



DOE-FIU Cooperative Agreement Annual Research Review – FIU Year 3

Wednesday, August 23, 2023		
9:00 - 9:05 am EDT	Kick-Off /Welcoming Remarks (DOE-EM)	Rod Rimando (Acting Director, Technology Development) – DOE EM-3.2
9:05 - 9:10 am EDT	Welcoming Remarks (DOE-LM)	Ms. Jalena Dayvault (Site Manager) – DOE LM
9:10 - 10:40 am EDT	Project 2: Environmental Remediation Science & Technology	FIU, DOE HQ, SRNL, PNNL, ORNL, LANL, LBNL, CBFO
10:40 am - 12:10 pm EDT	Project 1: Chemical Process Alternatives for Radioactive Waste	FIU, DOE HQ, PNNL, WRPS, SRNL, SRS
LUNCH BREAK [12:10 – 1:30 pm]		
1:30 - 3:00 pm EDT	Project 3: Waste and D&D Engineering & Technology Development	FIU, DOE HQ, SRNL, PNNL, LBNL, INL, ANL
Thursday, August 24, 2023		
9:00 - 10:30 am EDT	Projects 4 & 5: STEM Workforce Development and Training	FIU, DOE HQ (EM & LM), SRNL, PNNL, WIPP, SRS, ORP, LBNL, WRPS, INL, Grand Junction
BREAK [10:30 – 10:35 am]		
10:35 - 12:00 pm EDT	Wrap Up (FIU Projects 1, 2, 3, 4 & 5)	FIU, DOE HQ (EM & LM)

FIU

Applied Research
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DOE-FIU Cooperative Agreement Annual Research Review

PROJECT 3

Waste and D&D Engineering & Technology Development

Worlds
Ahead

Advancing the research and academic mission of Florida International University

FIU Personnel and Collaborators

Project Manager: Leonel Lagos

Faculty/Researcher: Himanshu Upadhyay, Joseph Sinicrope, Walter Quintero, Clint Miller, Santosh Joshi, Jayesh Soni, Masudur Siddiquee, John Dickson, Mellissa Komninakis, Kexin Jiao*

DOE Fellows/Students: Roger Boza, Aurelien Meray, Alejandro De-La-Noval, Aris Duani Rojas, Fabiola Rivera-Noriega, Bryan Torres, Nicholas Espinal

DOE-EM: Nancy Bushman, Dinesh Gupta, Genia McKinley, Jean Pabon, Jonathan Kang, Douglas Tonkay, Jennifer McCloskey, Nick Machara, Rod Rimando, Daniel Scott Boyd

SRNL: Nixon Peralta, Jeff Crenshaw, Hansell Gonzalez-Rayma, Thomas Danielson, Jennifer Wohlwend, Austin Coleman, Justin Kidd*, Connor Nicholson, Carol Eddy-Dilek

SRS: Jack Musall

PNNL: Rob Mackley, Xuehang Song

LBNL: Haruko Wainwright



Project Tasks and Scope

TASK 1: WASTE INFORMATION MANAGEMENT SYSTEM (WIMS) (HQ)

Subtask 1.1	WIMS System Administration - Database Management, Application Maintenance & Performance Tuning
Subtask 1.2	Waste Stream Annual Data Integration
Subtask 1.5	Cyber Security of WIMS Infrastructure

TASK 2: D&D SUPPORT TO DOE EM FOR TECHNOLOGY INNOVATION, DEVELOPMENT, EVALUATION AND DEPLOYMENT

Subtask 2.1	Development of Uniform Testing Protocols and Standard Specifications for Dust Suppressant Technologies in Support of Open-Air Demolition during D&D
Subtask 2.2	Applications of Intumescent Foams and Other Fire-Retardant Materials to Mitigate Contaminant Release during Nuclear Pipe Dismantling and other D&D Activities
Subtask 2.3	Certifying Fixative Technology Performance when Exposed to Impact Stressors as Postulated in Contingency Scenarios Highlighted in Safety Basis Documents
Subtask 2.4	Multi-functional 3D Polymer Framework for Mercury Abatement



Project Tasks and Scope

TASK 3: D&D KNOWLEDGE MANAGEMENT INFORMATION TOOL (KM-IT) (HQ, SRNL, INL, ANL)

Subtask 3.4	Content Management
Subtask 3.5	Marketing and Outreach
Subtask 3.6	D&D KM-IT System Administration
Subtask 3.7	Cyber Security of D&D KM-IT Infrastructure
Subtask 3.8	KM-IT Tech Talks



Project Tasks and Scope

TASK 7: AI FOR EM PROBLEM SET (SOIL AND GROUNDWATER) - EXPLORATORY DATA ANALYSIS AND MACHINE LEARNING MODEL FOR HEXAVALENT CHROMIUM (CR [VI]) CONCENTRATION IN 100-H AREA (PNNL)

Subtask 7.3 Algorithm development for spatiotemporal relationship identification

Subtask 7.4 Publishing AI/ML models on AAML System

TASK 8: AI FOR EM PROBLEM SET (SOIL AND GROUNDWATER) - DATA ANALYSIS AND VISUALIZATION OF SENSOR DATA FROM WELLS AT THE SRS F-AREA USING MACHINE LEARNING (LBNL, SRNL)

Subtask 8.6 Publishing AI/ML models on AAML System

TASK 9: AI for EM Problem Set (Waste Processing) - Nuclear Waste Identification and Classification using Deep learning (NEW)

Subtask 9.1 Algorithm & Model Development to Identify and Classify Nuclear Wastes

Subtask 9.2 Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System



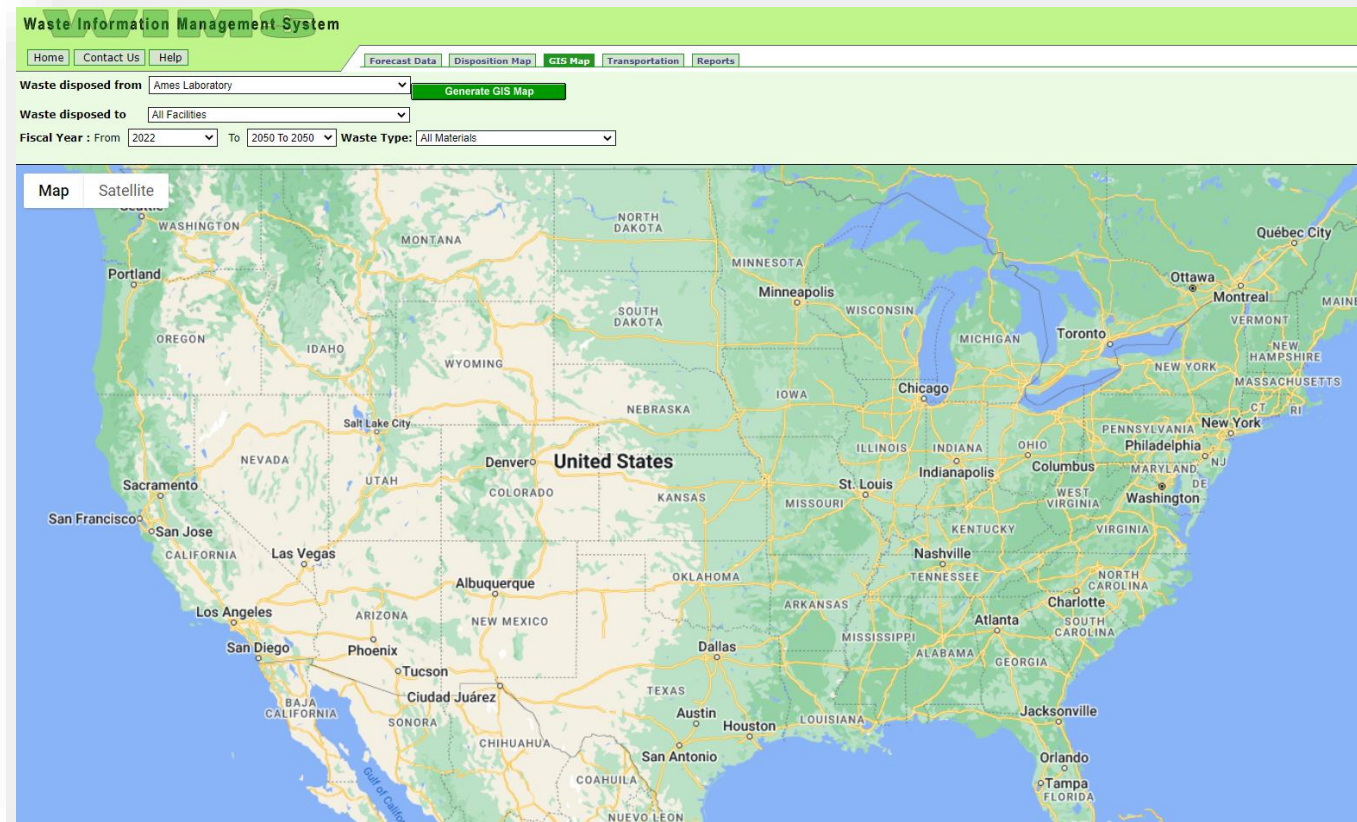
Task 1

Waste Information Management System (WIMS)



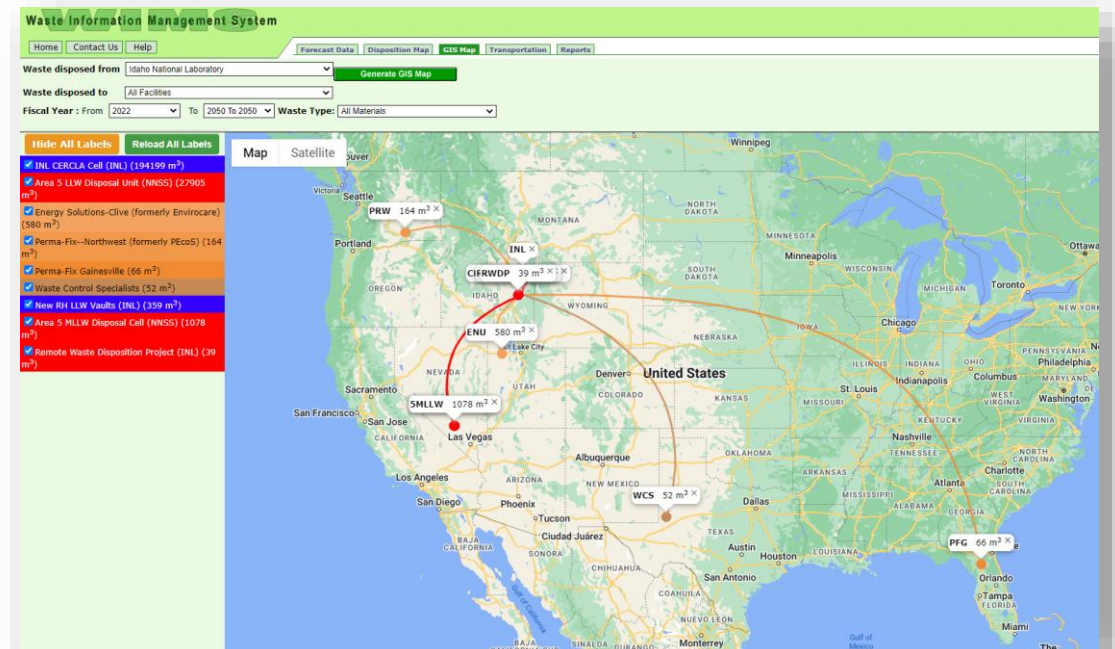
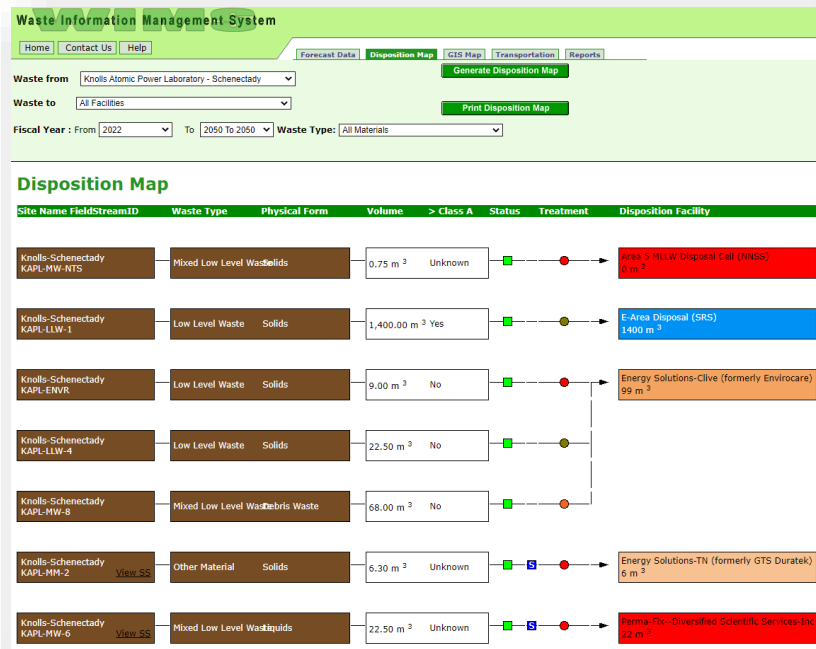
Waste Information Management System (WIMS)

Subtask 1.1	WIMS System Administration - Database Management, Application Maintenance & Performance Tuning
Subtask 1.2	Waste Stream Annual Data Integration
Subtask 1.3	Cyber Security of WIMS Infrastructure



Waste Information Management System (WIMS)

- Easy-to-use system to visualize and understand the forecasted DOE-EM waste streams & transportation information.
- Various modules of WIMS are Forecast Data, Disposition Map, Successor Stream Map, GIS Map, Transportation, Reports and Help.
- WIMS is deployed and available at <https://emwims.org>



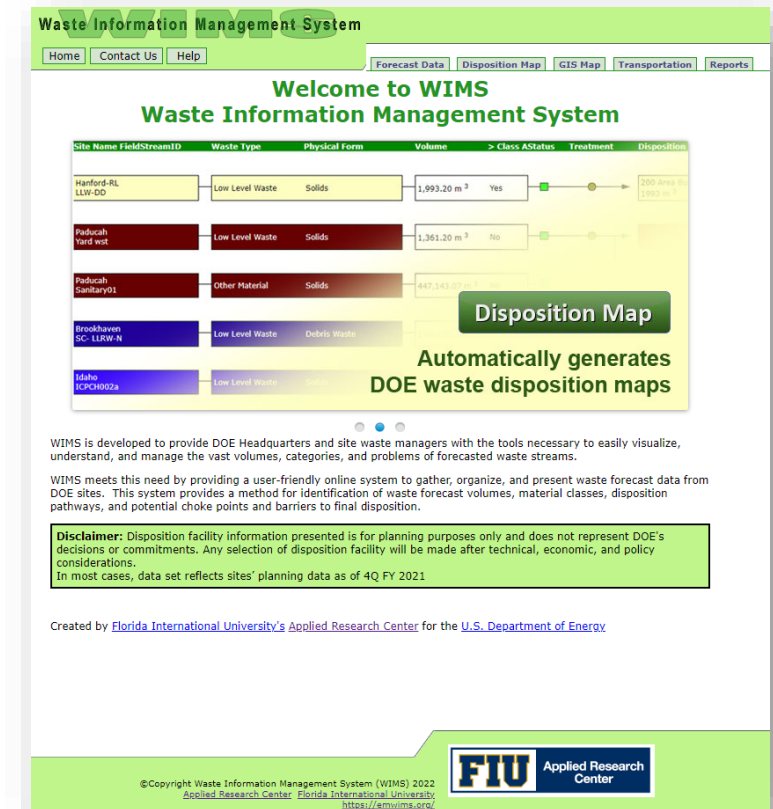
Waste Information Management System (WIMS)

Site Needs:

- Accurate estimates of the quantity and type of present and future radioactive waste streams is critical to the development of tools to integrate the complex-wide management of LLW/MLLW treatment and disposal. A complex-wide LLW and MLLW database and reporting system is needed to communicate this information to local and national stakeholders and governmental groups.

Objectives:

- Provide a central web-based system to access waste forecast streams for sites across the DOE complex.
- Provide easy-to-use systems to view & download waste stream forecast information in various formats.
- Update waste stream forecast information annually.



Waste Information Management System

Home | Contact Us | Help | Forecast Data | Disposition Map | GIS Map | Transportation | Reports

Welcome to WIMS
Waste Information Management System

Site Name	Field/Stream ID	Waste Type	Physical Form	Volume	Class A Status	Treatment	Disposition
Hanford-RL	LLW-DD	Low Level Waste	Solids	1,993.20 m ³	Yes		200 Area B 2000 sq ft
Paducah	ford end	Low Level Waste	Solids	1,361.20 m ³	No		
Paducah	Canberry01	Other Material	Solids	447,343.07 m ³			
Brookhaven	DC LLRW-9	Low Level Waste	Debris Waste				
Idaho	CCF0002a	Low Level Waste					

Disposition Map
Automatically generates DOE waste disposition maps

WIMS is developed to provide DOE Headquarters and site waste managers with the tools necessary to easily visualize, understand, and manage the vast volumes, categories, and problems of forecasted waste streams.

WIMS meets this need by providing a user-friendly online system to gather, organize, and present waste forecast data from DOE sites. This system provides a method for identification of waste forecast volumes, material classes, disposition pathways, and potential choke points and barriers to final disposition.

Disclaimer: Disposition facility information presented is for planning purposes only and does not represent DOE's decisions or commitments. Any selection of disposition facility will be made after technical, economic, and policy considerations. In most cases, data set reflects sites' planning data as of 4Q FY 2021

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FIU Applied Research Center



36 Supported Sites:

- Ames Laboratory
- Argonne National Laboratory
- Bettis Atomic Power Laboratory
- Brookhaven National Laboratory
- Energy Technology Engineering Center
- Fermi National Accelerator Laboratory
- Hanford Site-RL
- Hanford Site-RP
- Idaho National Laboratory
- Kansas City Plant
- Knolls Atomic Power Laboratory - Kesselring
- Knolls Atomic Power Laboratory - Schenectady
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- Naval Reactor Facility
- Nevada National Security Site
- NG Newport News
- Norfolk Naval Shipyard
- Nuclear Fuel Services, Inc. (cleanup site)
- Oak Ridge Reservation
- Paducah Gaseous Diffusion Plant
- Pantex Plant
- Pearl Harbor Naval Shipyard
- Pacific Northwest National Laboratory
- Portsmouth Gaseous Diffusion Plant
- Portsmouth Naval Shipyard
- Princeton Plasma Physics Laboratory
- Puget Sound Naval Shipyard
- Sandia National Laboratories - NM
- Savannah River Site
- Stanford Linear Accelerator Center
- Separations Process Research Unit
- Thomas Jefferson National Accelerator Facility
- Waste Isolation Pilot Plant
- West Valley Demonstration Project



36 Disposition Facilities:

- 200 Area Burial Ground (HANF)
- 746-U Landfill(Paducah)
- Area 5 LLW Disposal Unit (NTS)
- Area 5 MLLW Disposal Cell (NTS)
- Area G (LLW disposal) (LANL) (New)
- Clean Harbors
- Commercial TBD
- E-Area Disposal (SRS)
- EMWMF Disposal Cell (ORR)
- Energy Solutions-Clive (formerly Envirocare)
- Energy Solutions-TN (formerly GTS Duratek)
- ERDF (HANF)
- Heritage Liverpool (Ohio) (New)
- Impact Services-TN
- INL CERCLA Cell (INL)
- Integrated Disposal Facility (HANF)
- New RH LLW Vaults (INL)
- Omega Waste Logistics
- OSWDF(Portsmouth)
- Paducah CERCLA
- Perma-Fix Gainesville
- Perma-Fix--Diversified Scientific Services, Inc.
- Perma-Fix--Northwest (formerly PEcoS)
- Perma-Fix/Materials & Energy Corp
- Remote Waste Disposition Project (INLS)
- River Metals
- RMW Trenches (MLLW/LLW) (HANF)
- RMW Trenches/IDF (HANF)
- RWMC (LLW disposal) (INL)
- Siemens
- Smokey Mountain Solutions
- To Be Determined
- Unitech
- US Ecology-Idaho
- Veolia
- Waste Control Specialists



Waste Information Management System (WIMS)

Forecast Period and Waste Type:



Date Range

- 2023 - Inventory
- 2023 to 2025
- 2026 to 2030
- 2031 to 2035
- 2036 to 2040
- 2041 to 2045
- 2046 to 2050
- 2050

Waste Type

- Low Level Waste
- Mixed Low Level Waste
- 11e(2) Byproduct Material
- Other Material
- Unknown

Subtask 1.1: WIMS System Administration - Database Management, Application Maintenance & Performance Tuning

Accomplishments:

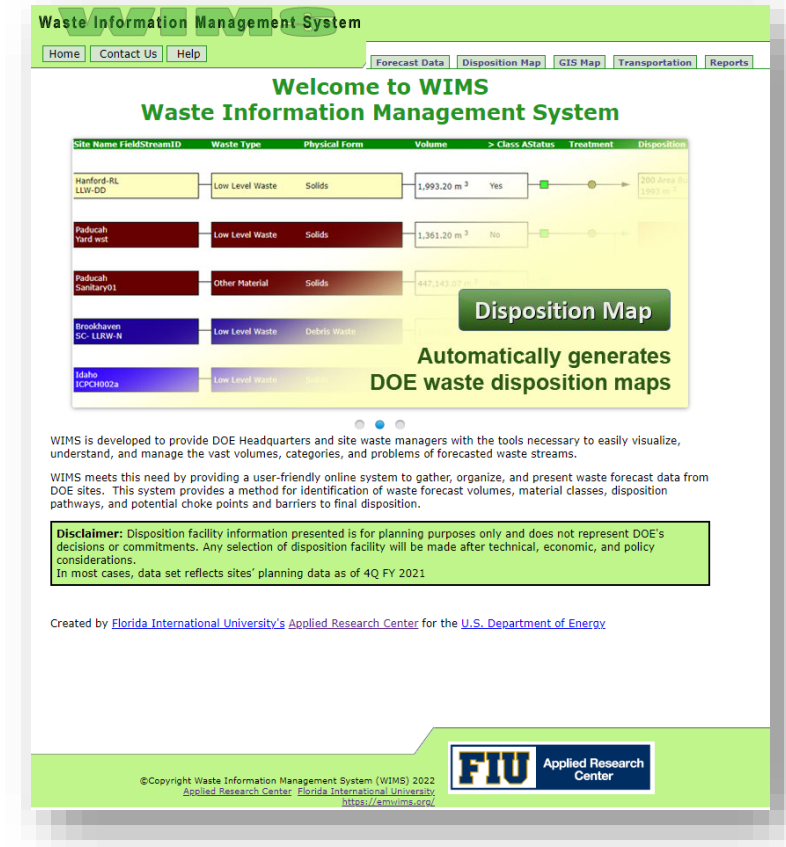
- Continue to perform day-to-day maintenance and administration to ensure consistent high level of performance of WIMS application.
- Updating patches and OS fixes, updating antivirus engines and definitions, updating drivers and assuring that the network is working properly.
- Hardware upgrades (memory, hard drives, video cards, routers, firewall, etc.).
- Updating backup scripts and backup repository hardware.
- Updated reporting server that supports WIMS Report module.



Subtask 1.2: Waste Stream Annual Data Integration

Accomplishments:

- FIU received the revised waste forecast data from DOE HQ and incorporated the data on the system.
- Completed integration of 2023 waste forecast and transportation data into WIMS system (Milestone 2022-P3-D5).
- Published 2023 Forecast Waste stream information and DOE was notified on May 5, 2023.
- Status: 6 waste types, 708 waste streams, 36 reporting sites and 36 disposition facilities.



Waste Information Management System

Home | Contact Us | Help | Forecast Data | Disposition Map | GIS Map | Transportation | Reports

Welcome to WIMS
Waste Information Management System

Site Name	Field/Stream ID	Waste Type	Physical Form	Volume	Class A Status	Treatment	Disposition
Hanford-RL	LLW-DD	Low Level Waste	Solids	1,993.20 m ³	Yes		200 Area 20
Peducuh	Yard wst	Low Level Waste	Solids	1,361.20 m ³	No		
Peducuh	Sanitary01	Other Material	Solids	447,341.00 m ³			
Brookhaven	SC-LLRW-N	Low Level Waste	Debris Waste				
Idaho	ICPC4002a	Low Level Waste	Solids				

Disposition Map

Automatically generates DOE waste disposition maps

WIMS is developed to provide DOE Headquarters and site waste managers with the tools necessary to easily visualize, understand, and manage the vast volumes, categories, and problems of forecasted waste streams.

WIMS meets this need by providing a user-friendly online system to gather, organize, and present waste forecast data from DOE sites. This system provides a method for identification of waste forecast volumes, material classes, disposition pathways, and potential choke points and barriers to final disposition.

