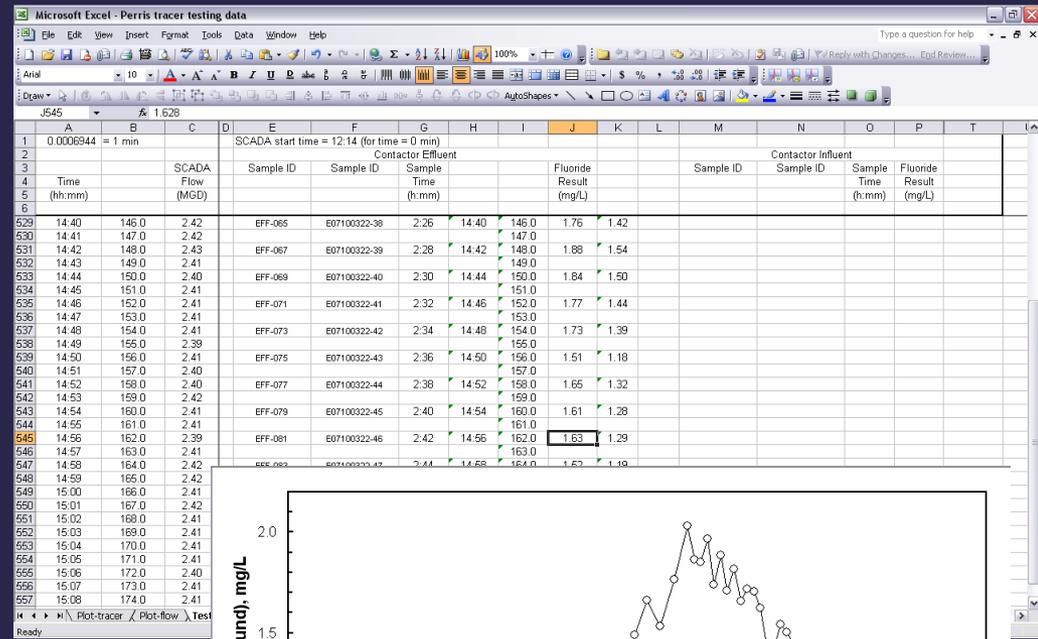
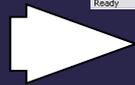
- Production of worthless information
- Loss of learning experience

The Data Collection Process

procedures overview



Analyze Results



Analyze Results

When Analyzing Your Results.....

determining criticality

| Have a Method for the Madness

- What does your 'note to self' look like?
- Live in the present & be accountable to the future

| Anticipate Impacts to ALL Customers

- Treatment / system improvements
- Utility management
- Public outreach / education
- Budget, environment, education value
- Regulatory growth and changes

When Analyzing Your Results.....

handling discrepancies

| Review Process

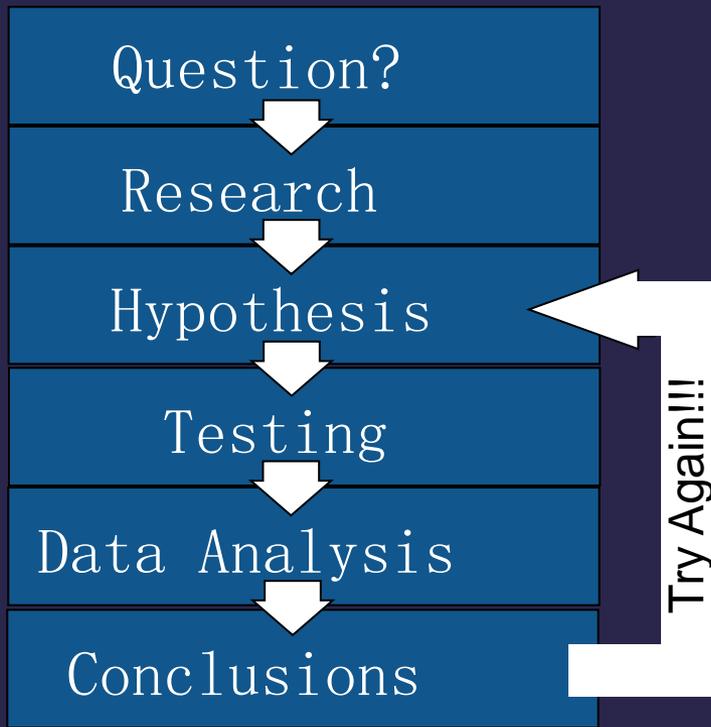
- Minimize time from occurrence
- Investigate with 'expert' witnesses (people and data)
- Objectivity (leave ALL agendas out of the equation)

