

Overview of Breakout Session 1

Monitoring and Modeling to
Support Performance
Assessment

Co-Chairs Tyler Gilmore and David Roelant

“What DOE Needs”

- ✦ Integrated monitoring systems where multiple pieces of data fit together to create a comprehensive picture of site performance
- ✦ Monitoring tools that require fewer samples or that measure performance more directly
- ✦ Better early warning indicators that performance may be slipping to enable quick corrective measures
- ✦ Computer models that can be used to integrate large data sets into easily understood representations and forecasts of performance

Objectives

- ✦ Identify better ways to conduct performance monitoring
- ✦ Identify research areas or technology targets for advancing performance monitoring
- ✦ Determine major technology needs for performance monitoring

Products

- ✦ Identify new monitoring and modeling tools and systems that can improve the state-of-the-art in performance monitoring— what's available now, in the near-term (within 3 years), and in the long-term
- ✦ Are there better ways to indicate that containment measures are effective? Identify those measures? Is the remediation successful?
- ✦ How can monitoring and modeling tools or concepts improve communication with regulators and stakeholders?

Products from Workshop

- ✦ Results published on web
- ✦ Report to DOE that identifies technology needs

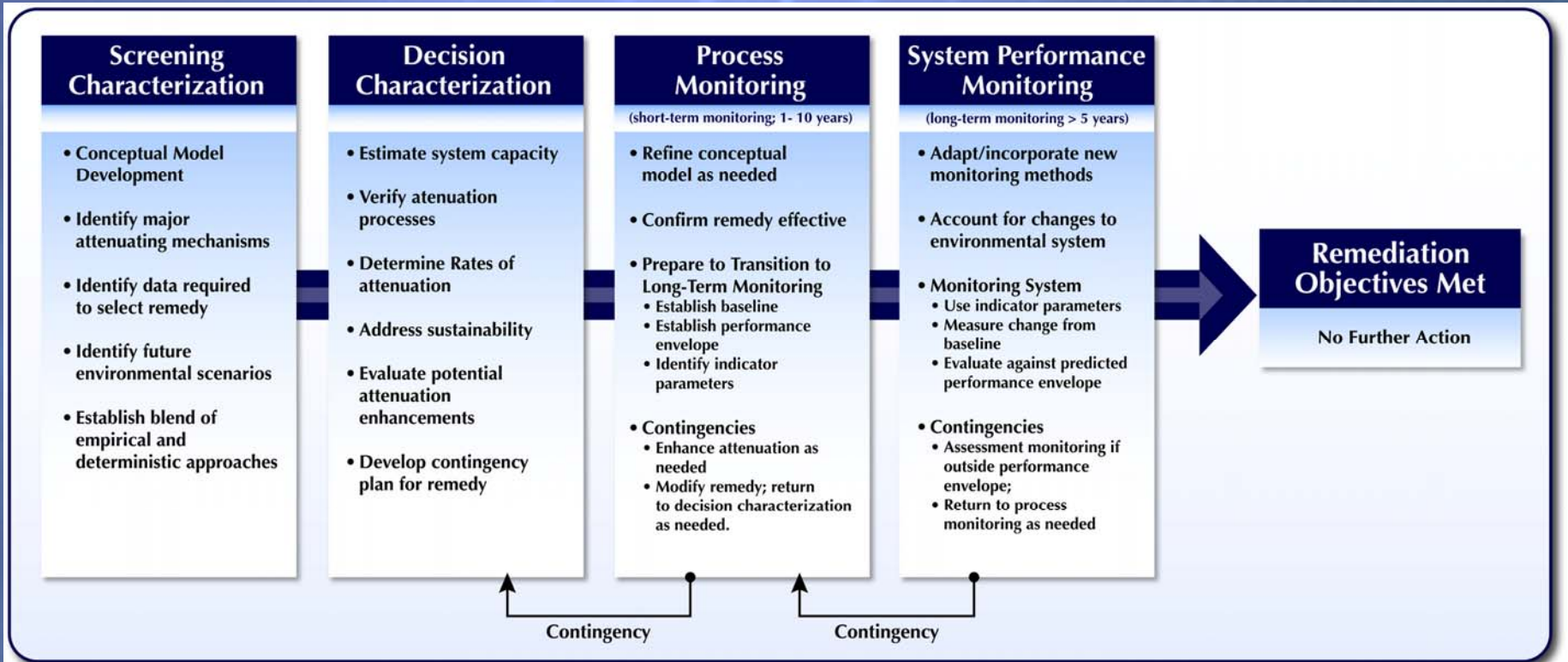
Breakout Session Rules

- ✦ Everyone participates
- ✦ No ball hogging
- ✦ No bad ideas
- ✦ Flexible but we have a schedule
- ✦ Need to produce a product

