



GEOTEX ENVIRONMENTAL SOLUTIONS

Consultants:

Brady Nock : Group Manager

Rachael Weissman : GIS Analyst

Mark Wilson : GIS Analyst / Webmaster / Graphic Designer

Amy Woods: GIS Analyst

April 2, 2012

Progress Report

Date: April 2, 2012
From: GeoTex Environmental Solutions
To: Greater Edwards Aquifer Alliance
Cc: Dr. Yongmei Lu
Subject: Progress Report of Wastewater Project

This memo describes the progress that has been made on the collection of wastewater spill data and interactive map component since our initial proposal on February 22, 2012. In this memo we will review the nature of the project, describe the work we have completed, the work that is currently in progress, and the work we have to complete by the end of the project timeline.

Purpose

By looking at the quantity of wastewater that is accidentally spilled into the recharge zone, the GeoTex Environmental Solutions team will create a database that will be used to examine and assess the vulnerability of streams related to these spills. The team will produce maps which will explore the relationship between the locations, dates, and volumes of wastewater spills in terms of their proximity to streams and other recharge features. An interactive map component will also be made and available to the public in an effort to heighten awareness of this issue throughout South Central Texas.

A similar project was released by the California State Water Resource Control Board which plots sewage discharge from sewer systems as reported by local California agencies to the online California Integrated Water Quality System. The project shows the location of the spill as well as the amount spilled, source of the spill, and the name of the responsible or reporting agency. The map containing all the information was also made available for online viewing by its local community. By looking at this similar project, GeoTex Environmental Solutions can model our work around this professional standard of mapping waste water spills to fit the needs of our own community.

Scope

The extent of the study area focuses on the Edwards Aquifer, located in the Edwards Plateau region of Texas. More specifically, the project will be focusing on the recharge zone of the Edwards Aquifer. The Edwards Aquifer recharge zone spans over seven Central Texas counties (Travis, Hays, Comal, Bexar, Medina, Uvalde, and Kinney) and has an area of 1,250 square miles. The project will focus on sewage spills that have happened within the past 5 years (2006-present) over the recharge zone of the Edwards Aquifer. A map of the scope is shown below as Figure 1.

