Title: Characterization of Produced Water In New Mexico
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Institution: Petroleum Recovery Research Center/New Mexico Tech

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 The database is now out of date, and online access to the database is currently not available.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.

Results:

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.

The revised design layout for the entire Go-Tech website, which hosts the water quality database access pages (NM WAIDS), is almost complete at this point. Internal beta testing is underway. It is anticipated that a beta version of this web site will be available for roll-out within the next six weeks. The major effort during the last quarter has been focused on revising the NM WAIDS web queries and previously-designed tools to work in the new programming environment. Most of these tools appear to be functional at this point.

Also, an effort has begun to digitize some recently-rediscovered unpublished data that was collected by the USGS from wells in southeast New Mexico. This data is primarily produced water samples from wells that were sampled in the mid-1950's to 1960's.

Efforts have also been underway to begin redeployment of the online GIS mapping service to both oil and gas production wells and produced water sample data. Initial work using one particular software solution did not work well on the large production well dataset so we are now focusing on using Google Maps as a programming interface. A beta product is now available but will require some modification before it can be useful to a general audience.

Remaining Work:

There are several items that remain to be completed. A server must be configured to handle two different operating environments that will be needed by various components of the web site; a legacy system was required by one of our other clients. Web-based tools must be verified to ensure they still handle data correctly. Finally, the ability to package and download data from multiple samples must be added into the new interface. Currently users could view data online but the only way to download it would be to copy and paste from the screens; an unsatisfactory solution. The online GIS maps will require a significant amount of attention and may not be completed by the end of the year; however the data can be made available as GIS shapefiles for user download.

Student Participants:

Graduate Students:
Dongyi Chen – PhD, computer science
Cris Gallegos – Master's, computer science
Matt Bradley – Undergraduate, Technical Communication

Powerpoint Update: see below, also sent as separate attachment.

Slide 1

Produced Water Search Query

Water Sample Search

API Number
County   Any
Township Any
Range   Any
Section   Any
Well Name
Formation
Field

Database Query Page
- Searchable on various parameters including location and formation

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- Most conversion to new website format is complete.
- Searchable database queries complete
- Sample mixing tools conversion partially done
- Data packaging and download file creation function partly complete.

Produced Water :: General Production Data Search Results

107 matching results found

Show 25 records per page

Filter:

ID	API	Well_Name	Section	Town	Range	Field	Formation	Date_Collected
		STATE RW 001	10	13S	32E	WILLIAMS NORTH	PENN	
		HEYCO BETENBOUGH 001	32	13S	36E	MCDONALD	ATOKA	
		STATE RW 001	10	13S	32E	WILLIAMS NORTH	PENN	
		STATE OF NEW MEXICO 001	20	13S	32E			
		G H COATES A 001	19	13S	38E			
		MARSHALL E COLE 001	13	13S	37E			

Query Results Page 1
- Listing of basic information meeting search criteria
- List is sortable by any column heading

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Slide 2

Water Sample Mix

API	Well Name	ID	Date Collected
	MARSHALL 1 COLE		1958-08-30

Water Sample 1: Ions & Dissolved Gases (mg/L)

Ca	Mg	Na	Ba	Fe	Sr
CO₃	HCO₃ 150.0	SO₄ 4520.0	Cl 37200.0	OH	
H₂S	O₂	CO₂			

pH 7.9   Temperature (F)   Ratio 1 / Volume   Clear

Water Sample 2: Ions & Dissolved Gases (mg/L)

Ca	Mg	Na	Ba	Fe	Sr
CO₃	HCO₃	SO₄	Cl	OH	
H₂S	O₂	CO₂			

Temperature (F)   Ratio 2 / Volume

Instructions:
There are two types of mixing available:
Mix by Ratio: Insert Temperatures and Ratios for each sample and the Total Volume
Mix by Volume: Insert Temperatures and Volumes for each sample.
Then click Mix

Sample mixing tools conversion partially done – this function enables users to mix waters of two different compositions and volumes to find the resultant water composition as well as predict scale and mineralization

Newly-found USGS water sample data being digitized. USGS personnel did not find this data in their existing databases, nor have I found it in NM WAIDS. Several townships in SE NM.

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