PROJECT TECHNICAL PLAN

Project 4 : Waste and D&D Engineering and Technology Development

For the period September 17, 2013 to May 17, 2014

CONTRACT NO. DE-EM0000598

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1000 Independence Avenue, SW
Washington, D.C. 20585

Submitted by:

Leonel Lagos, Ph.D., PMP®, Project Manager, Principal Investigator
Applied Research Center
Florida International University
10555 W. Flagler Street, EC2100
Miami, FL 33174

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FIU | Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

INTRODUCTION

This project focuses on delivering solutions under the decontamination and decommissioning (D&D) and waste areas in support of DOE HQ (EM-13). This work is also relevant to D&D activities being carried out at other DOE sites such as Oak Ridge, Savannah River, Hanford, Idaho and Portsmouth and international efforts being conducted by EM-1 with the Nuclear Decommissioning Authority (NDA) in England and the International Atomic Energy Agency (IAEA). Efforts on this project include the following tasks:

DOE EM HQ Contacts:
John De Gregory, DOE EM Technical Officer, EM-13
Andy Szilagyi, EM-13
Jonathan Kang, EM-31
Beth Moore EM-12
Kurt Gerdes EM-12
Ana Han, EM-1

DOE Site Contacts:
Mike Serrato, SRNL
Jeff Griffin, SRNL
Rob Vellinger, EFCOG D&D Working Group

ARC Program Contacts:
Leonel E. Lagos, Ph.D., PMP®
Director of Research
Project Mngr/Principal Investigator
(305) 348-1810 E-mail: lagosl@fiu.edu

Applied Research Center
Florida International University
10555 W. Flagler St., Suite 2100
Miami, FL 33174

Task 1: Waste Information Management System (WIMS)

This task provides direct support to DOE EM for the management, development, and maintenance of a Waste Information Management System (WIMS). WIMS was developed to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, GIS maps, transportation details, and other custom reports. WIMS is successfully deployed and can be accessed from the web address http://www.emwims.org. The waste forecast information is updated annually. WIMS has been designed to be extremely flexible for future additions and enhancements.

Task 2: D&D Support to DOE EM for Technology Innovation, Development, Evaluation and Deployment

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. For FIU Year 4**,** FIU will assist DOE EM-13 in meeting the D&D needs and technical challenges around the DOE complex. FIU will concentrate its efforts this year on working with the Savannah River Site to identify and evaluate innovative technologies in support of the SRS 235-F project. In addition, FIU will continue to support DOE EM-13 in their interactions with EFCOG on special topics of interest to DOE EM-13 and DOE Complex. FIU will further support the EM-1 International Program and the EM-13 D&D program by participating in D&D workshops, conferences, and serving as subject matter experts.

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

The D&D Knowledge Management Information Tool (KM-IT) is a web-based system developed to maintain and preserve the D&D knowledge base. The system was developed by Florida International University's Applied Research Center with the support of the D&D community, including DOE-EM (EM-13 & EM-72), the former DOE ALARA centers, and with the active

collaboration and support of the DOE's Energy Facility Contractors Group (EFCOG). The D&D KM-IT is a D&D community driven system tailored to serve the technical issues faced by the D&D workforce across the DOE Complex. D&D KM-IT can be accessed from web address http://www.dndkm.org.

Task 4: Centralized Knowledge Base System and FIU-DOE Research Website (New)

This is a new task for FIU Year 4 in which FIU will create and maintain the following: 1) a centralized web interface to connect all the knowledge base work under the FIU-DOE Cooperative Agreement, including the D&D Knowledge Management System, Waste Information Management System, and Environmental Contamination and Remediation Models on ArcGIS platform and DOE Research application developed in the part 2 of this task and 2) the DOE Research system to capture and make available all the resulting research documents developed under the Cooperative Agreement.

Task 5: Cyber Security Compliance and Deployment of Environmental Contamination and Remediation Models (New)

This is another new task introduced based on the comments made by Mr. Mark Gilbertson during annual DOE review meeting for FIU Year 4. In this task, FIU will publish and deploy an environmental contamination and remediation model over the web using ArcGIS (Geographic Information System) platform and framework for stakeholders. The GIS servers, applications and databases to host these models will be deployed in the secure infrastructure facility developed for D&D KM-IT at FIU. The platform will be in full compliance with all Federal cyber security requirements as identified by DOE.

IT team will work with subject matter experts at ARC to develop Geo database for hydrological modeling work being performed at DOE EM sites, providing access to data generated from simulation of contaminants. This information will be published over the web using maps, graphs and charts using ArcGIS platform. Users will have to register with ArcGIS and be approved before they can access these models. ArcGIS system will be deployed in FIU secured infrastructure for stake holders to view models over the web and take advantage of research work performed at ARC.

The activities described in the Continuation Application for FIU Year 4 were planned for a period of performance from May 18, 2013 to May 17, 2014. However, two no cost extensions were executed by DOE-EM for FIU Year 3, which extended the end of the FIU Year 3 period of performance to September 16, 2013. Therefore, the period of performance for the FIU Year 4 activities described in this Project Technical Plan is shortened to 8 months, September 17, 2013 to May 17, 2014. The scope of some tasks has been affected/reduced due to the shortened period of performance and will be re-evaluated as FIU approaches the May 2014 timeframe. The affected scope may transfer to FIU Year 5.

The affected tasks from the CA for this project include the following:

- Subtask 1.3 – No new enhancements or customization of WIMS will be performed this year.
- Subtask 2.2 – The subtasks in support of EM-13 and EFCOG have been re-defined based on the scope and objectives that the EFCOG D&D/FE Working Group have selected for this year.
- Subtask 2.3 – No technology development for robotics and laser technology for decontamination or remote technology development for the SRS 235-F facility will be performed this year.
- Subtask 3.3 – The mobile system deployment and evaluation at a DOE site will not be performed this year.
- Task 5 – FIU will publish and deploy only a single environmental contamination and remediation model, developed under Project 3, through the secured KM-IT platform.