Recharge Zone of the Edwards Aquifer

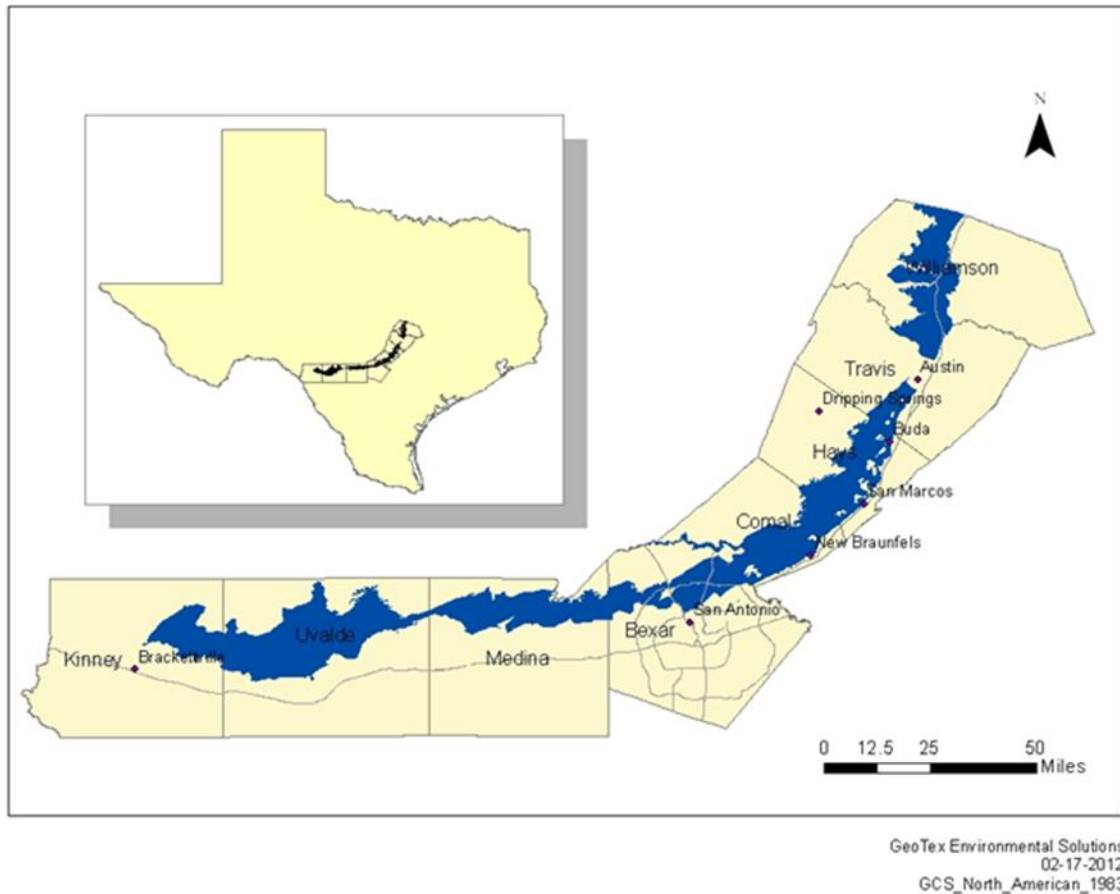


Figure 1. Scope

Data Collection

Work Completed

We have contacted various Wastewater Treatment Plants (WWTPs), Municipal Utility Districts (MUDs), the San Antonio River Authority (SARA), San Antonio Water Systems (SAWS), Texas Commission of Environmental Quality (TCEQ), and Edwards Aquifer Authority (EAA) with data requests. After speaking with all of them (via phone and email), we received 46 records which came from the TCEQ, the EAA, SAWS, and SARA combined.

Creative Geospatial Solutions, a group from a previous semester, provided a list of contact information for multiple MUDs and WWTPs. We contacted all of them the week March 5th, and as of now, we have still not received any data from them.

Last week (the week of March 26th) we received over 1,700 more records from the TCEQ, covering Region 13 (San Antonio). This region covers Comal, Bexar, Medina, and Uvalde counties, as well as some counties within the contributing zone of the Edwards Aquifer.

The 1,700 records we recently received from the TCEQ were extremely comprehensive, containing the following fields:

- Entity (majority was from SAWS)
- County (majority are within Bexar)
- Start and end date of spill
- Address / description of location
- Quantity of spill
- Duration of spill
- Cause of spill
- Danger (mostly in relation to the Edwards Aquifer)
- Actions Taken (repair, cleanup, future prevention)

In-Progress Work

While we do have a plethora of wastewater records from Region 13 of TCEQ, this does not cover the entire study area. We hope to, but cannot guarantee we will receive data for TCEQ Region 11, which includes both Hays and Travis counties.

Future Work

In the future we will pursue collecting data on recharge features, such as, springs and caves. If we are able to collect this data we will integrate the data into our ArcGIS, Manifold, and GoogleMap.

Data Processing

Work Completed

The wastewater data records were received in three different formats: EAA and TCEQ sent Microsoft Excel files, SAWS sent hand-written records which were scanned and then emailed, and the initial TCEQ files were received in a Microsoft Word document. These different formats were then standardized into one universal format on Excel to create a wastewater spills database. The hand-written records from SAWS and the initial TCEQ records were input manually into the database and the Lat/Long coordinates were found using GoogleEarth.

In-Progress Work

As we have recently received 1,700 wastewater spill points we are slowly but surely inputting the records into our Excel database to integrate into the interactive maps.

A major task ahead is geocoding the data we recently received. We have developed a method for importing and geolocating the spill points and are currently in the process of converting these records into useful latitude/longitude locations.

Geocoding the data we receive involves bringing all records into ArcGIS in a standard format. Each record must first be checked and ‘cleaned’ to ensure it fits a standard address format. An example of raw data (the data before it was cleaned) is shown below in Figure 2.

1	Description/Location
115	In the alley of Cedar Street and Brown Street, a sewer backup due to a collapsed line caused approximately 200 gallons to be discharged into residential area , 1901 Brown Street
116	1815 N Foster Rd sewer spilled on ground at the rear of the property
117	14331 O'Connor Rd discharged into a nearby drainage ditch.
118	
119	3838 Medical Dr in the rear entered the drainage channel
120	10102 Kings Grant in rear of address spilled into drainage
121	3400 Blk of Magic Dr in the rear entered a drainage easement
122	103 Rhinestone manhole overflowed into alley located between Twilight and Rhinestone into an open field.
123	6200 Wenzel Rd manhole overflowed and ran into drainage
124	5704 Glacier Sun in front overflowed and entered drainage
125	6623 Babcock Rd on the west side of the apartment complex by drainage ditch
126	5908 Elm Valley entered the dry Indian Creek
127	13131 Nacogdoches Rd. in front of address manhole overflowed into storm drain
128	100 Lyric manhole overflowed into storm drainage
129	8500 Blk of Floyd Curl at Huebner Creek valve stem broke causing recycled water to flow into Huebner Creek
130	145 Vista Del Ray
131	Manhole outside lift station in the center of the road at 9600 Autumn Ln

