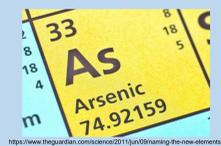




National Water Quality Monitoring Council Meeting – May 4, 2016

What is it Arsenic?



- Naturally-occurring semi-metal
- Results from natural deposits, agricultural & industrial activity
- Drinking water wells mobilize groundwater arsenic

Why is it important?

- Tasteless, odorless human toxin & carcinogen
- Chemical form is important
 - Inorganic arsenic highly toxic
 - Organic arsenic much less toxic
 - Total arsenic measurement doesn't distinguish forms
- Regulated by EPA at 10 ppb (drinking water)
- Dietary sources (rice, apple juice)



Current Approach – Arsenic Monitoring

Laboratory Methods

- Colorimetry ✓
- Hydride Generation Atomic Absorption Spectrometry ✓
- Electrothermal Atomic Absorption Spectrometry ✓
- Inductively Coupled Plasma-Atomic Emission Spectrometry ✓
- Inductively Coupled Plasma-Mass Spectrometry ✓

Field and on-line methods

- On-line voltammetry instruments ✗
- Field test strips ✗

- ✓ EPA-Approved
- ✗ Not EPA-Approved

Drawbacks to Current Approaches

Lab-based methods:

- Time lag from sample collection to data
- Difficult to make real-time decisions (e.g. process control)

High per-sample collection & analysis cost

Limited data (due to cost)

Lab instruments require trained analysts

Key for All Figures

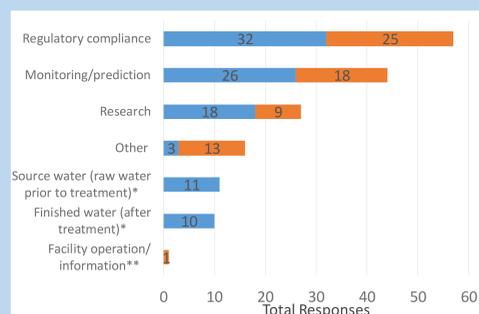
- Feedback received from federal employees & partner orgs
- Feedback received during arsenic sensor needs webinar

*Combined responses from federal employees & partners

**Option only available to webinar attendees

Note: there may be overlap between the feds & partners and webinar groups

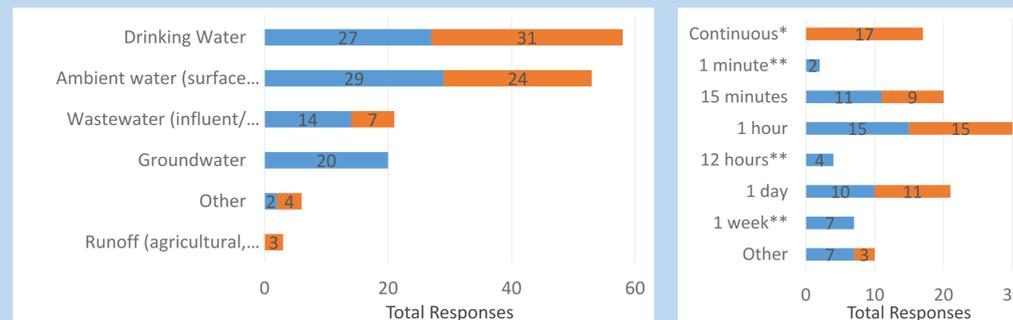
Reasons for Monitoring Arsenic



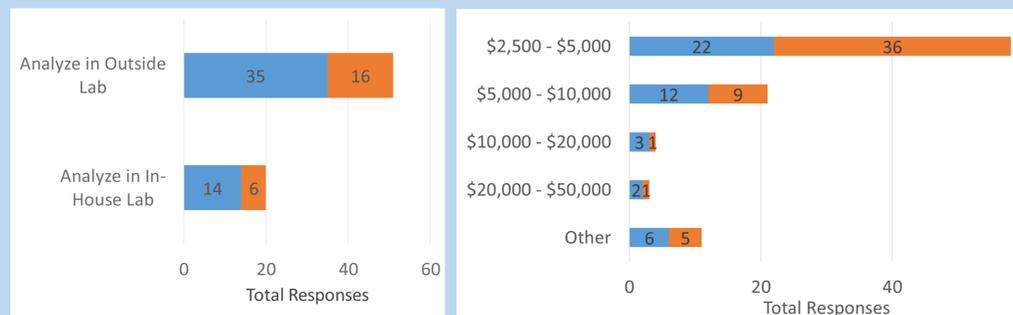
Summary of Arsenic Feedback

Characteristic	Need
Limit of Detection	Lower: 1 µg/L, Upper: 100 µg/L
Response Time	Real-time
Sampling Frequency	1 hour
Deployment Length	1 month
Data Logging	Integrates with external data logger
Data Transmission	Cellular/Satellite
Price	\$2,500 - \$5,000