Disclaimer: Disposition facility information presented is for planning purposes only and does not represent DOE's decisions or commitments. Any selection of disposition facility will be made after technical, economic, and policy considerations.
In most cases, data set reflects sites' planning data as of 4Q FY 2021

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Waste from

Waste To

Fiscal Year : From To

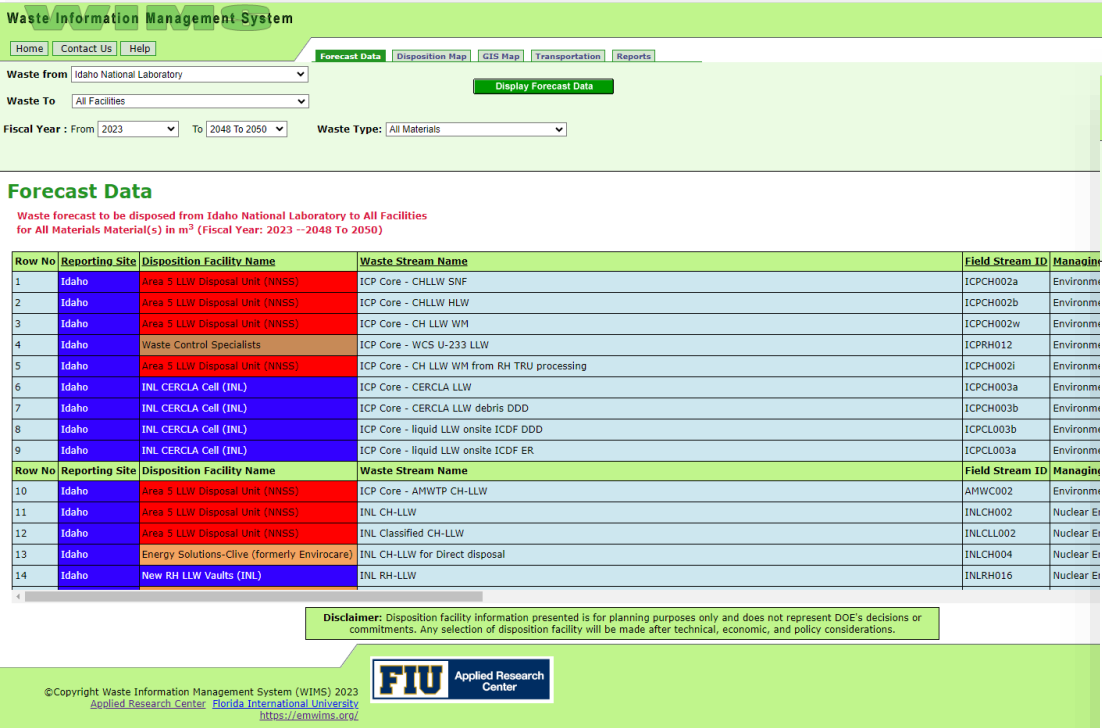
Waste Type:

Display Forecast Data

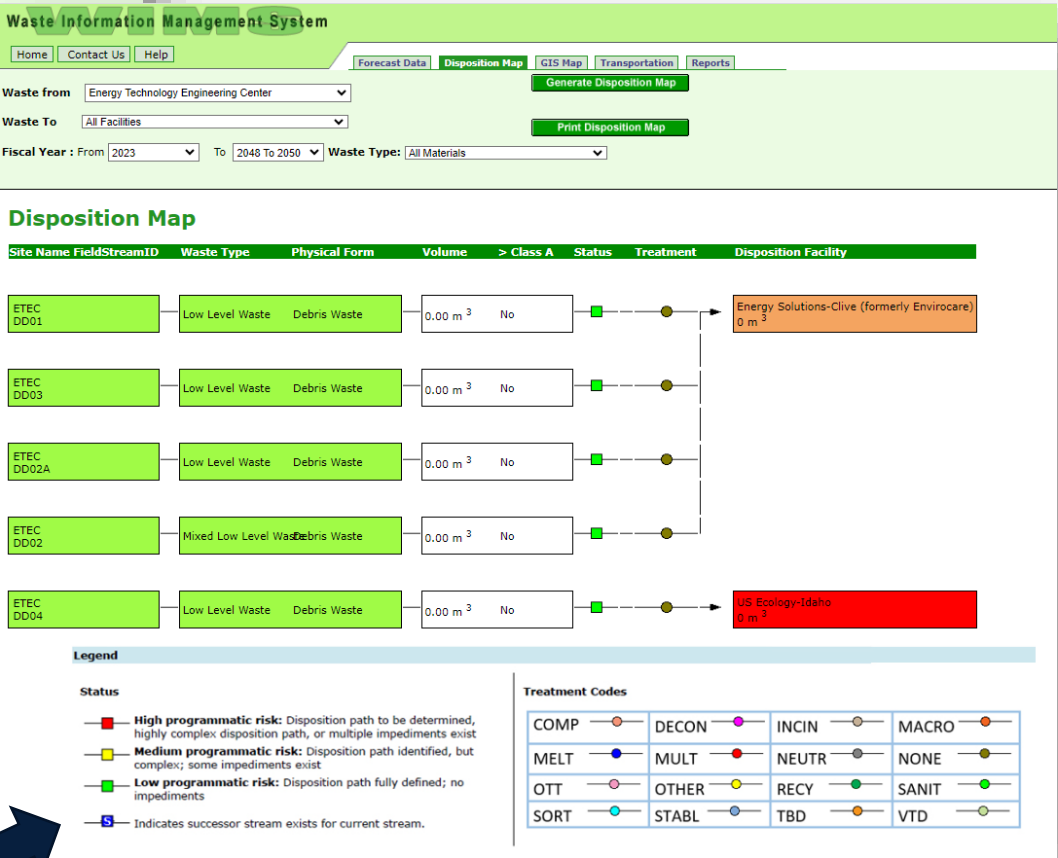


Subtask 1.2: Waste Stream Annual Data Integration

Accomplishments:



Forecast Data



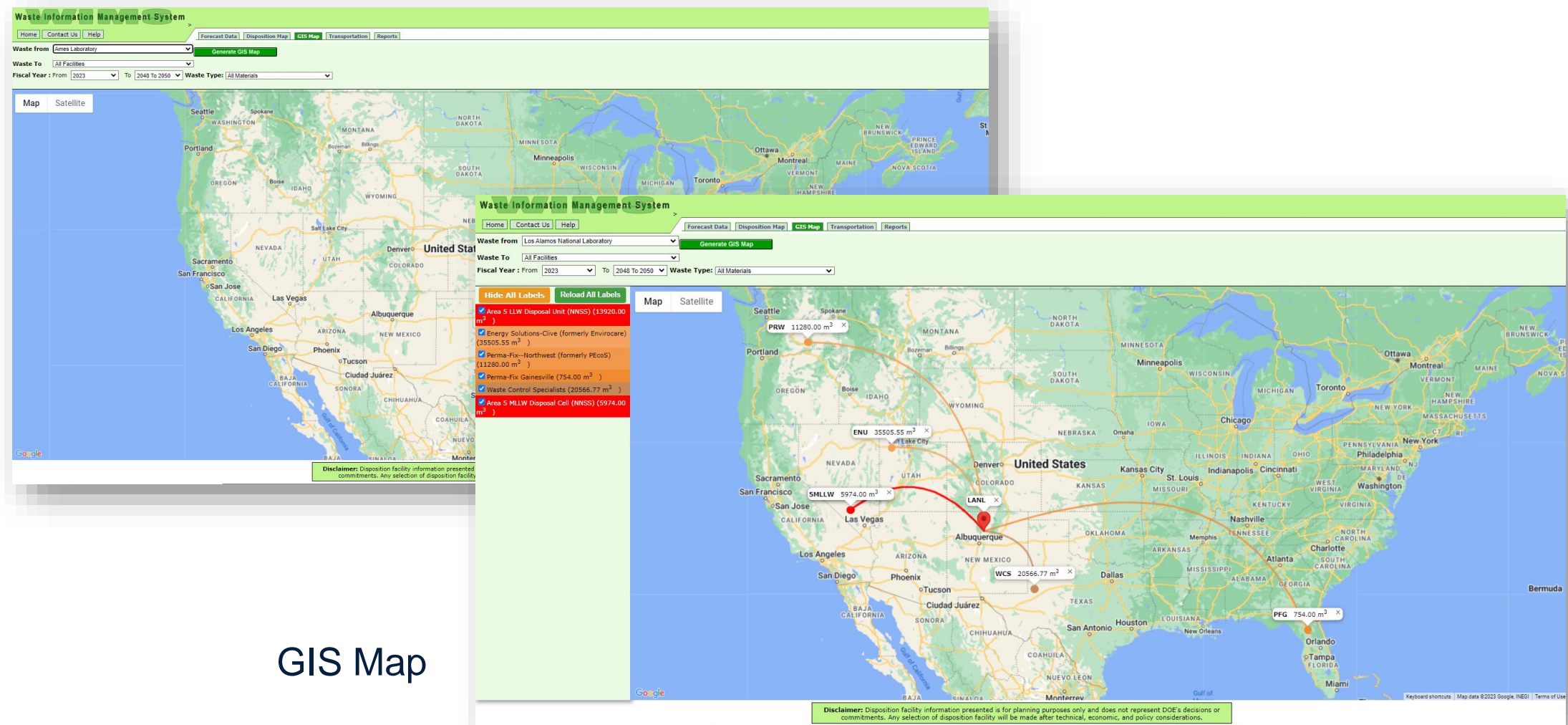
New Legend

Disposition Map



Subtask 1.2: Waste Stream Annual Data Integration

Accomplishments:



GIS Map

Uses Google Map API for enhanced user interaction



Subtask 1.2: Waste Stream Annual Data Integration

Accomplishments:

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Waste from

Savannah River Site

Waste To

All Facilities

Waste Type

All Materials

Display Transportation Data

Transportation

Shipping information for the Waste forecast to be disposed from Savannah River Site to All Facilities for All Materials Material(s) (Fiscal Year: 2023 --2048 To 2050)

Row No	Reporting Site	Disposition Facility Name	Waste Stream Name	Field Stream ID	Waste Type	Rail 2023	Truck 2023	Int
1	Savannah	E-Area Disposal (SRS)	Bulk Waste - From EMO	LLW-1	Low Level Waste	0	0	0
2	Savannah	Energy Solutions-Clive (formerly Envirocare)	Contaminated Soil/Debris - From ER	LLW-8-1	Low Level Waste	0	0	0
3	Savannah	Area 5 LLW Disposal Unit (WISS)	Contaminated Soil/Debris - LWO & Saltstone	LLW-8-1	Low Level Waste	0	2	0
4	Savannah	E-Area Disposal (SRS)	Bulk Waste	LLW-1	Low Level Waste	0	0	0
5	Savannah	E-Area Disposal (SRS)	Bulk Waste - From LWO	LLW-1	Low Level Waste	0	0	0
6	Savannah	E-Area Disposal (SRS)	Bulk Waste - From ER and D&D	LLW-1	Low Level Waste	0	0	0
7	Savannah	Energy Solutions-Clive (formerly Envirocare)	Contaminated Soil/Debris - LWO & Saltstone	LLW-8-1	Low Level Waste	0	0	0
8	Savannah	Commercial TBD	Liquid LLW - from SRPPF	LLW-5	Low Level Waste	0	0	0
9	Savannah	E-Area Disposal (SRS)	Bulk Waste - From Defense Programs (DP)	LLW-1	Low Level Waste	0	0	0
10	Savannah	E-Area Disposal (SRS)	Bulk from Naval Reactor	LLW-1	Low Level Waste	0	0	0
11	Savannah	E-Area Disposal (SRS)	Federal Baseline D&D Forecast	LLW-1 Out-Year	Low Level Waste	0	0	0
12	Savannah	Perma-Fix-Diversified Scientific Services-Inc	Liquid LLW	LLW-5	Low Level Waste	0	1	0
13	Savannah	E-Area Disposal (SRS)	Bulk Waste - From SRNL	LLW-1	Low Level Waste	0	0	0
14	Savannah	E-Area Disposal (SRS)	Bulk Waste - From FAO	LLW-1	Low Level Waste	0	0	0
15	Savannah	Perma-Fix-Diversified Scientific Services-Inc	Aqueous Liquids for Offsite Treatment	MLLW-7	Mixed Low Level Waste	0	0	0

Disclaimer:

Disposition facility information presented is for planning purposes only and does not constitute any commitments. Any selection of disposition facility will be made after technical, economic, and other factors are considered.

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Transportation

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Waste From

Argonne

Waste To

All Facilities

Waste Type All Materials

View Report

Transportation Report

[Transportation Forecast Report](#)
[Waste Stream Report](#)
[Waste Stream Info Report](#)
[Waste Stream Forecast Report](#)

Shipping Information for Waste Forecast to be disposed from Argonne to All Facilities (Fiscal Year: 2023 To 2024)

Reporting Site	Disposition Facility	Waste Stream Name	Field Stream ID	Waste Type	Intermodal 2023	Rail 2024	Truck 2024	Intermodal 2024
1	Argonne	Energy Solutions-Clive (formerly Envirocare)	LLW General Solid	LLW General Solid	Low Level Waste	0	0	8
2	Argonne	Perma-Fix Gainesville	LLW Organic Liquid	LLW Organic Liquid	Low Level Waste	0	0	0
3	Argonne	Energy Solutions-Clive (formerly Envirocare)	LLW Aqueous Liquids	LLW Aqueous Liquids	Low Level Waste	0	0	0
4	Argonne	Energy Solutions-Clive (formerly Envirocare)	306 D&D LLW	306 D&D LLW	Low Level Waste	0	0	0
5	Argonne	Energy Solutions-Clive (formerly Envirocare)	200 M-Wing D&D LLW	200 M-Wing D&D LLW	Low Level Waste	0	0	0
6	Argonne	Energy Solutions-Clive (formerly Envirocare)	B350 D&D LLW	B350 D&D LLW	Low Level Waste	0	0	0
7	Argonne	Energy Solutions-Clive (formerly Envirocare)	LLW - Stabilized/Treated Liquids	LLW - Stabilized/Treated Liquids	Low Level Waste	0	0	0
8	Argonne	Energy Solutions-TN (formerly GTS Duratek)	High Activity LLW (>200mr/hr or >Type A)	AE-L104DOE	Low Level Waste	0	0	0
9	Argonne	Energy Solutions-Clive (formerly Envirocare)	200 D&D MA/MB LLW	200 D&D MA/MB LLW	Low Level Waste	0	0	0
10	Argonne	Energy Solutions-Clive (formerly Envirocare)	212 D&D LLW	212 D&D LLW	Low Level Waste	0	0	0

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Reports - Sample Transportation Report



Subtask 1.2: Waste Stream Annual Data Integration

Accomplishments:

- FIU presented WIMS research and accomplishments at 2023 Waste Management Symposia, March 2023



FIU team presenting WIMS poster at WM2023. From left to right, Walter Quintero, Himanshu Upadhyay and Douglas Tonkay (DOE HQ).

Subtask 1.5: Cyber Security of WIMS Infrastructure

Description and Accomplishments:

- Cyber security of WIMS involves securing the network infrastructure that is deployed, secured and maintained in the FIU facility.
- This involves coordination between the FIU security team and DOE Fellows who learn cyber security skills while assisting staff do penetration testing and other tasks to test the overall security of the system at the application, database and infrastructure levels.
- Renewed and configured the yearly Secure Socket Layer (SSL) on WIMS website/server.



FIU Year 4 Projected Scope

- **Subtask 1.1: WIMS System Administration & Cyber Security - Database Management, Application Maintenance & Performance Tuning**
 - This subtask includes the day-to-day maintenance and administration of the application and the database servers.
 - Administrator will monitor the network and server traffic and performs updates necessary to optimize the application performance.
 - FIU will provide application and database security as well as help desk support to DOE site managers, HQ managers and other users who need assistance with WIMS.
 - Provide cyber security to WIMS infrastructure, application, database server and reporting server.
- **Subtask 1.2: Waste Stream Annual Data Integration**
 - Update WIMS modules – Forecast Data , Waste Stream and GIS map.
 - Update and publish reports.
 - Update and publish transportation module.



Task 2

D&D Support to DOE EM for Technology Innovation, Development, Evaluation and Deployment



Site Needs:

- A uniform, peer-reviewed, stakeholder endorsed test and evaluation methodology for D&D technologies, with a current emphasis on fixatives.
 - Define the operational requirement for the technology (What should it do and to what standard – characteristics and performance).
 - Develop uniform testing protocols so the D&D community can confirm it does, in fact, do it (also facilitates comparison).
- **Operationalize knowledge**, not just archive it.

Objectives:

- Engage ASTM International's E10.03 Subcommittee on Radiological Protection for Decontamination and Decommissioning of Nuclear Facilities and Components to develop, ballot and promulgate standard specifications and uniform testing practices for fixative technologies intended to support D&D activities.



Research Highlights & Accomplishments:

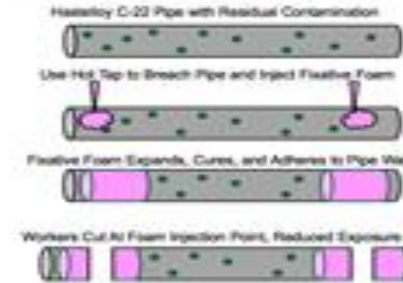
- ASTM E3104 (Decon Gels) and E3105 (Permanent Fixatives) were successfully balloted, approved, and renewed.
- Formal integration of ASTM standards related to fixative technology development, testing and evaluation is becoming mainstream (test plans, RFPs, peer-reviewed articles, etc.).
 - SRNL-STI-2023-00005, “Radiation Hardened Foam Cold Test Plan - Phase II: Foam Characterization Testing and Environmental Chamber Testing of FoamBag Fixative Foam”, 2023
 - **Supporting Foam Fixative Plug site deployment for F/H Labs**
 - Lee, E. H., et al., “Removable coatings: Thermal stability and decontamination of steel surfaces from 241Am,” Chemosphere, Vol 301, August 2022, 134680
 - FY 22 Minority Serving Institutions Partnership Program (MSIPP), RFP 000749



FIU Year 4 Projected Scope

- ASTM E 3191 (Foam Fixatives) updated and balloted
 - **Supporting Foam Fixative Plug site deployment for F/H Labs**
- ASTM Working Group established to codify experimental design developed in support of “certifying fixative technologies under impact stressors” into a formal testing practice

How do Fixative Foams Overcome these Challenges?



Experiments use HSE CP-620 Intumescent Fixative Foam:

- Commercially Available
- Known Quantity of Material
- Quick Curing Time
- Previously Used on Studies with 304 SS Piping



Alternative Fixative Foams (in the Event HSE CP-620 is NOT Viable) - FOAMBAG™

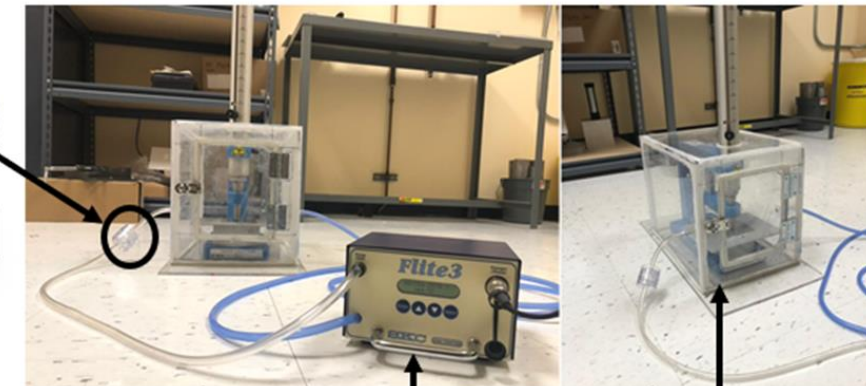
- FOAMBAG is very similar to the DRAINBLOCK technology:
 - PU resin foam that expands to form a permanent seal.
- The FOAMBAG technique has been in use in the UK in gloveboxes at Sellafield and meets the UK gas industry technical standard TSP/ES9.



The FOAMBAG™ foams the resin foam in place as it expands. As full expansion occurs, the foam seals through the irregular pores of the bag to form an adhesive seal with the pipe.



Filter



Air sampler

Acrylic housing

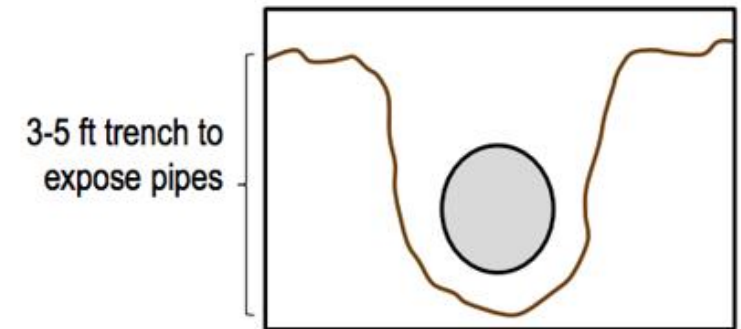
Site Needs:

- By FY '27, the F/H Laboratory Deactivation Project Team plans to remove all the buried LAD and HAD piping in the Courtyard between 772-F and 722-1F.
- The driver for removal is to prevent future release(s) to the environment from the buried, highly-contaminated piping.
- The intent is to remove the piping to within 1' of the respective building and then to cap both the 2 & 3-inch "core" pipe and the 3 & 4-inch "jacket" pipe.
- The piping is generally buried to a depth of 3-5 feet.
- Total length of piping to be removed is approximately 250 feet. Piping will be cut to 5' lengths so that it may be disposed to B-25.

Buried LAD and HAD
Piping between 772-F
and 772-1F



Aerial view of Potential Hot Site at F-Area



Research Highlights & Accomplishments: Identify & Down-select Most Compatible Technology

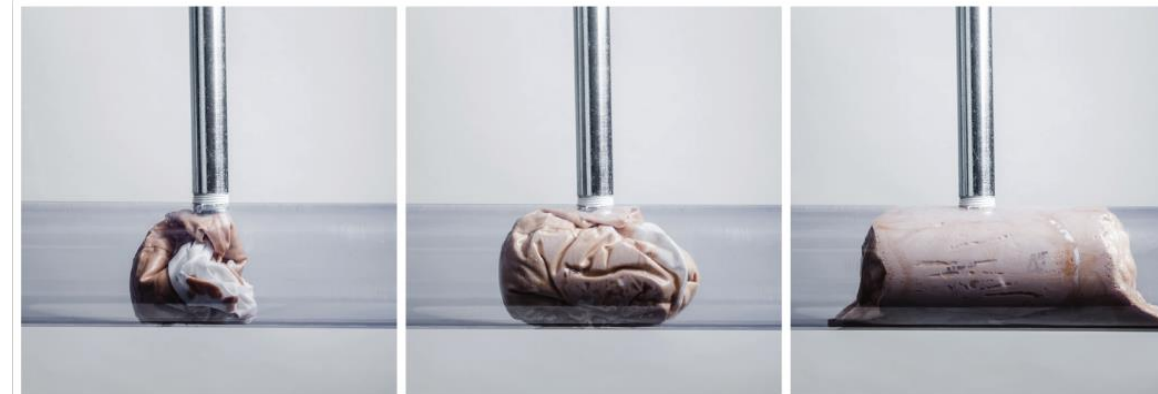
Hilti

- A two-component polyurethane (PU) intumescent foam that expands up to six times in volume upon application.
 - Meets ASTM E84 standard.
- Foam is applied through a dispenser and a mixer nozzle attachment.



FoamBag™

- Expanding PU resin foam.
 - Used in the UK in gloveboxes at Sellafield & meets the UK gas industry technical standard T/SP/E/59.
- Injected into a semiporous bag via an injection tube which passes up through the standpipe assembly.