Figure 2. Example of raw data

The records are mostly described by address, which must be converted into latitude and longitude coordinates. ArcGIS has a tool which helps automate this process. However, the output must be checked and confirmed for quality.

We have currently processed approximately ¼ of our data. So far, while geocoding in ArcGIS we have about a 70-80% success rate. The 20-30% that is not successfully matched we have to clean again and run the program for a second time to ensure success. This process takes a fair amount of time and effort, but must be completed before we can move forward with developing our maps and analysis.

Future Work

If we receive data for Hays and Travis counties from the TCEQ, we will update the database and maps with the information we receive.

Interactive Map

Our goal is to produce an interactive map which displays the information we have collected. There are many different ways to develop an interactive web-map. We will produce two options for you as final deliverables. One will be a GoogleMap interface. Google provides a user-friendly interface which the public knows and understands, however, it is dependent upon Google's servers to function correctly.

The other option will be created in a GIS software package called Manifold. The main difference is that the Manifold map will reside on the University's servers, and GEAA can directly link to the map that resides on the University's servers.

Work Completed

The first step in creating the maps was to bring all of the data into one place. We used ArcGIS to combine all the layers needed into a simple map and database. This includes:

- Edwards Aquifer layer
- Streams layer
- Counties layers
- Wastewater Spill Points layer

The Edwards Aquifer layer was retrieved from the EAA. The streams layer was from the Texas Natural Resource Information System (TNRIS), and was clipped to our study area. The counties layer, also from TNRIS, provides a background that outlines our study region. We have not acquired any data showing the location of recharge features.

ArcGIS is where we input, create, organize and manage all of our data. Once the layers were simplified to our study area, we were able to use tools within ArcGIS to export the layers to various formats. The prototype of the ArcGIS map is shown below as Figure 3.