| Describe / Document

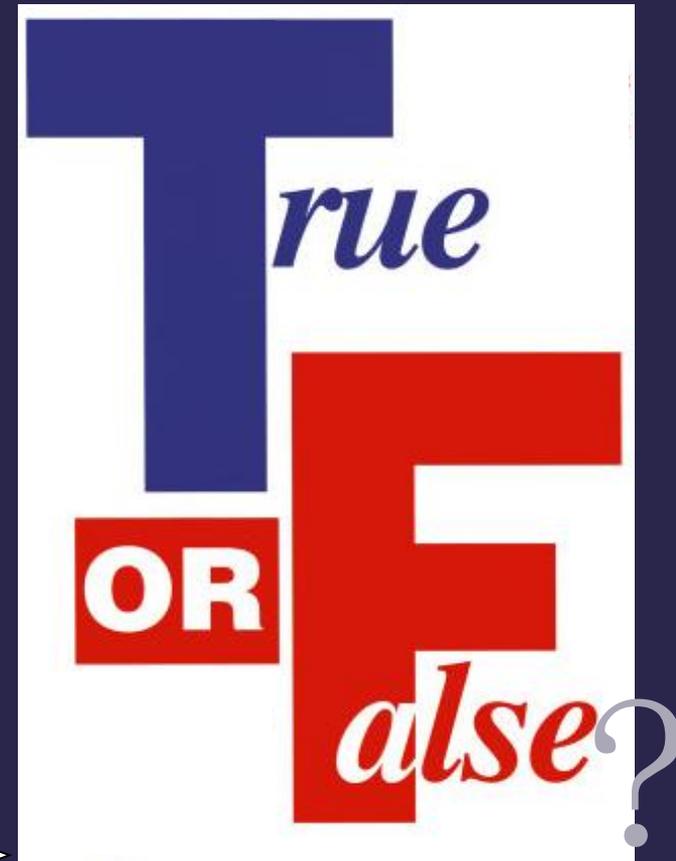
- Review becomes incomplete truth(?) after-the-fact
- Note concerns
- Provide feedback so all learn and don't repeat
 - Coach
 - Praise and encourage