The FOAMBAG™ holds the resin foam in place as it expands. At full expansion some of the foam seeps through the semi-porous panels of the bag to form an adhesive seal with the pipe

Research Highlights & Accomplishments: Technology Comparison to Support Down-selection

	Curing Time	Max Curing Temp.	Average Plug Strength	Adhesion to Wetted Surface	Fire Retardant	Environmental Chamber	Headspace	Hot Tap Compatible
Hilti	1-3 mins	276°F	7733 lbf	888 lbf	YES	PASS	PASS	FAIL
FoamBag	15-45 mins	277°F	9684 lbf	4741 lbf	YES*	In progress (SRNL)	In progress (SRNL)	PASS

*Fire retardant with addition of Exolit AP 750 additive



FIU Year 4 Projected Scope

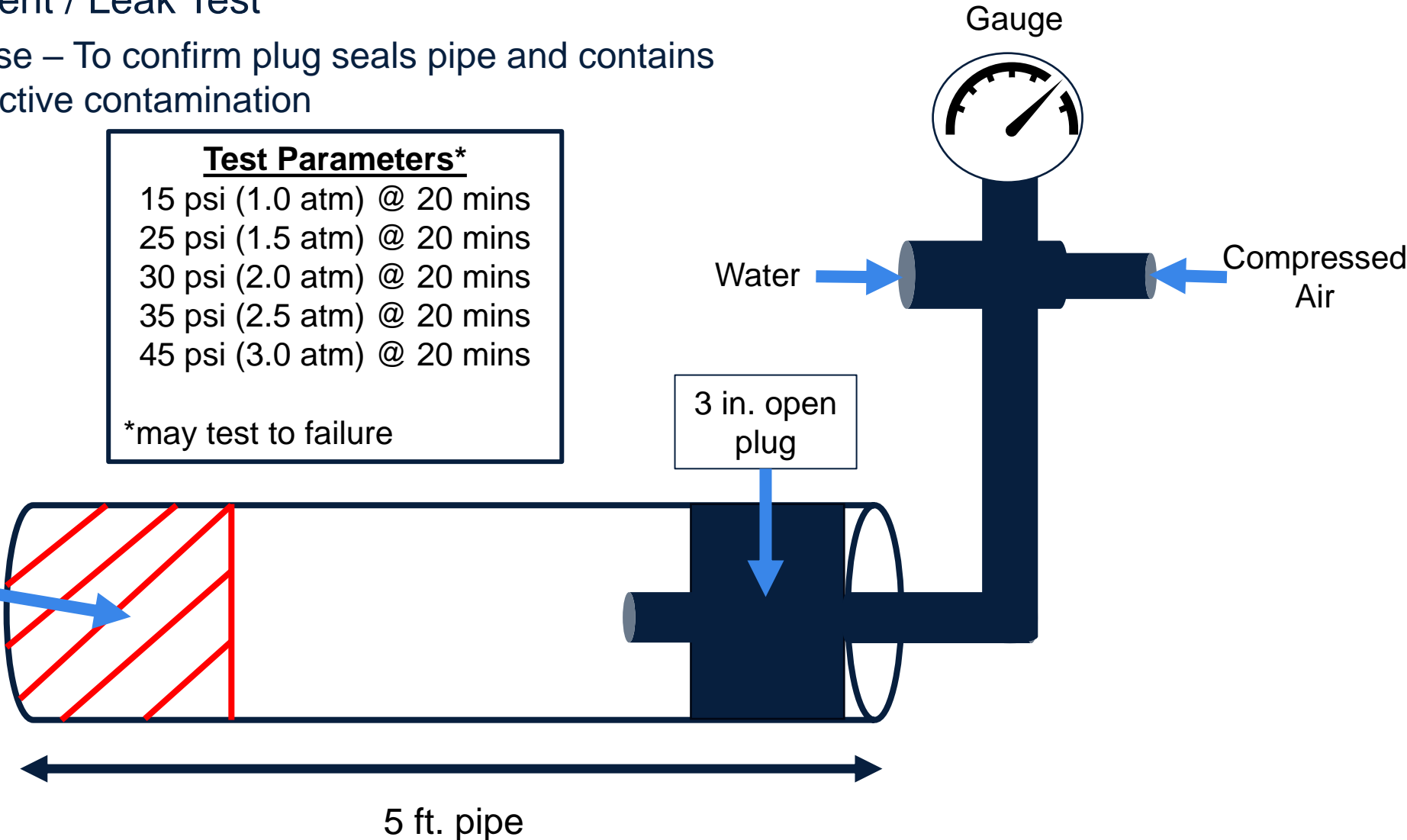
- Containment / Leak Test
 - Purpose – To confirm plug seals pipe and contains radioactive contamination

Test Parameters*

15 psi (1.0 atm) @ 20 mins
 25 psi (1.5 atm) @ 20 mins
 30 psi (2.0 atm) @ 20 mins
 35 psi (2.5 atm) @ 20 mins
 45 psi (3.0 atm) @ 20 mins

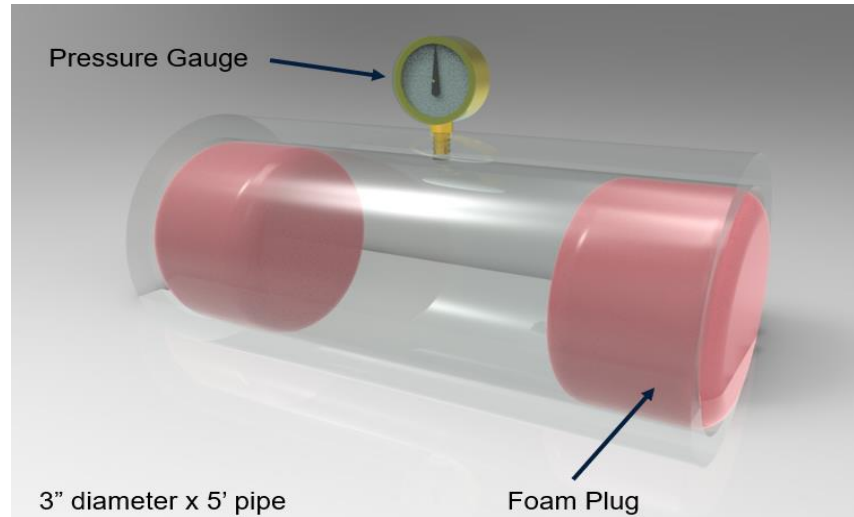
*may test to failure

FoamBag acts
as “closed plug”
in the system



FIU Year 4 Projected Scope

- Confirm Internal Pipe Pressure Conforms to SRS Manual under the following conditions:
 - During curing process (potential heat generation up to 277°F for 5 mins.)
 - During cutting process (heat generation from mechanical and/or torch cutting methods)



- SRS Manual 1S LLW WAC section 5.3 identifies the **maximum** amount of **allowable pressure** within a pressurized container to be **1.5 atm** (22 psi).
- Pressure will be monitored for 24 hours.



Subtask 2.3: Certifying Fixative Technology Performance when Exposed to Impact Stressors Postulated in Contingency Scenarios Highlighted in Safety Basis Documents

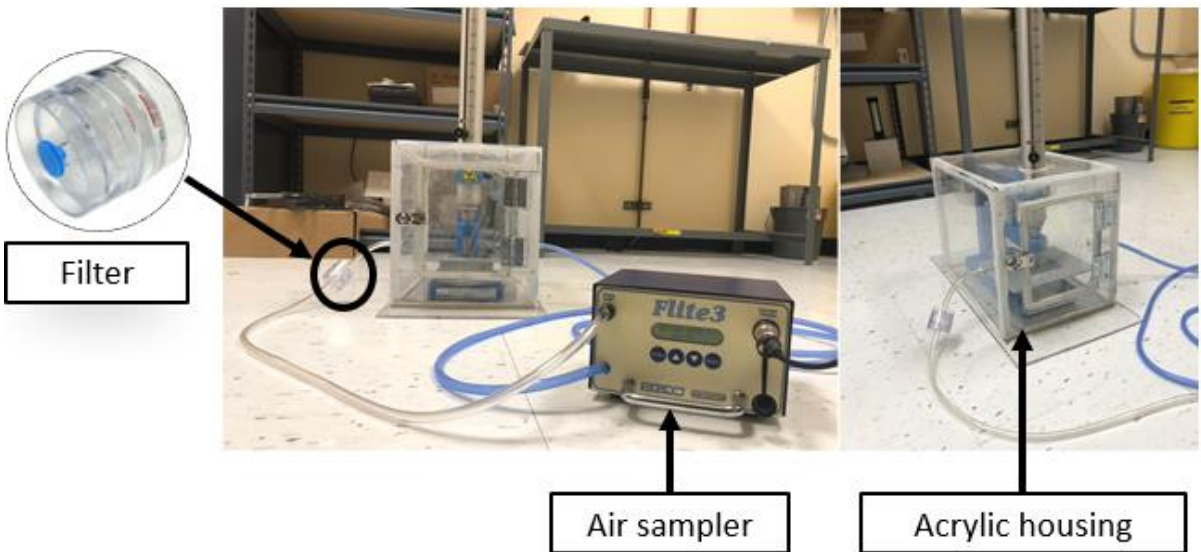
Site Needs:

- Outdated regulations, such as the DOE-HDBK-3010, outline factors for dealing with residual contamination, but fail to account for the positive impacts provided by fixative technologies in reducing ARF coefficients.
 - Results in inconsistent certification methodology for fixative technologies.
 - Produces varying Source Term calculations.
 - Fails to provide sufficient credit for improvements in state-of-the-art fixative technologies.
 - Key finding in the SRS 235F-PuFF research activity – after fixative deployment, site personnel could not take credit for fixatives in the safety basis calculations.
 - Potential to reduce cost due to a more accurate/lower Source Term.

FIXATIVE STATE	Contaminant Form	Impact ARF	
<ul style="list-style-type: none"> • Reduces ARFs ↓ • Reduces RFs ↓ 	Gas / Vapor	1.0	<div>High Risk</div> <div>Low Risk</div>
	Powder	4e-4	
	Liquid	4e-5	
	Metal / Solid	No significant airborne release is postulated for this accident configuration.	

Objectives:

- Reevaluate ARF coefficients for powder contaminants under impact.
- Determine ARF coefficients for fixative materials under impact.
 - Fixative/Polymer State
- Integrate results to update DOE-HDBK-3010.



Subtask 2.3: Certifying Fixative Technology Performance when Exposed to Impact Stressors Postulated in Contingency Scenarios Highlighted in Safety Basis Documents

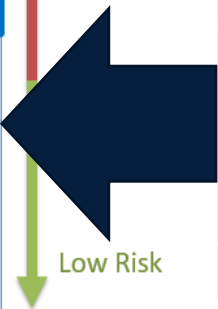
Research Highlights & Accomplishments:

- ARF for loose powder contamination under impact produced an average ARF of 3.47e-04 – **reconfirmed the validity of the value presented in the DOE-HDBK-3010, 4e-04.**
- Applying fixative technologies significantly reduced ARFs under impact stressors.
 - **Supports the addition of a new designation: “Fixative / Polymer State”**

	Impact (in-lb) / (kg-cm)	Average Airborne Release Fraction
Powder	320 / 368	2.23E-04
	240 / 276	1.08E-04
	200 / 230	1.05E-05
	160 / 184	6.32E-07
Total Average		3.47E-04

Contaminant Form	Impact ARF
Gas / Vapor	1.0
Powder	4e-4
Liquid	4e-5
Metal / Solid	No significant airborne release is postulated for this accident configuration.

High Risk



Low Risk

	Impact (in-lb) / (kg-cm)	Average Airborne Release Fraction
FD	320 / 368	5.55E-07
	240 / 276	6.78E-07
	200 / 230	8.34E-07
	160 / 184	3.33E-08
Total Average		5.25E-07



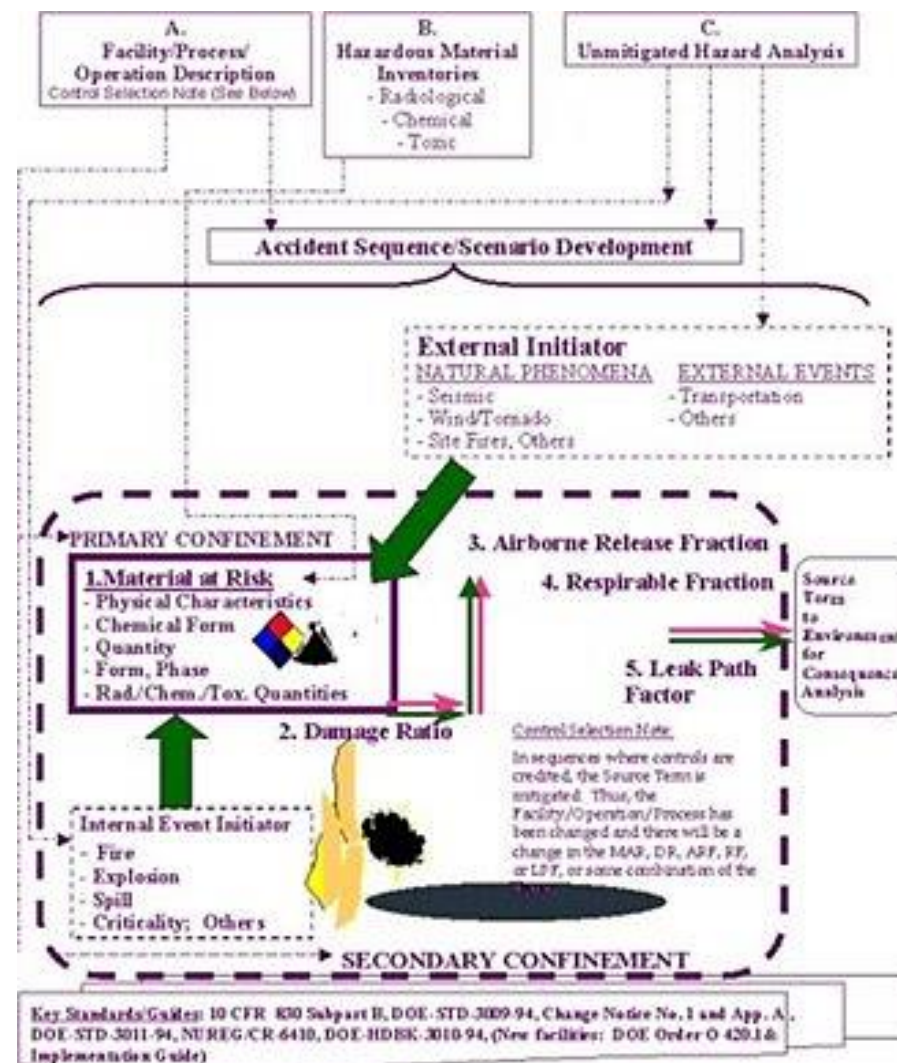
FIU Year 4 Projected Scope

ASTM Testing Practice

- Draft ASTM Testing Practice and submit to E10.03 for review and publication

Standardize Methodologies for Direct Comparison of Fixative Technologies for Impact Stressors

Provide Empirical Data to Support Potential Update to DOE HDBK



Site Needs:

- Development of novel technologies that support Hg remediation in water.
- Address the adsorption of various forms of Hg contaminants.
- Enable an easy, cost-effective method to recycle the used sorbent.

Objectives:

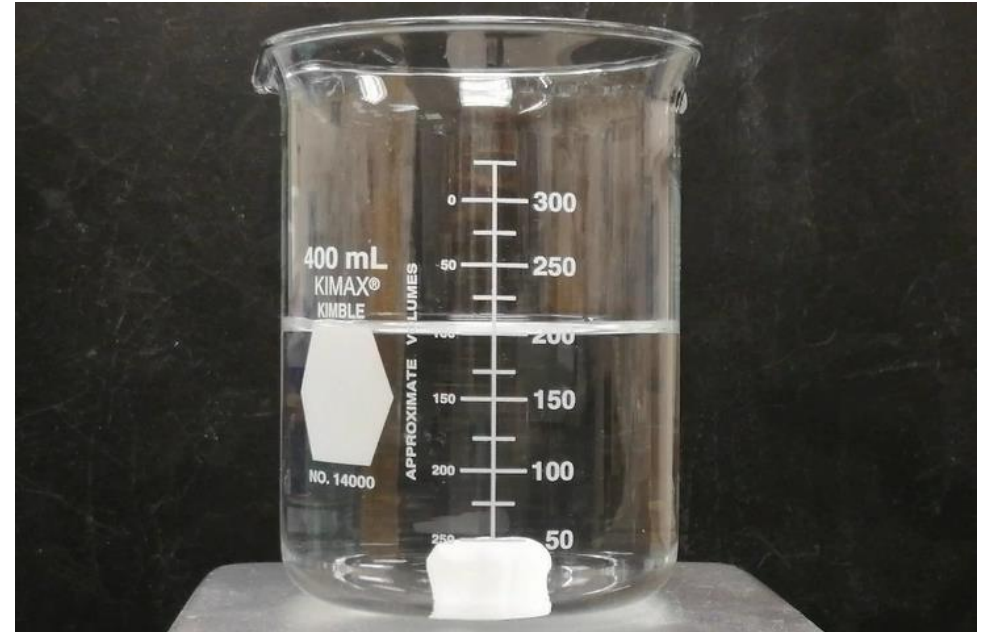
- Design recyclable polydimethylsiloxane micro-ribbons (PDMS-MRs) to achieve Hg^{2+} and CH_3Hg^+ abatement.
- Confirm application of PDMS-MRs for Hg^{2+} remediation in water.
- Confirm application of PDMS-MRs for CH_3Hg^+ remediation in water.
- Synthesis of magnetic PDMS-MRs (mPDMS-MRs).
- Confirm the recycling of mPDMS-MRs in water.



Research Highlights & Accomplishments:



Recycling m-PDMS-MRs from water



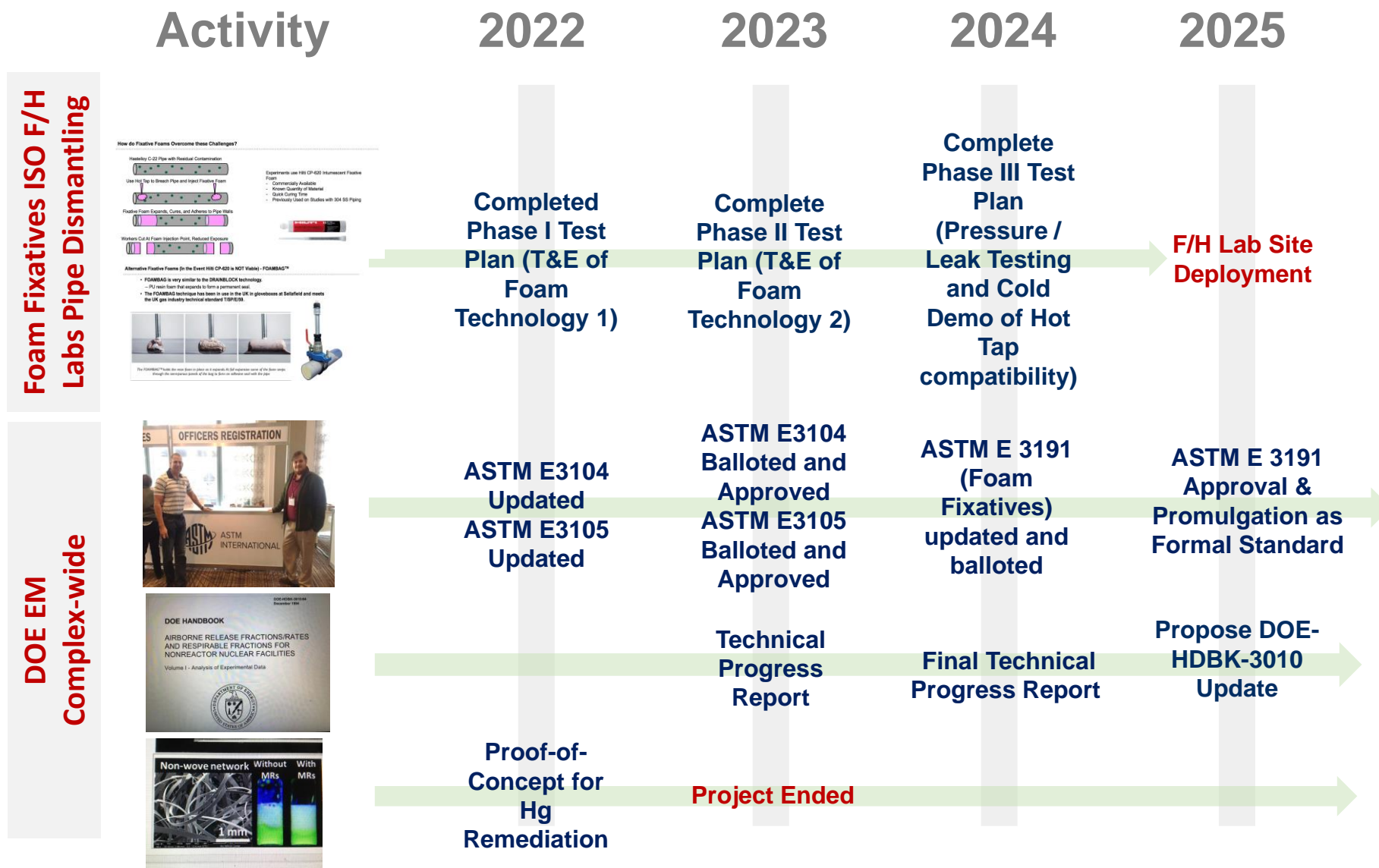
m-PDMS-MRs in Oil/Water separation

Conclusion:

1. The mPDMS-MRs demonstrated excellent capability for Hg remediation.
2. Cost effective method when compared to other technologies being investigated.
3. Recommend further investigation if correct resources/personnel can be identified.

Technology Development and Deployment Road Map

D&D Roadmap



DOE EM Citations Referencing ASTM E10.03 Fixative Technology Standards and Impact Performance

- ASTM E10.03 standards have established a recognized, community-wide, uniform methodology for testing, evaluating, certifying and crediting fixative technologies for use in support of D&D activities and have been extensively cited. A few recent examples include:
 - SRNL-STI-2021-00115, “A Novel Approach to Mitigating the Potential Release of Radioisotopes Under Fire Conditions - Enhancing Fire Resiliency of Radiological Contamination Fixatives During Deactivation & Decommissioning Activities”, 2021.
 - *Integrated into SRS 235-F PUFF Facility Work Plan for Incombustible Fixative site deployment
 - SRNL-STI-2023-00005, “Radiation Hardened Foam Cold Test Plan - Phase II: Foam Characterization Testing and Environmental Chamber Testing of FoamBag Fixative Foam”, 2023.
 - *Supporting Foam Fixative Plug site deployment for F/H Labs
 - Lee, E. H., et al., “Removable coatings: Thermal stability and decontamination of steel surfaces from 241Am,” Chemosphere, Vol 301, August 2022, 134680.
 - FY 22 Minority Serving Institutions Partnership Program (MSIPP), RFP 000749
 - PA3: Incombustible fixatives and decontamination agents
 - RN3: R&D leading to the development of these fixatives and agents for a nuclear facility. Also, the development of testing protocols to demonstrate their acceptance.
 - C3: Meets ASTM standard from E10.03. Protocols should be applicable to various DOE facilities
- Certifying Fixative Technology Performance Under Impact Stressors
 - Technical Progress Report, “Certifying Fixative Technologies – Impact” – submitted for upload to OSTI.
 - Technical Progress Report submitted as Peer-reviewed manuscript, “Determination of Airborne Release Fractions from Loose Powder Contamination under Impact Stress” – submitted to the Nuclear Technology Journal, Aug 2023.



Task 3

D&D Knowledge Management Information Tool (KM-IT)



Task 3: D&D Knowledge Management Information Tool (KM-IT)

Subtask 3.4	Content Management
Subtask 3.5	Marketing and Outreach
Subtask 3.6	D&D KM-IT System Administration
Subtask 3.7	Cyber Security of D&D KM-IT Infrastructure
Subtask 3.8	KM-IT Tech Talks



Task 3: D&D Knowledge Management Information Tool (KM-IT)

Site Needs:

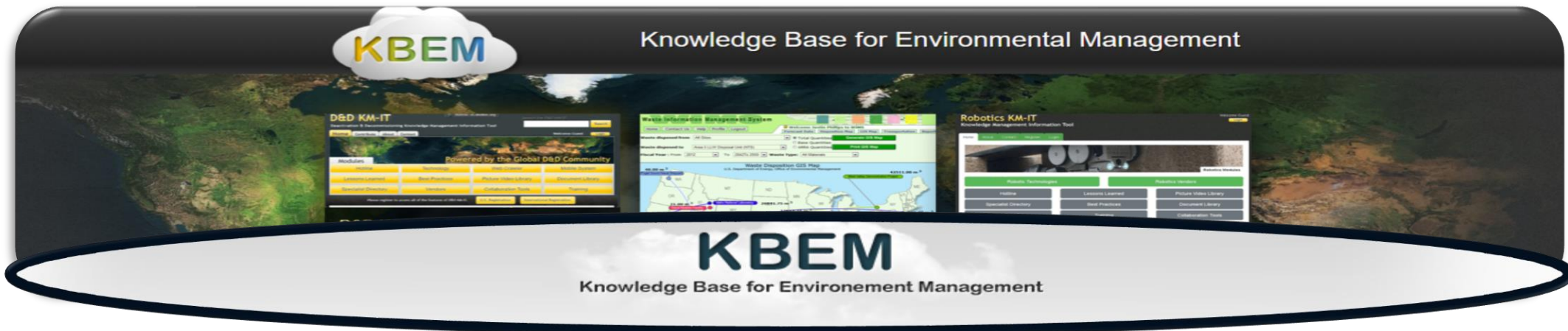
- To prevent the loss of the collective knowledge from the aging workforce, the need to collect, retain and disseminate knowledge in an organized and structured way through the development and maintenance of a universally available and usable knowledge management system for DOE-EM.

