

Summary of VMDS Bench-Scale Testing (PNNL-25892)

As part of ongoing efforts to better understand and manage chemical vapor emissions, and potential worker exposures, the Hanford Tank Operations Contractor—Washington River Protection Solutions (WRPS)— plans to deploy a vapor monitoring and detection system (VMDS) in the tank farms located in the 200W and 200E areas of the Hanford site. WRPS has evaluated the technical maturity of several vapor sensing technologies that make up the VMDS. Before committing to deployment of the VMDS, WRPS planned and executed bench-scale tests of the prototype system. The bench-scale tests were designed to provide input to the configuration and methodology of a pilot-scale test.

The Pacific Northwest National Laboratory (PNNL) was contracted to perform the bench-scale test in a facility outside the tank farm environment, in advance of pilot-scale testing in AP and A tank farms. The objectives of the bench-scale test were to verify that the VMDS components, especially the critical technology elements (CTEs), functioned together as a system, and to mature the technology to the point that a pilot-scale test could be conducted in an actual tank farm environment with a high level of confidence.

A set of specific objectives aligned with key CTE questions were defined, and a corresponding set of tests were devised and executed to address the objectives and technology maturation questions. The test gases including ammonia, nitrous oxide, and isobutylene (selected to represent Volatile Organic Compounds), were released at ground level in a series of bench-scale test runs to challenge key components of the integrated VMDS with actual vapor plumes. The tests evaluated the performance of the VMDS key vapor detection sensing components and the overall integrated system, including: point sensors, wide-area sensing and imaging systems, meteorological instrumentation, and the communication and analysis software (i.e., SAFER Systems). Following the bench-scale tests, specific recommendations were made to support advancement to pilot-scale testing.

The bench-scale tests confirmed the maturity of the VMDS and system readiness for advancement to pilot-scale testing, and integration of the VMDS components into the overall SAFER Systems analysis and reporting software. The report, PNNL-25892 (*Bench-Scale Testing of the Vapor Monitoring and Detection System*), summarizes the basis of the technology maturation status of the CTEs as a result of the bench-scale tests. In addition to CTEs, bench-scale testing confirmed the functionality, performance, limitations, integration, and lessons learned for non-CTEs, including point sensors and meteorological instrumentation that also make up part of the VMDS.

To read the full report, [click here](#).