Communicating with Decision Makers on Water & Wastewater System Needs

JD Solomon, PE, CMRP

2014 AWWA-WEA Financial Seminar
Presentation Overview

- Brief Context Background
- Phases, Issues, and Approaches
- Lessons Learned
- Summary Thoughts
- Discussion
JD Solomon – My Perspective

- Have lived in Clayton for 22 years
- 9-year Town Planning Board Member
- Worked once on contract basis as senior Town planner
- Active in community – Little League, YMCA, Cultural Arts Foundation….
- Former Johnston County Economic Development Commission Chairman

- Technical training and background provided in introduction
- Decision support and management consulting for wide range of projects
- Representation for controversial projects (Landfills, Subdivisions, Industrials)

- Former NC registered lobbyist
- Former County Political Party Chairman
- Government Affairs and Media Relations Training
Brief Background
Town of Clayton

- Located in Johnston County, North Carolina
- 17 miles from Raleigh
- Population of 16,200
- Traditional downtown
- Balance of economic vigor and historic charm
Brief History of Wastewater Issues in Clayton

- Small wastewater treatment plant with limited footprint
- Since the mid-1990s,
  - Several small but meaningful expansions
  - Re-rating
  - Nitrogen issues (first credits, now process improvements)
  - “Check book” flow balancing with NCDENR
  - Growing residential and industrial base
  - Partnerships with other public jurisdictions

Elected officials are a diverse group with different “come froms”. Information on wastewater infrastructure investment needs to acknowledge that diversity. In any group of elected officials you are likely to see competing values and interests that can make approval of capital expenditures more difficult.
Town Manager Steve Biggs

- It is valuable to keep a balance sheet and make abundance or scarcity of capacity a well known fact by elected officials and the development community.

- It is also very important for elected officials and the public to understand the relationship of development fees to new capital investment. They drive each other.

- It is important for elected officials to perceive how resources (treatment capacity) come to be consumed and what the costs are for replacement. Financial resources become encumbered years before we begin to see a financial return in the form of having new retail customers connected and contributing to the revenue stream.
Wastewater actually bridges diverse Board interests very well and properly presented consensus can be made easier.
- Some members simply support expansion of WWTP capacity for economic development purposes.
- Others may not be as pro growth but respond well to environmental protection and water quality.
- Still others want to understand the regulatory issues at play.

Covering all aspects, all benefits, helps build support.

Compliance and capital investment has been made more complex by the emergence of mass based limits e.g. Nitrogen. I try to keep the issue of gallons per day separate from Nitrogen removal. Mixing the two in a single study or presentation potentially sends a mixed message that can make the decision process less clear.
Finally, everyone can easily lose touch with the cost of maintenance. WWTP's operate in a very harsh environment. The materials are corrosive and the facilities typically operate 24/7/365. They tend to operate out of sight and out of mind. A vigorous maintenance program is essential but very seldom realized.

This is where having strong and credible operators becomes crucial. They need to be advocates of their infrastructure. Also, more so than many other engineering functions (streets design, water and sewer maintenance), the nature of a plant and treatment process indicate that longer term, consistent relationships with design and process engineers are important.
Project Overview
- 3 wastewater treatment options
- Growth will vary across the Town’s service area
- Industrial customer flow grows to 0.9 mgd by 2020 – 30% of 3.0 mgd of total flow
- Geographic areas within the Town have different potential for routing to treatment
Goals of the Conveyance System Optimization

- Develop a meaningful forecast of wastewater flows through 2035
- Identify the infrastructure requirements for conveyance to treatment locations
- Develop an optimization model to identify the least cost option for future wastewater conveyance and treatment
A meaningful definition of system sub-areas was necessary for this study.
So how much flow do we need to treat?

Traditional Deterministic Forecasting

Single Point Estimates

- Unit demand
- Population Growth
- Future Development Density
- Future Employment

A single deterministic forecast

![Graph showing finished water demand projections](image-url)
What About Uncertainty?