OVERVIEW OF WORK ACCOMPLISHED DURING FY12 (FIU YEAR 3)

- Completed the integration and deployment of the 2012 waste forecast and transportation data set onto WIMS (April 2012). Conducted administration and management of the WIMS database and web server as well as conducted user support and management for WIMS on a continual basis throughout the year (May 2013).
- Completed a Phase II feasibility study for the remote removal of strippable coatings. The results were documented in a feasibility study report (December 2012).
- Completed a meso-scale testbed system demonstration in support of *in situ* decontamination (November 2012) and developed a technical report for the demonstration (December 2012).
- Provided support to the DOE EM-2.1 international partnerships and support the DOE Bi-Lateral Agreement by providing D&D expertise, knowledge and support.
- FIU-ARC performed activities in support of DOE's Energy Facility Contractor's Group (EFCOG) by collaborating in the development of Lessons Learned and Best Practices, and other activities as identified and agreed by EFCOG and FIU-ARC. In addition, FIU-ARC participated in monthly conference calls and Fall, Spring and Annual EFCOG meetings and presentations (May 2013).
- A total of ten (10) Lessons Learned and Best Practices have been developed in collaboration with EFCOG. The first seven have been finalized and the remaining three have been developed and are in the review and approval process:
    - Explosive Demolition of Buildings 337, 337B, and the 309 Stack at the Hanford's 300 Area
    - Open Air Demolition of Asbestos Gunite by Using a Track Mounted Wet Cutting Saw
    - 185-3K Cooling Tower Demolition
    - Historical Hazard Identification Process for D&D

    - Unanticipated High Dose During the Removal of Wire Flux Monitor Cabling from the HWCTR Reactor Vessel
    - Structural Code Guidance for D&D Activities at DOE Facilities
    - Electrical Code Guidance for D&D Activities at DOE Facilities
    - Closure of the Reactor Maintenance, Assembly, and Disassembly Facility and the Pluto Disassembly Facility at the Nevada National Security Site
    - Radiological Contamination Event during Separations Process Research Unit (SPRU) Building Demolition
    - SRS R and P Reactor Disassembly Basin *In Situ* Decommissioning
- Completed data mining activities for D&D KM-IT throughout the year. These included adding vendors and technologies mentioned in industry publications, industry conference proceedings, and the archived ALARA Reports from the Hanford Site and the Integrated Safety and Solutions Center reports from SRS into the Technology and Vendor modules, as well as loading Lessons Learned and Best Practices documents developed in collaboration with EFCOG into the appropriate modules of the D&D KM-IT (May 2013).
- System, database, and network administration are ongoing activities that FIU undertakes to maintain servers and applications to ensure a consistent high level of performance of the D&D KM-IT system. FIU performed these efforts throughout the year (May 2013).
- Completed integration of the SRS Integrated Safety Solutions Center (ISSC) reports into D&D KM-IT (July 2012).
- Completed the design and development of the global search feature on D&D KM-IT (August 2012). This feature provides the user with a simple tool to search all KM-IT webpages and documents.
- Completed the design and development of the D&D dictionary module and integrated it with D&D KM-IT (September 2012).
- Completed the design and development the multiple SMS support feature for the D&D Hotline (November 2012).
- Completed the development of a summary report for the mobile development research (December 2012). Completed the design and development of the picture lite mobile application (January 2013) and the technology lite mobile application (February 2013). These applications allow access to the picture and technology module from the users' mobile devices.
- Completed enhancement of the D&D KM-IT website user interface (April 2013).
- Completed development of help videos for the D&D KM-IT website (May 2013).
- Presented results of research at the WM2013 Conference (February 2013).
    - Waste Information Management System with 2012-13 Waste Streams (13095), Himanshu Upadhyay, Walter Quintero, Leonel Lagos, Peggy Shoffner, David Roelant

- Application and Removal of Strippable Coatings via Remote Platform (13133), Peggy Shoffner, Leonel Lagos, Samuel Maggio (ICM)
- Sensor Network Demonstration for Monitoring Decommissioned Nuclear Facilities (13332), Leonel Lagos, Amer Awwad, Jose Varona, Jose Rivera
- Knowledge Framework Implementation with Multiple Architectures (13090), Himanshu Upadhyay, Leonel Lagos, Walter Quintero, Peggy Shoffner, John De Gregory (US DOE)
- Battery-less Wireless Sensors for Structural Health Monitoring for In-Situ Decommissioning of DOE Facilities (Student Poster), Elicek Delgado-Cepero (DOE Fellow)
- Degradation of Grout: Compressive Strength Comparative Analysis (Student Poster), Joel McGill, (DOE Fellow), Jose Rivera, Leonel Lagos
- Saltstone Processing of Low-Level Waste at Savannah River Site (Student Poster), Joshua Midence (DOE Fellow), Alex Cozzi (SRNL), Leonel Lagos
- Sensor Network Energy Demand for In-situ Decommissioning Applications at Savannah River Site (Student Poster), Raul Ordonez, (DOE Fellow)
- Mobile Device Applications using Cloud Computing on Service Oriented Architecture (Student Poster), Justin Phillips, Himanshu Upadhyay, Leonel Lagos
- SharePoint Based Secured Collaboration System for DOE-EM project management (Student Poster), Mariela Silva (DOE Fellow)
- D&D Technology Services Development using Windows Communication Foundation on Cloud (Student Poster), Revathy Venkataraman (DOE Fellow)

- Presented two technical presentations to the Decommissioning, Decontamination & Reutilization (DD&R) Conference in Chicago, IL (June 2012).
  - Service Oriented Architecture Based Framework for D&D Knowledge Management, Himanshu Upadhyay, Leonel Lagos, Walter Quintero
  - Development of a Remote Platform for Remote Removal of Strippable Coatings – A Feasibility Study, Leonel Lagos, Peggy Shoffner, Sam Maggio (ICM), Blake Fall-Conroy (ICM)

TASK 1: WASTE INFORMATION MANAGEMENT SYSTEM

TASK 1 TECHNOLOGY NEEDS

In order to facilitate accelerated cleanup initiatives, waste managers at DOE field sites and at DOE headquarters in Washington, D.C., need timely waste forecast information regarding the volumes and types of waste that will be generated by the DOE sites. Waste information from all sites needs a common application to allow interested parties to understand and view the complete complex-wide picture. A common application allows identification of total waste volumes, material classes, disposition sites, and any known barriers to treatment and disposal.

The Applied Research Center (ARC) has developed a Waste Information Management System (WIMS) to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, and other displayed reports. This system offers a single information source to allow interested parties to easily visualize, understand, and manage the vast volumes of the various categories of forecasted waste streams in the DOE complex.

TASK 1 DESCRIPTION

Objectives

The objective of the WIMS effort is to provide DOE and other stakeholders with the tools necessary to easily visualize and assist in understanding and managing the vast volumes of the various categories of forecasted waste streams in the DOE system and to offer a single source for this information. With this information available, decision making and achieving waste disposition goals and other EM goals will be less cumbersome and more efficient.

