Texas Stream Team Water Dashboard and Watershed Filtration Eligibility

Streamline Spatial Solutions

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1. Introduction

1.1 Summary

The Texas Stream Team is a community science and volunteer-based water quality monitoring program that records samples from various testing sites across the state of Texas. With a large number of testing sites along with recorded samples dating back to 1991, the Texas Stream Team's water quality database is quite large. While there exists an ESRI dashboard to visualize sites and other attributes, it can be difficult to parse through the thousands of records directly. This project aims to create a streamlined filtration and search tool that will enable the selection of specific watersheds based on specific criteria for water quality reporting and resource allocation.

1.2 Purpose

This project will focus on creating an application through ArcGIS Dashboard, which will take existing water quality data from the Texas Stream Team and present it in a user-friendly way. The application will contain a filter that will allow users to show eligible watersheds based on the reporting history, a minimum number of monitoring sites per watershed, and that each site within a watershed has at least ten water quality records. A scoring/ranking system will also be introduced that considers active sites, total record counts, data recency, and reporting gaps to help determine watersheds that may be prioritized for reporting. The hope will be that this ArcGIS Dashboard will provide a proper tool for the Texas Stream Team to manage their data.

1.3 Scope

The scope of the project will encompass statewide coverage of Texas Watersheds. The standard size/extent that will be used to organize spatial site coverage will be the HUC 10 watershed boundaries (with some possible exceptions on a case-by-case basis).

