Background on Comparative Analysis of Options

Doug Owen
TWG Representatives
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This Presentation

Objectives

Provisions

System compliance

Improvement

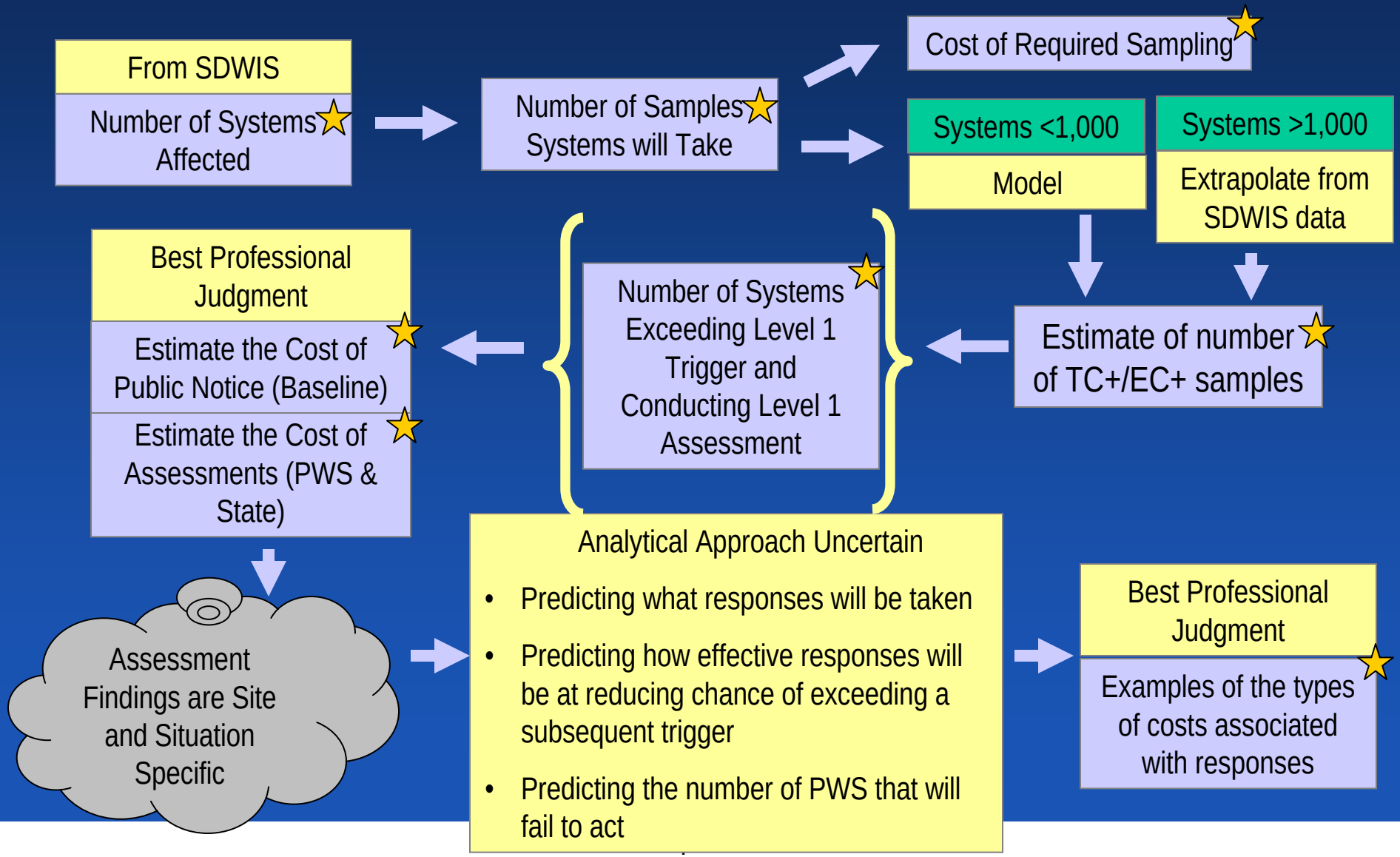
Research

Summary and Background of Options Analysis

Today's Presentations on Analysis

1. Summary and background (this presentation)
2. Option analyses and related findings for CWS < 1001
3. Option analyses and related findings for NCWS < 1001
4. Option analyses and related findings for all systems > 1000

Progress in Costing TCR Options



List of data that will be provided

- Baseline and repeat monitoring costs
- Systems triggered to level one assessment (number and percentage)
- Public notification costs
- Assessment costs for triggered systems
- Types of response for triggered systems, including example costs
- Household costs
- Acute violations

This represents the full extent of data that the TWG can provide for various options

Systems Affected and Monitoring Costs

- Estimates of Systems Affected
  - Analysis approach was similar to previous presentations
- Monitoring Costs
  - Analysis approach was similar to previous presentations
  - Sample analysis costs were revised to reflect collecting and shipping multiple samples and with updated shipping costs
  - Cumulative costs are lower than previous presentations

We did our best to accurately reflect rule options submitted – PLEASE check our interpretation!