Benefits

The benefits of WIMS include:

- Providing a central location to access DOE waste forecast data for sites across the DOE Complex,
- Providing easy-to-use tools to view the DOE waste forecast data in various formats,
- Achieving improved efficiencies of scale when outsourcing treatment and disposal services by providing information regarding complex-wide waste streams,
- Providing information to technology vendors regarding DOE waste needs to plan future technology capabilities and capacity, and
- Sharing site-to-site resources and treatment capabilities to allow the sites to leverage capacity and expertise.

FIU YEAR 4 TASK 1 EXECUTION PLAN

Project Tasks

The successful web deployment of WIMS, complete with waste information from all DOE sites, occurred in May 2006. Individuals may visit the website (http://www.emwims.org), choose the desired DOE facility, and view the projected volumes of waste that the facility plans to treat or dispose through the year 2050. The waste forecast information may be sorted or filtered in a variety of ways and presented in a tabular format, exported to other applications such as MS Excel®, or displayed with a disposition map, a geographical information system (GIS) format, or in a printable report. The data may also be viewed in a 'reverse' format that displays the volume of forecasted wastes scheduled to arrive at a specific treatment or disposal location from any or all generation sites. WIMS has been designed to be extremely flexible for future additions and enhancements. WIMS has been labeled DOE's tool-of-choice for waste forecasting.

Waste management support across the DOE Complex includes updating and improving DOE's official internet-based, waste forecasting and transportation information technology known as the Waste Information Management System (WIMS). Waste and transportation data is updated annually and technical support is provided to the DOE sites in the use of WIMS.

The following subtasks have been identified for the WIMS task for FIU Year 4:

Subtask 1.1: Maintain WIMS - database management, application maintenance, and performance tuning

- This subtask includes the day-to-day maintenance and administration of the application and the database servers. FIU will maintain the WIMS application system to ensure a consistent high level of performance. In addition, the database administrators will perform routine maintenance in order to keep the WIMS database and server in a stable condition.
- The WIMS application is also maintained on the web server by the Web Server Administrator. This administrator monitors the network and server traffic and performs changes necessary to optimize the application performance.
- In addition, as part of this subtask, FIU will provide application and database security as well as help desk support to DOE site waste managers, HQ managers, and other users who need assistance in using WIMS.

Subtask 1.2: Incorporate new data files with existing sites into WIMS

- Upon HQ request, FIU receives revised waste forecast data as formatted data files. To incorporate these new files, FIU builds a data interface to allow the files to be received by the WIMS application and imports it into SQL Server. SQL server is the database server where the actual WIMS data is maintained. Under this subtask, FIU will receive and incorporate one set of revised waste forecast data files (expected in the February to March 2014 timeframe). The 2014 waste data will replace the existing previous waste data and will become fully viewable and operational in WIMS.

- Upon HQ request, FIU receives revised transportation data as formatted data files. Under this subtask, FIU will receive and incorporate one set of revised transportation data files (expected in the February to March 2014 timeframe). The 2014 transportation data will replace the existing previous transportation data and will become fully viewable and operational in WIMS.

Project Milestones for Task 1

Milestone No.	Milestone Description	Completion Criteria	Due Date
2013-P4-M1.1	Import 2014 data set for waste forecast and transportation data	Data imported into WIMS and available for testing over the web	Within 60 days after receipt of data from DOE
2013-P4-M1.2	Waste Management Symposium 2014	Submit draft paper to WM14	11/7/2013

Deliverables for Task 1*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/17/2013
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	06/30/2014
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly

**Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.*

Anticipated Issues

Funding for WIMS beyond this project period will be needed to ensure the system will continue to be available for the user community.

Integration and deployment of new data onto the WIMS website will be completed within 60 days of receipt of the data from DOE. Delays in receiving the data will result in a subsequent delay in deployment of the new data.

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

TASK 2 TECHNOLOGY NEEDS

Many of the facilities DOE has historically operated have been shutdown as a result of changes in scientific and military objectives. This change in laboratory mission within the DOE complex, along with facilities that have reached the end of their operating life, has led to an increased need to deactivate and decommission (D&D) surplus and aging facilities. Many such facilities exist across the DOE complex and are currently or will soon undergo D&D. The facilities that will undergo D&D include highly contaminated hot cells, reactor pools, and a variety of other buildings and process systems. D&D of these facilities will require characterization, decontamination, demolition, material sorting and segregation, size reduction, and waste packaging. In addition, many of these structures may remain in place, where the need exists for unconventional surveillance and monitoring capabilities.

TASK 2 DESCRIPTION

Objectives

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. For FIU Year 4**,** FIU will assist DOE EM-13 in meeting the D&D needs and technical challenges around the DOE complex. FIU will concentrate its efforts this year on working with the Savannah River Site to identify and evaluate innovative technologies in support of the SRS 235-F project. In addition, FIU will continue to support DOE EM-13 in their interactions with EFCOG on special topics of interest to DOE EM-13 and DOE Complex. FIU will further support the EM-1 International Program and the EM-13 D&D program by participating in D&D workshops, conferences, and serving as subject matter experts.

Benefits

The benefits of this task include:

- Providing DOE with the information necessary to complete D&D safely and effectively with technologies that include remotely operated technologies for facilities which contain hazards that prevent the use of safe manual techniques,
- Enhancing safety while reducing risk to workers, the public, and the environment,
- Reducing the future cost, schedule, and risk for similar work through a thorough understanding of existing technologies and technical approaches from past D&D projects, and
- Providing the tools necessary to successfully complete difficult D&D tasks that can then be applied complex-wide to similar DOE facilities.

FIU YEAR 4 TASK 2 EXECUTION PLAN

Project Tasks

Subtask 2.1: D&D Technology Demonstration & Development and Technical Support to SRS's 235 F-Facility Decommissioning (New)

During FIU Year 2, FIU collaborated with Savannah River National Laboratory (SRNL) in investigating the feasibility of deploying a long-term monitoring system into an *in situ* decommissioning (ISD) closed nuclear facility by developing an experimental test site for the demonstration of multiple sensor systems. A meso-scale sensor network testing facility was constructed at FIU and a variety of remote/smart sensors were deployed inside a grouted pre-cast concrete cube to evaluate their performance and reliability. The sensors collected data on test parameters such as moisture, temperature, crack detection, fluid/contaminant mobility. The FIU Year 2 effort successfully measured the durability, performance, and precision of the sensors as well as monitored and recorded the curing process of the selected grout material under natural environmental conditions.