- There is uncertainty in every variable used
  - Growth rate
  - Development density
  - Wastewater return rate
  - Water efficiency

- Traditionally, might look at sensitivity tests

- Can we build uncertainty into the projection?
  - Monte Carlo analysis
  - Create input distributions for a range of variables
2035 Flow by ETJ Sub-Areas

**ETJ – North**
2012 - 0.45 mgd

**ETJ – South**
2012 - 1.5 mgd

- 98% probability < 40% build-out flow
  - Expected Flow = 1.2 mgd

- 99% probability < 40% build-out flow
  - Expected Flow = 1.9 mgd
Flow Forecasting Insights

- Understand how wastewater flows might vary
  - Magnitude and timing of flows
  - Risk of building too early or too late, as well as too big

Current Capacity Total

$10M in capital cost
An optimization model was developed to process all possible routing scenarios.

Model Target:
- Net present value (NPV) of all Town conveyance and treatment costs through 2035.

Model Constraints:
- Forecasted wastewater flows need to be routed to a treatment location.
- Flow routing, timing and final treatment location had to be consistent with identified routing options.
- Little Creek WRF cannot exceed 2.5 mgd permitted capacity.
Easy to say “optimize this”

Hard part is creating the logic to define flow routing

Optimization Model
Define costs based on future conveyance scenario flows
The Town can balance future flow with existing treatment capacity
- Enough capacity through 2035
- Excluding flow from ECIA

A review of the 25th, 50th and 75th percentile wastewater flows revealed that the majority of the optimal routes were similar
- Minor areas shift to balance flow and capacity

Need to start testing the waters on expanding current treatment contracts
- Duration and quantity

Model not concerned with sunk cost
- Optimizing based on lowest unit cost for treatment and conveyance
Least unit cost option for treatment is the Town’s facility, but due to its age it will best to reduce the load on the facility.

Good for the Town to maintain system flexibility:
- Balance short term capacity and cost by sending flow to Town owned facility
- Provides for future options
Lessons Learned - Communications
Lessons Learned – Phase 1 (Pre-treatment at source)

- Framing the problem correctly was essential for success
- Building the initial decision tree in Phase 1 was key to understanding future changes
- Probabilistic modeling of construction costs was very important for credibility with all parties

Phase 1 had limited external uncertainties and focused mainly on process engineering and construction cost estimating.

Probabilistic approaches can and should be used inside the relative technical environments, but over-complexity too early in the initial analysis stage related to external conditions should be avoided.
Lessons Learned – Phase 2 (Offsite pre-treatment)

- Be able to identify when the problem frame has changed!
- Build a new approach when the problem frame changes, rather than building complexity and layers into an existing one
- Use all of the tools at your disposal, and anticipate which ones will be most meaningful to decision makers
- At some points in the process, a deterministic approach may serve you better than a probabilistic one
- The truth is powerful – use it when it is on your side, and stay on an honest, non-threatening message

Elected officials and administrators do not need to be reminded or lectured on political realities – they work with them every day!
Decision trees, with or without financial expected values, are very effective in maintaining the project frame for technical team. However, not necessarily the tool for every elected official.
Conveyance Study Context

- 3 wastewater treatment options
- Growth will vary across the Town’s service area
- New industrial flow grows to 0.9 mgd by 2020
  - 30% of 3.0 mgd of total flow
- Geographic areas within the Town have different potential for routing to treatment

Geographic picture for ease of understanding is worth a thousand words
Uncertainty and Future Wastewater Flows

Most laypeople can understand potential uncertainty in costs and timing if conveyed visually.
Numerous options for routing wastewater for treatment

Be careful and limited in use of influence diagrams and flow charts when dealing with laypeople
Summary Comments
Example: What Elected Leaders Want
(Executives, Public Administrators, Coaches, Generals, etc. have their own lists)

- To do something good and be part of the solution
- To get re-elected
- To get things done that are important to them
- To avoid making people mad at them if they do not care much about the issue
- To not look bad or stupid to the public, their colleagues, or the media

We have some powerful (and cool) tools at our disposal. In presentation, they must be aligned with decision maker and needed purpose at that particular point in time. Do your best to understand the people and the situation, and make it about them and not you or the analysis.
Acknowledgements

- Adam Sharpe
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- Town of Clayton, NC
  - Steve Biggs, Town Manager
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  - Nancy Medlin, CFO
  - Tim Simpson, Public Works Director
  - James Warren, WWTP Manager
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