Reduced Monitoring Criteria

- Estimating the effect of rule criteria identified by FAC required several different data sources:
  - SDWIS database for MCL and M&R violations
  - 6-year review database for history of TC+
  - GWR EA for disinfection status
  - ASDWA / State data on sanitary surveys
  - Information on state CCC programs
- Degree to which criteria overlap with respect to individual systems could not be determined
  - Current estimate is more likely to reflect higher numbers of systems on reduced monitoring than will actually be realized

Estimating No. of Systems Triggered

- Statistical Model for Systems <1001 population served
  - Based on a single year of data (2005) collected from Six-Year Review Information Collection Activity
  - Relies on best-fit models of observed monitoring data for routine & repeat samples
  - Model provides predictions of current rule that are comparable to historical data from SDWIS
- SDWIS violation data were used directly for systems > 1000 population served

Underlying data are based upon current sampling practices with no assessment or corrective actions required. Limited ability to predict outcomes when actions are implemented through options

Conducting Assessments

- Analysis reflects FAC subgroup assumptions to best of our understanding
  - Definition of assessment is evolving
  - Hours and costs have changed since last month's draft analyses
- Analysis reflects a range of system costs based on two general approaches for implementation
- The cost of assessments were only aggregated to national level for current rule and Level 1

Assessment Components

- Costs reflect personnel time only, no direct cost
- Two cost centers captured – state and utility hours
  - Wage rates do not reflect indirect costs
- There is variation in effort expended in assessing elements depending upon system characteristics
- Hours vary as a function of system size / distribution system complexity
- Larger PWSs are presumed to have more extensive staff and internal review processes

Assessment Cost Ranges

Lower Bound

- Driven by best professional judgment
- Assumes limited resources
- Circumstances dictate, not regulatory due diligence

Upper Bound

- Regulatory due diligence
- State oversight requiring documentation
- Guidance assumed to be similar in detail and character to Stage 2 DBPR or recent LCR guidance

Individual situations may not be adequately captured – extended travel times, extensive investigations, proactive steps beyond FAC outline

Cost of Response(s) to Assessment Findings

- We prepared some examples illustrating the range of costs that could be incurred in response to assessment, depending on:
  - What is found during assessment, and
  - The range of actions envisioned within a selected rule option.
- We did <u>not</u> prepare a national estimate of response actions

Cost Data Summary

- The available analysis provides a useful tool for:
  - Comparing individual rule elements
  - Demonstrating the relative impacts of portions of rule packages that could be incorporated
- The uncertainty around response elements is large and national costs cannot be estimated.
- Did not include Level 2 & 3 cost estimates in national costs
- Additional clarity on intent underlying option descriptions may change estimates

Summary of Option Impacts Across System Sizes for CWS

Element / System Size	Monitoring Costs	Systems Triggered to Assessment (no. and %)	Assessment Costs	Acute violations acted upon
<100	$8M - $9M	677 - 939 5-7%	$39K - $366K	69 – 96
100 – 1,000	$11M - $12M	387 - 588 2-3%	$31K - $286K	45 - 63
> 1,000	$158M - $159M	355 2%	$0.2M – $1.0M	64

Summary of Option Impacts Across System Sizes for NCWS

Element / System Size	Monitoring Costs	Systems Triggered to Assessment (no. and %)	Assessment Costs	Acute violations acted upon
<100	$12M – $51 M	2,848 - 9,014 4 - 12%	$297K - $4,311K	302 - 1,088
100 – 1,000	$6M - $21 M	1,054-3,146 3-10%	$66K - $1,022K	110 - 368
> 1,000	$2 M	172 10%	$60K - $270K	33

Summary of Option Impacts on Household Cost for CWS

Element / System Size	Monitoring Cost for Systems not Triggered	Monitoring Cost for Triggered Systems	Cost for Assessment for Triggered Systems
<100	$26 - $29	$36 - $66	$4 - $36
100 – 1,000	$7	$9-16	$1 - $6
>1,000	$1	$2	$0.08 - $0.34

Summary of Typical System Costs for SW CWS 500 – 1,000

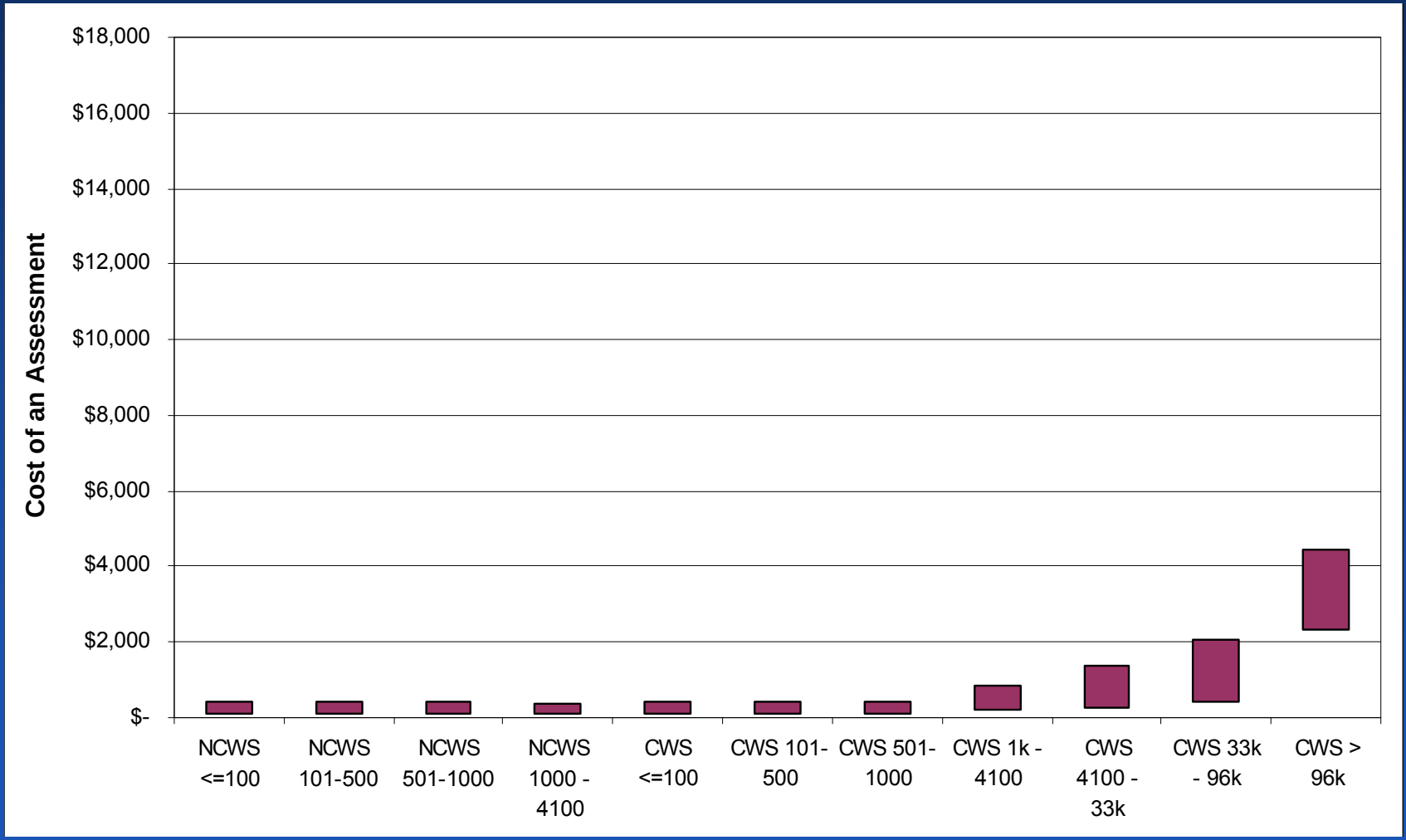
Item	Typical Annual System Cost ($)
Routine Monitoring	700
Level 1 Assessment	430
Public Notice for Acute Violation	310
CCC Program Implementation	7,500
Sampler Training Program	750
Inspection of Tank	5,200
Flushing & Disinfecting Tank	3,200