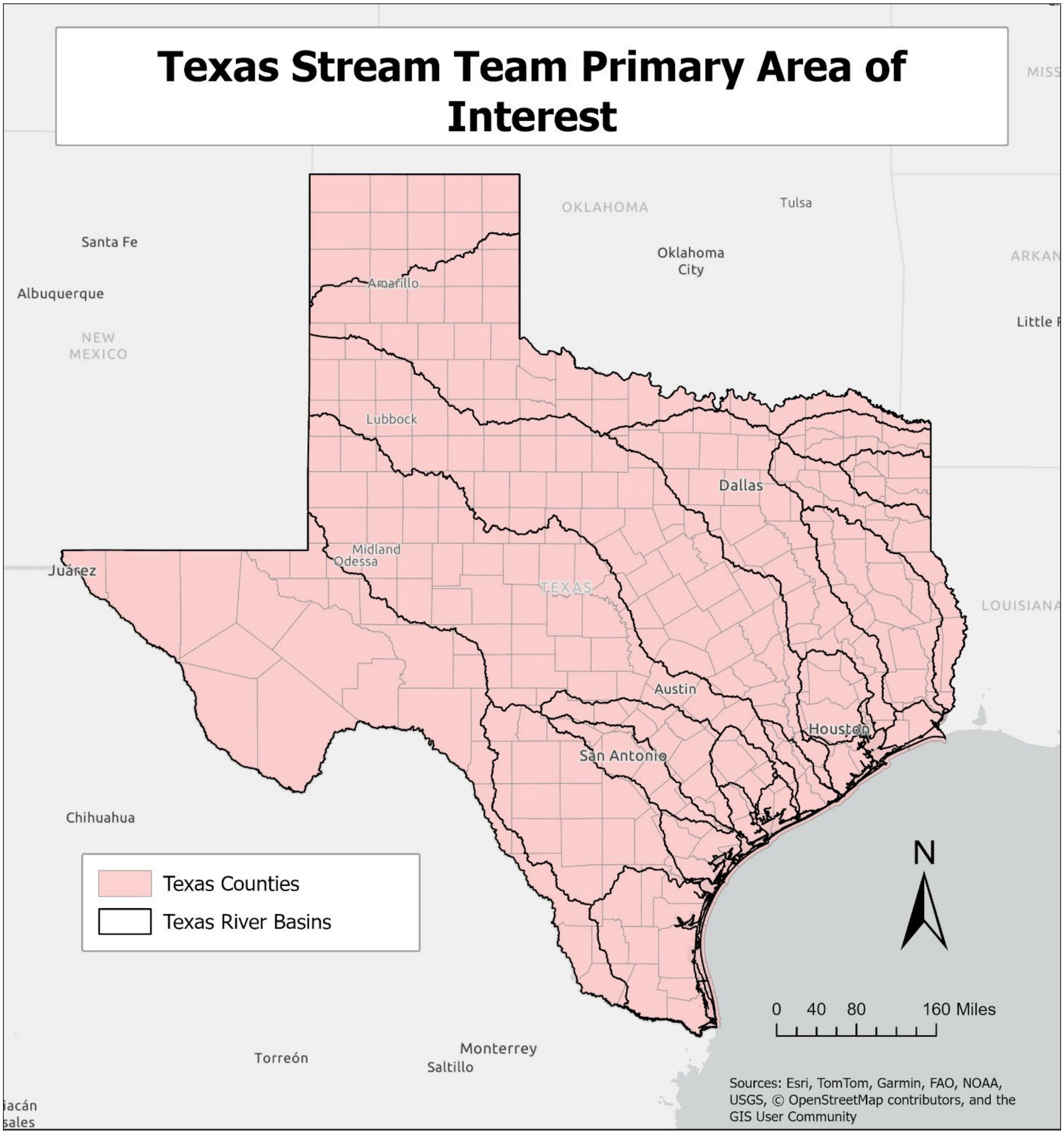

Figure 1. Project are of interest basemap

2. Literature Review

In water quality reporting Esri's ArcGIS applications such as Survey123, ArcGIS Online, ArcGIS Dashboards are utilized to collect and visualize data for monitoring the status across the state. The Meadows Center for Water and the Environment currently utilize these to present a dashboard to the public with data collected from the Texas Stream Team, a group of community scientists collecting water quality data by collecting water samples throughout the state. By making this information available through such routes, it acts as an accessible resource for general community and researchers to be aware of current water quality conditions based on reports.

In the environmental sector, data being accurate and correctly visualized is essential and important for the correct decision making in relation to protecting our natural limited resources such as water. The Susquehanna River Basin Commission collects water quality data through samples to monitor the condition of the basin. Using an ArcGIS dashboard, they incorporate Artificial Intelligence to predict the possible actions of the water from their selected criteria of temperature, turbidity, dissolved oxygen, and others (Aram, 2020). By collecting this data and then beginning predictions of how it may function, it again allows for further data visualization of important information, critical to key decisions since many people rely on it.

With numerous collection sites by community scientists, accurate spatial representation of sites is critical, for further research and addressing areas that need more reporting support. Regarding COVID-19 site locations for reporting was critical, and an ArcGIS dashboard was created by Supritiana, 2022 to accurately report the cases in Indonesia. Creation of interactive dashboards for reporting highly critical spatial information such as these cases and sites, where water quality is not meeting our selected criteria, is important. This type of development and reporting is important and relies on the community for highly critical correct information.

As our data, and other spatial data that is based off reporting, it spans over numerous years rather than a singular one most commonly. Bugica K, 2020 has analyzed water quality data of Texas Estuaries to find spatial trends in environmental conditions as the population of Texas continues to grow and further put stress on our water resources. Identifying different factors that have contributed to decrease flow. Data collected over long periods of time allows for elaborate examination of what has changed and is changing for the environment.

All of these articles highlight the different methodology and systems that we will be using in our project. Addressing the importance of water quality and the different elements that contribute to an accurate representation of the data collected. Providing ways that the environment can benefit from data being represented in an ArcGIS dashboard.

3. Data

The data that this project will utilize is a combination of data that was provided by our client, the Texas Stream Team, and publicly available spatial datasets to enable us to do eligibility analysis and dashboard development. Client-provided data include a monitoring site point feature layer, which includes spatial coordinates and site-level attributes, Survey123 monitoring records and water quality tables that contain sample-level measurements and temporal information, reporting histories, and a sample watershed report to use as a reference for expected outputs. Publicly available data includes HUC-8 and 10 watershed boundaries as well as river basin boundary layers, sourced from Texas Parks and Wildlife. No new data will be collected as the project's main focus is on developing a streamlined dashboard which will automate and blend existing datasets that were provided.

Table 1.

Entity	Spatial Object	Unit	Source	Status	Year	Attributes
Watershed Boundary (HUC)	Polygon	Hydrological Unit Codes (HUCs) 10, 8	TPWD	Available	?2026	Watershed Boundaries
River Basins	Polygon	River Basins	TPWD	Available	?2026	River Basin Boundaries
Site Locations	Point	Site Locations	MCWE	Available	2026	Site status and temporal information

Table 2.