Wastewater Spills Within the Edwards Aquifer Progress Report

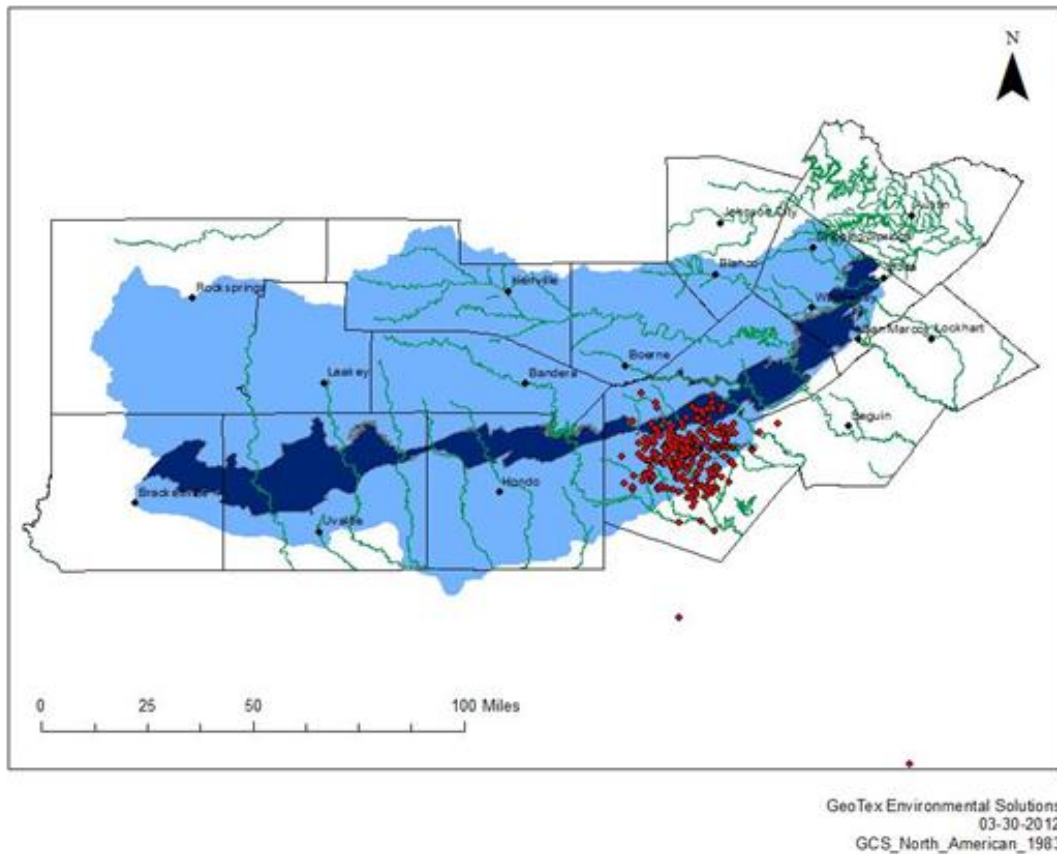


Figure 3. ArcGIS prototype of wastewater spills

We directly exported the information from ArcGIS to a format which can be displayed by GoogleMaps. We have created a simple website which displays a GoogleMap; this is the prototype of our final deliverable.

The interactive GoogleMap is focused on our study area. It has the four main layers listed above. At the bottom of the webpage, there are checkboxes which allow you to turn the layers on and off. You are also able to zoom in and out to your area of interest.

The most interactive part of the map is the ability to click on the various layers. When you click on a layer, an info-window pops up, displaying relevant information about the item. This is most important for the individual spill points, which will display details about each spill. The info-window currently only shows the volume and date of the spill. More attributes will be added as we get further along in data processing.

A prototype shows the layers listed above. It also contains the 46 wastewater spill points that have already been projected on the map. An image of the map is shown below as Figure 4.