The Data Collection Process

procedures overview

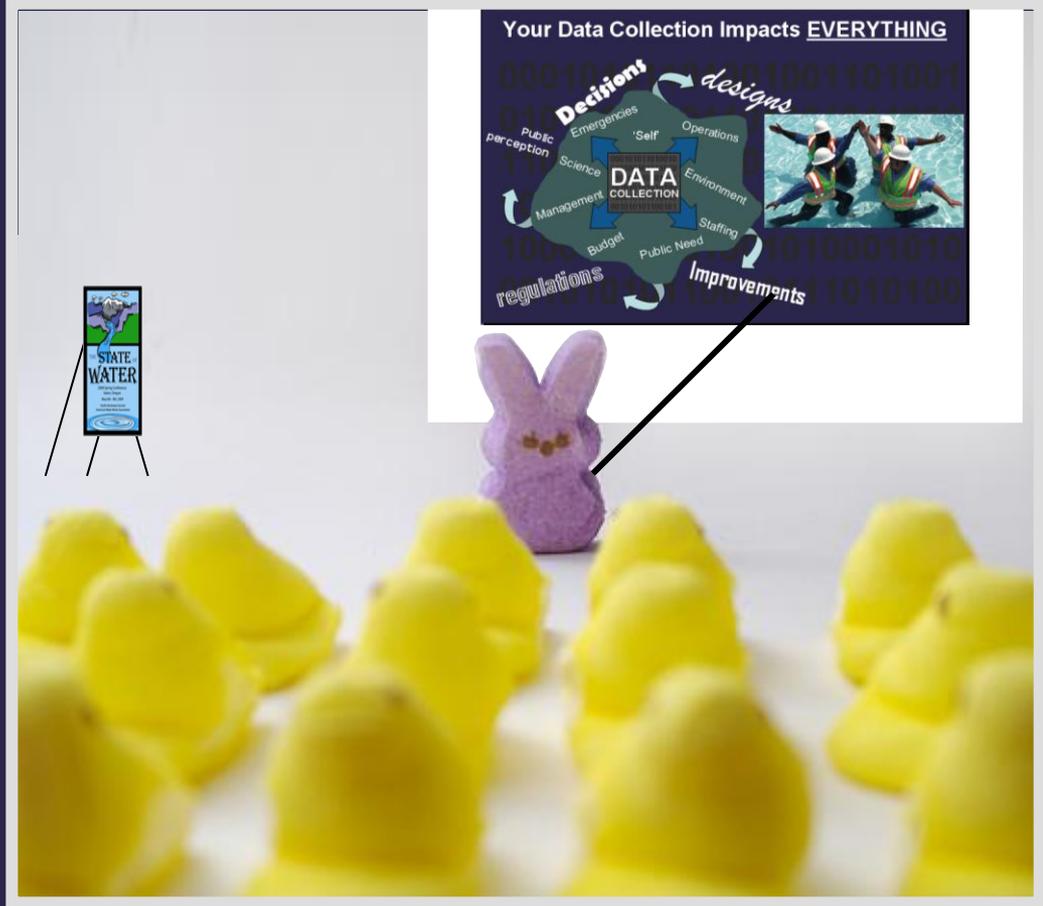
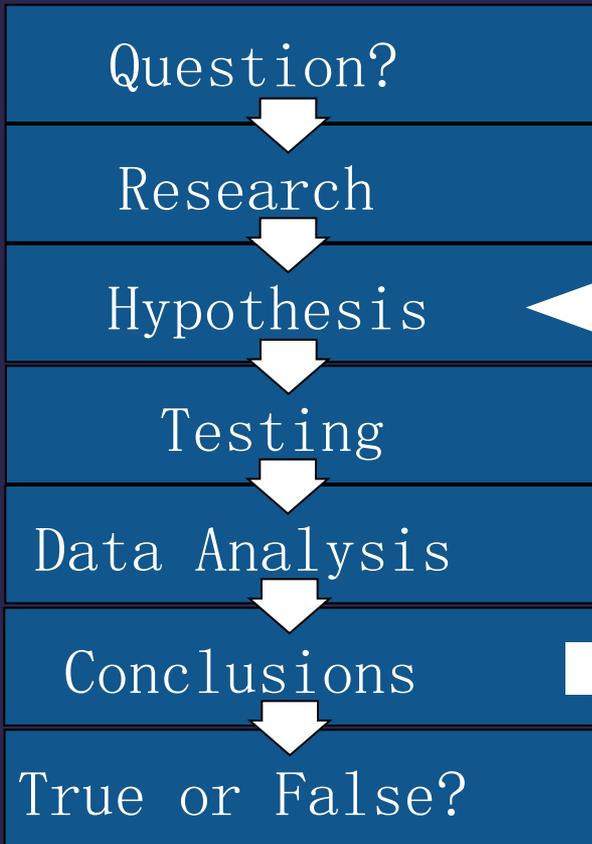


Hypothesis True or False?



The Data Collection Process

procedures overview



Report Your Results!!!

Summary

| You are Important and Your Job Matters!

- If it was easy, everyone would be doing it!
- Difficult ≠ impossible
- Making mistakes is OK, ignoring them is not
- It's like doing your taxes – except, it's a good thing!

| The Take-Home Message

- Documentation/communication is the priority
- Ask questions

The End
thank you!

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AECOM Water

With special thanks to:



Glen Boyd

Chris McMeen



Sam Perry

.....and the rest of your Research Committee!