During FIU Year 3, FIU extended the collaboration with SRNL by performing an energy analysis and transferring several sensor systems to a photovoltaic (PV) system to continuously monitor energy consumption parameters and overall power demands. An additional component of this research was focused on developing an integrated data network to capture, log and analyze sensor system data in near real-time from a single interface. The FIU Year 3 energy analysis work resulted in data on the constraints placed by some of the sensor systems on a power network that requires high reliability and low losses. In addition, a sensor system demonstration has determined that it is feasible to develop an integrated data network where data can be accessed in near real-time from all systems, thereby allowing for larger-scale integrated system testing to be performed. Information collected during the execution of this research project will aid decision makers in the identification of sensors to be used in nuclear facilities selected for ISD.

During FIU Year 4, FIU will concentrate its efforts on working with the Savannah River Site to identify and evaluate innovative technologies in support of the SRS 235-F project. The SRS 235-F facility was constructed in the 1950's as part of the weapons complex materials production and fabrication. The building is approximately 24,000 ft^2 per floor totaling 48,000 ft^2. The blast resistant, two-level, windowless structure was built to meet NPH PC-3 seismic and wind design criteria. The facility was built on a reinforced concrete slab foundation with exterior walls measuring 14-inch thick double-reinforced concrete. The 235-F building has three separate ancillary facilities: 291-2F (stack), 292-2F (sand filter fan house), and 294-2F (sand filter) plus an underground concrete tunnel connecting 235-F to the sand filter. Major modifications to the facility began in the mid-1970s to support the new Pu-238 fuel mission for NASA. The most significant quantities of residual contamination remaining in 235-F building are found in the Plutonium Fuel Form (PuFF), Plutonium Experimental Facility (PEF), Old Metallography Lab (OML), and Actinide Billet Line (ABL) facilities.

FIU will support the SRS 235-F efforts by providing experience and capabilities in technology evaluation/demonstration and deployment. Since its inception in 1995, FIU has conducted over 300 technology demonstrations for DOE-EM. Most of these technologies have been D&D innovative technologies.

Subtask 2.1.1: Decontamination agents/materials for radiological surface contamination (new)

For this subtask, FIU will perform a focused literature review on decontamination agents/materials for radiological surface decontamination in support of the SRS 235-F Risk Reduction Project. The resulting summary report will help the project team develop their decontamination concepts for the PuFF process cells and define the FY 14 and out year's technical activities.

The following information will be collected for each of the products identified by this study:

- Product name
- Manufacturer
- Strippable coating (Yes/No)
- Application instructions
- Price/coverage
- Use
- Advantages
- Sites experience with product
- Documentation
- Product website
- Photos
- Vendor contact information

FIU will develop a matrix spreadsheet containing the information on all of the products researched. The spreadsheet will be included in the Phase I summary report for this subtask. In order to provide even more detailed product information for each product, FIU will expand the literature research into Phase II, which will add the following information for each product:

- - Category (Fixative/Strippable/Washable)
- - pH
- - Ingredients (Published by Manufacturers)
- - Specific Gravity
- - Solubility
- - Incompatibility
- - Boiling Point
- - Conditions to Avoid
- - State
- - Color

After a preliminary selection, FIU-ARC will recommend a test and evaluation phase prior to selecting a final product to be field deployed at the SRS 235-F project. It is recommended that a mock-up test bed be constructed and several products be selected for

further evaluation and selection. It is very important to take into account the feasibility of the application, its cost effectiveness and the waste management.

Subtask 2.1.2: Fogging research and evaluation (new)

In a second subtask in support of the SRS 235-F efforts, FIU will collaborate with Idaho National Laboratory in the identification, selection, testing, and evaluation of fogging products. A formal test plan document will be developed in conjunction with SRS, INL and HQ personnel. Based on the needs, FIU will develop appropriate technology evaluation/ demonstration areas (test sites) to evaluate the fogging technologies at FIU. The selected technologies and technology vendors will be invited to demonstrate their systems/technologies at FIU. A formal report will be developed based on a consistent format and will address key elements similar to those identified in the legacy Innovative Technology Summary Reports (ITSRs). The reports will be issued to SRS and HQ for review and approval. Once approved, the report will be distributed via KM-IT and OSTI.

Subtask 2.2: Support to DOE EM-13 and Interface with EFCOG

During FIU Year 4, FIU will support DOE EM-13 in their interactions with EFCOG on special topics of interest to DOE EM-13 and DOE Complex. Based on feedback from EFCOG group and EM-13, the scope for FIU Year 4 will include the following topics of interest:

Subtask 2.2.1: Support for aging infrastructure

During March 1992 budget hearings, DOE's former Assistant Secretary for EM projected that DOE might ultimately close as many as 7,000 facilities (*Maintenance of Inactive Hanford Facilities: Procedures and Challenges*, September 2002). For many of the DOE's inactive facilities, the poor physical condition and the presence of hazardous materials pose serious risks to workers in and around them. The condition of specific inactive facilities depends on such factors as weather conditions, facility age and operating history, and DOE construction techniques and maintenance practices.

While allocating funds for surveillance and maintenance will prove cost effective over the long term, limits in immediate budgets may also limit surveillance and maintenance activities. Moreover, managers may face a need to balance conflicting considerations with facilities expected to be demolished in the near term. As long as demolition proceeds on schedule, then it may be cost-effective to defer immediate maintenance requirements. But as a facility remains in place, ages and deteriorates, surveillance and maintenance may become necessary before demolition.

For FIU Year 4, FIU will work in collaboration with the EFCOG D&D/FE Working group on the issue of aging infrastructure. FIU has previously developed *The Prioritization Tool for S&M Investment in Excess Facilities* (https://www.dndkm.org/News/DSS.aspx) to help Federal Project Directors and their contractors effectively prioritize S&M investment across a site's excess facilities so that the limited budget available can be used most effectively. The analytical hierarchy process (AHP), a multi-criteria decision making method developed by Dr. Thomas Saaty in the 1970's, was used to derive the weight of importance of a defined list of risk-based

criteria and typical S&M activities. A total of 10 facilities at the Oak Ridge National Laboratory (ORNL) varying in perceived hazards and conditions were chosen to test the tool by evaluating them with respect to each risk criterion and combining these results with the weight of importance of the S&M they require. The final result was a rank of S&M activities to be performed on all the facilities based on the relative weight of importance of the activity coupled with the risk posed by the facility. This method addressed the needs of all of the facilities without ignoring the S&M activities of the lower risk facilities. In doing so, the site can prevent the lower-risk facilities from becoming a higher risk in the future. The result of this study was analyzed for consistency and reflected the overall technical judgment of subject matter experts, based on the facilities used in the test. This tool can be a starting point to determine how to distribute S&M budgets, to help make consistent and risk-based decisions and to provide documentation for future reference and review. In addition, the tool is flexible enough to be modified and used at other DOE sites. This subtask may include the refinement and expansion of the prioritization tool for use at other DOE sites.