Discussion Questions

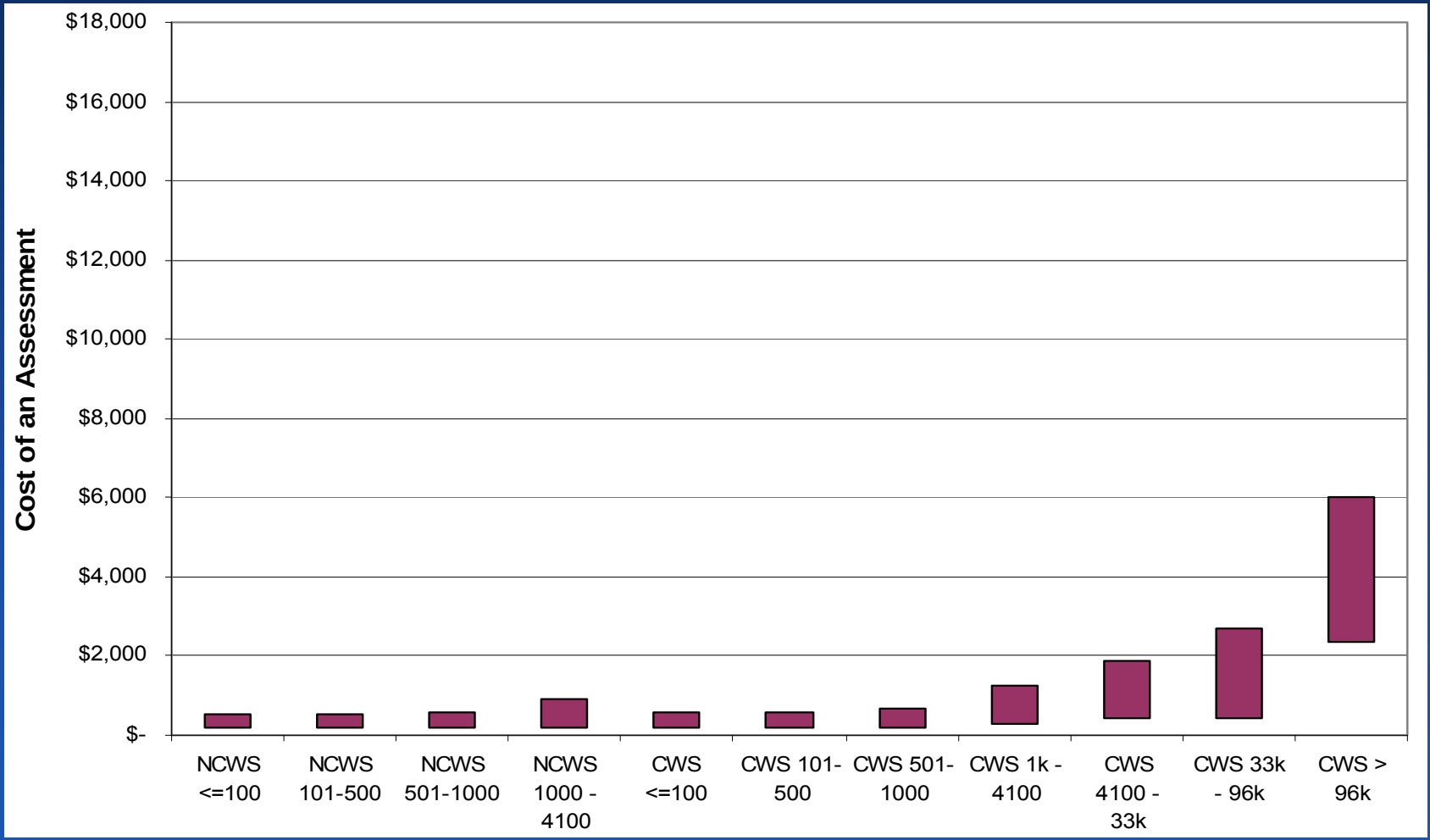
- How does this information help the FAC in evaluating the different options?
  - There are many rule elements to discuss, including assessments and responses
  - Much of the aggregated cost information is associated with monitoring
- How does the analysis capture the value of a new rule construct?

