

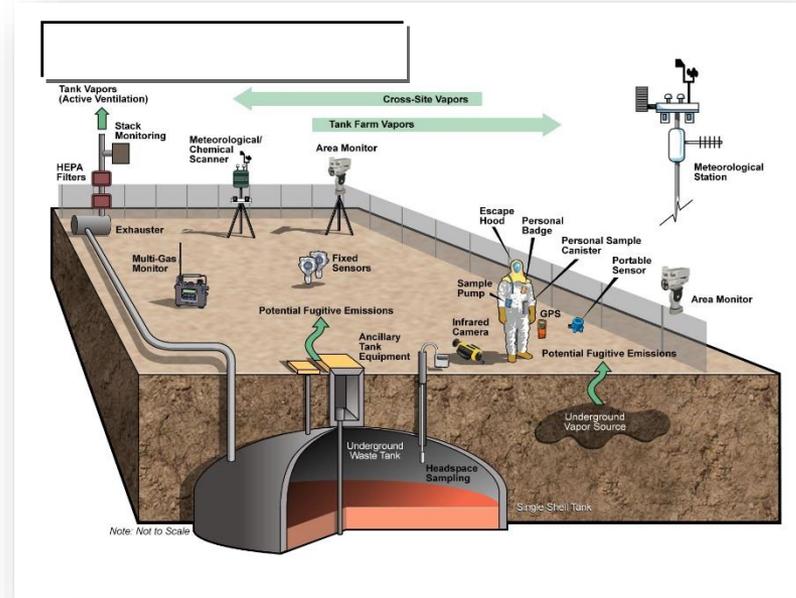
Vapor, Monitoring, and Detection System (VMDS) Technologies

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Solutions



Technology Selection

- Tank Vapor Assessment Team (TVAT) Recommendation
 - “Accelerate implementation of tailored engineering technologies to detect and control vapor emissions and exposures experienced in the Hanford tank farms”
- Develop tool box of technologies for tailored VMDS package deployment
 - Monitor for known sources and fugitive emissions
 - Monitor in work zones to confirm dispersion and dilution of potential vapor plumes
 - Monitor for potential vapors at fence lines
- Technology exchange to canvas and benchmark all available technologies



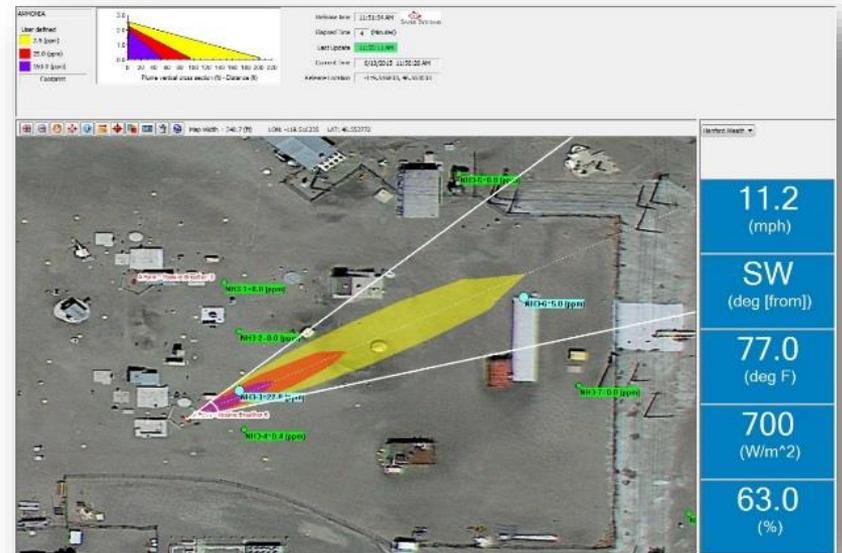
Technology Specifics

- Technologies
 - Direct Reading Instruments (DRIs)
 - Total volatile organic content (VOC)
 - Limited specific chemical analyses
 - Spectroscopic Instruments
 - Chemical species information
 - Real-time detection and monitoring
 - Meteorological data
 - Worker location
- Data Integration
 - Wireless data stream into existing Tank Farm Operations and IH programs
- Modeling
 - SAFER Systems software receive and evaluate data for modeling of plumes