Entity	Purpose	Year	Provided/Created
Forms			
Sample Watershed Report	Showcase deliverables that a dashboard/filtering system would aid in retrieving	2026	Provided
Dashboard Workflow Document	Showcasing methods used in the creation of the dashboard for future facilitation	2026	Created
Feature Layers / Datasets			
Site & Sample Status	Site point layer with spatial and temporal attributes	2026	Provided
Survey 123 Forms/Feature Layers	Comprehensive lists of monitoring results and relative testing attributes	2026	Provided & Created
Dashboards			

Internal ESRI Dashboard	Serve as a filtering and stats-retrieval tool for use in indicating future ST site monitoring focuses	2026	Created
Spreadsheets			
Water Quality table for Data map CSV	Site test result information	2026	Provided
Output Site Attribute Table	Comprehensive site information with site activity, temporal attributes, etc.	2026	Created
Filtering Standards	Provide filtering standards such as min. monitoring sites or reporting history	2026	Create

4. Methodology

The methodology detailed within the proposal shows the approach that we will use to create an intuitive data filtration system within a spatial context based on various eligibility criteria for Texas Stream Team and their provided Survey123 site-simple and water quality (WQ) datasets. Both the datasets consist of records dating back over thirty years with a wide variety of tests being performed as well as various attributes to indicate active or non-active sites and other locational specific information. The flow chart in figure 1 showcases the creation of an ESRI Dashboard and how we will implement various data filtration tools based primary on three different criteria to more easily differentiate eligible and non-eligible testing sites in tandem with provided statistical information for selected sites and spatial/attribute queried data.