Objectives:

- Knowledge management (KM) is a modern approach & discipline being used within EM to capture knowledge. Objectives for KM-IT are to attain the long-term active use, operation, and continued growth of the knowledge from across the DOE global community and capture within the KM-IT system, resulting in enhanced worker safety, improved operational efficiencies, improved communication & knowledge among stakeholders, and the cross-generational transfer of knowledge to the future workforce.



Knowledge Base for Environmental Management



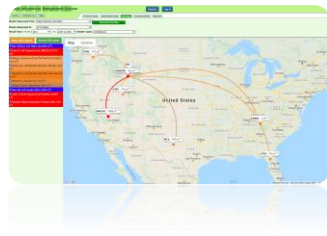
DND KM-IT
dndkm.org

WIMS
emwims.org

DOE FELLOWS
fellows.fiu.edu

DOE RESEARCH
doersearch.fiu.edu

Robotics KM-IT
rkmit.org



Knowledge Base for Environmental Management



Knowledge Base for Environmental Management



D&D KM-IT
Deactivation & Decommissioning Knowledge Management Information Tool

Powered by the Global D&D Community

D&D Knowledge Management Information Tool

D&D KM-IT is a web-based knowledge management information tool custom-built for the deactivation and decommissioning



Waste Information Management System

Waste Information Management System



Robotics KM-IT
Robotics Knowledge Management Information Tool

Robotics Knowledge Management Information Tool



D&D KM-IT Mobile

Fixative Native App

Deactivation and Decommissioning Mobile Platform



DOE / FIU Cooperative Agreement Research



Student Connection Zone

DOE / FIU Science & Technology WorkForce Development Initiative

About KBEM

The KBEM provides a common interface for all IT applications for DOE EM developed and maintained by the Applied Research Center at Florida International University. The Knowledge Base for Environmental Management (KBEM) provides a unified system of knowledge management (community of knowledge) for the Department of Energy Office of Environmental Management (DOE EM) and includes the following major areas: Deactivation and Decommissioning (D&D), Soil and Groundwater (S&GW), Waste Processing, and International Knowledge




- D&D Hotline
- Technology Module
- Vendor Module
- D&D Research
- Mobile applications
- Lessons Learned
- Document Library
- Pictures/videos
- Search tools
- Training
- Specialists
- Best Practices

<https://www.dndkm.org/>



The screenshot displays the D&D KM-IT website, which is titled "Deactivation & Decommissioning Knowledge Management Information Tool". The site features a navigation bar with links for Home, Contribute, About, and Contact. A search bar is located in the top right corner. Below the navigation bar, there is a section titled "Modules" with a grid of buttons for various services: Hotline, Technology, Web Crawler, Tech Talks, Lessons Learned, Best Practices, Picture Video Library, Document Library, Specialist Directory, Vendors, D&D Research, and Training. A banner below the modules section reads "Powered by the Global D&D Community". Below this, there are links for "U.S. Registration" and "International Registration". The "Additional Features" section includes links for "D&D RESEARCH", "Fixative Module", "ITSR Module", "Search SRS ISSC Reports", and "Prioritization Tool". A large banner for a "Virtual D&D Tech Talk" is prominently displayed, featuring a graphic of a head with binary code and the text "AI ML". The banner includes the date "JUL 18" and the title "TECH TALK ON KM-IT PLATFORM JULY 18, 2023 @ 11 am - 12 pm". Below the banner, there is a description of the event and links for "More information", "Signup to our newsletter", and "Add to Calendar". The footer contains a "Quick Links" section with links to DOE EM D&D, SRS ISSC, ALARA Center, EFCOG, and COGENTUS.



Subtask 3.4: Content Management

Accomplishments:

- Publishing D&D technologies, vendors, lessons learned, best practices, D&D news, conferences and other content to KM-IT
- Perform QA/QC of existing content in the system with assistance of DOE Fellows
- 33 technologies were published on this platform in this fiscal year, bringing the total technologies published to 1577



Portable Fume Extractor



Robotic Welders



Anti-Contamination "Blu" Suit

Subtask 3.4: Content Management

Accomplishments:

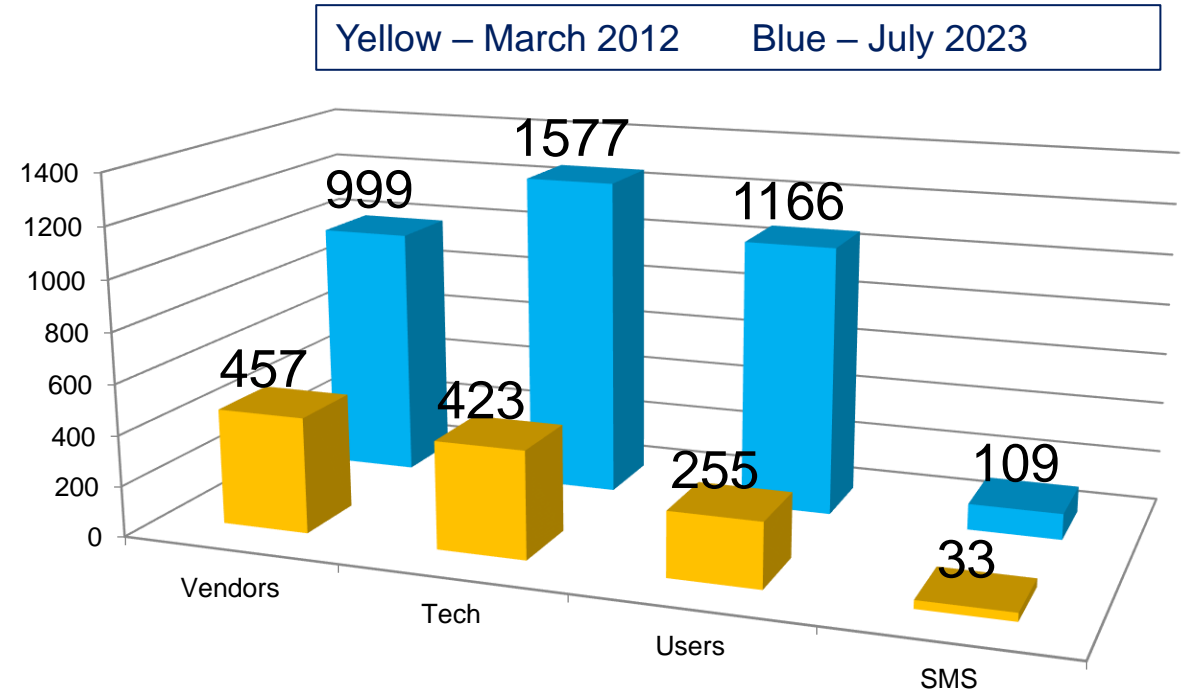
- 41 news articles published on the news module
- 23 event posted under the training module
- Currently updating legacy videos on the Video & Picture module from Adobe Flash to .mp4 and uploading them on YouTube because modern browsers stopped supporting Flash



Subtask 3.4: Content Management

Description and Accomplishments:

- D&D KM-IT web analytics to track usage metrics.
- 1577 D&D technologies
- 1166 registered users
- 999 D&D vendors
- 109 subject matter specialists



Growth from March 2012 to July 2023

Fully searchable resources – Original sources no longer available

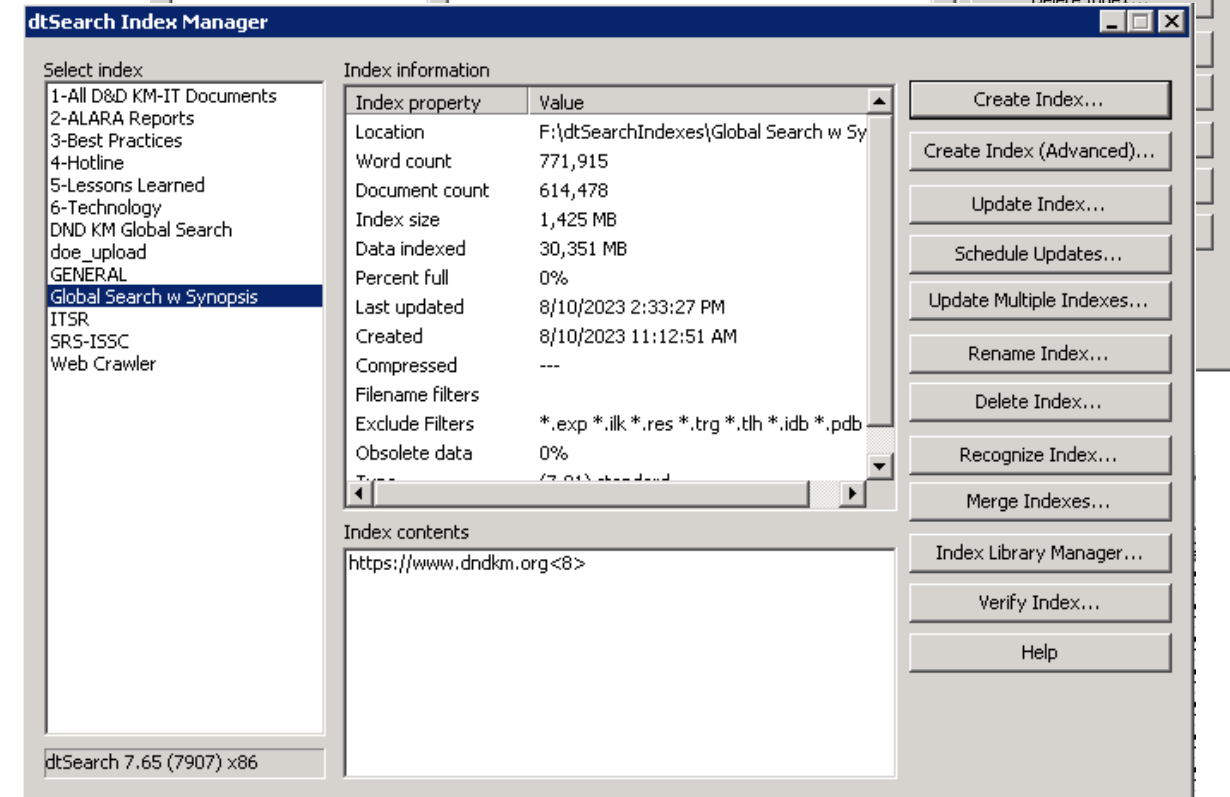
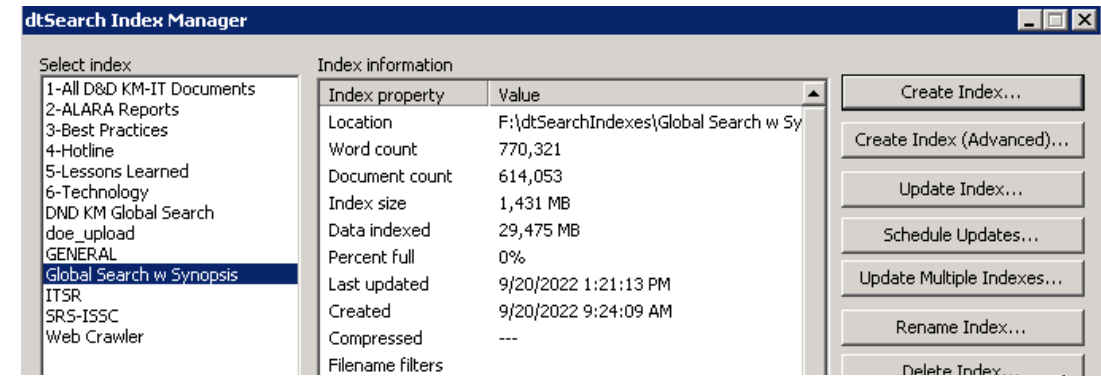
- 169 ALARA Center reports archived (Hanford and SRS)
- 231 Innovative Technology Summary Reports archived



Subtask 3.4: Content Management

Accomplishments:

- Search KM-IT – This feature involves search index optimization.
 - Search process crawls through D&D KM-IT system and stores key information about each document so that when users perform a search, the information can be retrieved in real time.
 - The index is built using word, pdf, html and other readable documents stored in the system.
 - The search index is updated manually after any significant changes to the D&D KM-IT (6-8 times per year).
 - Since last year, the D&D KM-IT has added 425 files (html, pdf and doc).



Subtask 3.4: Content Management

Aug 2022 - Jul 2023 DND KM-IT WEB ANALYTIC DATA

TOTAL PAGEVIEWS

30,641

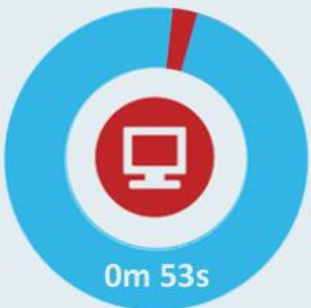
SESSIONS

17,150

UNIQUE USER VISITS

16,328

AVG. TIME ON SITE



TRAFFIC TYPE



TOP 5 DEMOGRAPHICS



USERS



TOP QUERIES (Clicks)

acm-r ail american atc avatar barrier
calculator coat denuke
dyneema elite excel gammacam
gasoline giraff gripper hglove iii inc isocs
manual military modiks niton nuclear oxy
parts pdf polymeric poxy radiation resrad
robot rotobec scaffolding scansort
schilling services sheet shirt specs
systems torch training vasteras versaball xlt

BROWSERS



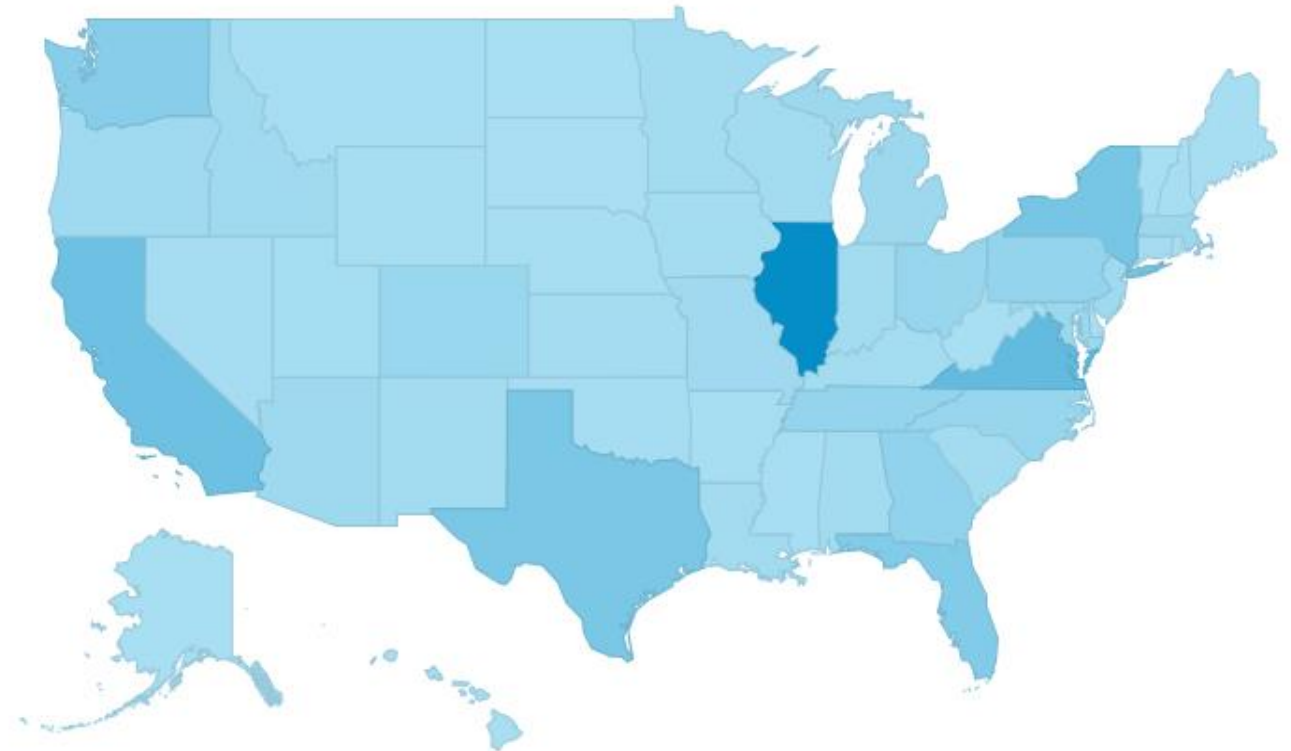
MODULE DESTINATION



Subtask 3.4: Content Management

Description and Accomplishments:

- KM-IT visited by every state of the union in the last 12 months
- Top 5 states include:
 - Illinois – 19.17%
 - Virginia – 8.28%
 - California – 7.07%
 - New York – 5.98%
 - Texas – 5.59%



Subtask 3.5: Marketing and Outreach

Accomplishments:

- Reaching out to sites/national labs to increase KM-IT user involvement
- Development of newsletters, post cards and factsheets
- Other marketing and outreach to introduce the system to SME who may not be aware of its features and capabilities

D&D KM-IT
Knowledge Management Information Tool

JAN 24

TECH TALK
ON KM-IT PLATFORM

JANUARY 24, 2023 @ 10 AM

International Perspective on Decommissioning with focus on 3D hazard aware digital and robotics technology based transformation

Florida International University (FIU) is conducting a series of D&D Tech Talks focusing on several D&D topics relevant to the DOE EM Complex. On January 24, 2023, FIU will feature a Tech Talk from István Székely, from the Institute for Energy Technology in Norway, who will share an international perspective on decommissioning with focus on 3D hazard aware digital and robotics technology based transformation. The presentation will be centered around some of the most dominant international trends related to 3D digital and robotics technology based transformation of nuclear decommissioning and waste management, and will present important international developments aiming at furthering these trends.

Join us for this informative session presented by FIU-ARC in collaboration with the Institute for Energy Technology. This virtual event will be held on the KM-IT platform.

VISIT [DNDKM.ORG](https://www.dndkm.org) OR SCAN QR CODE ABOVE FOR MORE INFORMATION ABOUT THIS EVENT

This event is sponsored by The U.S. Department of Energy

FIU Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

U.S. DEPARTMENT OF ENERGY

INFORMATION TECHNOLOGY/KNOWLEDGE MANAGEMENT

PROJECT: Waste and D&D Engineering and Technology Development, Decommissioning and Decommissioning Knowledge Management Information Tool (D&D KM-IT)

CLIENT: U.S. Department of Energy

SITE: DOE Complex-wide

PRINCIPAL INVESTIGATOR: Dr. Leonel Laga

Description:
D&D work is a high priority across the DOE complex.

Reducing the need to rediscover the knowledge of the past while capturing the new knowledge and experience gained during D&D operations.
Resulting in enhanced worker safety and schedule efficiencies.

Accomplishments:

- Technology module contains information on over 934 D&D related technologies and includes over 83 related technologies compiled by FIU.
- Vendor module provides descriptions, areas of expertise and contact information for over 977 vendors.
- Library lists D&D experts, their areas and contact information.
- Module includes D&D questions and answers from experts.
- Web site is searching the D&D KM-IT for D&D related information.
- Library hosts legacy innovation Summary Reports (FSRs), documents, ALARA Center and other documents from the D&D.
- System provides access to modules on the devices supporting Windows, Android, and Apple iOS.

Modules

- Hotline
- Technology
- Web Crawler
- Best Practices
- Lessons Learned
- Video Picture Library
- Vendors
- Planning
- Mobile System
- ALARA Reports
- Specialist Directory
- Collaboration Tools

<https://www.dndkm.org>

Dr. Leonel Laga, Director of Research, Applied Research Center, Florida International University 305-243-1810 lgaga@fiu.edu

D&D KM-IT
Knowledge Management Information Tool

OCT 19

TECH TALK ON KM-IT PLATFORM
OCTOBER 19, 2022 @ 11 am - 12 pm

University R&D and Deployment of Robotics Systems at DOE Facilities

Looking forward to seeing you!

just a friendly reminder about the Tech Talk today
at 11 am EST on the KM-IT platform

JOIN THE TECH TALK

D&D KM-IT Knowledge Management Information Tool

In this issue...

- [Virtual D&D Tech Talk on KM-IT Platform - DOE's ALTEMIS Project: Advanced Long-Term Monitoring of Complex Groundwater Plumes](#)
- [FIU-ARC participates at 2nd Annual Cleanup Caucus Event Showcasing Technology in Use at EM Sites](#)
- [FIU-ARC Lateral Gamma Scanner featured at WRPS FY2022 Accomplishments](#)

Virtual D&D Tech Talk on KM-IT Platform - DOE's ALTEMIS Project: Advanced Long-Term Monitoring of Complex Groundwater Plumes



On April 25, 2023, FIU featured a Tech Talk from Dr. Hansel Gonzalez-Raymat a Senior Scientist at the Savannah River National Laboratory (SRNL). This talk focused on the DOE-EM project that is funding a National Laboratory team from Savannah River National Laboratory (SRNL), Lawrence Berkeley National Laboratory (LBNL), and Pacific Northwest National Laboratory (PNNL) to establish the overarching framework of long-term monitoring by systematically combining advanced hardware and software technologies. This project is titled "Advanced Long-Term Environmental Monitoring Systems (ALTEMIS)" and is sponsored by the DOE-EM Technology Development Program.

If case you missed it, the archive of this and other Tech Talks can be accessed via the [D&D KM-IT platform](#).

FIU-ARC participates at 2nd Annual Cleanup Caucus Event Showcasing Technology in Use at EM Sites



FIU's Applied Research Center participated and presented at the House of Representatives Cleanup Caucus Event showcasing technology in use at EM sites.



Subtask 3.5: Marketing and Outreach

Accomplishments:

- Participation at workshops and conferences such as Waste Management
 - FIU ARC Booth
 - Presented KM-IT poster at WM2023

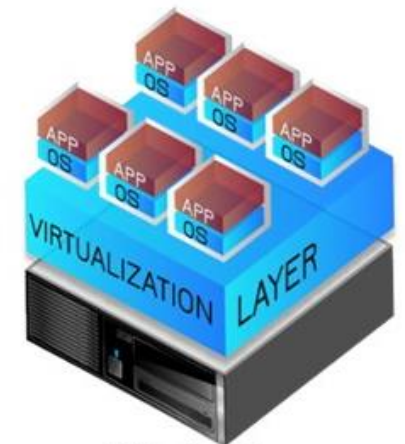


Dr. Himanshu Upadhyay (FIU), Nancy Bushman (DOE) and Walter Quintero (FIU) in front of the D&D KM-IT poster at WM2023.

Subtask 3.6: D&D KM-IT System Administration

Description and Accomplishments:

- D&D KM-IT System Administration is an ongoing task, which involves day-to-day administration of servers that house the KM-IT databases and web applications.
- This task includes updating patches and OS fixes, updating antivirus engines and definitions, updating drivers and assuring that the network is working properly.
- Under this task, hardware upgrades are also conducted (memory, hard drives, video cards, routers, firewall, etc.).
- Other administrative task consist of network access control of staff and DOE Fellows (including remote network access).
- This task also supports creating development environments for other subtasks, data and application backups.

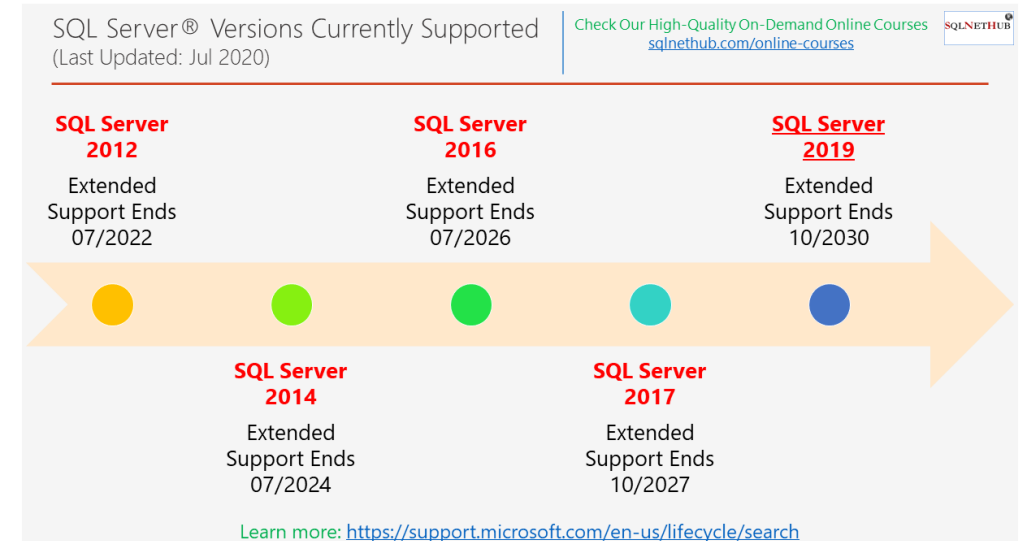


Virtualized Server
Architecture

Subtask 3.6: D&D KM-IT System Administration

Description, Process and Accomplishment:

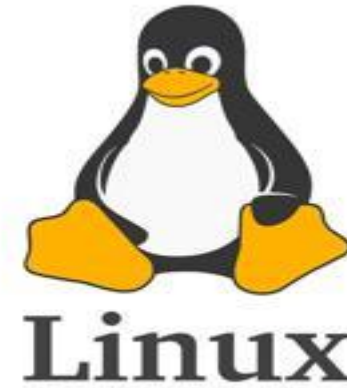
- This task involves migration/backup of the existing databases and KM-IT modules to latest .NET Framework.
- Created a development environment for the application and database server
- Testing application before moving to production on staging servers
- This constant administration improve performance, security, stability and long-term support of the system



Subtask 3.7: Cyber Security of D&D KM-IT Infrastructure

Description and Accomplishments:

- Cyber security of D&D KM-IT involves securing the network infrastructure maintained in the FIU facility.
- Updating of Secure Socket Layer (SSL) for dndkm.org domain.
- Maintaining and optimizing firewall rules.
- Regularly performed penetration testing on network, KM-IT database and application servers.
- Trained DOE Fellows in DOE-EM Cybersecurity lab on advanced security tools commonly used in the industry.