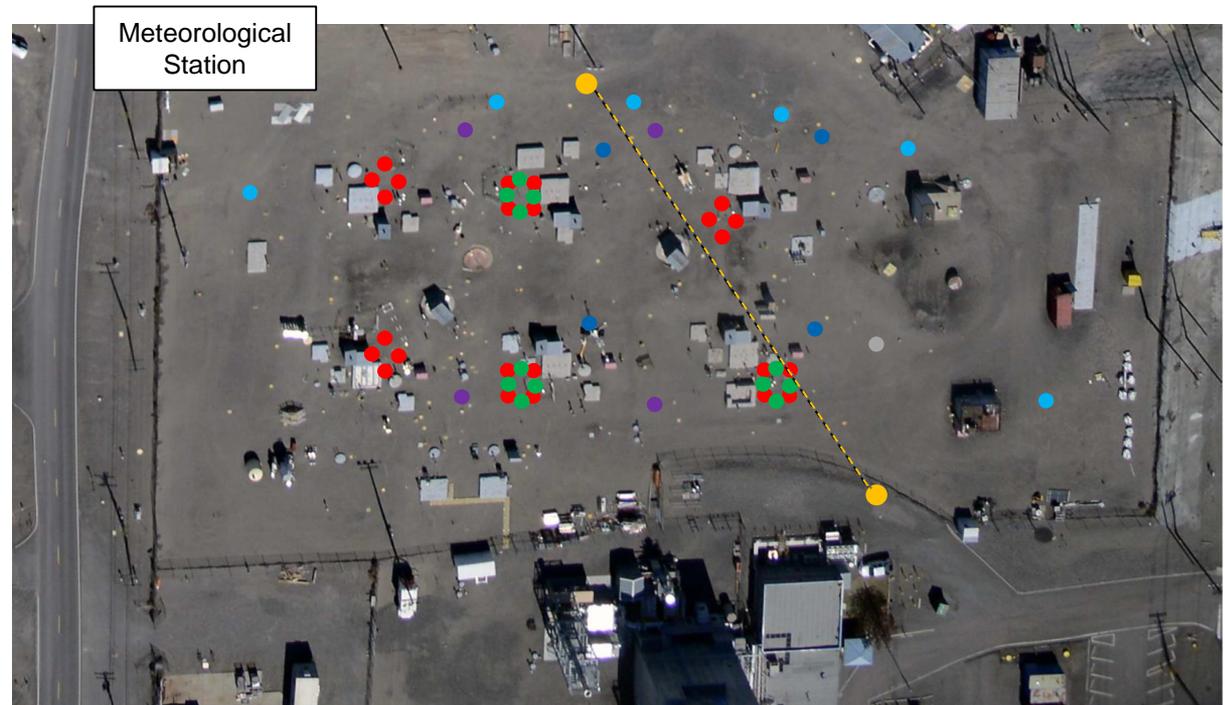
Technology Maturation

- Rigorous technology maturation process
- Bench-Scale Testing
 - Pacific Northwest National Laboratory (PNNL) Testing facility
 - Completed testing of group of sensors, weather station, SAFER software
- Pilot-Scale Testing
 - Deployment in A (single shell) and AP (double shell) Tank Farms
 - Data collection and communication from VMDS using existing rigorous engineering protocols
 - Integration of data between instruments, commercial software (SAFER Systems) and Tank Farm control software
 - Evaluate data collected to determine correlations



A (SST) Tank Farm Deployment

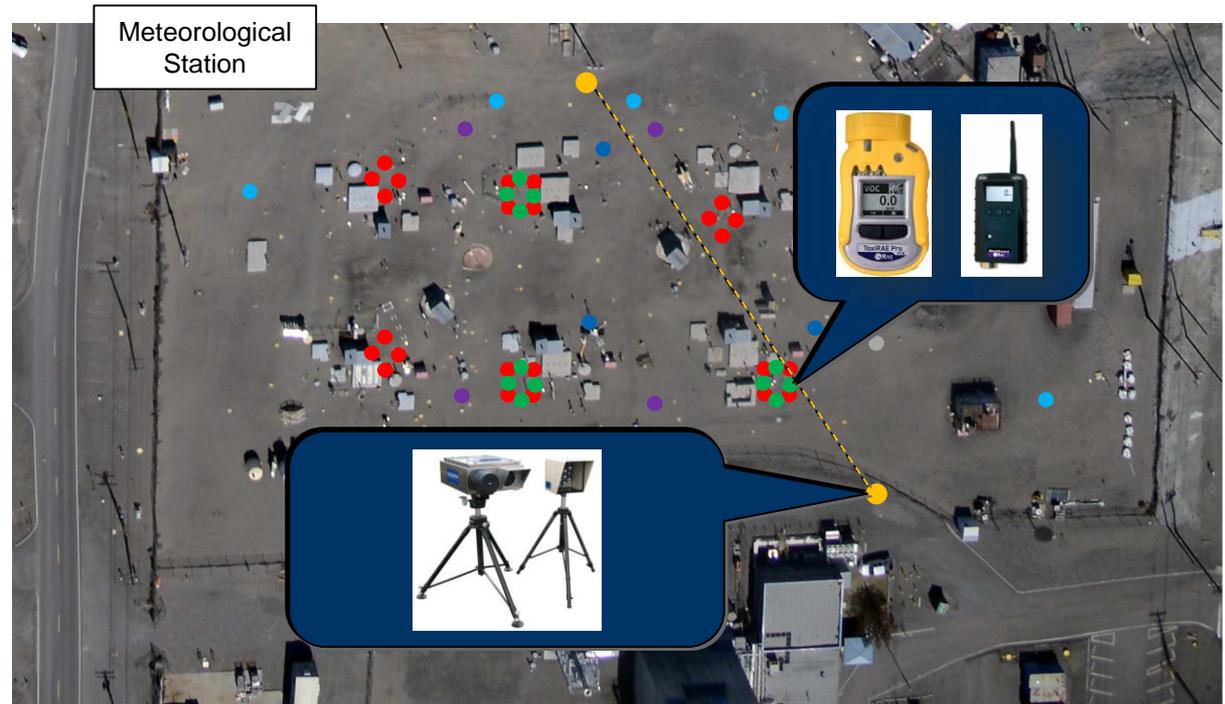
- Goal is to collect data for design inputs, integrate data from all instruments, identify sources (fugitive emissions), monitor/model transport of vapors, and speciation of vapors in plumes when possible.
- Direct reading instruments
 - Installed and carried
 - SST breather filters to monitor known release points
 - Account for prevailing and changing winds
 - Wireless communication
- Spectroscopic equipment
 - Speciation information for numerous VOCs