Wastewater Spills Within the Edwards Aquifer

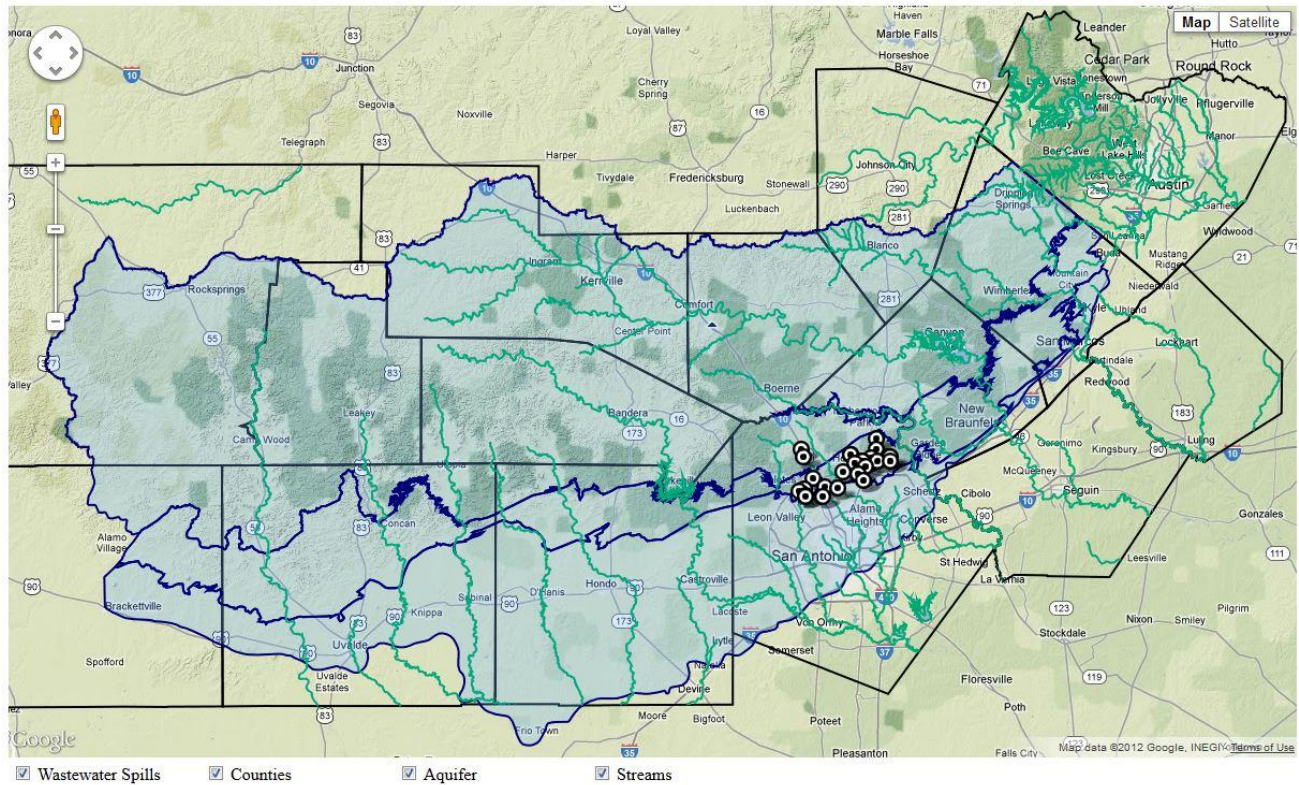


Figure 4. GoogleMap prototype of wastewater spills

We have created a prototype map within Manifold that, like the GoogleMap, projects all of the layers we see necessary for our project thus far. The Manifold Map contains an Edwards Aquifer layer, streams, and a counties layer. It also has the same 46 wastewater spill points on it that the GoogleMaps prototype has. These two maps have all the same information on them; they are just two different programs to present the maps.

Currently, we have a Manifold map which shows the location of the spills as they are related to the aquifer, county, and stream layers. It can be displayed directly on a website as-is. A prototype can be seen below as Figure 5.

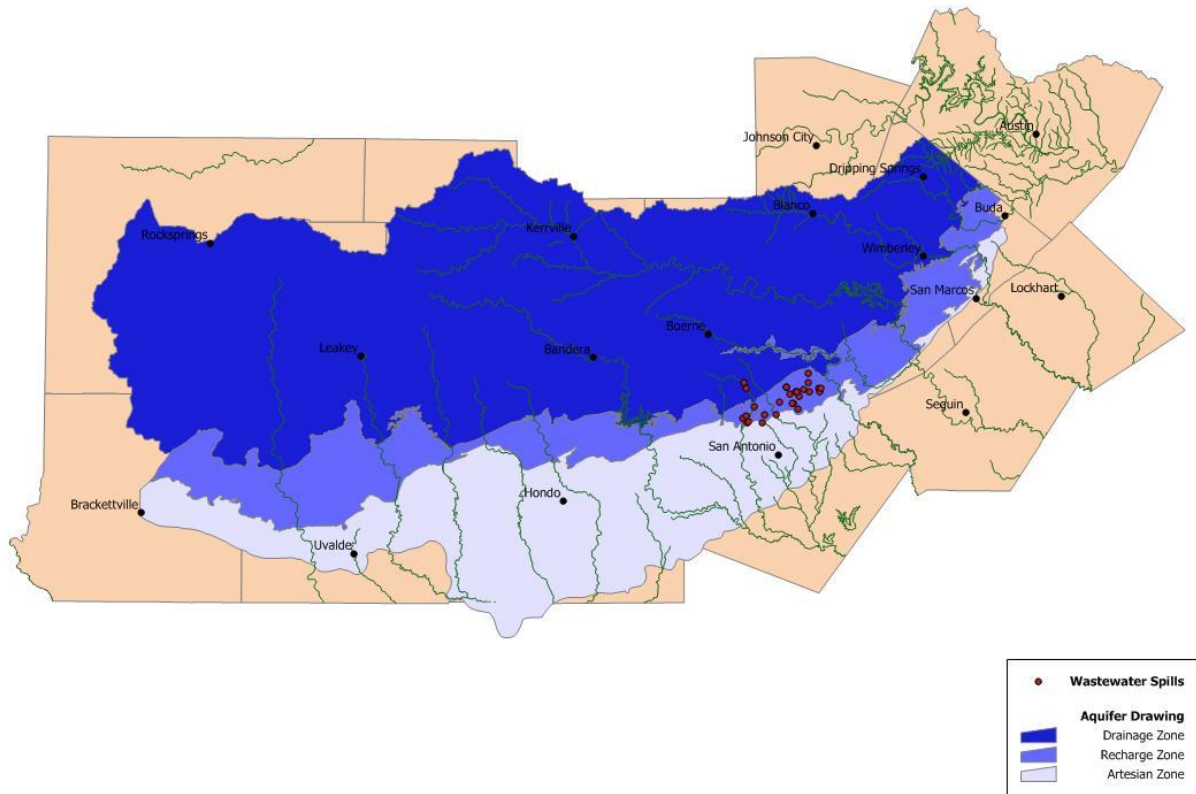



Figure 5. Manifold prototype of wastewater spills


In-Progress Work

We have a working prototype of our GoogleMaps interface. We are currently determining the best format for the various layers. This includes choosing appropriate colors and other style decisions.