Appendix – Assessment Costs

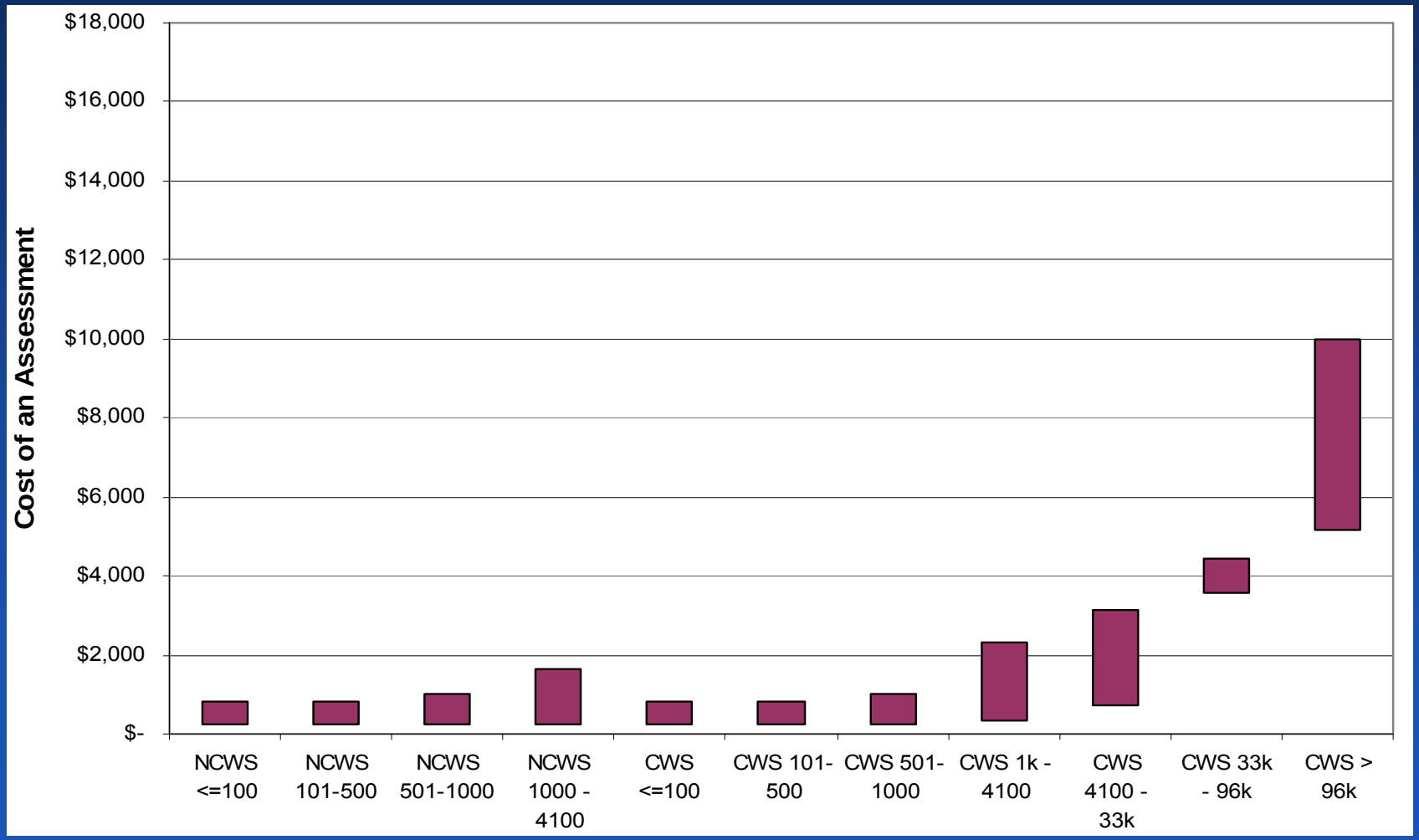
Assessment – Estimate of Current Voluntary Activities