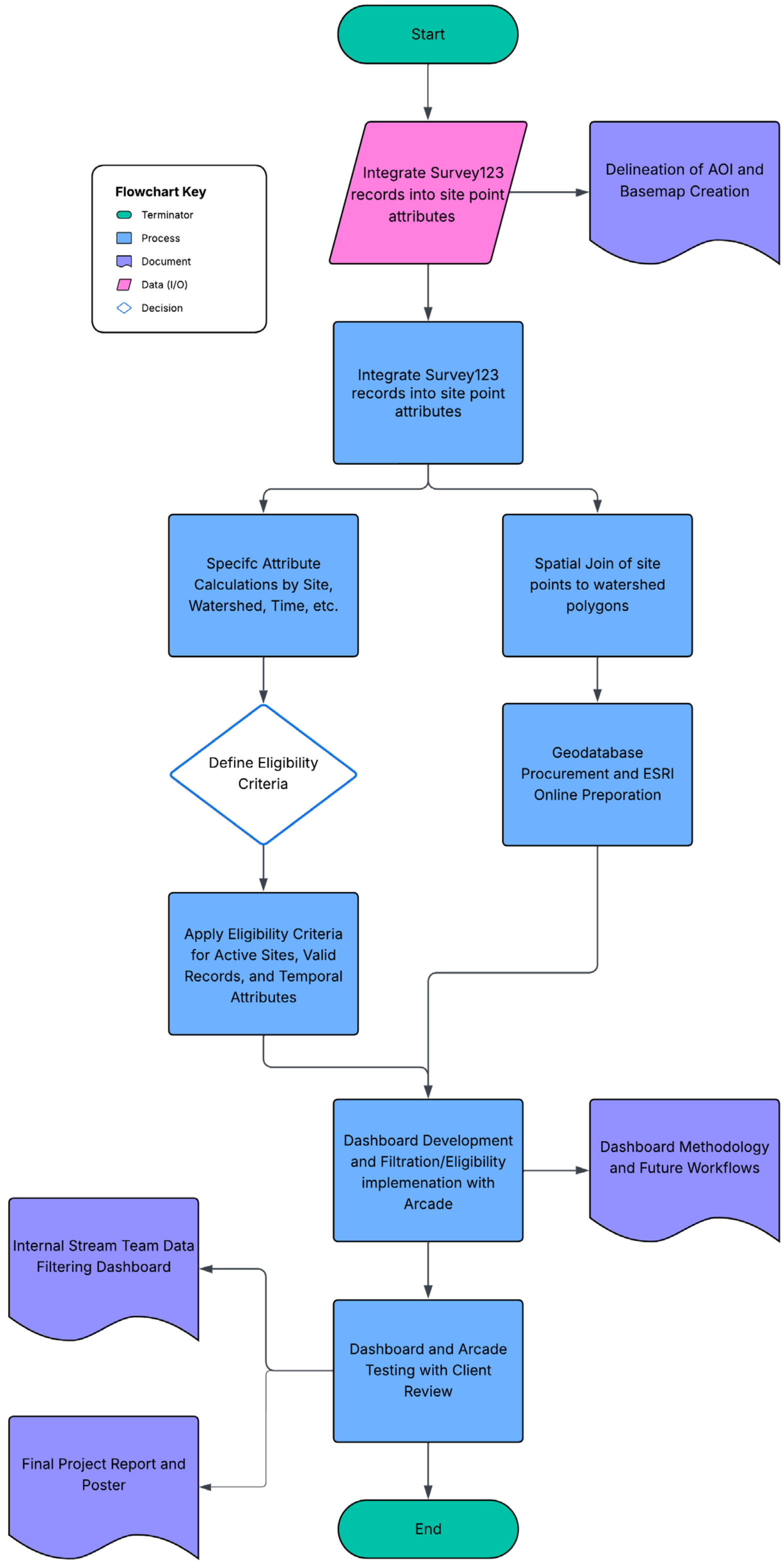

Figure 2. Data flow chart

4.1 Data Integration and Preparation

With the overall goal of the Texas Stream Team Water Quality Database project being to facilitate an intuitive search/filtering query function with other descriptive elements, aggregating all the provided data and preparing it for future attribute calculation is where he initial stages of the project focused on. The Survey123 results as well as the site-by site water quality database would be parsed through and be added to a singular geodatabase to facilitate future spatial joins and attribute calculations with the side ID functioning as the linking attribute between the two datasets

4.2 Spatial and Attribute Analysis

The second phase of the project workflow would begin to diverge between a workflow focusing on spatial and attribute calculations/geodatabase procurement and a workflow focusing on data organization and defining specific eligibility criteria that will be utilized in filtering and showcasing summary statistics.

4.2.1 Feature Joins and Data Standardization

For the eventual filtration system to be implemented using an ESRI Dashboard, the water quality and sample testing data must be spatially joined with other features layers that would aid in assessing the spatial extent or distribution of active and non-active sites. The primary spatial delineator will be a HUC-10 (and HUC-8 if needed on a case-by-case basis) statewide watershed layer that will be used to allow sites to be filtered by each watershed area along with the major Texas river basins.

Additionally, any standardization of the datasets when it comes to attribute language or formatting that would be needed for any spatial joins and/or visualization would be performed here along with adding metadata as needed to work towards the end goal of establishing future workflows of the data and dashboard.

4.2.2 ArcOnline Map and Dashboard Set-up

After most of the data layers and their respective attributes have been established and are largely organized, the next phase will be to set up an ArcOnline map project to be integrated into the internal ESRI Dashboard to be used by Texas Stream Team. While the specific architecture of the filtration/eligibility system will be implemented later within the workflow of the project, the initial process of the Dashboard creation would ensure all the data and feature layers are visible their attributes are able to be accessed with a similar layout as the current public Texas Stream Team site sample dashboard seen in figure 3.