Additionally, we are currently testing various formats for an interactive Manifold Map that will display the relevant information about each spill when a user clicks on that point. We have some examples of other Manifold-based websites that serve similar functions as our final deliverable. A Manifold web based map example is shown below as Figure 6.

Cities

Click on the  tool and then click near a city dot for info.

Click on the  tool and then click any location to find cities within the queried distance.

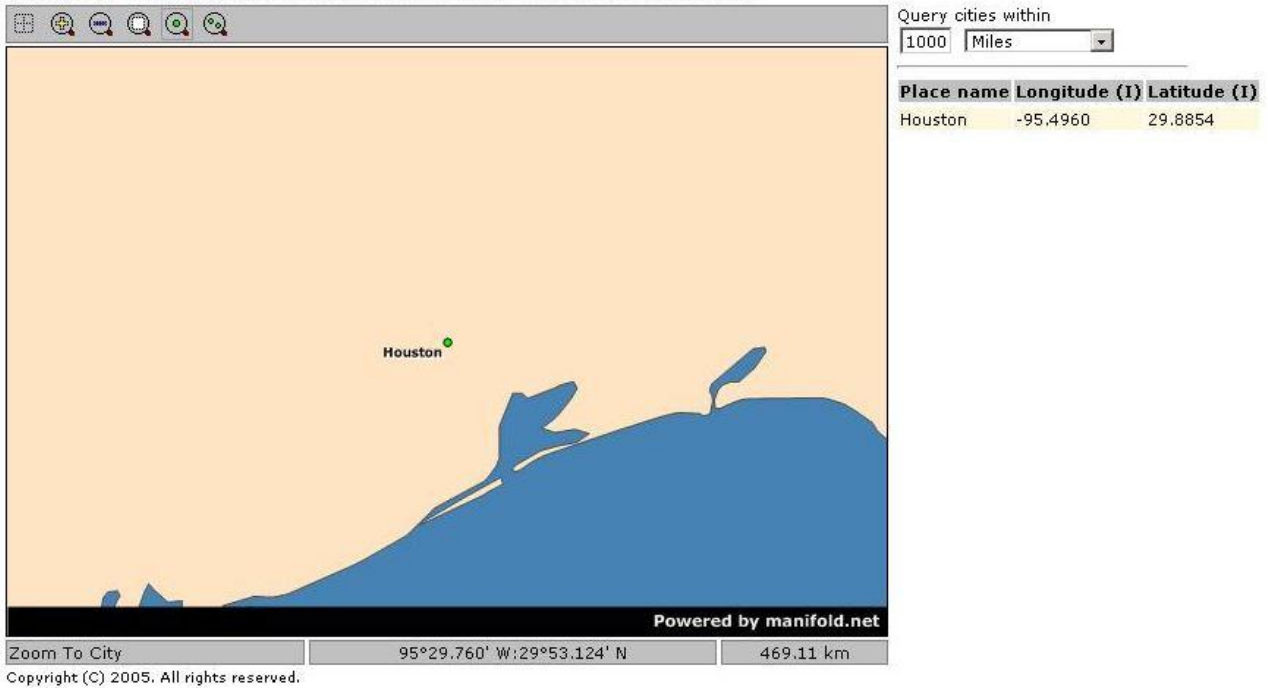


Figure 6. Examples of interactive Manifold Maps
Source: Manifold.net

Future Work

Our next step involves integrating the new TCEQ dataset. With this information, our understanding about each individual spill will become much more in-depth. We must determine how and where to display the information, and which fields are most important. This applies to both the GoogleMap and the Manifold map.

Developing an interactive Manifold map will be a major task in the coming weeks. In our remaining time, our focus will be on completing this interactive map into a working deliverable which can proudly be displayed on the GEAA website for public education purposes.

Conclusion

Though the process was lengthy, we are excited to have acquired as many wastewater spill points as we did. Now that we have gathered our data we can begin processing into digital formats for analysis and presentation. We do not anticipate running into any remaining problems with this phase of the project.