Monitoring and Modeling for Performance Assessment

	Time	Topic	Speakers
1	Tue 12:45-3pm (2:15hrs)	Overview of Breakout Session: expectations, products from meeting. overview of topics	Gilmore Roelant
2	Wed 8:30-10:15 (1:45hrs)	Process monitoring uncertainties and strategies prior to achieving equilibrium in plumes, landfills, MNA sites or stabilized/contained sites	Truex
3	Wed 10:30-12noon (1:30hrs)	Transition from process monitoring/modeling to performance m/m	Chan- Hilton Ankeny Benson
4	Wed 1-3pm (2:00hrs)	Monitoring to verify Performance modeling/Long-term monitoring strategies	Gilmore
5	Wed 3-4:30pm (1:30hrs)	Research needs, innovative ideas	All
	Thursday closeout		

Background and Introductions



EPA Tiering

Ref. Robert Ford et al. AGU conference

Tier 1

Actively demonstrate removal

Tier 2

**ID rate and mechanisms of
attenuation**

Tier 3

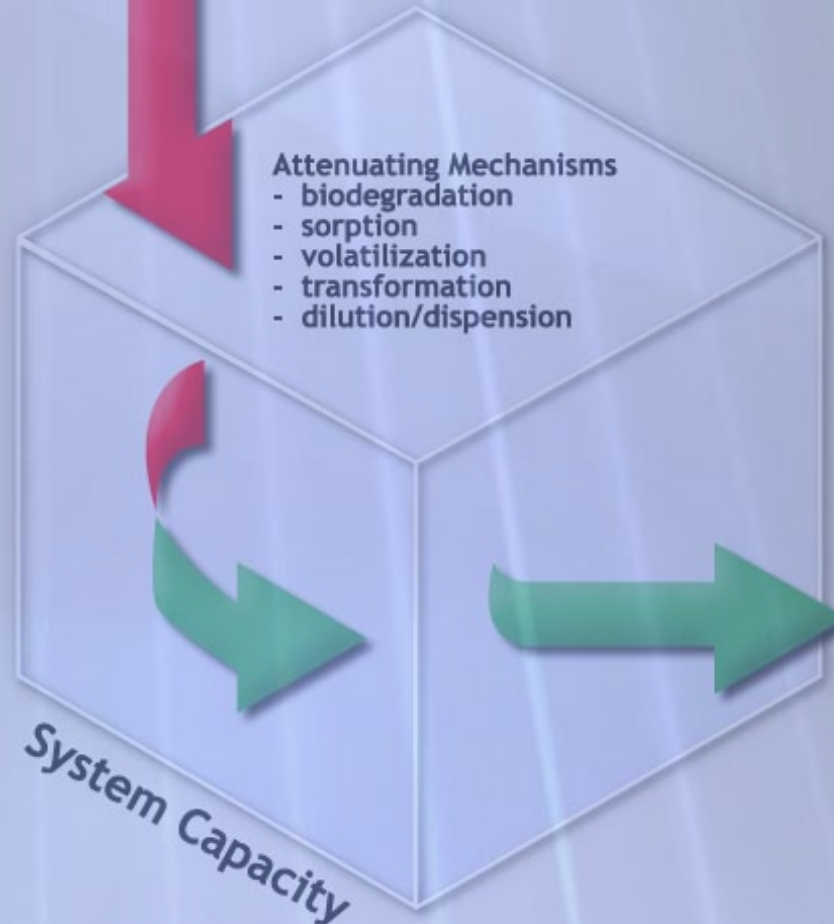
**Demonstrate long-term capacity
and stability**