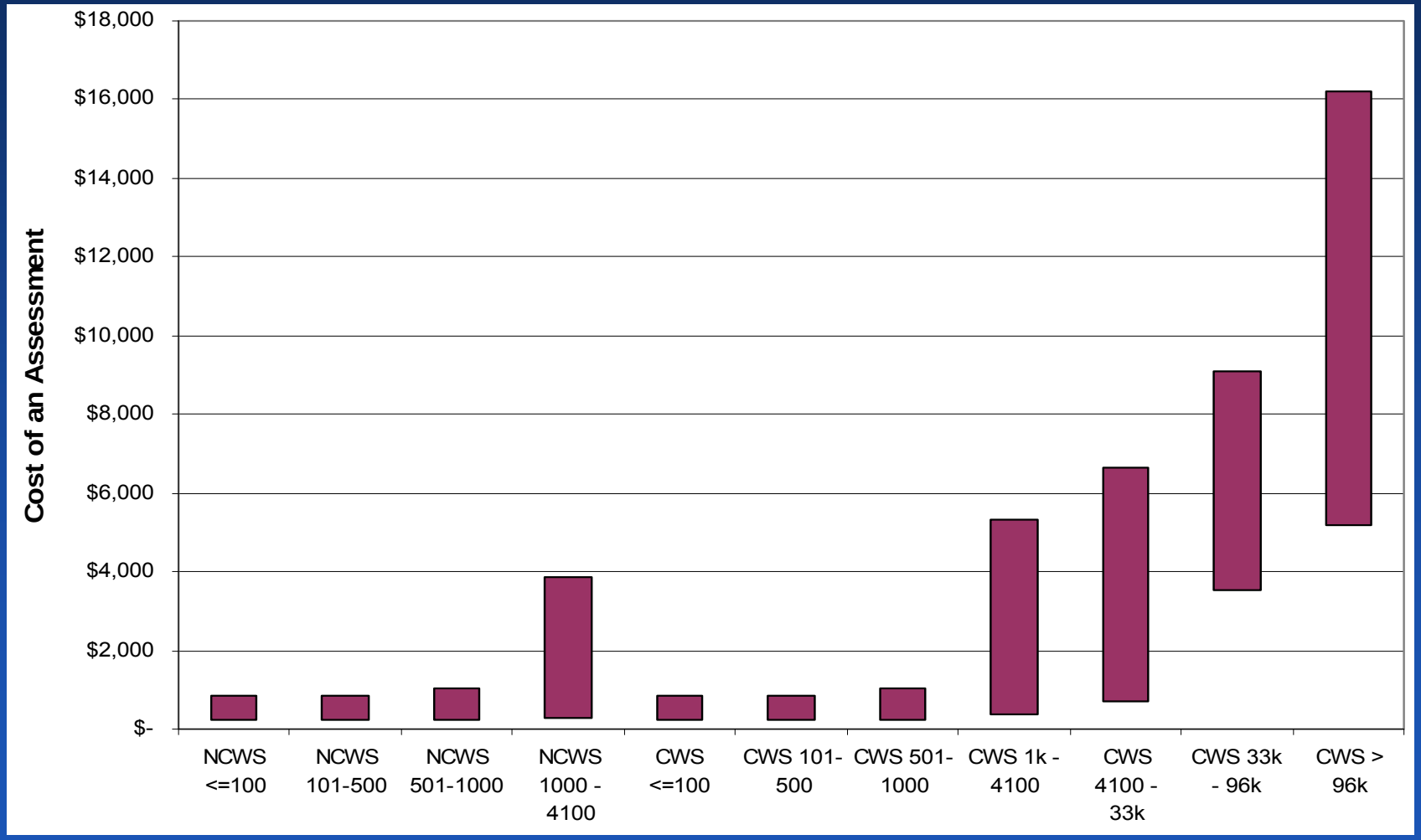
Initial Assessment



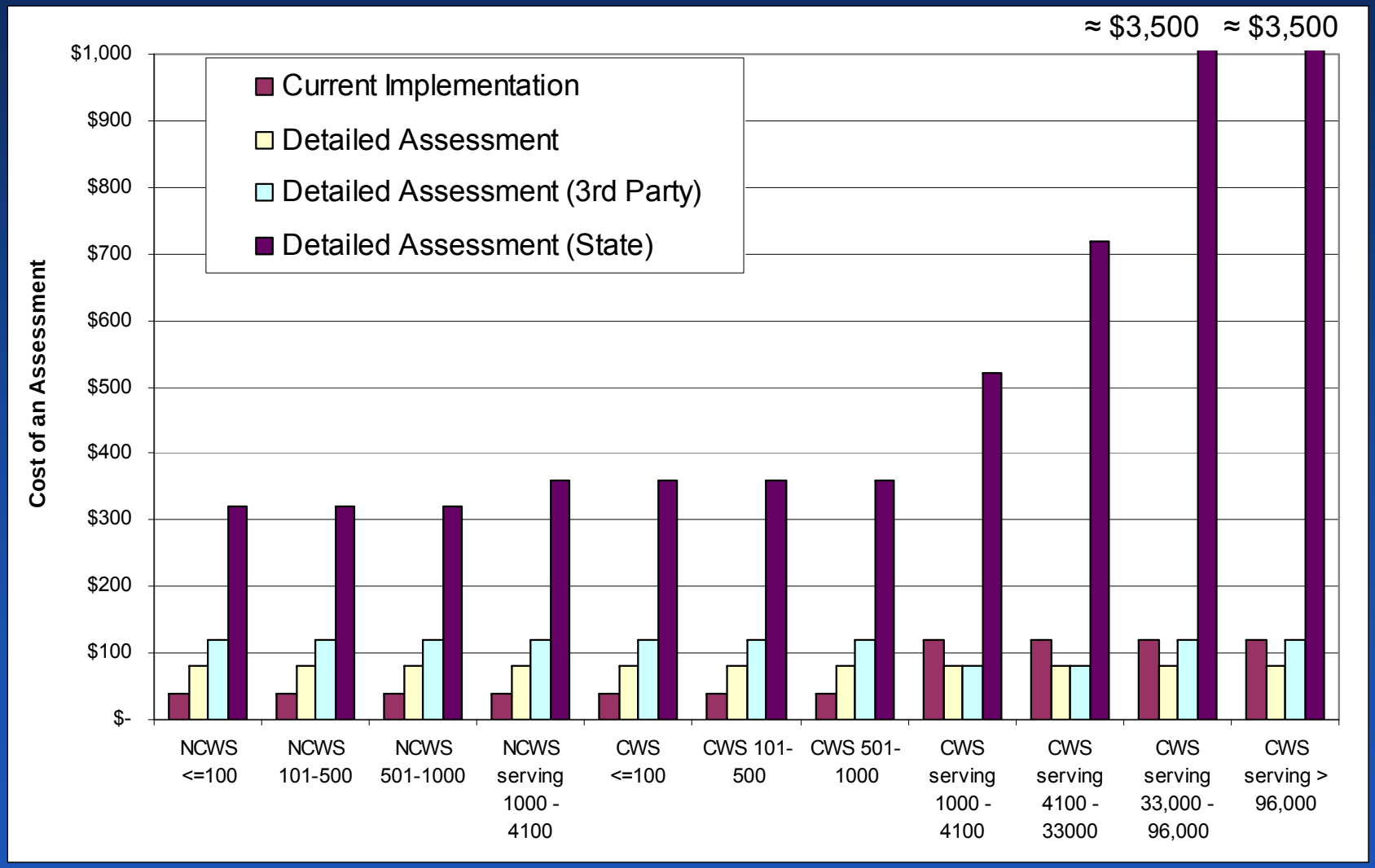
Assessment- Detailed Guidance



Assessment with 3rd Party



State Costs Overseeing Assessment



Observations from Assessment Costing

- Accurate costing requires a clear understanding of the breadth and detail of the investigation
  - NCWS
    - Initial assessment involved ½ - 2 person-day for most NCWSs
    - Level 2 assessment, current range is 1 day to ≈1 week for similar sized systems
  - CWS
    - Initial assessment
      - Required personnel is closely tied to system size
      - CWS<1000 pop served – ½ - 2 person-days
      - CWS 1000 – 33,000 pop served – 1 – 5 person-days
      - CWS >33,000 pop served – no less that 2-3 person days and as much as 2 – 5 weeks of personnel time

Observations from Assessment Costing

- Level 2 assessments diverge rapidly based on underlying assumptions
  - The lower bound estimate reflects no more than 1 day of effort for all NCWSs and CWSs up to 1000 pop served.
  - The upper bound estimate suggests as much as 1 week of personnel time would be required for even many NCWSs
  - Divergence between two estimates increases with system size but both estimates agree that systems of 33,000 pop served or greater will expend at least 3 weeks of personnel time on a Level 2 assessment
  - The upper bound estimate reflects multiple weeks of personnel effort being required even for systems in the 1,000 – 4,001 pop served size category

Appendix – Response Costs

Describing Response

- Difficult to predict nature of typical response in abstract
- Example costs provided
  - Public notification – current rule requirement for non-acute violation
  - Potential corrective actions
- ASDWA compiled recent sanitary survey deficiencies more frequent items included
  - **Lack of a CCC/BP Plan or Program**
  - **Storage tank repairs**
  - **Inadequate monitoring planning and execution**
  - **Most other deficiencies were linked to water source**
