

# STUDENT SUMMER INTERNSHIP TECHNICAL REPORT

## Assisting DOE EM 4.12, Office of Groundwater and Subsurface Closure

### DOE-FIU SCIENCE & TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

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## **ABSTRACT**

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This report provides an overview of a 2018 summer internship served with the Department of Energy's Office of Environmental Management 4.12 Office of Groundwater and Subsurface Closure based in the Germantown, Maryland headquarters. Over the duration of the internship, the tasks assigned focused on the following: (1) improvements to Interstate Technology Regulatory Council documents so that they are more easily accessed by the public, (2) review of a case study based on the 300 Area Uranium Stabilization Through Polyphosphate Injection: Final Report, (3) discussion of new parameters for the Automated Transportation Logistics and Analysis system (ATLAS) project plume mapping application, and (4) a visit and tour of the Savannah River Site. This report will delve into each of these tasks to present a brief summary of the entire internship experience.

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# 1. EXECUTIVE SUMMARY

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This research work was supported by the DOE-FIU Science & Technology Workforce Initiative, an innovative program developed by the US Department of Energy's Office of Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC). During the summer of 2018, DOE Fellow Silvia Garcia spent 10 weeks participating in a summer internship at the Department of Energy's Office of Environmental Management 4.12 Office of Groundwater and Subsurface Closure based in Germantown, Maryland, under the supervision and guidance of Senior Program Manager, Mr. Grover Chamberlain. The intern's project was initiated on June 2, 2018, and continued through August 11, 2018 with the following interdisciplinary objectives: (1) suggesting Interstate Technology Regulatory Council (ITRC) webpage document improvements, (2) setting up parameters for the Automated Transportation Logistics and Analysis System (ATLAS) story mapping project, (3) creating a case-study based on the 300 Area Uranium Stabilization Through Polyphosphate Injection, and (4) visiting and touring the Savannah River Site.

## 2. INTERNSHIP DESCRIPTION AND RESULTS

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### 2.1 ATLAS STORY MAPPING PROJECT

**Background:**

The Automated Transportation Logistics and Analysis system (ATLAS) is an EM Groundwater and Soils Story Mapping application. This web-based project includes infographic and story mapping tools to describe the process of site closure for DOE-EM sites. It allows for better communication with headquarters and DOE sites across the complex by compiling all transportation data into one interface. The ATLAS project identifies the sites on an overview map and provides various parameters of the plumes, including the geospatial footprint of groundwater plumes.

**Goals:**

Ms. Garcia and Mr. Chamberlain reviewed the webpage and discussed the following topics: 1) evaluating which parameters should be indicated within the story map, 2) determining the public and private face of the webpage, 3) exploring ways to receive the needed information from DOE sites, and 4) remaining cost efficient for the implementation of some of these motifs.

**Recommendations:**

It was suggested that the webpage would be more beneficial with: 1) the development of two interfaces, one for EM officials and another for the public; 2) the inclusion of additional parameters such as plume attenuation rate, contaminant concentrations, contaminant mass discharge (CMD) (flow path), estimated time to reach Remedial Action Objectives (RAOs), and 3) the minimization of parameters to only those of greatest importance, which will aid in lowering the cost of implementation. Addition of the parameters listed above as well as the development of two separate interfaces are still pending with no implementation date.

### 2.2 ITRC DOCUMENT IMPROVEMENTS

**Background:**

The Interstate Technology and Regulatory Council (ITRC) is a union that works with members, private and public, from all 50 states to better connect the knowledge within areas such as: air, water, waste, and remediation environmental technologies and processes. The ITRC webpage produces documents that inform and train individuals in technical topics within the areas mentioned.

**Goals:**

One of the main concerns with the ITRC documents was the absence of standardized navigation. Standardizing the navigation throughout all the documents was one of the project's main goals, because with uniformity they will be easier to manage.