During FIU Year 4, FIU will contact each of the major DOE sites to gather information on what efforts are being implemented to: a) identify all the excess facilities, b) prioritize the maintenance/surveillance activities, and c) prioritize D&D when funding becomes available. FIU will further determine whether the site has made use of *The Prioritization Tool for S&M Investment in Excess Facilities* or whether they have used a commercial product or developed their own process for making these determinations. The information gathered will be compiled to provide an overall picture on the status of aging infrastructure across the DOE complex.

Subtask 2.2.2: Best Practices and Lessons Learned

FIU will also support the EFCOG group by collaborating in the development of Lessons Learned and Best Practices documents. Once approved by EFCOG and DOE, these documents will be made available via D&D KM-IT and the EFCOG website. Topics identified for development include:

- Remote tapping tool developed at INL for the location and removal of residual liquids in pipelines
- Mechanical code guidance for D&D

Project Milestones for Task 2

Milestone No.	Milestone Description	Completion Criteria	Due Date
2013-P4-M2.1	Draft summary report for SRS 235-F Facility on decontamination agents/materials for radiological surface contamination (subtask 2.1.1)	E-mail notification to SRS	September 30, 2013
2013-P4-M2.2	Draft report on aging infrastructure (subtask 2.2.1)	E-mail notification to DOE	May 2, 2014

Deliverables for Task 2*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/17/2013
Lessons Learned and Best Practices	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30 days after final approval from DOE & EFCOG
Draft technical reports for demonstrated technologies	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after evaluation/demo
Draft Tech Fact Sheet for technology evaluations/ demonstrations	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after evaluation/demo
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	06/30/2014

**Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.*

Anticipated Issues

Identification, documentation, review and approval of Lessons Learned and Best Practices will be completed in collaboration with the EFCOG D&D Working Group. The schedule for completion is highly dependent on the review and revision process between FIU, the site point of contact, EFCOG, and DOE.

TASK 3: D&D KNOWLEDGE MANAGEMENT – INFORMATION TOOL

TASK 3 TECHNOLOGY NEEDS

The web-based D&D KM-IT was developed to capture and preserve the knowledge-base of the D&D community and to provide a platform tailored for easy retrieval by the user base. This system collects information from the subject matter specialists and builds a knowledge repository for future reference. The D&D Knowledge Management Information Tool goes beyond lessons learned, since it functions as a point-of-access to broad D&D information on the world-wide-web. In addition, functionality will continue to be expanded over time to strengthen the focus of the D&D information sources available via the web from other government agencies, industry and academia.

TASK 3 DESCRIPTION

Objectives

The objective of the D&D KM-IT is to provide a focused web-based tool to assist the DOE D&D community in identifying potential solutions to their problem areas by using the vast resources and knowledge-based tools available through the web. The D&D KM-IT archives in a retrievable module within the system information collected from the subject matter specialists, thereby building a knowledge repository for future reference. The long-term *strategic vision* for the D&D Knowledge Management Information Tool (D&D KM-IT), which has been developed for DOE's D&D community of practice, is that *it will continue to grow and mature into a self-sustaining system through the active participation of the D&D community it was designed to serve.*

Benefits

D&D KM-IT makes excellent use of the knowledge that exists within the D&D community by allowing D&D project managers around the DOE complex to share innovative ideas, lessons learned, past experiences, and practices. The system is a knowledge tool that harnesses web technology, thereby enhancing communications; information searching, gathering, and distribution; and knowledge collection and exchange. Most importantly, the system encourages collaboration within the D&D community of practice.

Too frequently, people in one part of the community "reinvent the wheel" or fail to solve problems quickly because while the knowledge they need exists elsewhere, it is not known or accessible to them. This tool helps to resolve these issues through better collaboration, knowledge sharing, and by following best practices for D&D application.

D&D KM-IT defines, stores, categorizes, indexes and links digital information. It allows searching for relevant content and it presents the content with sufficient flexibility in order to render it meaningful and applicable across multiple contexts of use.

D&D KM-IT makes D&D knowledge available to the people who need it, at the time they need it, and in a readily usable format. It uses the World Wide Web as the primary source for content in addition to information entered by the subject matter specialists and D&D community of practice.

FIU YEAR 4 TASK 3 EXECUTION PLAN

Project Tasks

The following subtasks have been identified for the KM-IT task:

Subtask 3.1: Outreach and Training (D&D Community Support)

- **Newsletter:** Newsletters are a great way to bring waves of traffic to the website. By using the registered users as recipients, websites can keep the users up to date on new features and content on the website. Newsletters will be sent on a regular basis; a goal of 4 newsletters will be sent during this performance period .
- **Workshops:** Scheduling a workshop with the target audience is a great way to promote the website and increase ownership. At these workshops, the site features can be explained in detail and participants can share their feedback and ideas. As a result, they feel like contributors of the product and stay involved. One workshop will be offered over the web using web conferencing tools. In addition, two live workshops will be offered during the Waste Management 2014 Symposium. One of these live workshops will be targeted to the EFCOG D&D/FE Working Group and will be offered in conjunction with their regularly scheduled meeting at the conference. A second live workshop will be offered to the general conference attendees. Agendas for these workshops will be developed and sent to DOE prior to each workshop.
- **Collaboration with D&D Working Groups:** Collaboration will be a keystone in accomplishing the long-term vision of KM-IT of becoming self-sustaining by the community it serves. Involvement of the EFCOG Group and other D&D community forums (such as the DDSC and the Nuclear Decommissioning Authority) will spark interest in the website and create a greater user group that will eventually lead to more registered SMS and more traffic to the site. All cyber security requirements per Federal regulations will need to be met and is especially critical in collaboration efforts with foreign nationals. D&D KM-IT receives the support and collaboration from EFCOG so this cooperation also needs to be leveraged to expand exposure of the system to the target community.
- **Conferences:** Participation and presentations of D&D KM-IT at industry conferences will boost awareness of the website and its capabilities to the target users. D&D KM-IT will be presented at conferences such as the Waste Management conference in Phoenix, AZ. Additional industry conferences will be targeted to widen the audience.
- **Wikipedia Integration:** The general D&D knowledge which has been gained through this project offers an opportunity to expand access to a broad audience via Wikipedia, which has a significant presence on the web, thereby offering greater opportunities for collaboration on D&D knowledge. FIU-ARC will research and target D&D information

on Wikipedia where D&D KM-IT can provide additional information that is lacking. FIU-ARC will provide Wikipedia with information that is missing while citing the D&D KM-IT as a source with a link back to the original information on D&D KM-IT. A starting point for this knowledge management collaboration between Wikipedia's information and the D&D KM-IT will be the D&D KM-IT's D&D Dictionary.