- Ammonia monitoring around passive breather filters
- Total VOCs around passive breather filters
- Total VOCs, ammonia, carbon monoxide, LEL, and Oxygen in work space
- Total VOCs, ammonia, N₂O around work space
- Ultraviolet Differential Optical Adsorption Spectrometer (UV-DOAS)
- Sampling Points: area, grab, stack
- Total VOCs, CO, NO₂, SO₂, CO₂, CH₄, O₃, Meteorological station

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AP (DST) Tank Farm Deployment

- Direct reading instruments
 - Installed and carried
 - On top of tanks
 - On tank farm boundary and outside tank farms
 - In higher occupancy areas
 - Account for prevailing and changing winds
 - Wireless communication
- Spectroscopic equipment
 - Speciation information for numerous VOCs

- Ammonia monitoring
- Total VOCs
- Total VOCs
- Total VOCs
- UV-DOAS
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- Total VOCs, CO, NO₂, SO₂, CO₂, CH₄, O₃, Meteorological station
- Open-Path Fourier Transform Infrared Spectroscopy



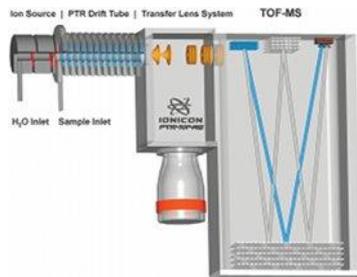
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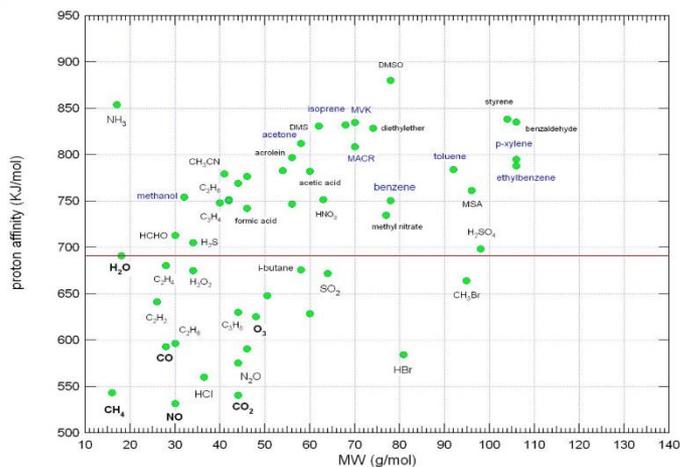
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Proton Transfer Reaction Mass Spectrometry (PTR-MS) Mobile Laboratory



- Detects 46 of 59 COPCs
- Stack & Passive Breather Filter Monitoring
- VOCs Associated With Aerosol Releases
- Leading Indicator Study
- Locating/Monitoring Vapor Plumes
- General Tank Farm Area Monitoring for VOCs
- Background Air Monitoring



Status and Path Forward

- VMDS system components
 - All DRI instruments are installed and undergoing calibration
 - Spectroscopic instruments are staged and ready for installation
 - Meteorological towers installed and ready for configuration
 - Software integration and testing underway
- Mobile Laboratory
 - Completed four 1-week test campaigns in travel and stationary modes
 - Vapors detected consistent with numerous combustion sources
 - All data to date are below OEL/STEL/IDLH limits
- Vapor abatement technology workshop completed for tailored abatement solutions