**Recommendations:**

A few alterations would make the ITRC documents more easily navigable. For example, an overview of every chapter would be useful to those that wish to skim the article or to even briefly see if the article applies to their focus area. The side panel of the table of contents should also be

collapsible so that the reader can have more room to view the article. Ms. Garcia, Mr. Chamberlain and the four other interns who assisted agreed that the following alterations would improve the document navigation:

- 1) Adding a search bar that searches the document rather than the whole website.
- 2) Including plus signs in order to let the user know you can expand the sections.
- 3) Linking videos that are related to the subject matter to further expand on the topic.
- 4) Displaying the chapter overview first and then including the subheadings under in case you decide to keep reading.
- 5) Making the option to download the PDF always visible.
- 6) Using standard welcome icons which look better than actual pictures.

These recommended alterations are still pending approval and there is currently no implementation date.

### **2.3 CASE-STUDY ON POLYPHOSPHATE INJECTION FOR URANIUM REMEDIATION**

Ms. Garcia read and analyzed the “300 Area Uranium Stabilization through Polyphosphate Injection: Final Report” from PNNL in order to compose a case-study document that summarizes the polyphosphate injections performed in the Hanford 300 Area. The summary document was created by Ms. Garcia with the assistance of Mr. Chamberlain, so that it can be used by ITRC for training of employees or to provide a brief summary of the remediation strategy employed. The purpose of this exercise was to summarize previous pilot scale testing on the ability of polyphosphate injection to sequester uranium in groundwater plumes into a more concise format. This case study summary will be used by the ITRC for those that need a quick overview of the polyphosphate injection study, how it was done, and what the implementation challenges were. The three general steps used for the injection strategy included an initial polyphosphate amendment injection which causes uranium to precipitate as autunite, followed by injection of a calcium chloride solution as a calcium source for the apatite formation, and then one final polyphosphate injection. The two leading challenges of this injection strategy were the formation and arrangement of apatite and the rebound of the uranium after a couple of months of the injection due to geochemical variations in the environment.

### **2.4 SAVANNAH RIVER SITE TOUR**

Ms. Garcia had the privilege of touring Savannah River Site (SRS) and the various projects that are currently being worked on at the field sites and the saltstone facility. In addition, she was able to learn more about the role that the Savannah River Ecology Laboratory plays and the animals that are typically present within this site. The tour provided a lot of background information on SRS and allowed Ms. Garcia to establish new connections. Ms. Garcia was able to visit the P and R reactor and learn the history behind it. The P and R reactor used to produce plutonium-238, plutonium-239 and tritium for the testing of nuclear weapons for the defense of the nation. Both were shut down in 1964 when they were no longer needed and fully deactivated and decommissioned in 2011. Ms. Garcia also had an opportunity to utilize the virtual reality equipment that is used to train the employees in assembling and disassembling the various apparatus used for their particular job. The tour also included a visit to the Applied Research Center where she saw what other interns were working on, such as the intumescent coating made

to fixate residue radioactive contaminants in place as part of the deactivation and decommissioning process.





### 3. CONCLUSIONS

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This internship experience allowed Ms. Garcia to become familiar with the role of Office 4.12 at the DOE. Working on the projects mentioned in this report allowed her to better understand the various tasks that the Office of Groundwater and Subsurface Closure performs. The ATLAS project and the ITRC documentation improvement exercise allowed Ms. Garcia to think more abstractly about what the public will find accessible and useful, as well as learn more about the process that comes with revising a webpage. The case-study provided a good foundation on how polyphosphate injections work, the approaches taken and the challenges that come with this strategy. Overall, the internship allowed Ms. Garcia to gain more comprehensive knowledge and hands-on experience of what Office 4.12 does on a day-to-day basis, and insight into the complexities and time required for each process.

## 4. REFERENCES

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Vermeul, Vincent R., et al. "300 Area Uranium Stabilization Through Polyphosphate Injection: Final Report." 2009, doi:10.2172/967237.