Tier 4

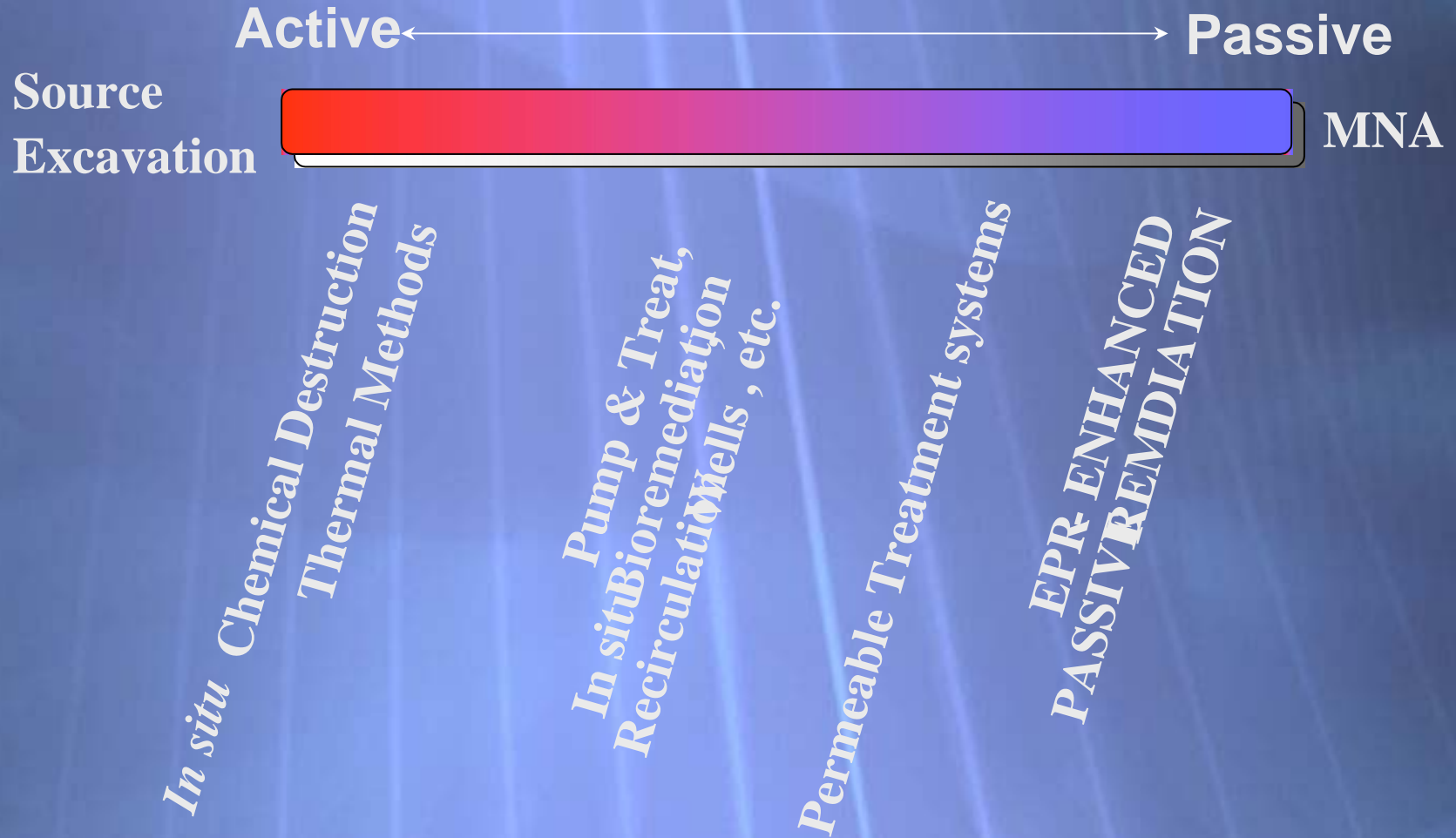
**Design monitoring program,
define triggers for failure and
establish contingency plans**