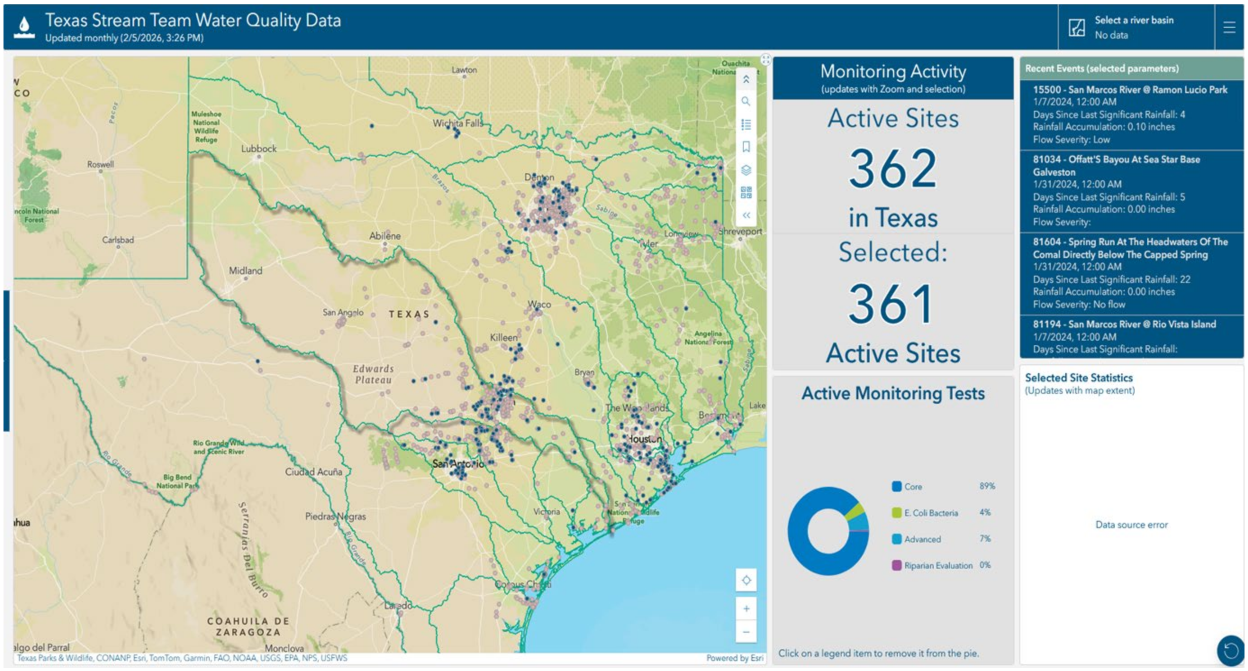

Figure 3. The existing Texas Stream Team datamap

4.3 Eligibility Criteria Application

In addition to the data collection and visualization of the dashboard and its look-up potential, certain statistical and spatial criteria will be used to facilitate a separate eligibility checking/query system on a site-by-site basis. The specific watershed and testing site criteria will need to be defined before anything can be implemented in the development of the dashboard. Said criteria will be focused on three different pillars:

1. Minimum Monitoring Sites
2. Reporting History
3. Data Completeness

Each of these criteria will enable the search/filtration system to be used to actively assess data health, extent, and other factors across watershed within the state. Minimum monitoring sites would be based on having at least 3 active sites within a given watershed. Reporting history would look at each watershed and give it a pass or fail rating based on if it has been included in a water quality report within the past 5 years. Lastly, data completeness would judge each individual water monitoring site with the standard of each needing a minimum of ten valid water quality records across its testing history.

4.4 Dashboard Development and Implementation

With all the site sample and WQ data able to be seen within ArcGIS Online as well as various eligibility and filtering criteria defined, the creation of the internal ESRI Dashboard would begin. The form and structure of the dashboard would use the existing Texas Stream

Team dashboard as a guiding framework. This would apply to such things as how active and non-active sites are visualized, how only the data within the current map view would be queried or be providing the user with information, as well as the general delivery of summary statistics or currently filtered data.

The implementation of the filtering and eligibility criteria along with the display of relevant summary statistics would be implemented through the use of native dashboard functions/panels as well as Arcade in order to create more custom tools in order to deliver a more specific and intuitive internal dashboard. In addition to the actual creation of the ESRI Dashboard, all specifications, methodologies, and future/recommended workflows would be documented in order to enable Texas Stream Team to upkeep and customize the dashboard to any respective need and ensure its longevity as a successful data filtration/organizational tool.

4.5 Testing and Validation

The final phases of the project workflow will be quality assurance focused consisting of working within the final draft of the internal dashboard to ensure it is functioning as intended and that there are no issues in term of data visualization, filtration and the communication of statistical information, as well as working with Texas Stream Team and our client in order to take any given feedback and deliver on requested edits for the dashboards final rendition. With everything finalized, the final deliverables of the project will consist of the internal ESRI Dashboard for the Texas Stream Team, the methodology and future workflow document for the dashboard, and the final project report and poster.

5. Budget

Role	Hours per week (12 weeks)	Hourly Rate ($)	Total Pay ($)	Travel (Miles, twice per week)	Total (Cost of Gas, 12 weeks)
Project Manager	6	32	2,304	70	84
GIS Analyst	8	22	2,112	50	72
GIS Analyst	8	22	2,112	10	14.4
GIS Analyst	8	22	2,112	2	2.88
GIS Analyst	8	22	2,112	8	11.52
Total:	**-**	**-**	**10,752**	-	**184.8**

Additional Factors	Cost ($)	Total Cost ($)
Arc GIS Pro License	2,200	**-**
USGS + Meadow Center Data	0	**-**
5 Personal Computers	6,000	**-**

-	-	<u>**8,200**</u>

<u>**Total Expenses: $19136.8**</u>

6. Timetable

Table 3. Timetable highlighting important dates for project schedule

Timeline	
Familiarization with Dashboards, Arcade, and Survey123	01/21/2026 – 02/13/2026
Method Research and Data Prep	02/16/2026 – 02/27/2026
Creation of Layers, Dashboards, and Tools	03/2/2026 – 03/20/2026
Automation, Validation, & Visualization	03/23/2026 – 04/10/2026
Validation	04/13/2026 – 04/29/2026

