An Extensive Industrial Hygiene Data Analysis and Visualization (IDAV) Toolset

Data management, analysis, and visualization

November 15, 2023

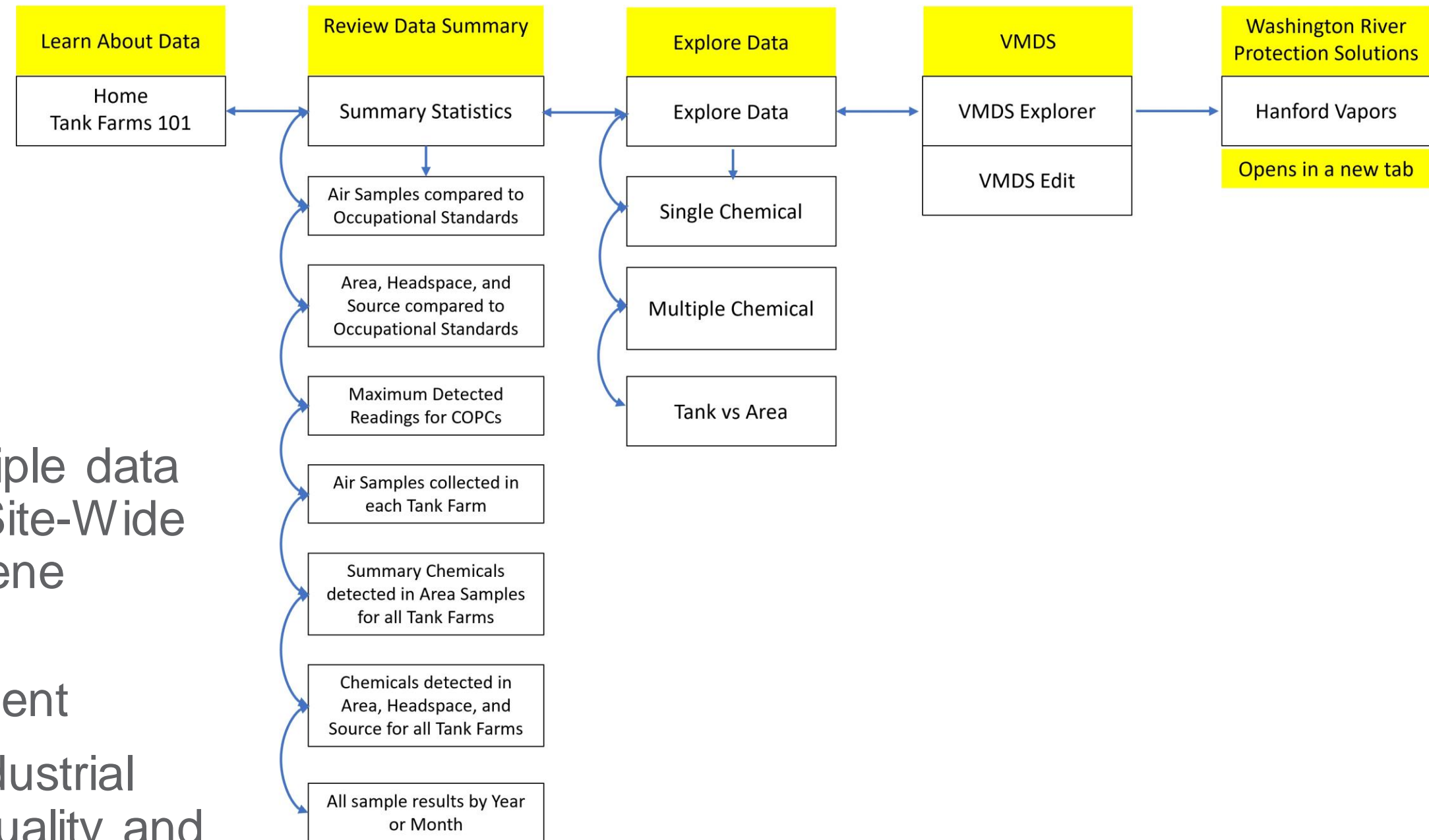**Hongfei Hou**

Pacific Northwest National Laboratory

Overview

- Access to multiple data sets from the Site-Wide Industrial Hygiene Database
- Risk management
- Ensure that Industrial Hygiene (IH) quality and conditioning requirements are met