FIU ARC's SMS will also evaluate Wikipedia entries on D&D related topics, looking for mentions of undefined topics or topics lacking clear definition. FIU ARC will then generate 4 edits to existing articles based on these topics or, if no article exists, create new articles on the topics. Each edit or new article will conform to Wikipedia standards and contain citations linking back to the D&D KM-IT as the source for the information. This information may come from lessons learned, best practices and hotline.

- **Help Videos:** Currently, D&D KM-IT has text based help for each module. Under this task, help videos will be developed for all of the completed modules. Each video will be of short duration displaying the major features of the module. External and internal resources will be used to develop professional looking videos. FIU will target completion of 10 videos for the performance year. The help videos to be developed include:
    - Searching best practices
    - Uploading best practices
    - Searching lessons learned
    - Uploading lessons learned
    - Uploading pictures/videos
    - Basic searching technologies
    - Advanced searching technologies
    - Using the D&D dictionary
    - Introduction to the homepage
    - Specific features on the homepage

Subtask 3.2: D&D KM-IT Application Development

- **Community Content Contribution Process:** To further community awareness to knowledge management, a community contribution module will be added to the KM-IT in the hopes of fostering greater community contribution in the area of D&D. The community contribution module will be linked from the home page of the KM-IT. The content displayed will be short, precise and quickly readable highlights about how to begin contributing to the information contained in each module. This will list all features of KM-IT with short descriptions, links to each module's help page, and inform the user on uploading or adding content to the KM-IT's various modules. Community Content Contribution will be integrated with the homepage of KM-IT. This will provide users with more readily accessible information on how they can participate in the knowledge management goals of the D&D KM-IT.
- **Popular Technologies:** Page views will be recorded by the KM-IT and utilized to provide further user retention. The most viewed content, relevant to the content being

viewed, will be displayed so that users have additional navigation options on detail or content pages.

Subtask 3.3: Mobile D&D KM-IT Application Development

FIU will develop Hotline Lite mobile applications targeting currently popular mobile devices like iPhone, Blackberry, Android and Windows along with tablets like iPad from Apple and Surface from Microsoft.

- **Hotline Lite**: This application will provide the framework where users can search through the posted problems published over the web and look for a problem and solution title and description in any of the supported functional categories (e.g., characterization, decontamination, dismantlement, size reduction, worker's health & safety, etc.).

Subtask 3.4: D&D KM-IT C&A Certification

ARC will work with the DOE EM IT department toward achieving C&A certification for the D&D KM-IT infrastructure in the current fiscal year. The D&D KM-IT system and infrastructure will be audited by internal and external auditors on a periodic basis. Findings of the audit will be implemented in the application, servers and infrastructure. FIU will work with EM-72 to establish the requirements for the C&A Certification.

Subtask 3.5: Data and Content Management

This task will focus on capturing information in KM-IT from different sources. Vendors, technologies, lesson learned/ best practices, videos and pictures will be captured, reviewed and published in D&D KM-IT. DOE Fellows will work with EFCOG, ALARA Center Reports (SRS and Hanford), DOE sites, national labs, Waste Management 2014 and other conferences to collect information and publish them in D&D KM-IT.

- **SRS Data and Content Management:** DOE Fellows will go through the SRS ALARA reports and extract information related to the D&D technologies, vendors and demonstrations, if any. This will be reviewed and published in the KM-IT Technology module.
- **Vendor Information:** Publish vendor information from Waste Management 2014 and other similar conferences, DOE sites /contractors and by contacting vendors directly.
- **Technology Information:** Publish technology information by collecting technology information directly from vendors published in KM-IT.
- **Lessons Learned/Best Practices:** This task will focus on capturing the manager experience through the EFCOG points-of-contact. In an effort to capture the lessons learned and best practices acquired at DOE sites, FIU will work with EFCOG with an existing data collection process where subject matter specialists (SMS) from various sites will be able to share their experiences and lessons learned with the EM D&D community.
- **Hotline:** Publish Problems / Solutions from SRS ALARA reports and current users.

- **Video/Pictures:** Publish videos and pictures from demos and sites. ISDSN demo was performed at FIU and videos and pictures from this demo will be published in KM-IT.
- **D&D Dictionary:** DOE fellows will work on collecting information related to popular D&D search keywords used in KM-IT, obtained from monthly analytics report, as well as terms identified by subject matter specialists. This information will be published into KM-IT and a brief definition will be entered into appropriate topics on Wikipedia where D&D KM-IT will be identified as the source of the information.

Subtask 3.6: D&D KM-IT Administration and Support

- **System administration:** This task includes the day-to-day maintenance and administration of the D&D KM-IT Servers. Major tasks involve load balancing, active directory accounts, security patches, operating system updates, system optimization, server monitoring, emergency problem resolution etc. FIU will maintain the KM-IT application system to ensure a consistent high level of performance.
- **Database administration:** This task includes database backup, optimization, performance tuning, and system security, controlling and monitoring user access to the database, maintain database cluster and other management tasks on a regular basis.
- **Network administration:** This task involves monitoring the network and server traffic, installation and maintenance of network hardware/software, assigning addresses to the computers and devices on the network, troubleshooting network activities and performance tuning.
- **Performance analysis and reports**: Under this task, FIU-ARC will capture usage and search data on the KM-IT using various tools and code, including Google Analytics. The data will be analyzed and used to market the site, measure the sites usage, and support decisions for ongoing content development to ensure that it remains relevant to the needs of the community the system serves. Detailed reports will be generated from the captured data and reviewed on a quarterly basis with an annual analysis summary report with trends and recommendations to improve performance and outreach.
- **D&D KM-IT support:** This task includes supporting D&D KM-IT users with a help desk role to resolve issues on a day to day basis.