Subtask 3.8: KM-IT Tech Talks

Accomplishments:

- Conducted D&D related Tech Talk every quarter on the D&D KM-IT platform.
- Collaborated with National Laboratories and/or DOE sites to identify and present technical topics of interest to the community.
- Tech Talks are conducted virtually using an online meeting platform that can be accessed via KM-IT
- Promoted Tech Talks via newsletters, website, emails and flyers developed by FIU.
- Conducted 4 Tech Talks (<https://www.dndkm.org/TechTalk>)
 - October 19, 2022
University R&D and Deployment of Robotics Systems at DOE Facilities
 - January 24, 2023
International Perspective on Decommissioning with focus on 3D hazard aware digital and robotics technology-based transformation
 - April 25, 2023
DOE's ALTEMIS Project: Advanced Long-Term Monitoring of Complex Groundwater Plumes
 - July 18, 2023
AI/ML Research support for Advance Long-Term Environmental Monitoring Systems (ALTEMIS)



Subtask 3.8: KM-IT Tech Talks

Accomplishments:

October 19, 2022

University R&D and Deployment of Robotics Systems at DOE Facilities

Collaborator:

Florida International University Robotics Team

Speakers:



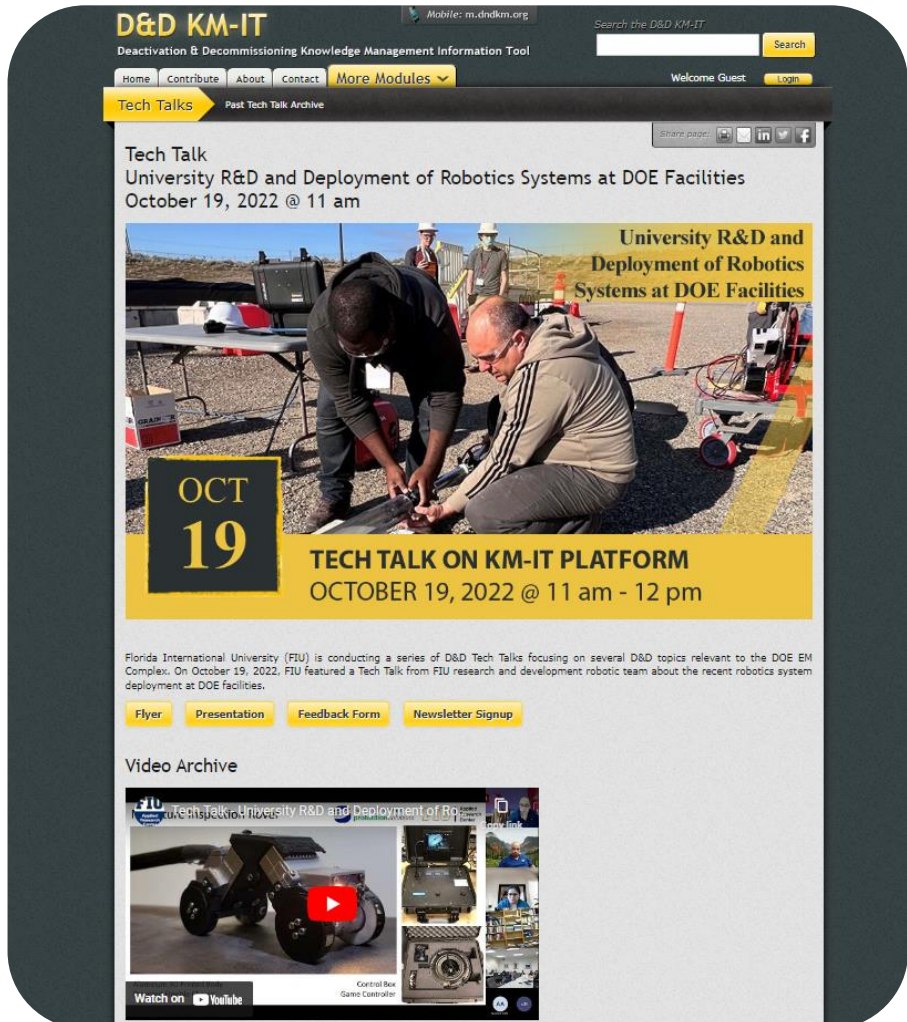
Dr. Leonel Lagos

FIU-ARC Director of Research
Florida International University



Anthony Abrahao

Research Scientist
Florida International University

The screenshot shows the D&D KM-IT website interface. At the top, there's a navigation bar with links like Home, Contribute, About, Contact, and More Modules. Below this, a banner for a Tech Talk is displayed, featuring a photo of two people working on a robot. The text on the banner reads: "Tech Talk: University R&D and Deployment of Robotics Systems at DOE Facilities, October 19, 2022 @ 11 am". A yellow box highlights "OCT 19" and "TECH TALK ON KM-IT PLATFORM OCTOBER 19, 2022 @ 11 am - 12 pm". Below the banner, there's a paragraph of text about the event, followed by buttons for "Flyer", "Presentation", "Feedback Form", and "Newsletter Signup". At the bottom, there's a "Video Archive" section with a video player showing a robot and a "Watch on YouTube" button.

Subtask 3.8: KM-IT Tech Talks

Accomplishments:

January 24, 2023

**International Perspective on
Decommissioning with focus on 3D hazard
aware digital and robotics technology
based**

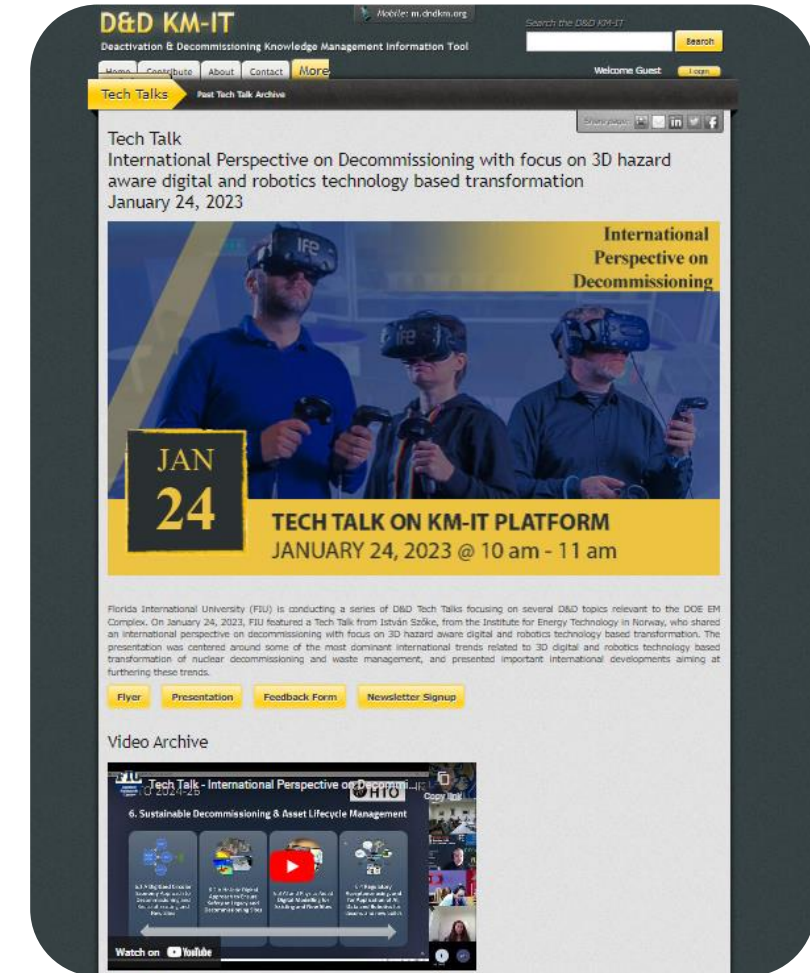
Collaborator:

Institute for Energy Technology in Norway

International Speaker:

István Szőke, PhD

Principal Scientist, Research Manager
Applied Physics Head of Research
DECOM Cluster



Accomplishments:

April 25, 2023

DOE's ALTEMIS Project: Advanced Long-Term Monitoring of Complex Groundwater Plumes

Collaborator:

Savannah River National Laboratory (SRNL)

Speaker:

Hansell Gonzalez-Raymat

Senior Scientist at the
Savannah River
National Laboratory (SRNL)



Subtask 3.8: KM-IT Tech Talks

Accomplishments:

July 18, 2023

AI/ML Research support for Advance Long-Term Environmental Monitoring Systems (ALTEMIS)

Collaborator:

Idaho National Laboratory (INL)

Speaker:

Jayesh Soni

Postdoctoral Associate at the
FIU's Applied Research Center



Subtask 3.8: KM-IT Tech Talks

Next Tech Talk:

SAVE THE DATE!

October 17, 2023

Topic:

To be finalized

Speaker:

Paul Dixon



FIU Year 4 Projected Scope

- **Subtask 3.4: Content Management**

- Publishing D&D technologies, vendors, D&D technologies, lessons learned, best practices, D&D news, conferences and other content to KM-IT
- Perform QA/QC of existing content in the system with assistance of DOE Fellows

- **Subtask 3.5: Marketing and Outreach**

- Reaching out to sites/national labs to increase KM-IT user involvement
- Participation at workshops and conferences such as Waste Management and engagement with other agencies such as the IAEA.
- Introduce the system to SME who may not be aware of its features and capabilities
- Development of newsletters, post cards, factsheets and other print material to promote KM-IT



FIU Year 4 Projected Scope

• Subtask 3.6: D&D KM-IT System Administration & Cyber Security

- D&D KM-IT System Administration is an ongoing task which involves day-to-day administration of servers that house the KM-IT databases and web applications.
- This task includes updating patches and OS fixes, updating antivirus engines and definitions, updating drivers and assuring that the network (firewall, routers and switches) is working properly.
- Securing the network by conducting routine cyber security tasks to test the network's vulnerability.
- Coordination between the FIU security team and DOE Fellows who learn cybersecurity skills while assisting staff do penetration testing and other tasks to test the overall security of the system at the application, database and infrastructure levels.

• Subtask 3.8: KM-IT Tech Talks

- Conduct D&D related Tech Talk every quarter on the D&D KM-IT platform.
- Collaborate with National Laboratories and/or DOE sites to identify and present technical topics of interest to the community.
- Tech Talks will be performed virtually using an online meeting platform (KM-IT)
- Promote Tech Talks via newsletters, website, emails and flyers developed by FIU.



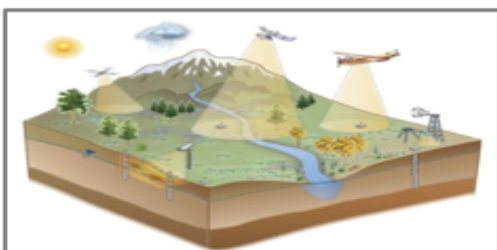
Artificial Intelligence Support to DOE-EM

Advanced Automated Machine Learning System (AAMLS) Transition to DOE-EM



ARTIFICIAL INTELLIGENCE / MACHINE LEARNING

APPLICATION DOMAIN



**SENSOR / IMAGERY
DATA FROM DOE-EM
SITES**

AI / ML TECHNOLOGY



**AI / ML
FRAMEWORKS AND
ALGORITHMS**

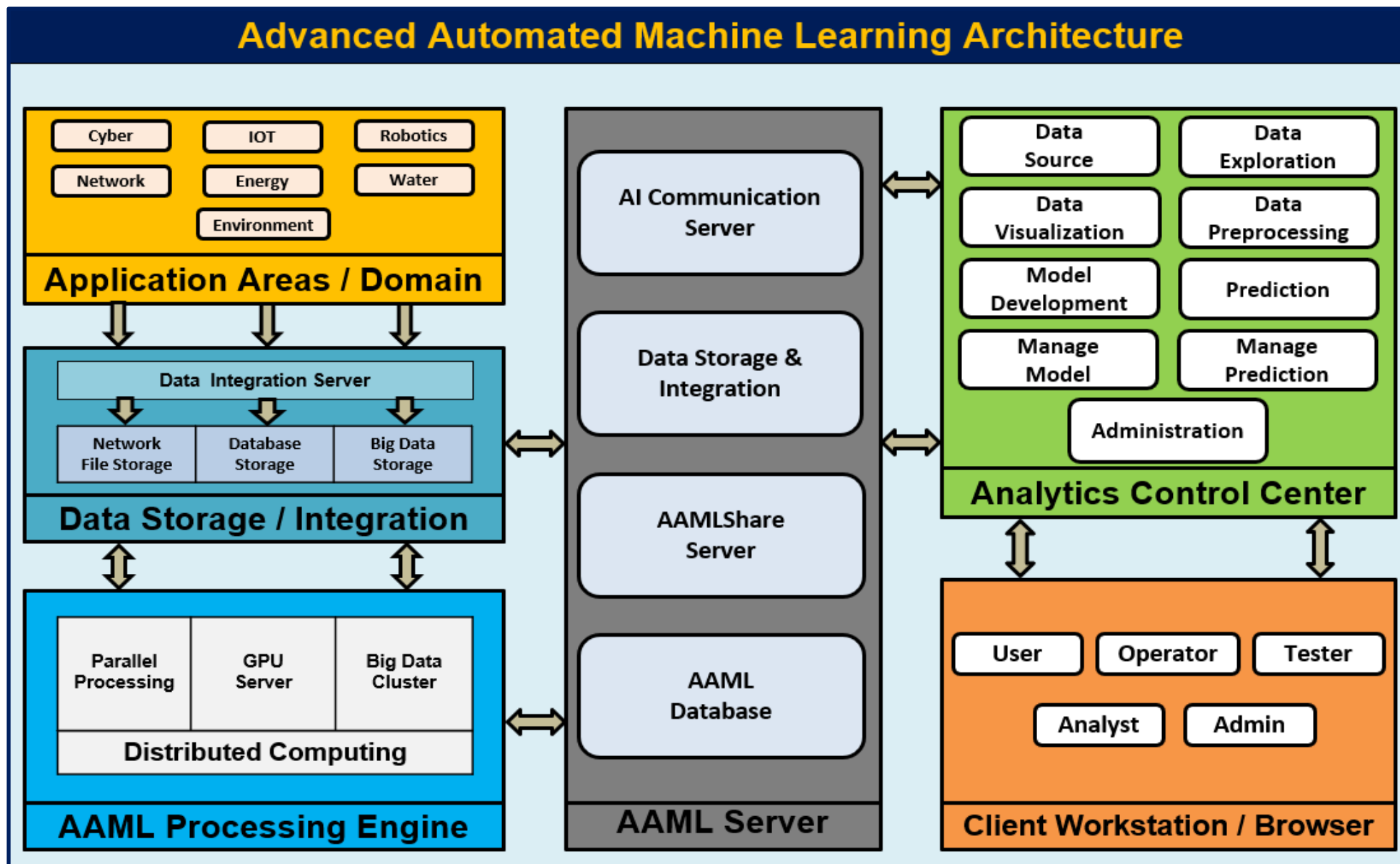
OPERATIONALISE AI / ML MODEL



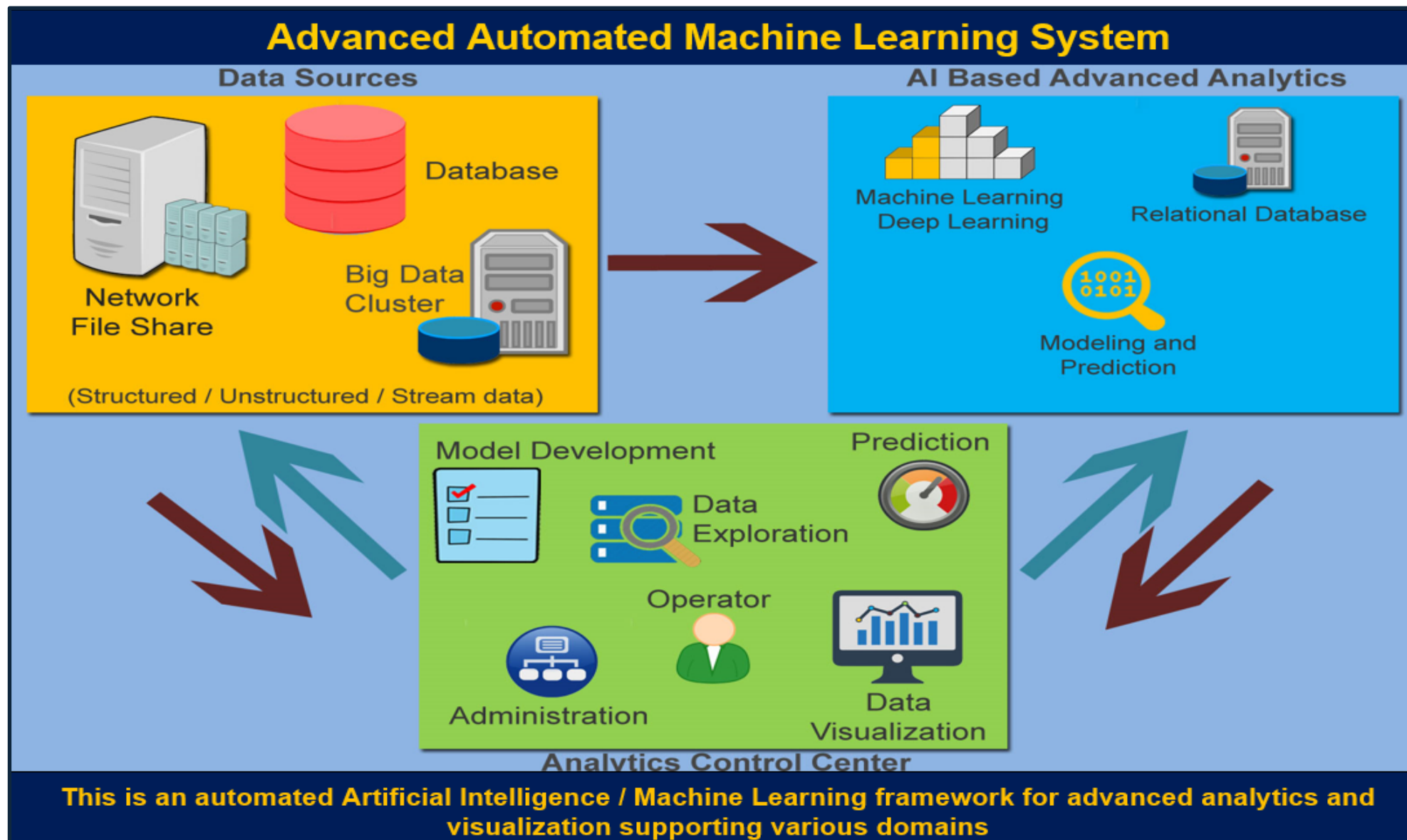
**DATABASE / MACHINE LEARNING
SERVERS / BIG DATA CLUSTER**

**IT
INFRASTRUCTURE
AND APPLICATIONS**


Advanced Automated Machine Learning System (AAMLS)




Advanced Automated Machine Learning System (AAMLS)



Advanced Automated Machine Learning System (AAMLS)

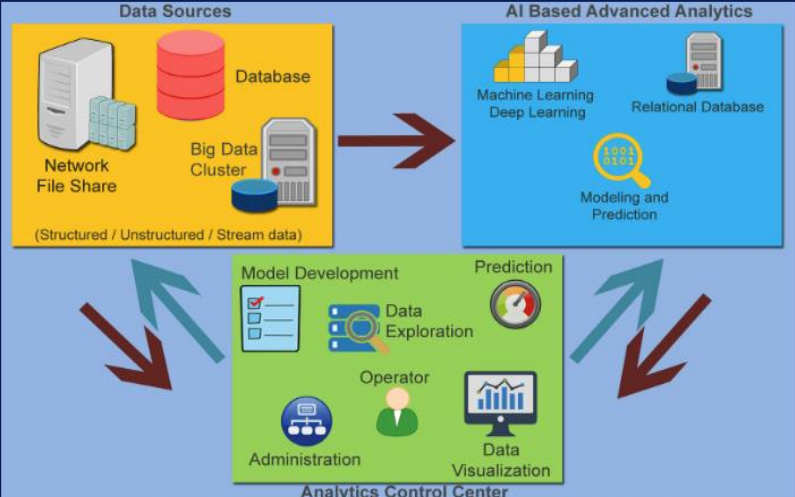

AAMLS


 Advanced Automated Machine Learning System


Hello, TRMCAAdmin!
 [Log Off](#)

- Home
- Data Source
- Data Exploration
- Data Visualization
- Data Preprocessing
- Model Building
- Prediction
- Computer Vision Modeling
- Computer Vision Prediction
- Manage Model
- Manage Prediction
- Administration
- Help


Advanced Automated Machine Learning System



This is an automated Artificial Intelligence / Machine Learning framework for advanced analytics and visualization supporting various domains.

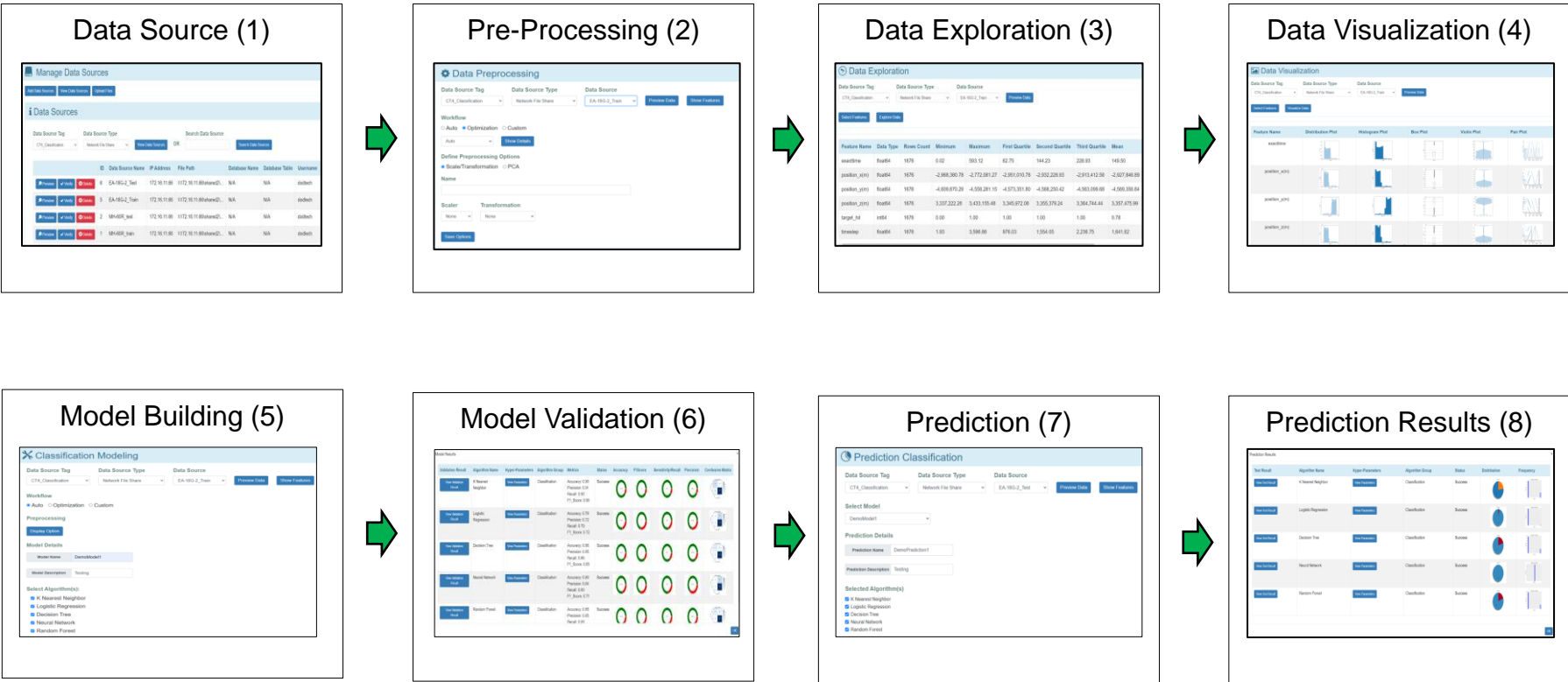


Research Sponsored by
Department of Defense
 Test Resource Management Center
 Developed by
 Florida International University





FIU Year 3 Research Highlights:



AAMLS Workflow

- Automation of Machine Learning model development and prediction in few steps
- Application can be used with minimal machine learning knowledge
- Dynamic connectivity to existing data sources in network file share, database and big data cluster
- Explore and visualize datasets prior to building model and prediction
- Access to the historical model and prediction results



Task 7

**AI for EM Problem Set (Soil & GW):
Exploratory Data Analysis and Machine
Learning Model for Hexavalent Chromium [Cr
(VI)] Concentration in 100-H Area (PNNL)**



Task 7: AI for EM Problem Set (Soil & GW): Exploratory Data Analysis and Machine Learning Model for Hexavalent Chromium [Cr (VI)] Concentration in 100-H Area

Subtask 7.3 Algorithm Development for Spatiotemporal Relationship Identification

Subtask 7.4 Publishing AI/ML models on AAML System **(NEW)**



Task 7: AI for EM Problem Set (Soil & GW): Exploratory Data Analysis and Machine Learning Model for Hexavalent Chromium [Cr (VI)] Concentration in 100-H Area

Site Needs:

- Subsurface Chromium transport temporal and spatial relationships identification using Artificial Intelligence and Machine Learning.