Learn About Data

Home
Tank Farms 101

Review Data Summary

Summary Statistics

Air Samples compared to Occupational Standards

Area, Headspace, and Source compared to Occupational Standards

Maximum Detected Readings for COPCs

Air Samples collected in each Tank Farm

Summary Chemicals detected in Area Samples for all Tank Farms

Chemicals detected in Area, Headspace, and Source for all Tank Farms

All sample results by Year or Month

Explore Data

Explore Data

Single Chemical

Multiple Chemical

Tank vs Area

VMDS

VMDS Explorer

VMDS Edit

Washington River Protection Solutions

Hanford Vapors

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Main Features

- Industrial Hygiene Sampling and Monitoring

- Exposure Assessment

- Chemical Mixture Methodology

- Additional Tools

Home

Introduction to the Tank Farms Data Access and Visualization Program

Sampling Results

Sampling Results

Beryllium Program

Beryllium Program

Ventis Pro

Ventis Pro Data

Industrial Hygiene Data Analysis and Visualization Program

The Industrial Hygiene Data Analysis and Visualization (IDAV) suite of applications provides access to multiple data sets from the Site-Wide Industrial Hygiene Database (SWIHD). Data are available from the beginning of the current Tank Operations Contractor's (TOC) contract, October 2008. All data have been reviewed to ensure that Industrial Hygiene (IH) quality and conditioning requirements are met. A detailed description of chemical vapors detected on the Hanford site, including worker protection strategies, can be found at https://hanfordvapors.com.

Industrial Hygiene Sampling and Monitoring

Tank vapor sample-based data sets, which require subsequent laboratory analysis, enable IH staff to assess potential hazards and worker protection strategies. These sample results do not reflect the protection afforded by the use of respiratory protection or other PPE. Data sets include:

- **Personal Samples** – Samples collected from devices worn by workers that are representative of breathing zone concentrations. These are the best measure of worker exposures.
- **Area Samples** – Samples collected from stationary devices that are representative of concentrations in the area of sample collection. They can be indicative of worker exposures in the immediate vicinity of the sampling location.
- **Non-Headspace Source Samples** – Samples collected from locations that are or are suspected to be sources of airborne hazards but are not representative of headspace concentrations due to mixing with air or having no direct connection to the tank headspace.
- **Headspace Representative Samples** – Samples collected directly from tank headspace or source samples collected from access points that are representative of headspace concentrations (e.g., exhauster stacks).

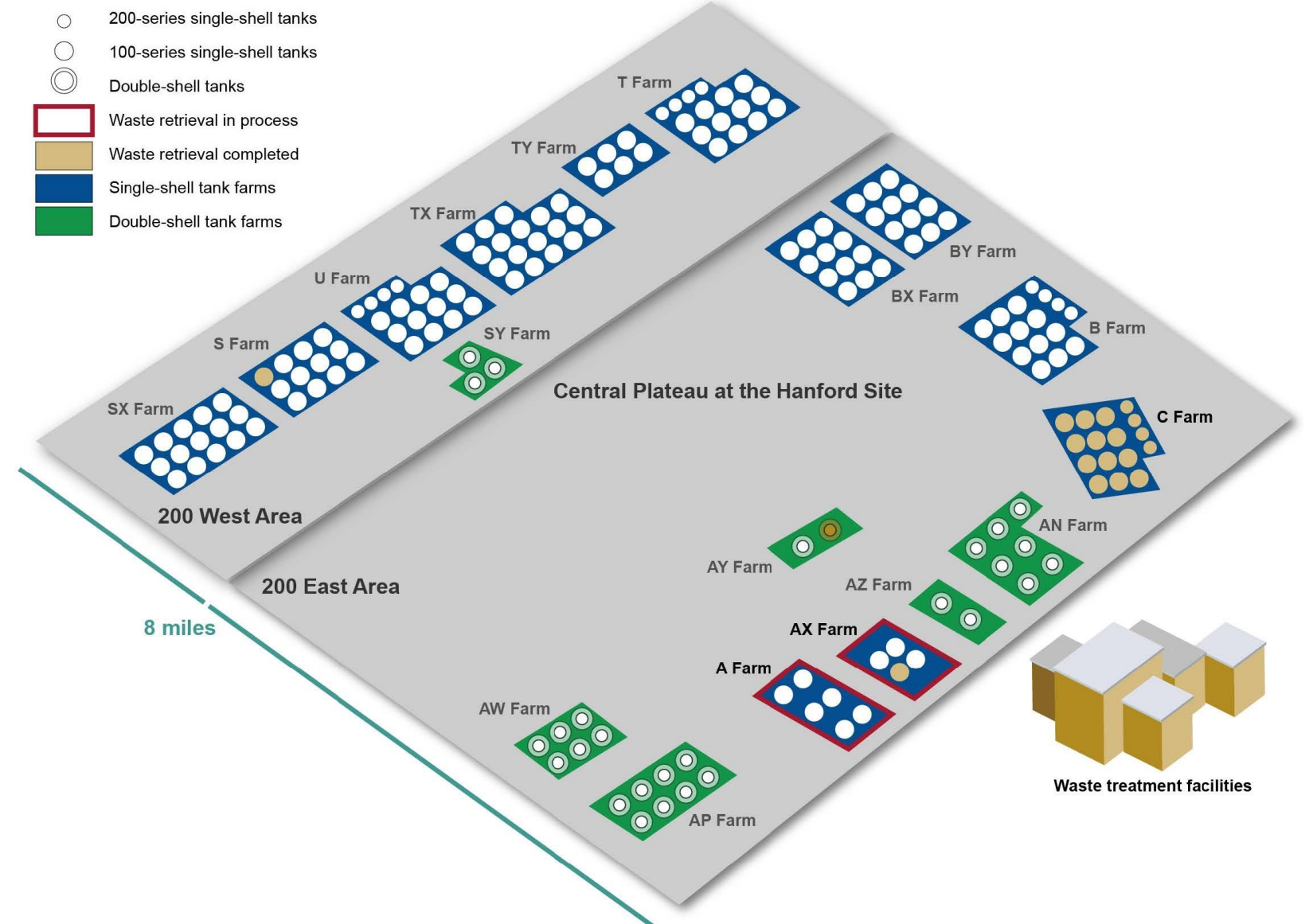Monitoring of the work area provides real-time field measurements and are made with:

- **Direct Reading Instruments (DRI)** – measures concentrations of ammonia, volatile organic compounds (VOCs), mercury, and sometimes other gases.
- **Personal Ammonia Monitors (PAM)** – continuously measure ammonia concentrations in worker breathing zones.

Non-vapor industrial hygiene samples are also obtained to ensure the safety of Hanford's work force:

- **Bulk and Surface Samples** – physical samples collected from the workplace to measure surface contamination primarily for beryllium, lead, and asbestos.
- **Noise Dosimetry** – measurement of a worker's exposure to noise.
- **Sound Level Survey** – measurements to characterize noise levels in an area or noise produced by a particular source.

Background

- Hanford has 177 tanks: 149 single-shell and 28 newer double-shell

- Hanford's tanks contain 56 million gallons of high-level radioactive and chemical wastes

- There are 1,800 different chemicals in Hanford's tank waste

- 61 of those chemicals pose a potential health concern to Hanford workers

https://hanfordvapors.com/

https://www.hanford.gov/files.cfm/2021_Jan_GAO-21-73_Tank_Farm-Closure.pdf

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Data Management

- Extremely large datasets
  - Data are available from October 2008

- Variety of data sources
  - Historical data
  - OSI/PI
  - Sensors
  - IOT

- Data synchronization

- Data security and privacy

- Data storage
  - Cloud-based databases
    - ✓ Azure SQL Server
    - ✓ Elastic pool
  - Local archives
    - ✓ Historical data
  - Hybrid data partitioning
    - ✓ Horizontal partitioning
    - ✓ Vertical partitioning
   - ✓ Functional partitioning