Project Milestones for Task 3

Milestone No.	Milestone Description	Completion Criteria	Due Date
2013-P4-M3.1	Waste Management Symposium 2014	Submit draft paper to WM14	11/07/2013
2013-P4-M3.2	Help videos development complete and sent to DOE for review	E-mail notification to DOE	01/31/2014
2013-P4-M3.3	Deployment of hotline lite mobile application to DOE for review/testing	E-mail notification to DOE	02/28/2014

2013-P4-M3.4	Deployment of community contribution module to DOE for review/testing	E-mail notification to DOE	03/28/2014
2013-P4-M3.5	Deployment of popular content displays to DOE for review/testing	E-mail notification to DOE	04/25/2014
2013-P4-M3.6	Four Wikipedia integration edits/articles	E-mail notification to DOE	5/09/2014

Deliverables for Task 3*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/17/2013
D&D KM-IT Workshop Agenda	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	02/03/2014
Draft Security Audit Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after completion of audit
D&D KM-IT Performance Analysis Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly
Draft Tech Fact Sheet for new modules or capabilities of D&D KM-IT	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after deployment of new module or capability
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	06/30/2014

**Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.*

Anticipated Issues

Funding for the D&D KM-IT System beyond this project period will be needed to ensure the system will continue to be available for the user community.

Continued enhancements to the system will have to be implemented based on feedback from the D&D community and a User Advisory Group.

TASK 4: CENTRALIZED KNOWLEDGE BASE SYSTEM AND FIU-DOE RESEARCH WEBSITE (NEW)

TASK 4 TECHNOLOGY NEEDS

The centralized knowledge base system and FIU-DOE research website will serve to capture and make easily available the work that FIU performs for DOE under the FIU-DOE Cooperative Agreement. These virtual tools will function as a point-of-access for easy retrieval by the users. In addition, these features could be expanded over time to provide additional functionality.

TASK 4 DESCRIPTION

Objectives

The objective of this task is to provide a single interface (single page) linking all the web based systems developed by ARC IT for EM to provide ease of navigation. Each application will run on its individual platform and framework and will have its own authentication (User ID and Password). Some systems like DOE Research may not need User ID and Password at all.

The objective of this task is to centralize access to the web applications that FIU uses to capture and make available the work they perform for DOE under the FIU-DOE Cooperative Agreement.

Benefits

The benefits include:

- Having one centralized location from which to access three web based systems:
    - D&D Knowledge Management System
    - Waste Information Management System
    - Environmental Contamination and Remediation Models
- Securing all web based systems via the FIU-ARC secured infrastructure.
- Having a centralized location for all the research information developed under the Cooperative Agreement (DOE Research Website) in order for stakeholders to conveniently and efficiently retrieve research documents developed by FIU for EM.

FIU YEAR 4 TASK 4 EXECUTION PLAN

Project Tasks

Under this task, FIU will create and maintain two centralized virtual systems: 1) a centralized system to connect all the knowledge management base work under the FIU-DOE Cooperative Agreement, and 2) the DOE Research website to capture and make available all the resulting research, reports, publications developed under the Cooperative Agreement.

Subtask 4.1: Knowledge Base for Environmental Management

FIU ARC will develop a common interface on the KM-IT platform for all the applications developed for DOE–EM. This will serve as the Knowledge Base for Environmental Management and will be accessed at www.kbem.org (Knowledge Base for Environmental Management). It will provide the centralized access to the research work done at ARC in the following areas:

1. **D&D Knowledge Management Information Tool**

   D&D Knowledge Management Information Tool is a web-based application developed for the D&D user community in collaboration with DOE-EM, EFCOG and the former ALARA centers at Hanford and Savannah River. It provides information related D&D technology, problem solutions, lessons learned, best practices, document library, D&D specialists and a real-time web crawler. This system is available at www.dndkm.org.

2. **Waste Information Management System**

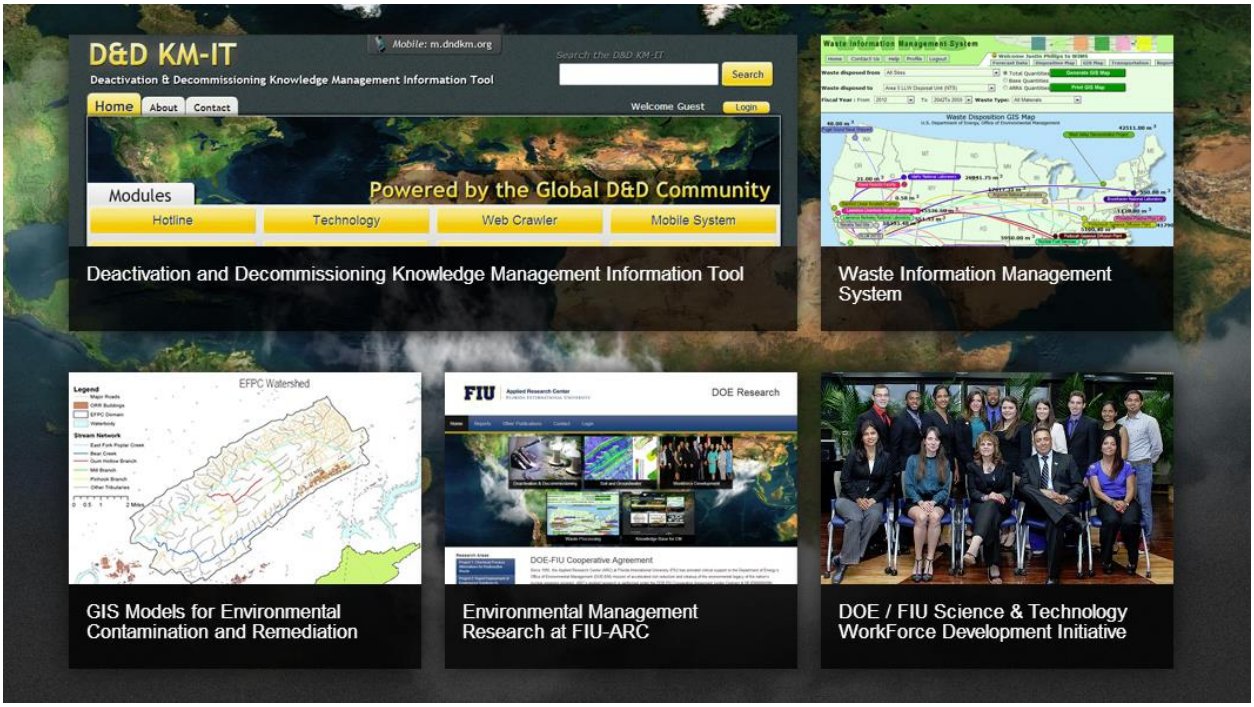
   Waste Information Management System (WIMS) provides DOE-wide forecasts for waste streams and transportation information via waste forecast tables, disposition maps, GIS maps and custom reports. WIMS is deployed at www.emwims.org.