Mass Balance Approach

Contamination
Input



Remediation Continuum



Direct Measures of Natural System

- ✦ Contaminant Flux
- ✦ Advective Flow
- ✦ Natural Attenuation Mechanisms

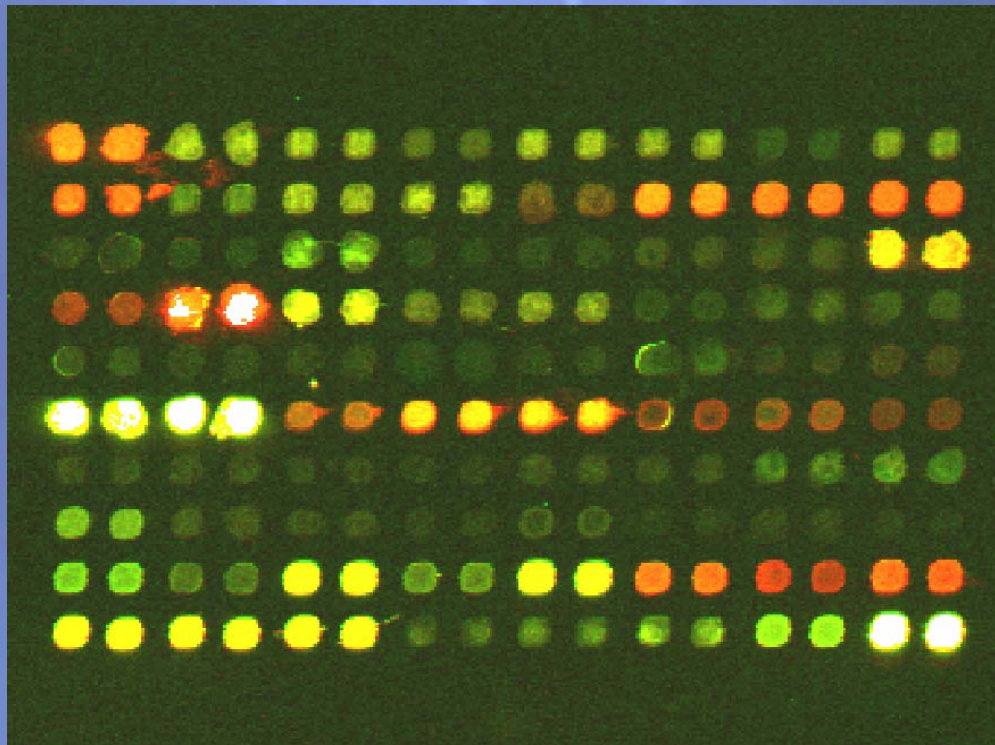
Painting a Portrait from a Silhouette

- ✦ *The different components of natural attenuation capacity contributing to the mass balance of a given site cannot be directly measured.*
- ✦ Actual evaluations of natural attenuation must rely on indirect measurements and indicators for each component of the mass balance problem.



Prototype DNA Microarray

64 Genes, mixed & pure cultures, over time



mRNA from Succinate fed cells ----Cy-3 (green)

mRNA from 2,4D-induced cells ----Cy-5 (red)

Flux Measurements

- ✦ Current methods
 - ✦ Estimated from extrapolating point-measurements
 - ✦ Estimated from computer modeling
- ✦ Need more direct field measurements
 - ✦ Volumetric measures

Compliance monitoring vs long-term monitoring

- ✦ Current strategy is to ring the waste site with detection wells
- ✦ Is this by default the long term monitoring network?
- ✦ How can modeling be used to facilitate monitoring?

Current Approaches to Long-Term Monitoring

- ✦ Monitoring Network Optimization (ASME others)
- ✦ Data-Quality Objectives (EPA)
- ✦ Grouping Waste Sites (Savannah River)

Attributes of Long-term Monitoring

- **Passive**
- **Robust**
- **Flexible**
- **Utilize leading (failure) indicators**
- **Measure change from baseline**
- **Utilize indicator parameters**
- **Low maintenance**
- **Low cost**
- **Measures volume or flux**
- **Measures of ecological health**

Adherence to these attributes should promote development of non-traditional monitoring configurations

Summary

- ✦ Monitoring and characterization based on the mass balance concept
- ✦ 4 transitional phases through characterization and monitoring form the framework
- ✦ Advance the science of Monitoring
 - ✦ Natural Systems Approach
 - ✦ Mass Balance
 - ✦ Better measures of flux
 - ✦ Promote unconventional monitoring networks for Long-term monitoring

- ✦ Regulations and Requirements
- ✦ Current strategies
- ✦ Lessons learned deficiencies
- ✦ Plans for near-future applications
- ✦ Opportunities for improvement
- ✦ Emerging strategies, methods, tools that could address deficiencies, needs
- ✦ Transition to LTM
- ✦ Priorities R&D