Objectives:

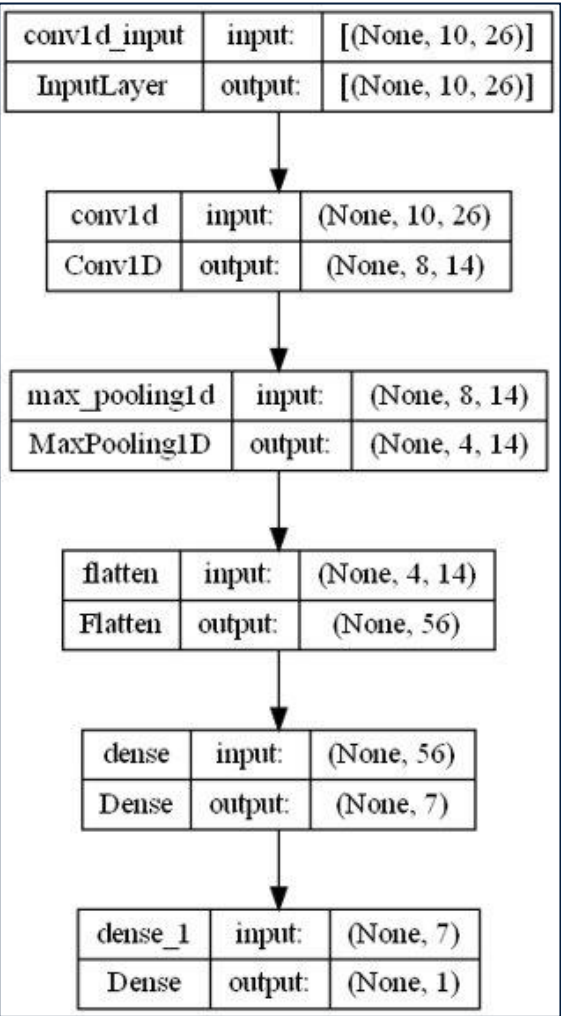
- Develop Artificial Intelligence and Machine Learning algorithm for spatiotemporal relationship exploration.
- Perform exploratory data analysis using state-of-the-art statistical methods.
- Explain historical contaminant transport through model interpretation.



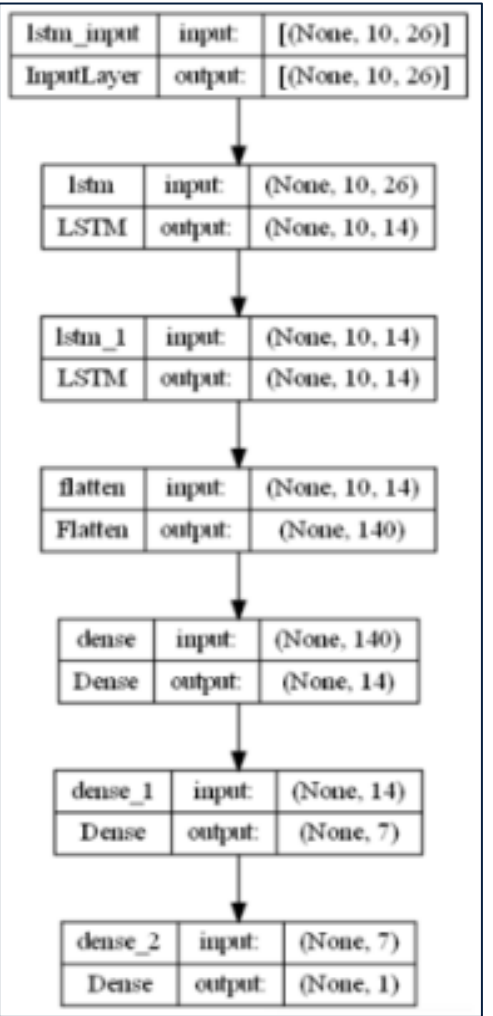
Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

- FIU team researched different algorithms to build ML/DL models to predict Hexavalent Chromium contamination concentration using historical Wells datasets.
- A 1-Dimensional Convolutional Neural Network (CNN) and LSTM-DENSE algorithms are employed to build models.



CNN model architecture
targeting well 199-D4-98.



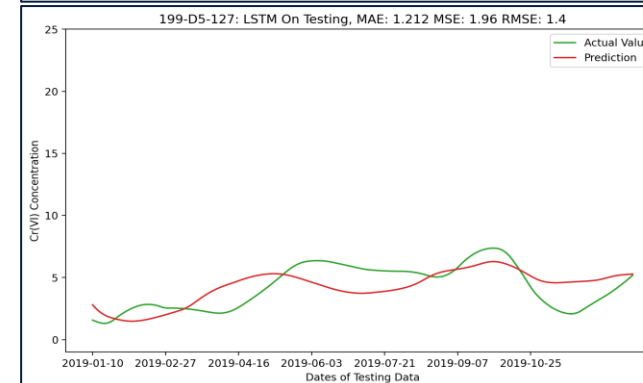
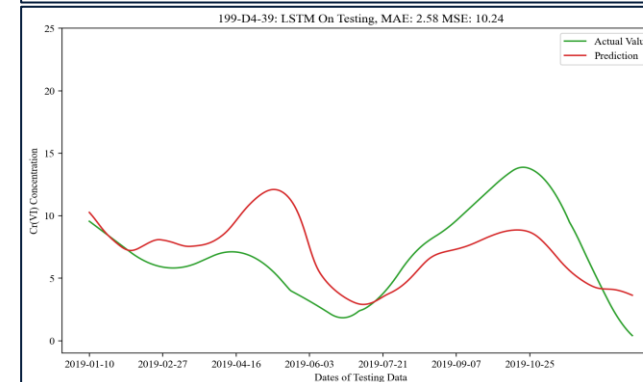
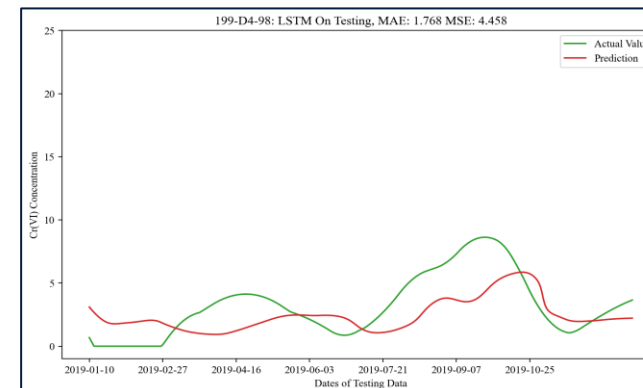
LSTM-DENSE model architecture
targeting well 199-D4-98.



Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

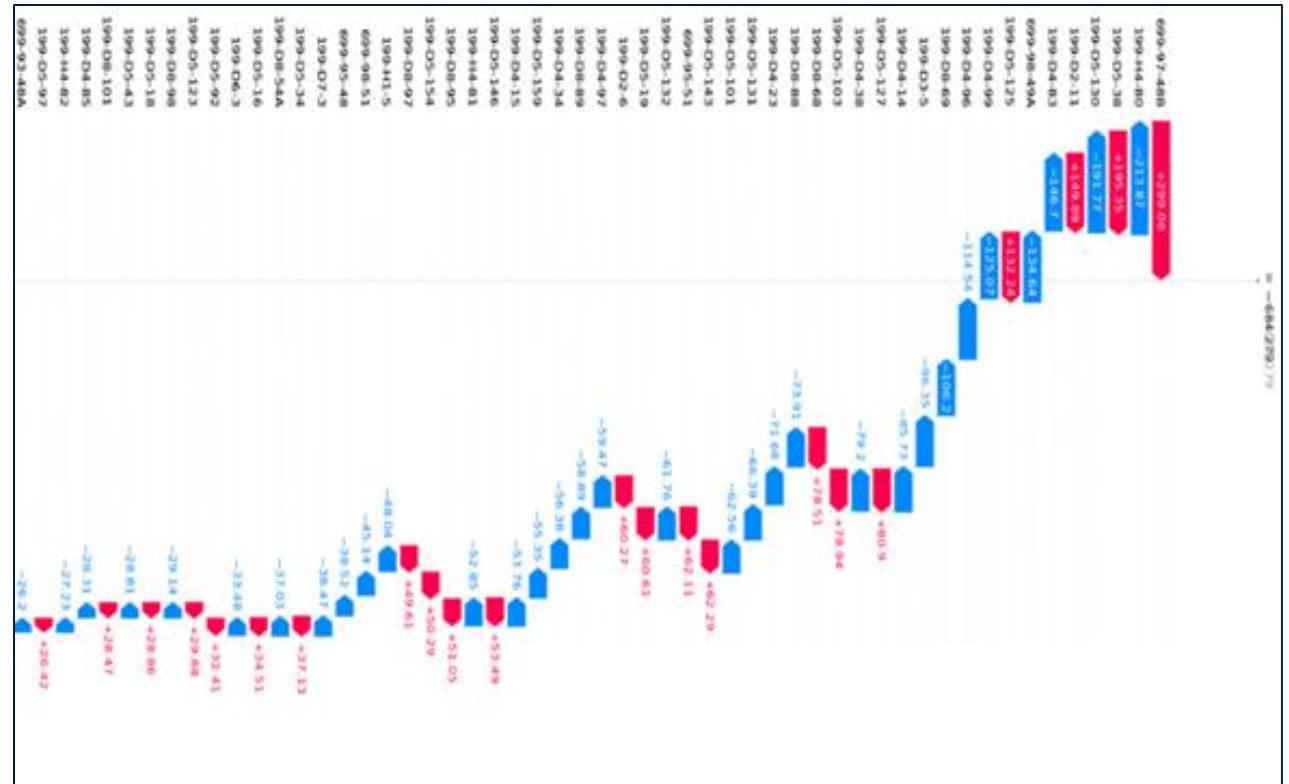
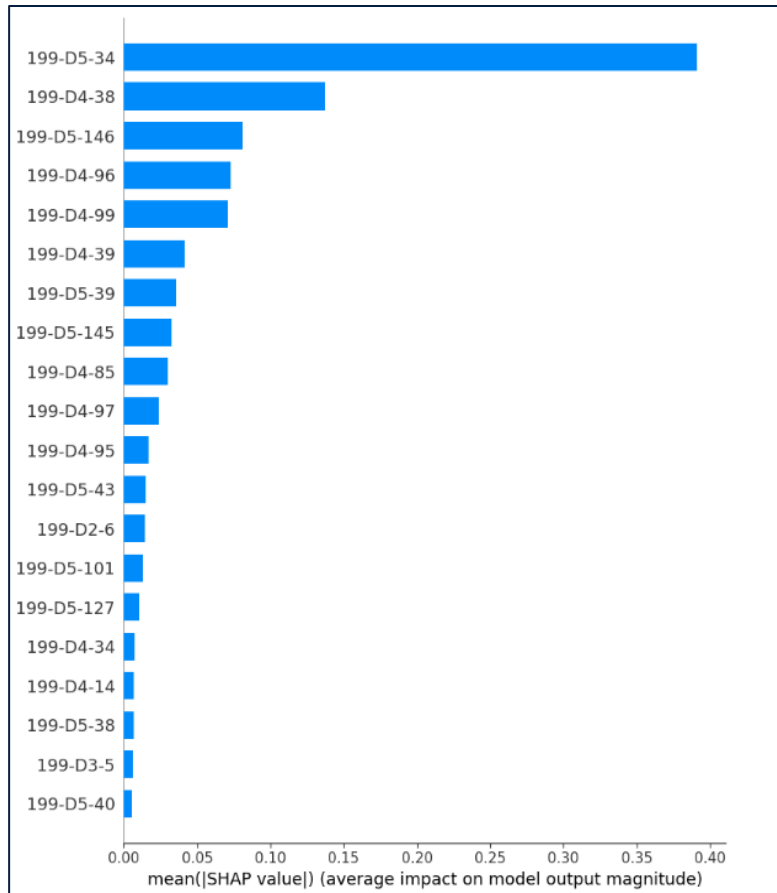
- Developed ML/DL model for prediction of chromium contaminant concentration based on historical data using LSTM-DENSE algorithm.
- Timeseries dataset for the chosen well with contaminant concentration was used to train the model and algorithm was executed 10 times to identify the best model with the desired metrics used for further analysis.
- Targeted wells 199-D4-98, 199-D4-39, and 199-D5-127 prediction performance for contaminant concentration are shown on the right.



Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

- Extraction of well contributions towards contaminant concentration using feature importance evaluation on the LSTM-DENSE models using SHAP (shapely additive explanations) was built into analysis pipeline.

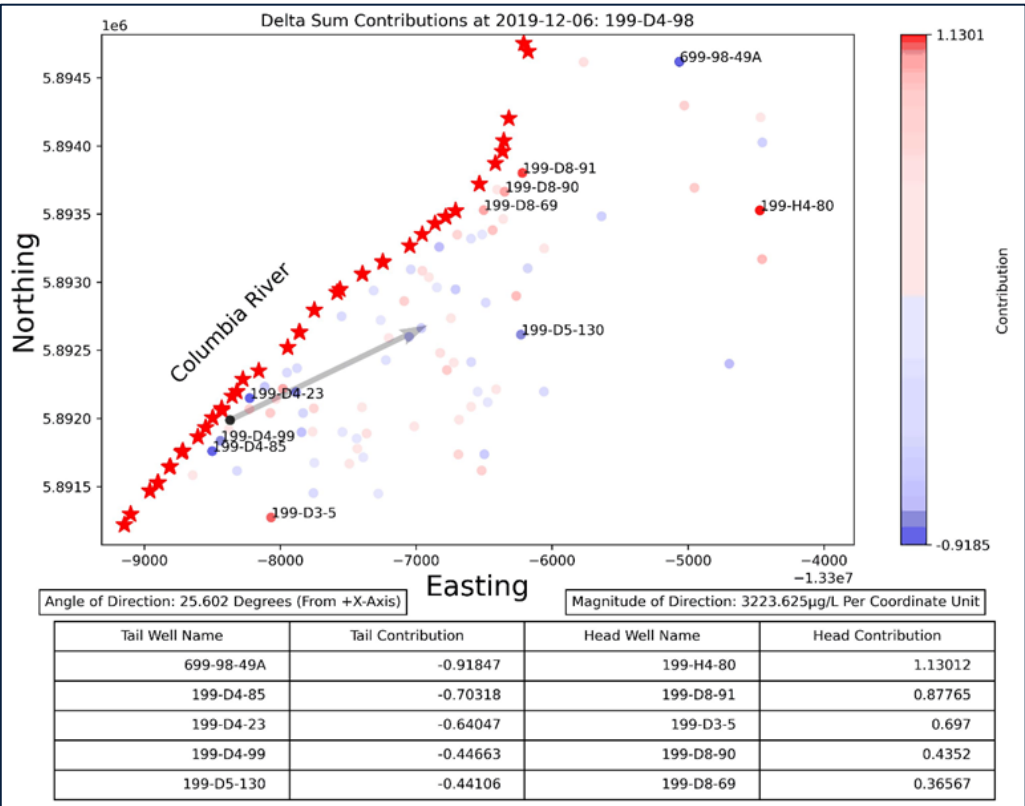


Cumulative contributions of feature wells on target well for the constitution of final predicted contaminant concentration value.

Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

- Mapped contributions of feature wells to spatial-temporal visualization illustrating directivity and distribution of contaminant concentration relative to target well.
- Generated plots are snapshots of concentration profile for a given day within the inspected testing window.
- Contribution values mapped are the contribution change from the previous day, or a derivation of the series of contributions throughout the test window.



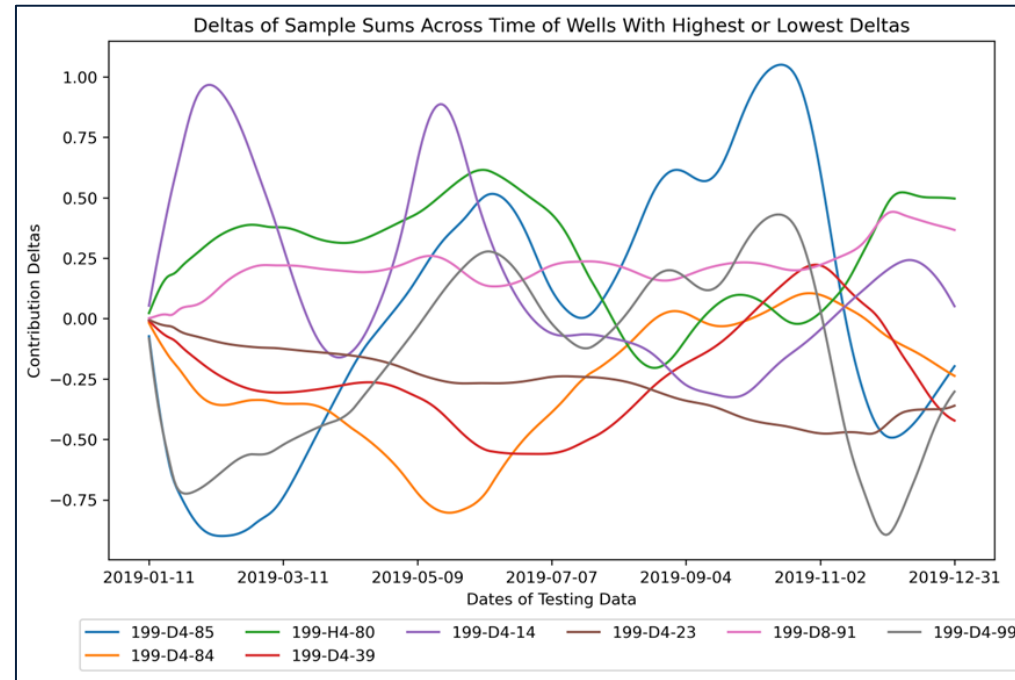
Example snapshot of spatiotemporal visualization for target well 199-D4-98 for the December 6th, 2019, dataset



Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

- Analyzed individual well contribution change with respect to time to determine which wells have highest contribution variance throughout the year and how those changes impact the predictions.



Shows the 10 top feature wells (with 199-D4-98 as a target for the model) that have exhibited highest daily change (negative or positive) throughout the year.

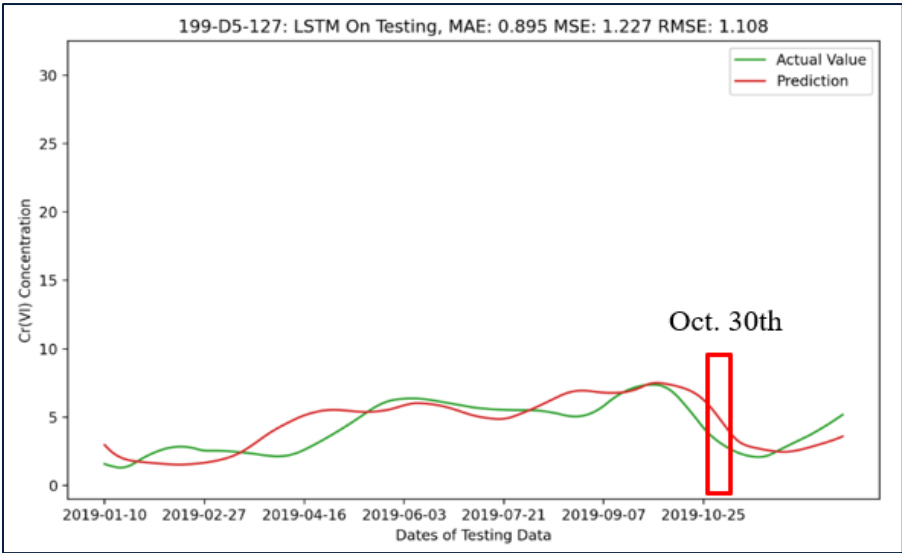
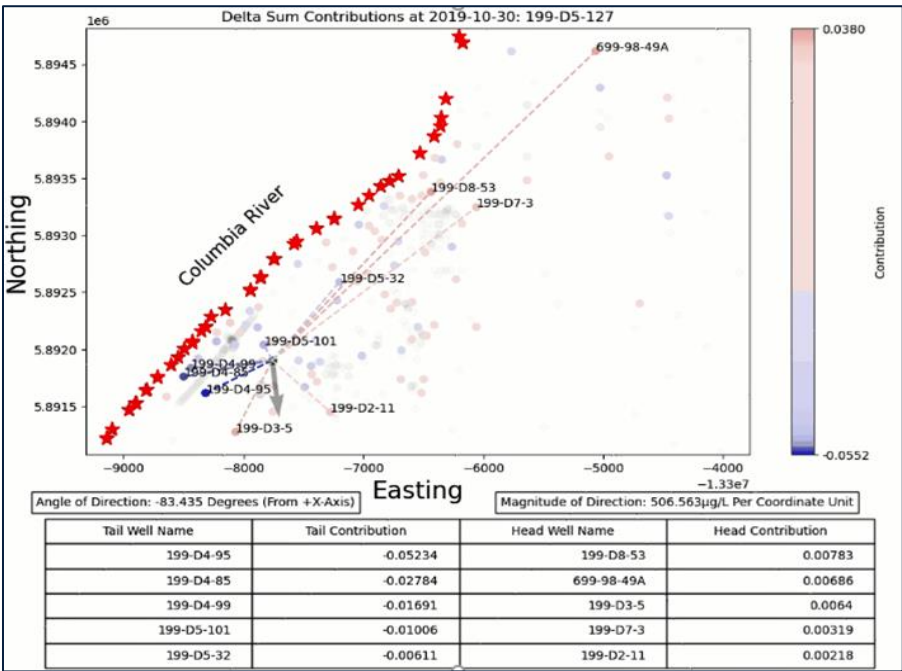
Highest fluctuation does not always mean the well had the highest overall contribution, but it may explain trends in prediction



Subtask 7.3: Algorithm Development for Spatiotemporal Relationship Identification

FIU Year 3 Research Highlights:

- The contribution balance at a given date helped to explain the prediction trend (tangent) at the same date.
- As an example, results shown on the right, depicts:
 - Change in concentration over time (for target well 199-D5-127).
 - Spatial-temporal visualization around the date interval exhibiting prediction trend.
- As far as the model is concerned, the change in concentration on October 30th is majority-caused by negatively contributing wells 199-D4-95, 199-D4-85, and 199-D4-99.