Phase 1: Jan 21st – Feb 13th

The initial four week phase of our project is focused on our group becoming familiar with Esri tools, Survey 123 and Arcade coding that we plan to use during the duration of our work to build and help operate our final dashboard product. Data from Survey123 will be integrated into site point attributes and the basemap for our dashboard will be created. The Meadows Center for Water and the Environment has provided water quality reporting data and site sample test location and status. During this time, we will collect other necessary data and process it to ensure consistent quality among all being utilized.

Phase 2: Feb 16th – Feb 27th

Important Date: Proposal Presentation February 25th

Our second phase consists of two weeks dedicated to researching methods and selecting our technical approach that we will follow to create our interactive dashboard for refined filtration search for watersheds meeting minimum requirements. During this time, we will define the eligibility criteria for watersheds based on specific attributes such as sit location, and sample collection time. Applying this criterion to our active sites based off of selected criteria and attributes. The proposal will be finalized and presented to our client during this phase.

Phase 3: March 2nd – March 20th

Three weeks have been allocated to create our layers, forms, and implement tools in the early stage of our dashboard development. Our focus is to create our different feature layers that contain key attributes such as the sample site location. From these layers we will develop our forms, implementing data from Survey123 and Arcade expressions to complete our filtration system for easy selection and screening of different watersheds based on certain criteria. We will perform a spatial join of our site points to watershed polygons and ensure that our geodatabase is ready for development.

Phase 4: March 23rd – April 10th

Important Date: Progress Report Presentation March 29th

This time is devoted to developing our dashboard and implementing expressions from Arcade to automate our dashboard. guaranteeing that our layers and data are accessible on the dashboard. The current Texas Stream Team dashboard will act as a guiding framework for our creation. Visualization will focus on how data is viewed within the map view or will be queried and how it will provide users with information. Sections delivering summary statistics and filtered data will be provided as well. A progress report to our clients for feedback will be completed during this time to ensure steady and accurate progress.

Phase 5: April 13th – April 29th

Important Date: Final Presentation May 4th

The final phase of our project will be validation, working with our final draft of our dashboard to ensure it is functioning as intended and that any issues with data visualization, filtration, and communication of statistical information are corrected before presentation. Any feedback given and delivery requests provided to us by our client will be implemented into our final rendition. We will prepare our final presentation and deliverables for client presentation at the end of this phase.

7. Final Deliverables

A complete report detailing our process, results, and findings will be provided on April 29th, 2026. In addition, a poster will be created to visually present all layers and the dashboard to the client. We will define how our data automation and validation was completed and our updates to user interaction with our dashboard.

This table summarizes the deliverables of this project, forms will be user friendly, and accurate through data validation, feature layers provide streamlined data management, and our internal dashboard will be simple and intuitive.

Table 4. Final Project Deliverables

Deliverables	
Forms	**Feature Layers**
Site and Sample Status	Site Point Layer
Dashboards	**Excel Spreadsheets**
Internal ESRI Dashboard	Water Quality Monitoring Data

8. Conclusion

Overall, this project will provide the Meadows Center with an efficient and user-friendly GIS-based dashboard designed to streamline water quality data analysis and watershed eligibility assessment. By including factors such as long-term monitoring records with spatial analysis and filtering tools, the product will enhance accessibility of more complex datasets. The implementation of standardized eligibility criteria and visualization functions will help users to identify priority watersheds quickly and efficiently. These factors inside the dashboard will help to improve proper resource allocation and support informed decision-making. This project aims to strengthen long-term water quality monitoring efforts across Texas by providing a sustainable and adaptable solution that supports both operational efficiency and environmental control.

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10. Appendix:

Participation

Katie Harwood: Project Manager, GIS Analyst, Timetable, Flowchart, Participation, and Final Deliverable

Josiah Watson: GIS Analyst, Flowchart, Methodology, Data, Basemap, and Final Deliverable

Ceri Prior: GIS Analyst, Logo, Data, Flowchart, Literature Review and Methodology

Edie Jacques: GIS Analyst, Budget, Literature Review, Methodology, and Final Deliverable

Jared Olson: GIS Analyst, Introduction, Literature Review, and Final Deliverable

AI Use Disclosure

No AI tools were used by our group when preparing this proposal document.