3. **Environmental Contamination and Remediation Models**

   Environmental contamination and remediation models are developed based on the GIS research work done in Project 3 of the DOE Cooperative Agreement. These models are limited to the desk-top stand-alone machines. These models will be deployed on a GIS server to be made available over the web under Task 5 of this project. They will be made available to the research community across the DOE complex through the secured KM-IT platform. Users will have to be registered and approved before they can access these models. A two-step approval process to access Environmental Contamination and Remediation Models will be built on the KM-IT platform.

Users from each area will have the opportunity to access the other systems. This will have a parent-child relationship as all the mentioned subsystems will be under the umbrella of the Knowledge Base for Environmental Management (KBEM). Individual applications will have navigation to the parent system and vice versa. KBEM will also provide access to the DOE Research Website which is a centralized repository for research information developed under the Cooperative Agreement (see Subtask 4.2). This will provide an integrated process to access all the systems from single interface built on the KM-IT infrastructure. This will increase the

visibility of KM-IT system to other communities associated with WIMS and ECR. Following diagram shows the simple interface connecting all independent applications or systems developed for DOE-EM under different projects.



Subtask 4.2: DOE Research Website

The DOE Research website (www.doeresearch.fiu.edu) will provide a centralized location for the research information developed under the Cooperative Agreement and include technical reports, quarterly progress reports, end of year reports, presentations, journal articles, conference papers, and more.

Project Milestones for Task 4

Milestone No.	Milestone Description	Completion Criteria	Due Date
2013-P4-M4.1	Deployment of centralized knowledge base system to DOE for review/testing	E-mail notification to DOE	11/27/2013
2013-P4-M4.2	Deployment of DOE research website to DOE for review/testing	E-mail notification to DOE	12/20/2013

Deliverables for Task 4*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date

Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/17/2013
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	06/30/2014
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly

**Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.*

Anticipated Issues

No anticipated issues are expected for this task.

TASK 5: CYBER SECURITY COMPLIANCE AND DEPLOYMENT OF ENVIRONMENTAL CONTAMINATION AND REMEDIATION MODELS (NEW)

Under this task, FIU will publish and deploy one environmental contamination and remediation model, developed under Project 3, through the secured KM-IT platform.

TASK 5 TECHNOLOGY NEEDS

During FY2008-2012, FIU developed integrated flow and transport models of East Fork Poplar Creak (EFPC), Upper EFPC (Y-12 NSC) and White Oak Creek (WOC) watersheds for Oak Ridge, TN. In addition, a variable density model which was developed by site contractors for the Moab Site was used by FIU to provide simulations of several scenarios related to creating a hydraulic barrier between the mine tailings stored at the site and ecologically sensitive areas of the Colorado River. These models currently reside on servers and personal computers at the Applied Research Center at FIU in Miami. This task will publish and deploy one of these models on a secured platform to improve access to the models by project stakeholders.

TASK 5 DESCRIPTION

Objectives

The objective of this task is to publish and deploy one environmental contamination and remediation model that has been developed under Project 3. This model will be made available on the secured ArcGIS platform.

Benefits

The benefits include:

- Making the remediation models more easily assessable to the stakeholders.
- Providing a secure platform from which to deploy the models.

FIU YEAR 4 TASK 5 EXECUTION PLAN

Project Tasks

FIU has developed a GIS database under Project 3 to support modeling work which has been developed for the Oak Ridge Reservation and the Moab UMTRA site. The database serves as a central repository of observed hydrological, water quality and subsurface contamination data. This GIS database allows for data storage, concurrent editing and import/export of spatial data and configuration.

Under this task, FIU will publish and deploy a single environmental contamination and remediation model through the secured FIU infrastructure for stakeholders. Users will have to register with the ArcGIS platform for authentication and be authorized before accessing the model. This will secure the integrity of the site-specific data considered sensitive to cyber compromise. Access to the model will be provided through the common interface developed as part of Project 4, Task 4, published over the web. The servers, applications and databases to host the model will be deployed in the secure infrastructure facility developed for D&D KM-IT at FIU.

Project Milestones for Task 5

Milestone No.	Milestone Description	Completion Criteria	Due Date
2013-P4-M5.1	Deployment of environmental contamination and remediation model to DOE for review/testing	E-mail notification to DOE	5/16/2014

Deliverables for Task 5*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/17/2013
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	06/30/2014
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly

**Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.*

Anticipated Issues

No anticipated issues are expected for this task.

COMMUNICATION PLAN, REGULATORY POLICIES AND SAFETY CONCERNS

Communication Plan

The project has some elements that require significant information and/or action from the site in order to proceed with proposed scope. Therefore, the communication with the clients and relevant experts at DOE sites and DOE-HQ is a critical component of the project. The mode of communication will be e-mails, telephone/conference calls, meetings at the site, and where possible and warranted, web meetings such as Webinars and WebEx. Though site-specific contact persons have been identified, constant communication will be maintained with client stakeholders at DOE HQ and the DOE sites to ensure all parties involved are aware of the project progress.

Information Item	Client Stakeholder	When?	Communication Method	Responsible Stakeholder
Status Update Teleconferences	DOE-HQ (John De Gregory, Andy Szilagyi, Jonathon Kang)	Monthly	Phone	Project Manager
EM-HQ Status Update Phone Call	DOE EM-13	Bi-Weekly	Phone	Principal Investigator/Project Manager
Quarterly Report	DOE EM-13	End of Q1, Q2, Q3, Q4	E-mail	Project Manager
Project videos, photographs, and graphics	DOE EM	At completion of demonstrations and other project activities where the collection of multi-media data is appropriate and allowed	E-mail	Project Manager
Draft Year End Report	DOE EM-13	30 working days after completion of performance period	E-mail	Project Manager
Papers and presentations	DOE EM	As developed for conferences (e.g., WM13)	E-mail	Project Manager
Milestone completion E-mail	DOE EM	At completion of milestone	E-mail	Task Manager

Regulatory Policies and Safety Concerns

Tasks 1, 3, 4 and 5 involve information technology development. Therefore, standard health and safety issues normally associated with field activities and laboratory experiments do not directly apply. All pertinent ARC health and safety policies will be followed.

Task 2 includes research conducted in facilities at the Applied Research Center which are designed specifically for R&D and technology development/demonstrations. All primary, secondary, and tertiary waste generated by these technology demonstrations will be disposed of according to local, state, and federal regulations. In-house testing will be conducted, and necessary health and safety precautions will be followed in accordance with FIU and ARC procedures. All student employees will complete online safety courses as well as a briefing for the safety in the laboratory in which they are performing research. No undergraduate student will perform research in a laboratory without direct oversight of faculty, staff, or a qualified graduate student.