FIU Year 3 Research Highlights:

Regression Modeling

Data Source Tag

Task7

Data Source Type

Network File Share

Data Source

WellDataTrain

Preview Data

Show Features

Workflow

☒ Auto
 ☐ Optimization
 ☐ Custom

Preprocessing

Preprocessing Options:

Default

Display

Model Details

Model Name

LSTM-DENSE_Model

Model Description

LSTM-DENSE_Model

Select Algorithm(s):

☐ K Nearest Neighbor
 ☐ Linear Regression
 ☐ Ridge Regression
 ☐ Lasso Regression
 ☐ ElasticNet Regression
 ☐ Random Forest
 ☐ ExtraTrees
 ☐ Gradient Boosting
 ☐ AdaBoost
 ☐ Long Short Term Memory
 ☒ LSTM-DENSE

Select All

Display Hyper-Parameters

Display Hyper-Parameters

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Display Hyper-Parameters

Feature/Target Label Selection

Selected Directory

\\172.16.17.63\AAMLShare\OrganizationData\TRMC\Regression\WellDataTrain

Select Features

Select Target Label

Review Feature Selection



FIU Year 3 Research Highlights:

Prediction Regression

Data Source Tag

Task7

Data Source Type

Network File Share

Data Source

WellDataTest

Preview Data

Show Features

Select Model

LSTM-DENSETest3

Preprocessing

Preprocessing Options:

Display

Prediction Details

Prediction Name

LSTM-DENSE_Prediction

Prediction Description

LSTM-DENSE_Prediction

Select Algorithm(s):

☒ LSTM-DENSE

Select All

Display Hyper-Parameters

Feature/Target Label

Selected Directory

\\172.16.17.63\AAMLShare\OrganizationData\TRMC\Regression\WellDataTest

Features

199-D2-11, 199-D2-6, 199-D3-5, 199-D4-14, 199-D4-15, 199-D4-23, 199-D4-34, 199-D4-38, 199-D4-39, 199-D4-83, 199-D4-84, 199-D4-85, 199-D4-86, 199-D4-95, 199-D4-96, 199-D4-97, 199-D4-99, 199-D5-101, 199-D5-103, 199-D5-104, 199-D5-123, 199-D5-125, 199-D5-127, 199-D5-13, 199-D5-130, 199-D5-131, 199-D5-132, 199-D5-133, 199-D5-14, 199-D5-142, 199-D5-143, 199-D5-145, 199-D5-146, 199-D5-153, 199-D5-154, 199-D5-159, 199-D5-16, 199-D5-17, 199-D5-18, 199-D5-19, 199-D5-32, 199-D5-34, 199-D5-36, 199-D5-38, 199-D5-39, 199-D5-40, 199-D5-41, 199-D5-43, 199-D5-92, 199-D5-97, 199-D6-3, 199-D7-3, 199-D8-101, 199-D8-4, 199-D8-5, 199-D8-53, 199-D8-54A, 199-D8-55, 199-D8-68, 199-D8-69, 199-D8-70, 199-D8-71, 199-D8-72, 199-D8-88, 199-D8-89, 199-D8-90, 199-D8-91, 199-D8-95, 199-D8-96, 199-D8-97, 199-D8-98, 199-H1-5, 199-H4-80, 199-H4-81, 199-H4-82, 699-93-48A, 699-95-48, 699-95-51, 699-96-52B, 699-97-48B, 699-98-49A, 699-98-51

Target Label

199-D4-98

Build Prediction





FIU Year 3 Research Highlights:

Predictions

Data Source Tag: Task7 Data Source Type: Network File Share ML Problem: Regression View Predictions OR Search Prediction: Search Predictions

	Test Name	Description	Preprocessing	Status	Username	Label(s)	Inserted On	
View Features View Results	Test9	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 8:28:42 PM	Delete
View Features View Results	Test8	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 8:22:35 PM	Delete
View Features View Results	Test5	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 8:16:16 PM	Delete
View Features View Results	Task7WellData_Prediction	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 8:04:15 PM	Delete
View Features View Results	Predtest	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 7:55:16 PM	Delete
View Features View Results	Test4	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 5:17:52 PM	Delete
View Features View Results	Test3	Regression	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 5:06:03 PM	Delete
View Features View Results	Test2	Prediction	Show Options	Completed	TRMCAdmin	199-D4-98	5/31/2023 4:39:42 PM	Delete
View Features View Results	Auto_WellPred	Regression	Show Options	InProgress	TRMCAdmin	199-D4-98	5/31/2023 2:03:36 PM	Delete

Prediction Results						
Test Result	Algorithm Name	Hyper-Parameters	Algorithm Group	Status	Frequency	TimePlot
View Test Result	LSTM-DENSE	View Parameters	Regression	Success		



FIU Year 4 Projected Scope

- Achieve more consistent accurate prediction performance with current pipeline with the inclusion of more well characteristics other than contaminant concentration.
- Other well characteristics from the sensor data such as specific conductance and/or Ph of water will be explored. Characteristics could also include spatial coordinates of the well and/or water depth level for indication or river stage.
- This work would involve pre-processing features from simple values into vector representations, the addition of another dimension to input data.
- Explore the use of generative models to create a pipeline that can predict contaminant concentration at a given coordinate point, as opposed to a well.
- These algorithms would include Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and SMOTER (Synthetic Minority Over-sampling Technique for Regression).
- Continue to deploy the implemented models on the AAML System.
 - Deep Learning Models will be deployed on the AAML System for automating the contaminant concentration predictions.



Task 8

AI for EM Problem Set (Soil and Groundwater)

- Data analysis and visualization of sensor data from the wells at the SRS F-Area using machine learning (LBNL, SRNL)



Task 8: AI for EM Problem Set (Soil & GW):Data analysis and visualization of sensor data from the wells at the SRS F-Area using machine learning

Subtask 8.6 Publishing AI/ML models on AAML System (NEW)



Site Needs:

- Develop machine learning tools to automate the monitoring and forecasting of contaminant transport dynamics at the Savannah River Site (SRS) F-Area to support DOE-EM's goal for long time monitoring of contaminated groundwater sites.

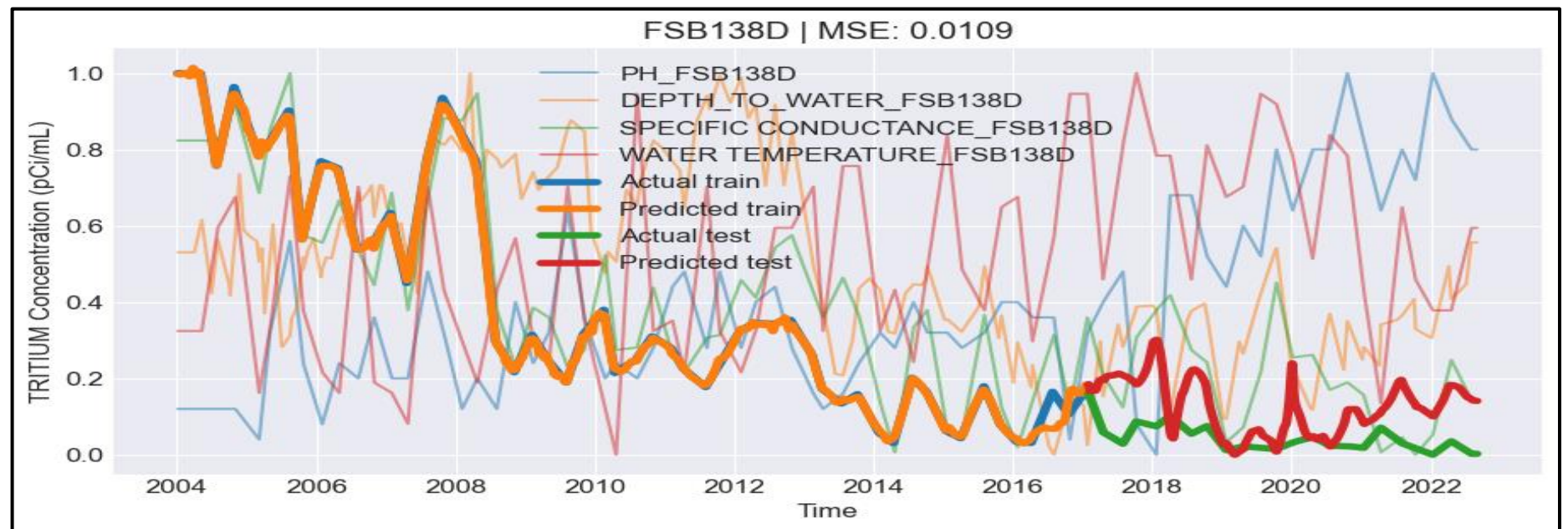
Objectives:

- Develop data exploration tools for understanding the spatial and temporal distribution of the F-Area dataset.
- Develop a spatial interpolation approach for estimating a plume.
- Examine proxy variables at the site.
- Development of the AI/ML based system to perform predictive analytics.



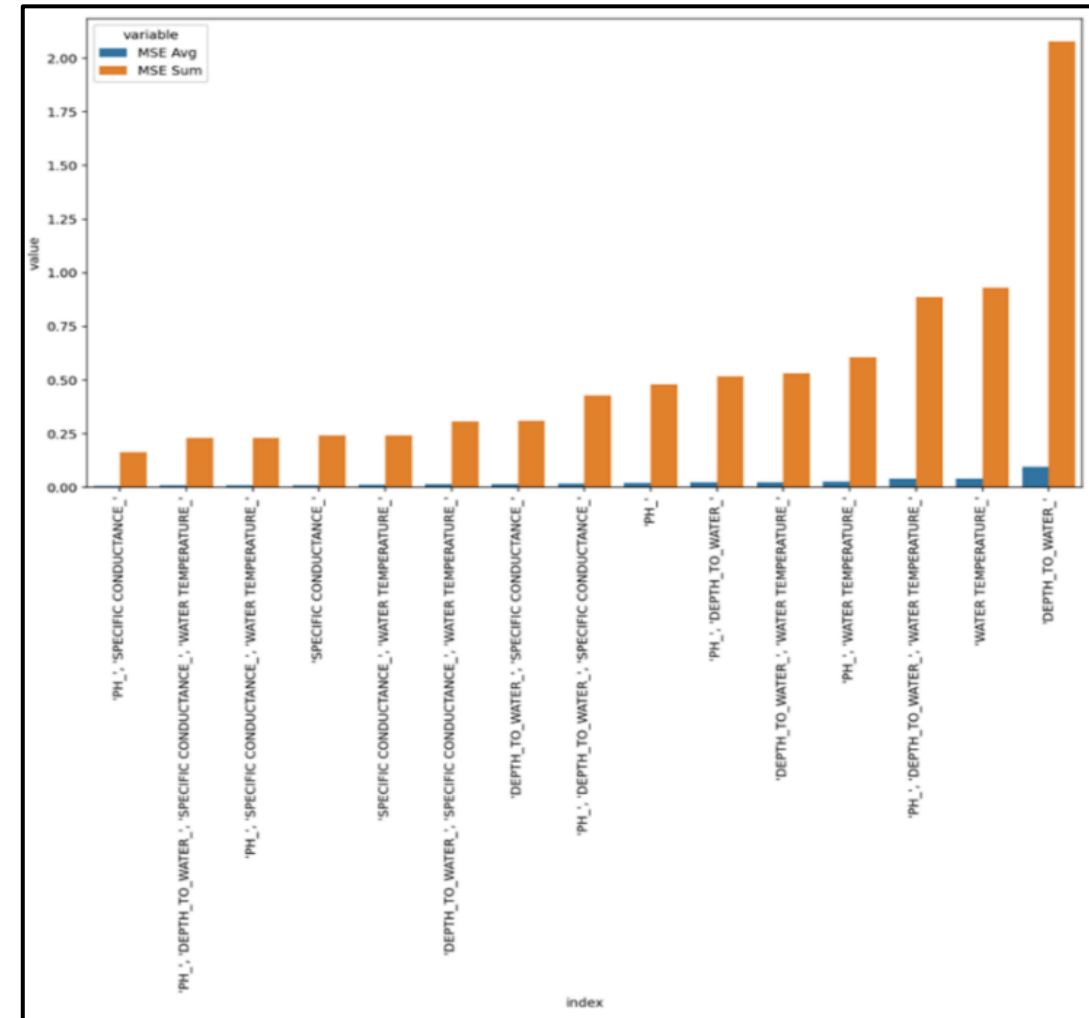
Research Highlights & Accomplishments:

- Developed Deep Learning based LSTM model for predicting contaminant concentrations. The following four insitu variables are used as feature vectors: (pH, specific conductance, water temperature and water table).
- Below Figure demonstrate the predictive capability of the model for FSB138D well. Thin lines shows the input variables whereas the thick line shows the target predictor tritium.



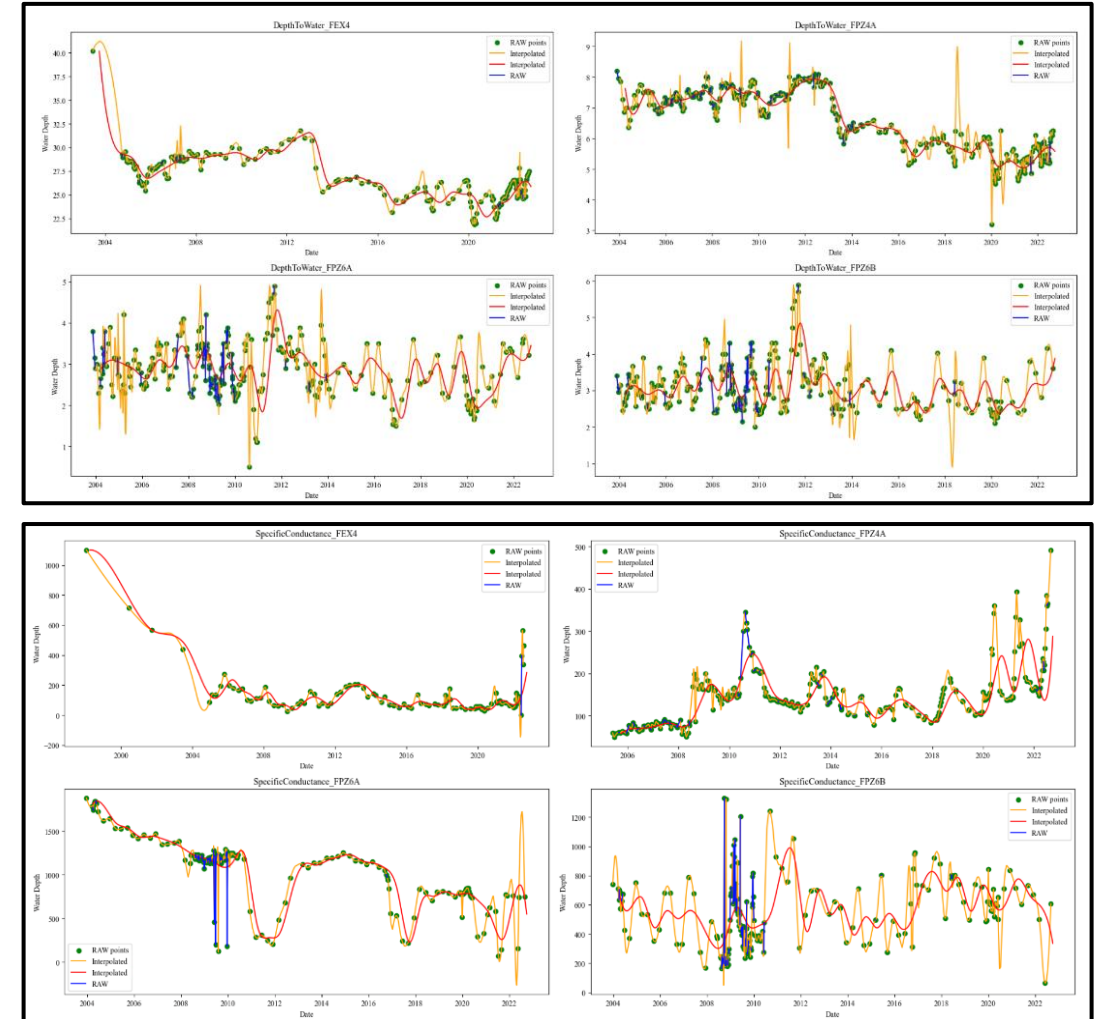
Research Highlights & Accomplishments:

- To test the importance of each input variable on the output prediction, FIU team developed a model on the powerset of the 4 input parameters.
- To compare the performance of each experiment, the MSE of all 22 well predictions was aggregated using both the average and sum, although these two metrics show the same trend.
- From this analysis, specific conductance is shown to be the most important individual input to the model as it appears in the top 7 of the 15 experiments.
- The results are as shown in the graph mentioned in the right side.



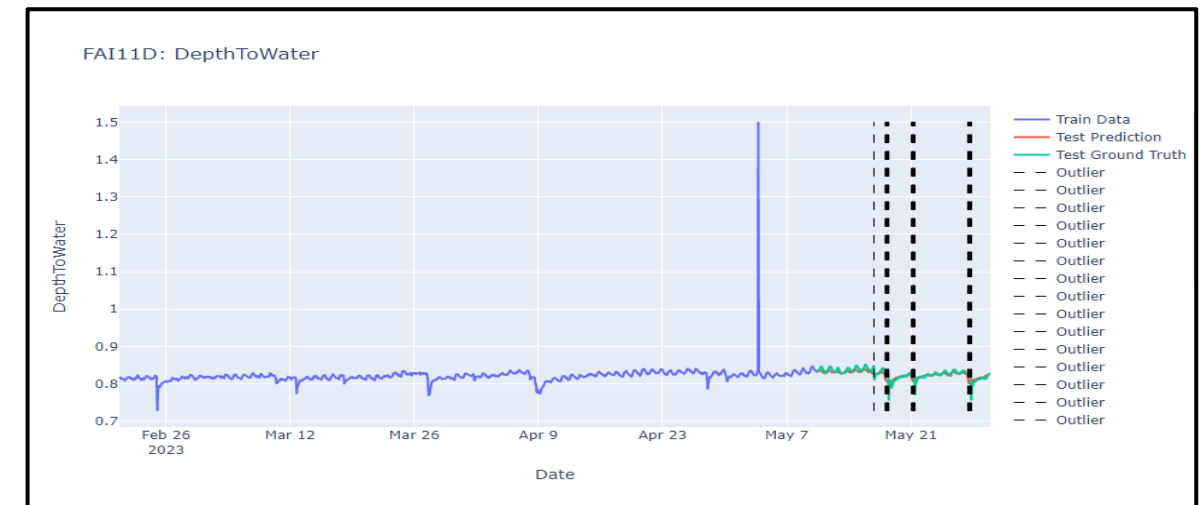
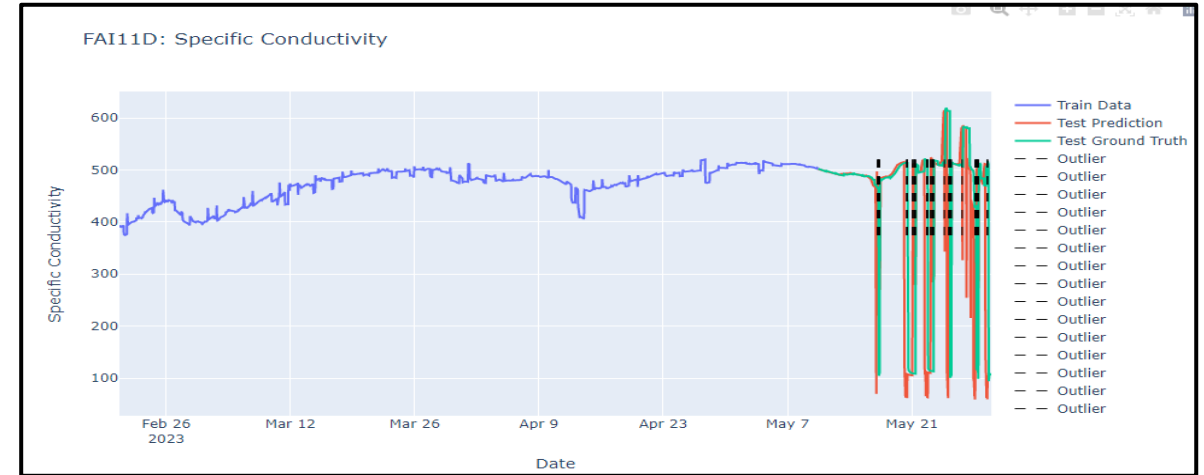
Research Highlights & Accomplishments:

- A pilot Python Script for Downloading In-Situ Data from HydroVu API as developed.
- The Python script carries out three primary functions to retrieve data from the HydroVu API and store it in the FIU-ALTEMISAI database.
- This script uses pyodbc to connect to a database and retrieve the last recorded time step for each well. It then fetches data from the HydroVu API, saves it to a temporary folder, and formats it into a master_json list.
- Finally, it inserts the data from the master_json list into the FIU-ALTEMISAI database using an SQL INSERT statement and commits the changes. Figure shows samples time series for Depth to Water and Specific Conductance.



Research Highlights & Accomplishments:

- Figure shows the visual representation of the time series data for Specific Conductivity and DepthToWater respectively, along with the LSTM model's predictions and the detection of outliers.
- The red line represents the LSTM model's predictions for the Specific Conductivity values during the testing phase.
- The black dotted line in the figure represents the outliers.



Research Highlights & Accomplishments:


AAMLs


Advanced Automated Machine Learning System

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Data Source

Data Exploration

Data Visualization

Data Preprocessing

Model Building

Prediction

Computer Vision Modeling

Computer Vision Prediction

Manage Model

Manage Prediction

PowerBI Reports

Administration

Help

Regression Modeling

Data Source Tag

Preventive Maintenance

Data Source Type

Network File Share

Data Source

Tritium_Train

Preview Data

Show Features

Workflow

☒ Auto
 ☐ Optimization
 ☐ Custom

Preprocessing

Preprocessing Options:

Default

Display

Model Details

Model Name

Water_Contamination_Mod

Model Description

Water_Contamination_Mod

Select Algorithm(s):

☒ K Nearest Neighbor
 ☒ Linear Regression
 ☒ Ridge Regression
 ☒ Lasso Regression
 ☒ ElasticNet Regression
 ☒ Random Forest
 ☒ ExtraTrees
 ☒ Gradient Boosting
 ☒ AdaBoost
 ☒ Long Short Term Memory

Unselect All

Display Hyper-Parameters

Display Hyper-Parameters

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Research Highlights & Accomplishments:


AAMLs


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Computer Vision Prediction


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Data Source Tag

Preventive Maintenance

Data Source Type

Network File Share

Data Source

Tritium_Test

Preview Data

Show Features

Select Model

Water_Contamination_Model

Preprocessing

Preprocessing Options:

Display

Prediction Details

Prediction Name

Water_Contamination_Pred

Prediction Description

Water_Contamination_Pred

Select Algorithm(s):

☒ K Nearest Neighbor

☒ Linear Regression

☒ Ridge Regression

☒ Lasso Regression

☒ ElasticNet Regression

☒ Random Forest

☒ ExtraTrees

☒ Gradient Boosting

☒ AdaBoost

☒ Long Short Term Memory

Unselect All

Display Hyper-Parameters

Display Hyper-Parameters

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Display Hyper-Parameters


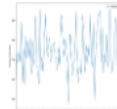

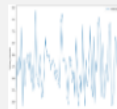

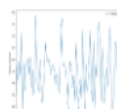

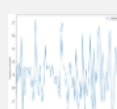

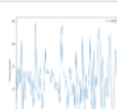

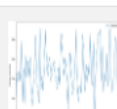
Display Hyper-Parameters



AAMLs - Prediction

Research Highlights & Accomplishments:

Prediction Results

Test Result	Algorithm Name	Hyper-Parameters	Algorithm Group	Status	Frequency	TimePlot
View Test Result	K Nearest Neighbor	View Parameters	Regression	Success		
View Test Result	Linear Regression	View Parameters	Regression	Success		
View Test Result	Ridge Regression	View Parameters	Regression	Success		
View Test Result	Lasso Regression	View Parameters	Regression	Success		
View Test Result	ElasticNet Regression	View Parameters	Regression	Success		
View Test Result	Random Forest	View Parameters	Regression	Success		

AAMLS - Prediction Results



FIU Year 4 Projected Scope

- Research and implement advanced deep learning models for time series data:
 - Develop a transformer model for learning temporal and spatial features from in-situ real-time sensor data of various analytes from the SRS site. The model's self-attention mechanism can assign significance to different sensor readings, capturing short-term fluctuations and long-term dependencies. This empowers the model to discern temporal dynamics, detect patterns, trends, and anomalies in real-time sensor data.
 - Develop an AutoEncoder model for effectively capturing both temporal and spatial dependencies of various analytes from the SRS site. The model is trained to reconstruct normal sensor data, effectively learning a compressed representation of the input. This approach holds promise for anomaly detection in real-time sensor data, providing a valuable research for early warning systems, fault detection, and maintenance optimization.
- Continue to deploy the implemented models on the AAML System.
 - Deep Learning Models will be deployed on the AAML System for automating the contaminant concentration predictions.



Task 9

AI for EM Problem Set (Waste Processing):

Nuclear Waste Identification and Classification using Deep learning (SRNL)



Task 9 - AI for EM Problem Set (Waste Processing): Nuclear Waste Identification and Classification using Deep learning

Subtask 9.1	Algorithm & Model Development to Identify and Classify Nuclear Waste
Subtask 9.2	Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System



Task 9 - AI for EM Problem Set (Waste Processing): Nuclear Waste Identification and Classification using Deep learning

Site Needs:

- To understand and identify the presence of nuclear waste within multiple, different, environments in real time.
- Be able efficiently develop and use deep learning models to facilitate any operation that requires computer vision.

Objectives:

- Research and explore the development of different deep learning solutions.
 - There are different algorithms that aim to solve the problem, each with their own advantages and disadvantages.
- Deploy developed models for the integration with ROS2 code.
 - Once the models identify and classify an object, it might be of interest to forward those results to a robot or a similar system.
- Deploy developed models on the AAML System.