- Concerns at NCWS and CWS linked to the source (most frequently a well) are addressed under other regulations

Response – Cost Implications

- Moving from a “Driven-by-PN” to “Assess-and-Respond approach will likely have significant cost consequences for specific PWSs
- There are direct impacts on:
  - How systems will respond to individual TC positives when one or perhaps a few more positives trigger an active regulatory requirement for assessment and response?
  - Assessments resulting from initial trigger events will lead to operational and potentially capital responses
- Unfortunately these factors make a meaningful prediction of the national cost consequences associated with response:
  - Impractical to prepare
  - Potentially misleading if the assumptions underlying the cost analysis were to mislead the policy discussion

Response – Cost Implications

- Unfortunately, the prelude to every TC exceedance will be unique
  - What is the history of management at the system?
  - How well is the operator trained in distribution management?
- No option, including the current rule, results in a large percentage of these systems being triggered
  - The TCR applies to more than 150,000 PWSs; only a relatively small fraction of which will be “triggered” formally by the rule
- At present, the substance of what states will expect from the assessment process under different rule options is not clear

Response Actions with Cost Detail

- Public notification
- Backflow prevention
- Sampler training
- Storage tank repairs
- Flushing
- Pipe and tank replacement

Response - Public Notification

- Current Public Notice requirement costs for TCR Nonacute MCL violation

Cost	NCWS <=100	NCWS 101-500	NCWS 501-1000	NCWS serving 1000 - 4100
PN for nonacute MCL violation	$ 102	$ 102	$ 102	$ 102

Cost	CWS <=100	CWS 101-500	CWS 501-1000	CWS serving 1000 - 4100	CWS serving 4100 - 33000	CWS serving 33,000 - 96,000	CWS serving > 96,000
PN for nonacute MCL violation	$ 154	$ 205	$ 205	$ 1,220	$ 5,320	$ 16,900	$ 25,770