Sampling Environment, Sampling Frequency



Current Monitoring Practices, Desired Price



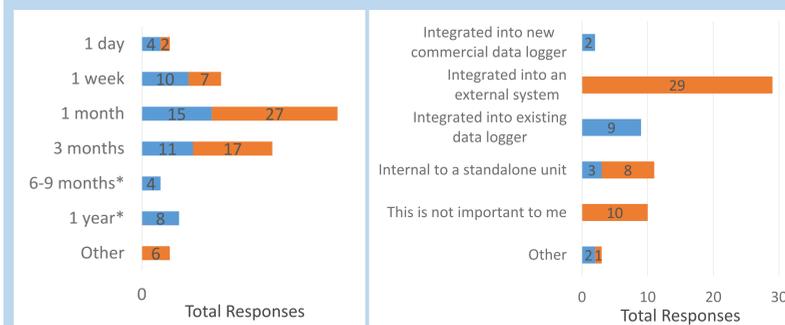
Limits of Detection, Response Time



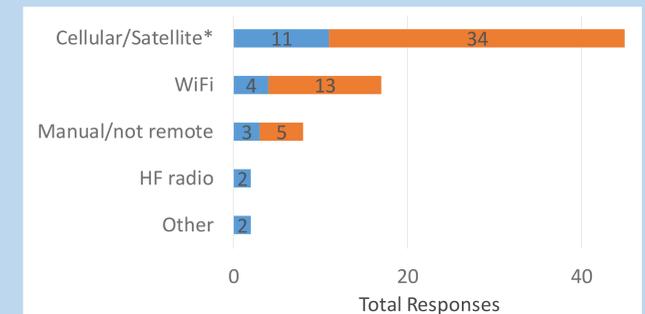
ACKNOWLEDGEMENTS

- Alliance for Coastal Technologies
- Association of Clean Water Administrators
- Association of State Drinking Water Administrators
- National Water Quality Monitoring Council
- U.S. Agency for International Development
- U.S. Bureau of Reclamation
- U.S. Department of Agriculture
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Park Service
- Water Environment Federation

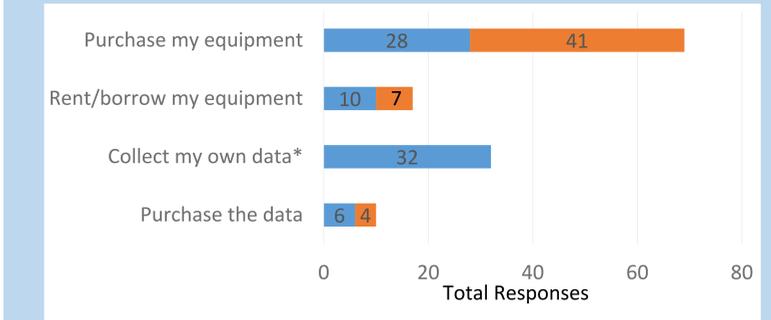
Deployment Length & Data Integration



Data Transmission



Ownership



Potential Benefits of Advanced Arsenic Sensors

Benefits

- “Real-time” data
- Easy to operate
- Continuous monitoring
- Field-deployable
- Portable
- Affordable

Applications

- Drinking water:
 - Source monitoring
 - Point of use monitoring
 - Treatment optimization
- Wastewater treatment
- Contaminated site monitoring

Next Steps

Arsenic Sensor Challenge

- Phase 1: Ideation
- Phase 2: Prototype development
- Fall, 2016 launch date
- Winners may receive cash prizes, commercial partnerships, assistance from government scientists

DISCLAIMER

The U.S. Environmental Protection Agency through its Office of Research and Development collaborated in the efforts described here. This does not signify that the contents necessarily reflect the views of the Agency. Mention of trade names, products, or services does not convey official EPA approval, endorsement, or recommendation.