Data Analysis

- Stored procedures

- RESTful API

- Tableau

  - Interactive Dashboards

  - Speed and Efficiency

  - Collaboration and Sharing

Data Visualization

- Wide range of charts, graphs, and interactive visualizations

- Supports both live data and snapshot

- Integration with other tools, such as Microsoft Excel, R

- Supports advanced analytics and predictive modeling

- Allows for extensive customization for the charts
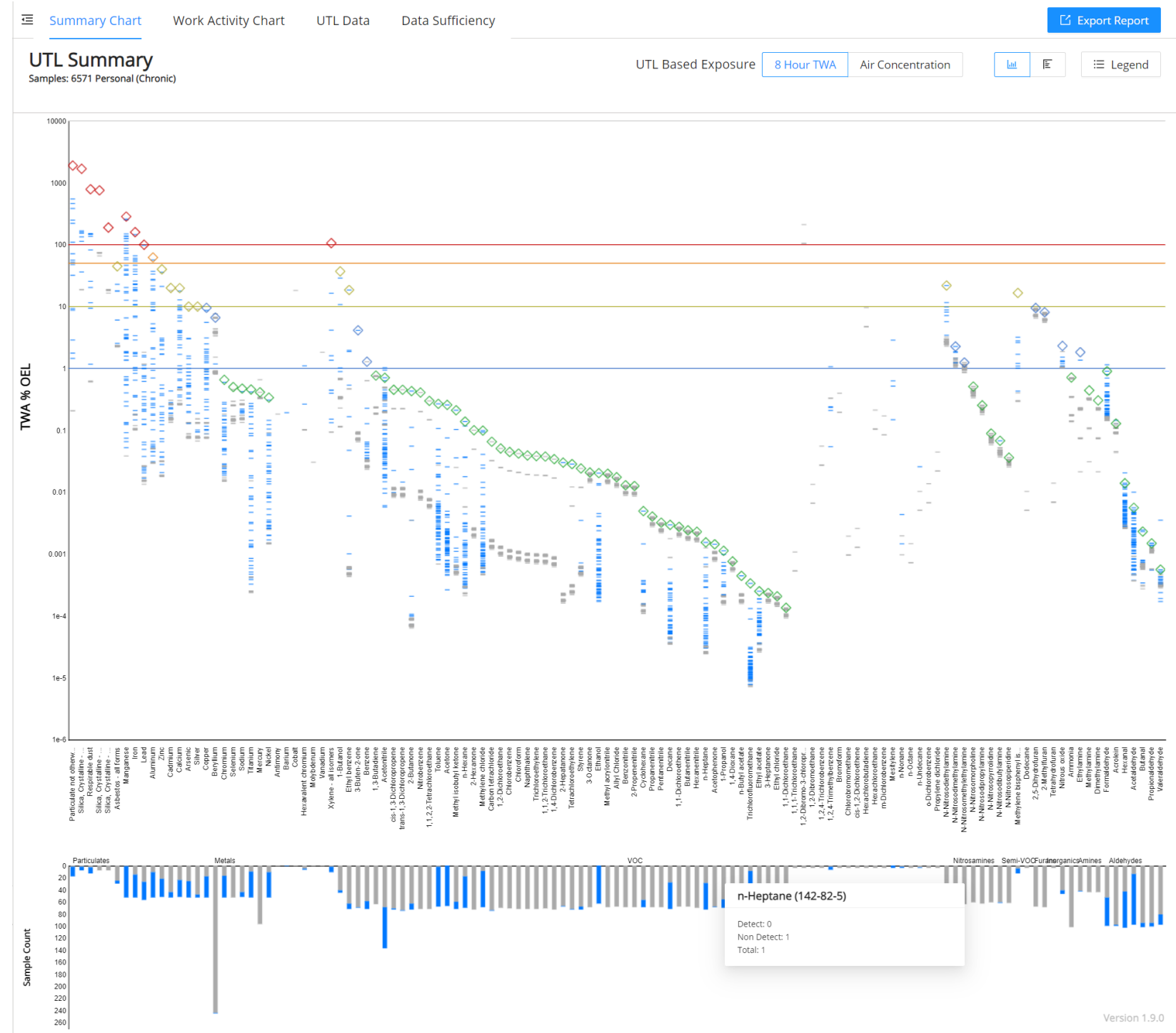
Acknowledgements

- Funded by Washington River Protection Solutions

- Team members

  - **PNNL:**
    - ✓ Hongfei Hou
    - ✓ Sadie Montgomery
    - ✓ Scott Upton
    - ✓ Randy Tran
    - ✓ Avinash Joshi
    - ✓ Eric Engel
    - ✓ Matthew Sturtevant
    - ✓ Caleb Warwick
    - ✓ Paul Tran
    - ✓ John Garza

    - ✓ Brett Simpson
    - ✓ Mark Triplett (retired)
    - ✓ Erin McCann
    - ✓ Nathan Anderson
    - ✓ Heather Sabella
    - ✓ Jarrod Ver Steeg
    - ✓ Anastasia Bernat
    - ✓ Jace Olsen
    - ✓ William Huang

  - **WRPS & HMIS**
    - ✓ Eugene Morrey
    - ✓ Jason Reno
    - ✓ Chandra Lindberg
    - ✓ Marco Medina
    - ✓ Ryan Cramer
    - ✓ Sally Maxwell
    - ✓ Amber Maynard
    - ✓ Karina Ellis
    - ✓ Tracy Maling
    - ✓ Michael Zabel
    - ✓ Joseph Meacham
    - ✓ Daniel Kinkel
    - ✓ Ruth Chaffee
    - ✓ Sarah Deleon

Questions?