Response – Backflow Prevention

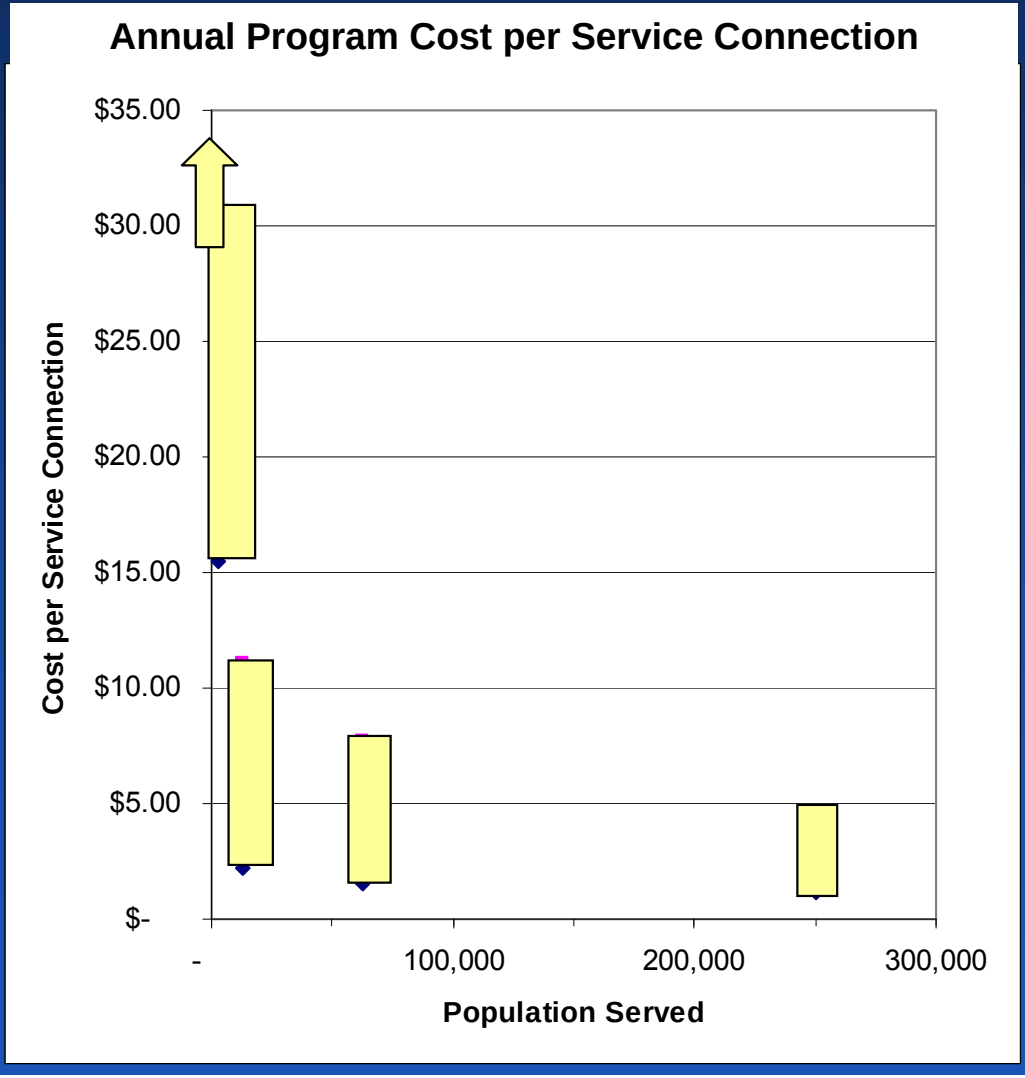
- NCWS
  - A potential concern is backflow internal to a property
  - Actual costs of installation will vary with
    - Number of hazards,
    - Pipe size,
    - Regional contractor rates
    - Local permit fees
    - Ancillary trenching
    - Landscaping
    - etc.

Contamination Hazard (Common Domestic)	Isolation Requirements	Range of Cost
Water Softeners	Point of Use	$150 to $400
*Auxiliary Supply	Premises	$150 to $700
Water Treatment Units	Point of Use	$150 to $400
Irrigation System	Point of Use	$100 to $300
Swimming Pools	Point of Use	$25 to $150
Hot Tubs	Point of Use	$25 to $150
Hose Bibs	Point of Use	$5 to $50
Animal Water Trough	Point of Use	$25 to $100

Response – Backflow Prevention

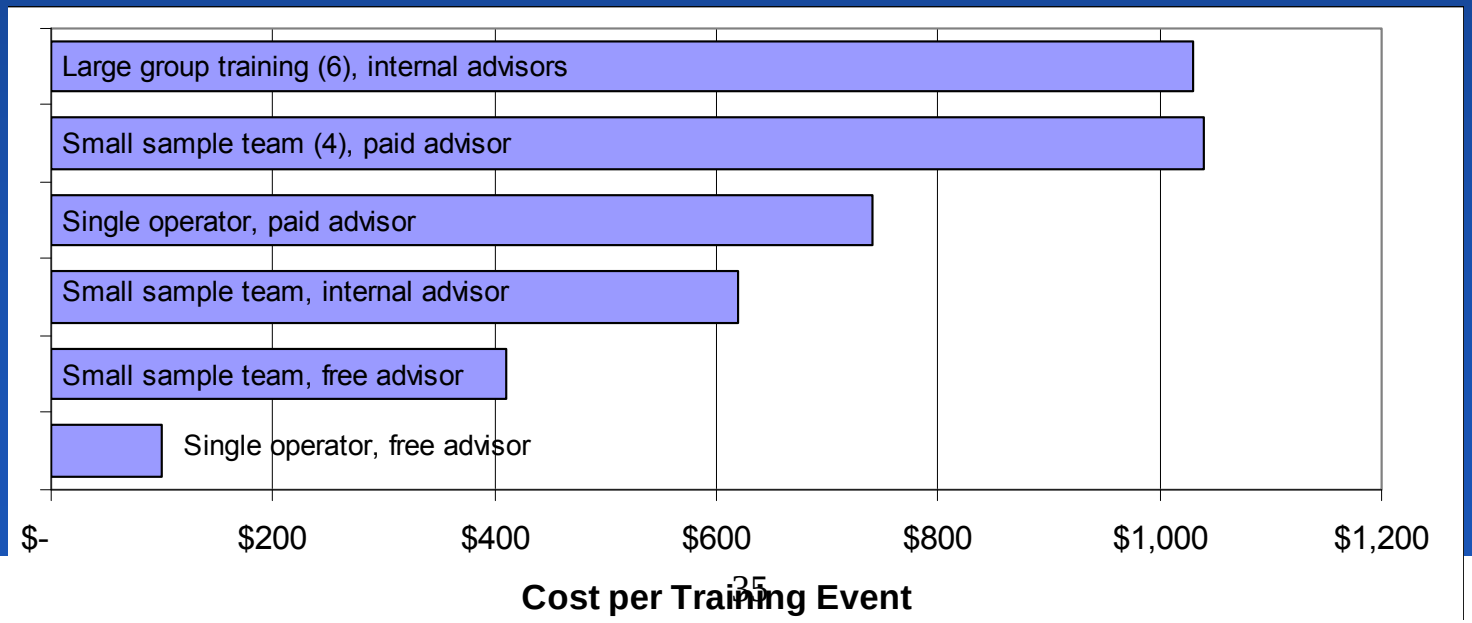
- CWS Annual Program Costs were captured in a 1999 AwwaRF study (Swartz et al)
- Additional customer costs include
  - **$150 – 700 in installation fees**
  - **$60+ for regular testing**
  - **$90+ for repair (e.g., replacing seals, etc.)**

