Breakout: Building Scale

• Public education – perception, wastewater quality controls & safety, operation and maintenance
• Regulatory framework – building codes
• Technology – scalable systems
• Responsibility - who should be responsible?
• Risk assessment – persistence of contaminants
Key Point: With advances in online analytics, we have the technology for cluster-scale scalping of wastewater for reuse, and public acceptance is there for irrigation and toilet applications.

- Knowledge of local site (hydrogeology, geography) is an advantage
- Regulatory cooperation is critical and may be problematic in some areas
- Scalping is a more likely to be successful upfront than full decentralized (anaerobic) treatment
- Game-Changing Technologies:
  - Membrane systems
  - Advanced oxidation (UV treatment, Ozone)
  - Sand Filtration systems
Breakout: Cluster Scale

• Technology Needed:
  • Online Analytics at small scale
  • Efficiency & cost of membrane systems
  • Odor prevention
  • Remote operation and management

• Public acceptance of reuse:
  1. Irrigation
  2. Toilet
  3. Showers
  4. Drinking water (option of last resort)
Breakout: **Catchment**

**Key Point:** We Need a Joint Vision for Bay Area

Incremental Pathway
Collaboration between plants for experimentation and scale-up
Regulatory/Compliance Environment
Flexibility?
  - Technologies for:
    - NH3 + N removal
    - Enhanced primary treatment
    - Residual solids

Wastewater as a Resource: Focus on the Bay
Breakout: **Catchment**

**Research:**
Energy Budgets for all Treatment Plants
Measurement of Flows- water, BOD, nutrients, I/I
Effects/Potential of different technologies
Effects of concentration
Toxics?
TSS
Salts
Risk analysis of upstream scalping failure
Breakout: REGIONAL SCALE

Key Point: Source-market proximity and connections
• Case studies, successful models
• Identify “markets” and their water quality needs
• Marketing mechanisms (brokers)

Key Point: Funding/permitting incentives
• Funding/permitting heterogeneity
• Ex. Storm water (altering hydrograph)
Breakout: **REGIONAL SCALE**

**Key Point:** Next generation of WWT
- Regional themes/problems (sea level rise)
- Opportunities for habitat creation/restoration, renaturalization

**Key Point:** Retrofit versus new
- Appropriate scale for tackling retrofit
- Technology needs
- Tech transfer (e.g., Australia)
- New sources (e.g., urban runoff)
Key Point:

- Important to realize the fundamental challenge of introducing novel systems to a hesitant public and agencies with conflicting missions.
- Potential Solution: Identifying proximate sites for demonstrations where liability can be minimized. (e.g., Institutionalized exceptions to discharge regulations)
Breakout: Economics of Distributed Systems

Questions:

• What is the minimum size of a customer for a distributed WWT system that results in (a) nutrient, (b) energy, (c) water recovery.

• What are the variable costs that may be associated with any single distributed system and what are the costs of handling large variability in WW flows.

• What is value to a “green-brand” derived from using recycled water if any and to whom.

• Can investors recover the fixed costs of a distributed system.
Breakout: Bench to Pilot to Full Scale

Bench -> Pilot -> Full Scale is iterative

Key Point: Need to establish a Non-Profit Entity

• Sponsors a bench-scale facility
  • Shared with a current facility
• All stakeholders involved (funding)
• Streamlined permitting system
• Regulatory certification
Key Point: Stakeholders must be involved

- WWT authorities
- Equipment companies
- Consultants
- Regulatory body (approval / validation)
Key Point: Funding

- Stakeholders + government (public & private collaboration)
- Surcharge associated with water bills
- Education fees
- Consultant trials and equipment trials at facility
- Material suppliers pay for use
Breakout: Bus. Gov & Finance

Key Point: “Treated Hetch Hetchy”

• Balance between price, value and cost of water
• Public Awareness
• Decoupling sales of water from profit
• Creating market place for resources found in wastewater
• Use existing infrastructure for Rec. water

Wastewater as a Resource: Focus on the Bay