

Title: Characterization of Produced Water In New Mexico
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Project Description:

The Petroleum Recovery Research Center (PRRC), a division of the New Mexico Institute of Mining and Technology, compiled data on quality and quantity of produced water (water produced as a byproduct of oil and gas production) into the NM WAIDS database. This database encompassed information on water quality/quantity in various producing regions of the state. Purposes of the original database included assessments of the amount and quality of produced water to support the design of water treatment systems to promote the use of produced water. Work on the database ceased about 10 years ago. The database is now out of date, and online access to the database is currently not available. The proposed project would update the NM WAIDS database, bring the database online, provide GIS user-friendly functionality and analysis tools, and identify and attempt to fill in data gaps in newly active plays in the San Juan and Permian basins.

The NMWAIDS database was taken offline in 2013 due to concerns about the security of the web pages and queries that accessed the database. In the ten years that have elapsed since the database was first put online, cyber security has become an increasingly important consideration and the old interface was becoming highly vulnerable. In addition, there is a need to obtain more data. Several oil and gas plays have come to the foreground since the bulk of the data was collected, including new horizontal plays in both southeast and northwest New Mexico.

Methodology:

The project objectives are:

- 1) Reactivate access to the current water quality/quantity database by recoding the web interface using current best practices,
- 2) Examine the existing produced water database to identify data gaps and make efforts to fill in those gaps,
- 3) Provide data access via online search queries, both text-based and through an online GIS based system if possible. Sufficient location information will be provided to enable users to map data in their own systems via a common format such as GIS shapefiles.

Initial efforts have concentrated on Objectives 1 and 3, the reactivation of the current database and efforts to make the data available online. The original project was created using the Integrated Development Environment (IDE) Microsoft Visual Studios, using C# as a programming language. The project utilized ASPX pages for the user interface. The website was complex and difficult to revise. All of this old code had security flaws that could be exploited to hack servers, change data, or even infect client computers with malware and was removed at the request of NMT's Information Technology division. Before the database can be made available, all pages and interfaces must undergo a series of security tests. I

The following has been completed to date: PRRC has created a new project based on a different IDE and language, structured the project to have a Model View Controller (MVC) layout, converted ASPX files to Thymeleaf .html files, recycled and reformatted old Javascript code, and connected and tested Water Quality Database and Petro Data Database connections using more secure coding. Work to be completed under this objective still includes recoding all C# to Java, testing all the various tools and pages, integrating a new visual design with back end code, and converting python xml to Java.

The Model View Controller (MVC) structure has become a popular way to structure a project because it's easy to maintain, update, and test code along the way. Also it allows for a much more organized project by separating big problems into many small sections, and having specific areas perform specific tasks.

In order for clients to retrieve data from all our databases, an application program interface (API) needs to be created, allowing clients to easily retrieve data via any browser safely, quickly, and easily. The best way to do this is to use **Representational State Transfer (REST)**, which has built-in classes to make implementation easier.

The revised design layout for the entire Go-Tech website, which hosts the water quality database access pages (NM WAIDS), has recently been finalized and design implementation has begun. Code optimization, which includes standardization, commenting, and creating more readable code, have all been high priority work items during this quarter.

Work on Objective 2 will be started during the second quarter. Methods will include analysis of data using GIS and knowledge of currently active oil and gas plays to identify data gaps, and soliciting oil and gas producers for additional data that covers these plays.

Student Participants:

Graduate Students:

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