(Ongoing O&M costs would also be relevant to NCWS installations)



Response – Sampler Training

- Monitoring Errors will lead to Sampler / Laboratory staff training
  - There is existing literature from EPA and states to assist systems
  - Internal staff at larger CWSs will use available materials and internal SOPs to support training
  - Smaller CWS and NCWSs will need outside advisors which may or may not provide this service for free



Response – Storage Tank Repairs

- Storage tank repairs are a function of the type of repair, size of the tank, and criticality of the facility
  - Large, critical tanks are difficult to take offline without affecting PWSs ability to provide reliable water service
  - For NCWSs if there is a tank, there may only be one tank
- For CWSs repairs are typically preceded by an inspection
- Repairing a missing screen involves labor and materials
  - Location will be critical to cost of labor
  - Actual cost of screens is $200 – 500 a piece.
- Repairs can include:
  - Washout
  - Patching seams or leaks, replacing hatches, etc.
  - Repainting interior and / or exterior
- Elevating the residual in a tank without taking the tank out of service can eliminate some TC problems

Response – Example Tank Activities

- If contamination of a tank is severe then the entire volume of the tank can be discharged to surface water or sewer

Tank Size (MG)	Activity				
	Flushing	Inspection	Washout	Disinfection	Elevating Residual
0.01	$700	$3,500	$300	$100	$200
0.5	$2,200	$5,200	$600	$200	$200
1.0	$4,300	$6,500	$1,200	$300	$300

- Typically NCWS to have much smaller tanks than those represented above.
  - 1 MG tanks would be typical of CWSs in the 5 – 50,000 pop served range,
  - Larger systems would tend to install 5 MG, 10 MG or larger facilities
  - Combinations of tank sizes would be common across all CWSs

Response – System Flushing

- When TC positives are accompanied by low residuals, flushing portions of the distribution system can be used to elevate the residual
- When low residuals are a more systemic issue unidirectional flushing can be used to clear pipe. Application also involves:
  - Ongoing use as part of routine practice
  - Initial investment in engineering planning of flushing program
  - Requires supporting valve repair /replacement program

Field Costs	
Approach	**Cost Per Mile**
Flushing alone to raise residual	$1,140
Flushing with chlorine addition to raise residual	$1,150
Unidirectional flushing to clean pipe	$1,275

One 8 hour shift will flush ≈1 mile of pipe, which is rough scope of area a CWS would likely target in vicinity of a positive TC site.

Response – Pipe and Tank Replacement

- It is possible under some of the options to require major capital investments
  - NCWS Examples
    - Replace storage tank
    - ???
  - CWS Examples
    - Replacing piping to address concern about infiltration
    - Install tankage to prevent loss of pressure

Item	Unit Cost
CWS	
6-inch pipe replacement (Cost per mile)	$109,000
Install hydropneumatic tank (20,000 G)	$42,000
NCWS	
???	
Install 2,500 G bulk storage tank	$750

Appendix – Unit Costs

TCR Sample Unit Costs

System Size \ # Simultaneous Samples	5	4	3	2	1
≤100	$38.28	$39.46	$41.43	$45.37	$57.19
101-500	$39.31	$40.51	$42.50	$46.50	$58.48
501-1000	$47.58	$48.79	$50.81	$54.86	$67.01
1001-4100	$50.22	$51.47	$53.54	$57.68	$70.10
4100-33,000	$53.14	$54.41	$56.53	$60.78	$73.51
33,001-96,000	$57.16	$57.81	$58.89	$61.05	$67.54
>96,000	$71.90	$72.03	$72.25	$72.69	$74.01

Assumptions on Unit Sample Costs

- Increased sample burden to account for travel time
  - ≤500: 0.5 hours/sample
  - 501 – 96,000: 0.75 hours/sample
  - >96,000: 1.0 hour/sample
- Updated labor rates to 2007 dollars
- Used $20.94 as average contractor lab analytical cost (based on quotes from labs in 9 states)
- Shipping 100 miles away
  - Most use ground shipping (50%)
  - Some using lab courier pick-up (20%), standard next day (12.5%), priority overnight (12.5%), and some delivering themselves (5%)
- In-house based on O&M cost + 0.5 hour x labor rate for given size category
- Same assumptions as before for in-house vs. contractor
  - ≤33,000: 100% contract lab
  - 33,000 – 96,000: 50% contract lab, 50% in-house
  - >96,000: 10% contract lab, 90% in-house

Delivery Assumptions for Unit Sample Costs

	Total Shipping Cost				
	1 sample	2 samples	3 samples	4 samples	5 samples
Courier	$3.50	$3.50	$3.50	$3.50	$3.50
Ground	$6.65	$6.77	$6.88	$7.00	$7.12
Std. Next Day	$38.48	$38.48	$38.48	$38.48	$38.48
Priority Overnight	$45.12	$45.12	$45.12	$45.12	$45.12

	Per Sample Cost				
	1 sample	2 samples	3 samples	4 samples	5 samples
Courier	$3.50	$1.75	$1.17	$0.88	$0.70
Ground	$6.65	$3.39	$2.29	$1.75	$1.42
Std. Next Day	$38.48	$19.24	$12.83	$9.62	$7.70
Priority Overnight	$45.12	$22.56	$15.04	$11.28	$9.02

Self-delivery depends on labor rate for given system size: Range of $184-238 for a single sample (per sample cost decreases when >1 sample is self-delivered)