FIU Year 3 Research Highlights:

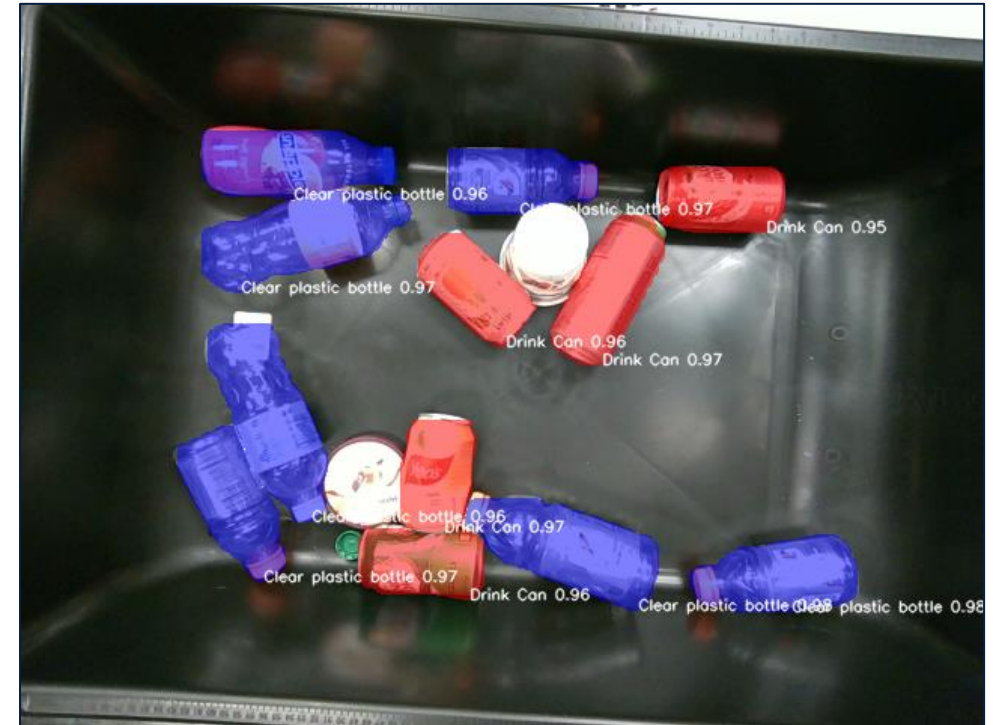
- **Implemented YOLOv7 model for Object Detection.**
 - The model is designed to detect objects in real time using a CPU.
 - For a given object, the model predicts the object's class, bounding box, and its confidence on the prediction.
 - It reaches a high mAP on the test set. The shortcoming of this algorithmic method is that it requires labeled data to learn how to detect objects, since it learns from bounding box. It is difficult to learn how to detect thin and/or long objects where the background is most of the box.



Example of the predictions results for a given image

FIU Year 3 Research Highlights:

- **Implemented YOLOv7 model for Instance Segmentation.**
 - The model is designed to detect objects in real time using a CPU, though it is slower than the Object Detection version.
 - For a given object, the model predicts the object's class, segmentation mask, and its confidence on the prediction.
 - The shortcomings of this model is that it requires labeled data to learn how to detect objects and it can detect thin and/or long objects better than the previous version.

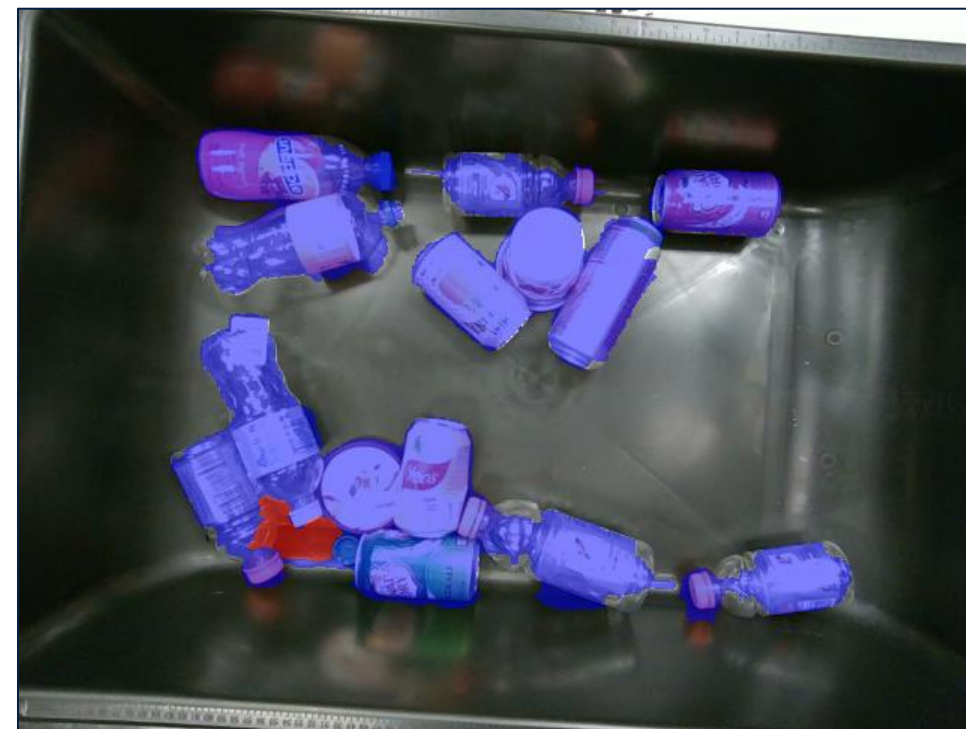


Example of the predictions results for a given image

Subtask 9.1: Algorithm and Model Development to Identify and Classify Nuclear Waste (NEW)

FIU Year 3 Research Highlights:

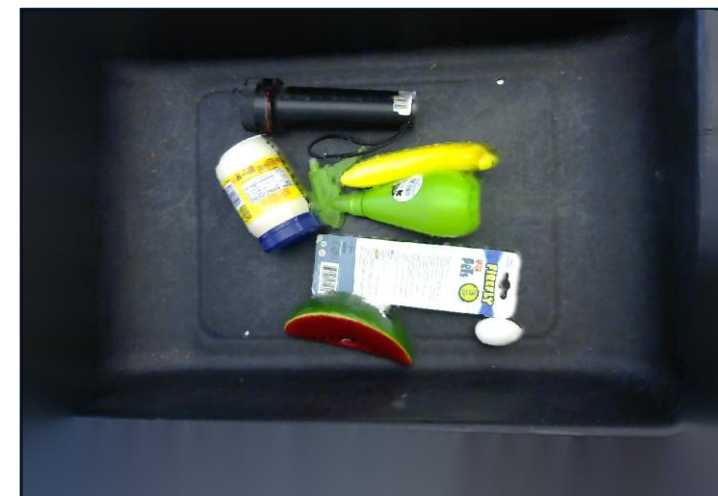
- **Implemented STEGO model for Unsupervised Semantic Segmentation.**
 - The model is not designed to detect objects in real time using a CPU. However, by keeping a sufficiently small image size, it is possible to reach real-time inference speeds.
 - For a given image, the model predicts a set of clusters and the segmentation mask for each cluster.
 - It does not require labeled data to learn how to detect the clusters.
 - Sometimes it is unfeasible to convert the cluster masks into a polygon format because a cluster can contain one or more objects.



Example of the predictions results for a given image where blue marks the object and red marks empty space within the object.

FIU Year 3 Research Highlights:

- **Implemented Mask RCNN model for Disparity Image Segmentation.**
 - This model is not designed to detect objects in real time using a CPU. However, by keeping a sufficiently small image size, it is possible to reach real-time inference speeds.
 - For a given disparity image, the model predicts an object's segmentation mask and its confidence that it is a foreground object.
 - It does not require labeled data to learn how to detect the clusters. But it can only detect foreground vs background objects.
 - Predictions are not accurate for the nested objects.



Example of the predictions results for a given disparity image. The top image is used for comparison purposes only.

Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System **(NEW)**

FIU Year 3 Research Highlights:

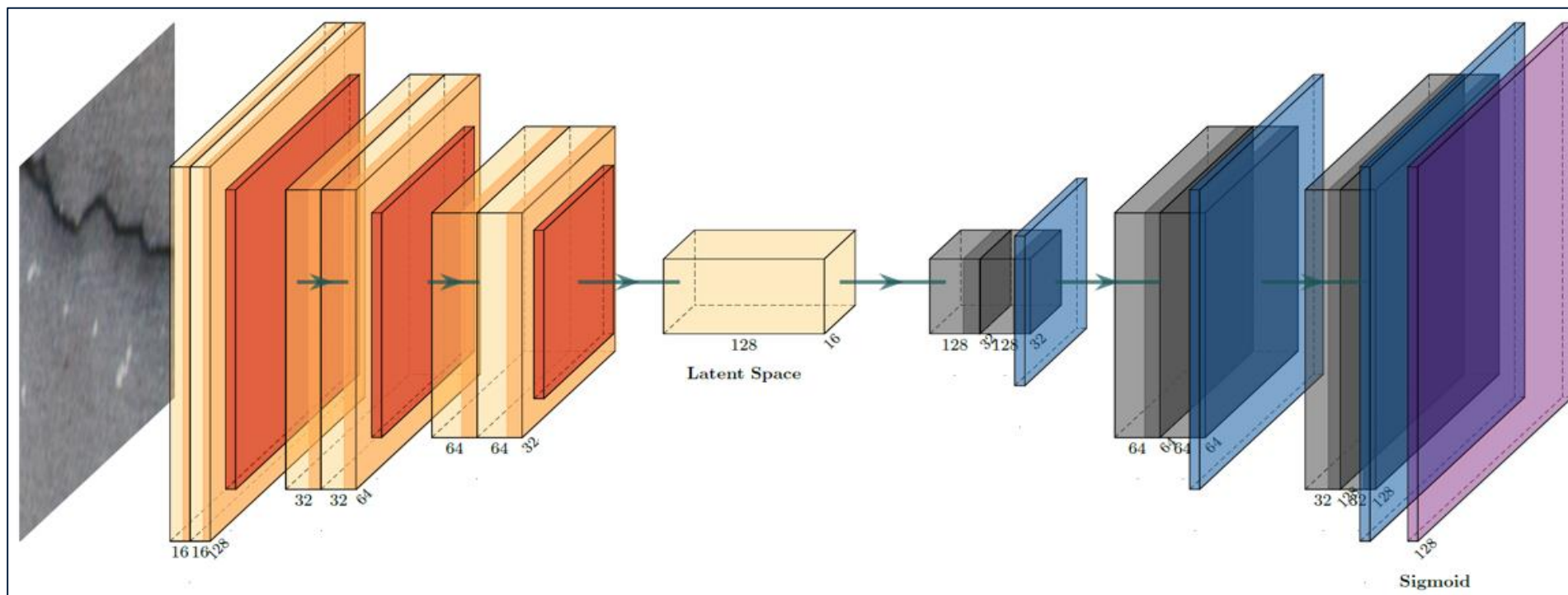
- **Implemented Anomaly Detection Models (Wall Crack Detection).**
 - Added a custom model with good performance on detecting cracks on walls.
 - Implemented the ability to customize the models with different number of layers, activation functions, etc., to enhance the performance of the model on new data.
- **Implemented Object Detection Models.**
 - Added YOLOv3 model that has high performance and low latency when predicting.
 - Implemented the ability to customize the model's confidence and IoU thresholds. Also implemented transfer learning to reduce training time while maintaining a high performance.



Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

FIU Year 3 Research Highlights:

- The models developed as part of the Task 6 in the previous year (2022) are deployed on the AAML System.



Convolutional AutoEncoder (CAE) Deep Learning Architecture

Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System **(NEW)**

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Preprocessing Options:

Default

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Model Details

Model Name

Crack_Classification_Mode

Model Description

Crack_Classification_Mode

Select Algorithm(s):

Unselect All

Convolutional Neural Network

Display Hyper-Parameters

VGG Network

Display Hyper-Parameters

RES Network

Display Hyper-Parameters

Inception Network

Display Hyper-Parameters

Efficient Network

Display Hyper-Parameters


Alex Network


Display Hyper-Parameters



Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

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Select Model

Crack_Classification_Model

Preprocessing

Preprocessing Options:

Display

Prediction Details

Prediction Name

Crack_Classification_Predic

Prediction Description

Crack_Classification_Predic

Select Algorithm(s):

☒ Convolutional Neural Network

☒ VGG Network

☒ RES Network

☒ Inception Network

☒ Efficient Network

☒ Alex Network

Unselect All

Display Hyper-Parameters

Display Hyper-Parameters

Display Hyper-Parameters

Display Hyper-Parameters

Display Hyper-Parameters















AAMLs - Computer Vision Prediction - Classification


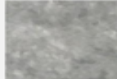

Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

FIU Year 3 Research Highlights:

Prediction Results

Test Result	Algorithm Name	Hyper-Parameters	Algorithm Group	Status	Distribution	Frequency
View Test Result	Convolutional Neural Network	View Parameters	Image Classification	Success		
View Test Result	VGG Network	View Parameters	Image Classification	Success		
View Test Result	RES Network	View Parameters	Image Classification	Success		
View Test Result	Inception Network	View Parameters	Image Classification	Success		
View Test Result	Efficient Network	View Parameters	Image Classification	Success		
View Test Result	Alex Network	View Parameters	Image Classification	Success		

Algorithm Name: Convolutional Neural Network [Download Results](#)


Predicted	Filename	Image
CrackedWalls	data\00242.jpg	
SmoothWalls	data\00356.jpg	
CrackedWalls	data\00480.jpg	


AAMLS - Computer Vision Prediction Results – Classification



Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

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Preview Data

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 ☐ Optimization
 ☐ Custom

Preprocessing

Preprocessing Options:

Default

Display

Model Details

Model Name

Crack_Detection_Model

Model Description

Crack_Detection_Model

Select Algorithm(s):

☒ YOLO

Select All

Display Hyper-Parameters

Class Selection

Selected Directory

\\172.16.11.66\shared2\ACC_Data\AdvancedCyberAnalysis\ObjectDetection\WallCracks\Training

Classes


Crackw


Build Model



Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

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WallCracks ObjectDetection test

Preview Data

Select Model

Crack_Object_Detection_Model

Preprocessing

Preprocessing Options:

Display

Prediction Details

Prediction Name

Crack_Detection_Predictior

Prediction Description

Crack_Detection_Predictior

Select Algorithm(s):

☒ YOLO

Unselect All

Display Hyper-Parameters

Class Selection

Selected Directory

\\172.16.11.66\shared2\ACC_Data\AdvancedCyberAnalysis\ObjectDetection\WallCracks\Testing

Classes

Crackw

Build Prediction

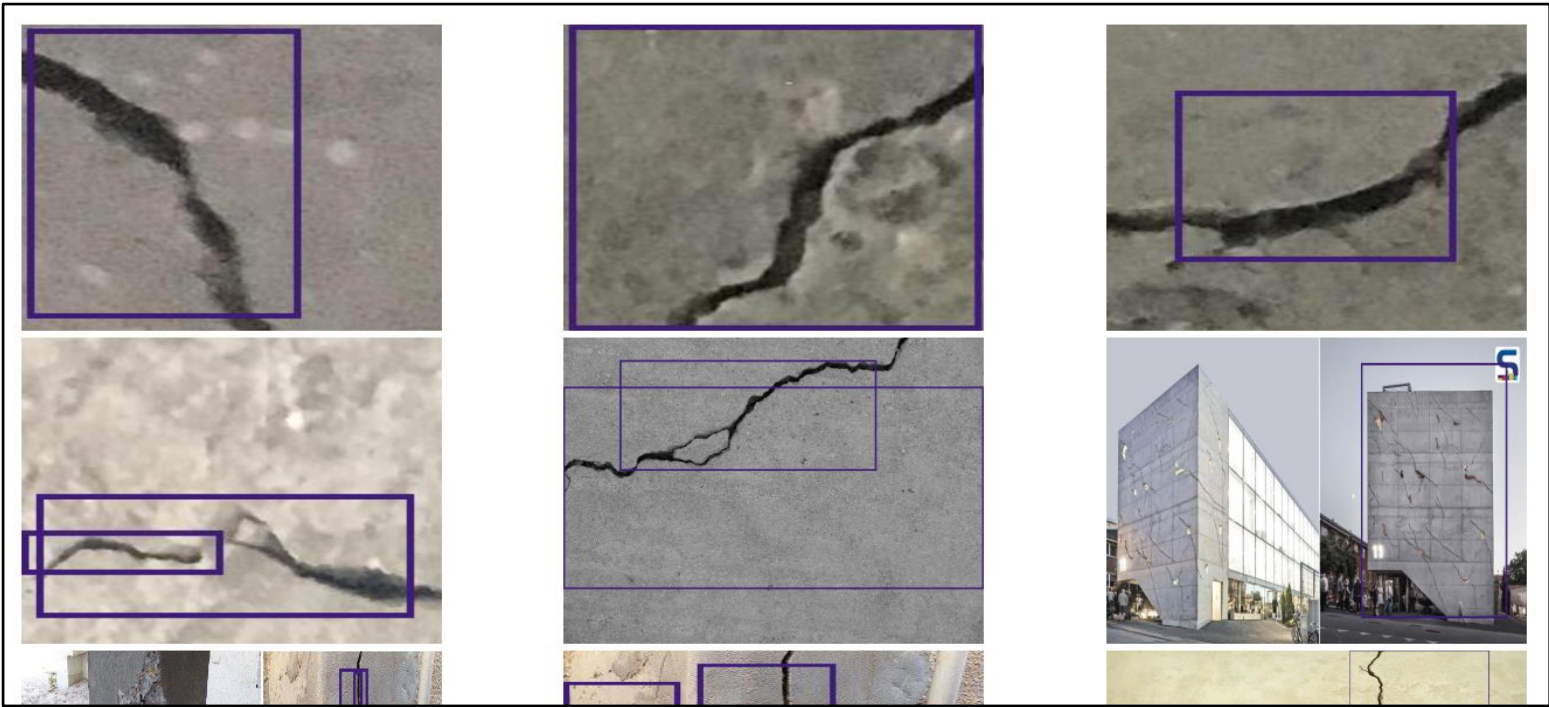


Subtask 9.2: Transition Previously Trained Deep Learning Models to the Advance Automated Machine Learning (AAML) System (NEW)

FIU Year 3 Research Highlights:

Prediction Results ✕

Test Result	Algorithm Name	Hyper-Parameters	Algorithm Group	Status
View Test Result	YOLO	View Parameters	Image Object Detection	Success



AAMLS - Computer Vision Prediction Results - Object Detection



FIU Year 4 Projected Scope

- Research and implement an object detection algorithm with the following properties:
 - Does not require labeled data to learn to detect a new object.
 - Has the ability to choose which objects to detect, not just every foreground object.
 - Has real-time or close to real-time inference speeds.
- Continue to deploy the implemented models on the AAML System.



Accomplishments:

February 28, 2023

**ASME Best Oral Paper/Presentation
Award at the WM2022 Conference,
for Paper # 22045.**

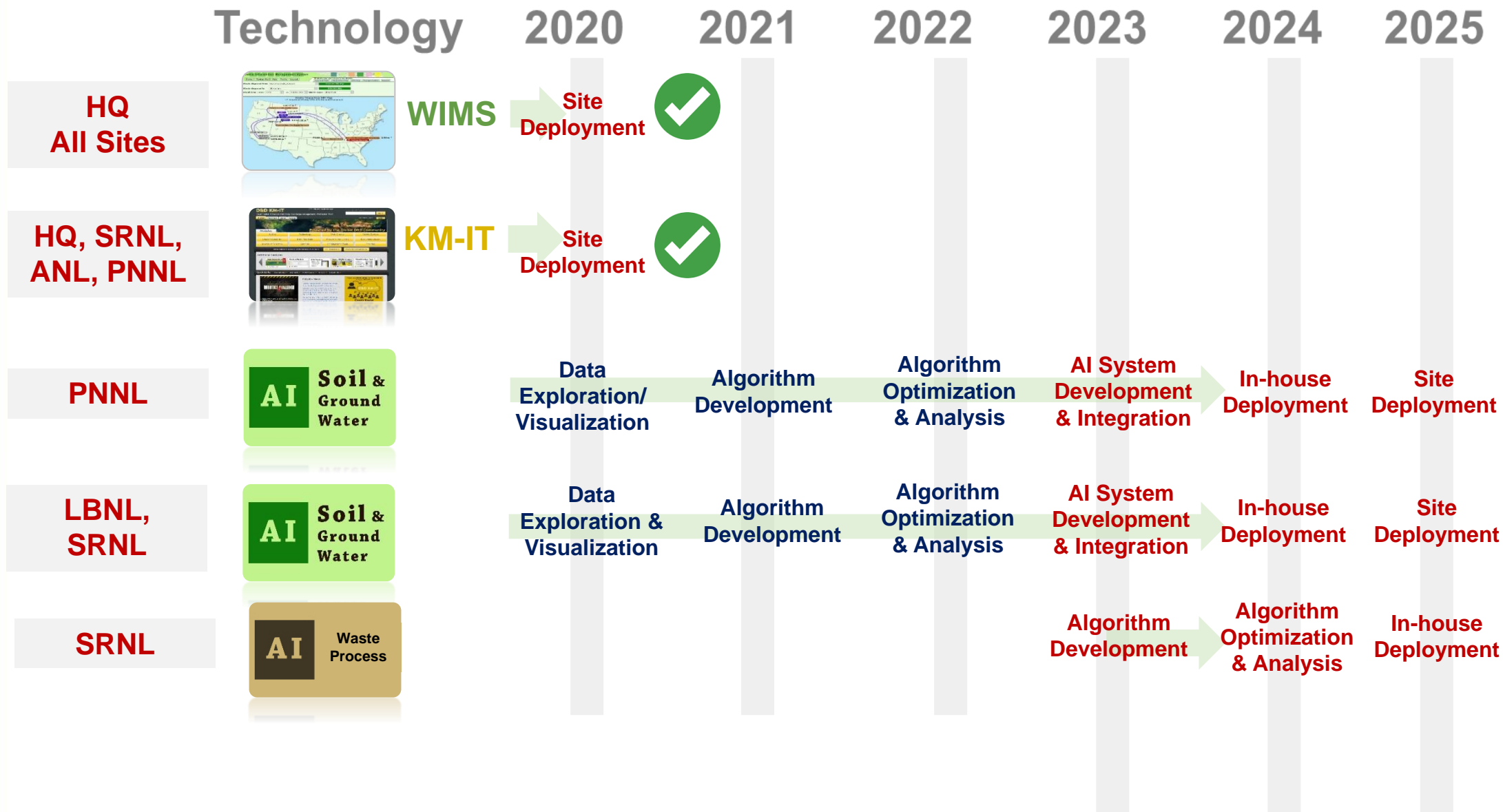
**“Mobile Platform for Structural Health
Monitoring Using Convolutional Neural
Network”.**

**Conference : WM2023 Symposia, Pheonix,
Arizona**

**Team Members: Himanshu Upadhyay,
Santosh Joshi, Roger Boza, Leonel
Lagos, Walter Quintero**



DOE EM IT/AI Deployment Roadmap



DOE EM IT/AI Deployment Roadmap

HQ
All Sites



WIMS

HQ, SRNL,
ANL, PNNL



KM-IT

PNNL



LBNL,
SRNL



SRNL



- WIMS - Web application deployed at <https://emwims.org> - Used by DOE sites, disposition facilities and DOE HQ
- KM-IT - Web application deployed at <https://www.dndkm.org> - Used by DOE sites/facilities, National Laboratories, DOE HQ and D&D community
- AI PNNL (Soil & Ground Water) - AI Models will be deployed on AAMLS to be used by PNNL
- AI SRNL (Soil & Ground Water) - AI Models will be deployed on AAMLS to be used by LBNL, SRNL
- AI Waste Process (SRNL) - Site deployment



Applied Research
Center

DOE-FIU Cooperative Agreement

Upcoming Events Announcement



**FIU**Applied Research
Center*17th Annual*

DOE FELLOWS POSTER EXHIBITION

NOVEMBER 7, 2023

1 pm – 4 pm

FIU ENGINEERING CENTER

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A STEM WORKFORCE DEVELOPMENT PROGRAM

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Save the Date

DOE-FIU Science & Technology Workforce Development Program's

17th DOE Fellows Induction Ceremony
Annual (Class of 2023)

Host: Applied Research Center, Florida International University

When: Wednesday, November 8, 2023 at 12:00 pm

Where: FIU Modesto Maidique Campus
Graham Center (GC) Ballroom
11200 SW 8th St, Miami, FL 33174

*A collaboration between the U.S. Department of Energy's Office of Environmental Management
and Florida International University's Applied Research Center*





Thank You. Questions?