

GIS-Based Environmental Long-Term Monitoring Web Portal Phase II

Prepared for the

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16. Abstract A GIS-based online portal was developed to store, analyze, and display data from multiple sources pertinent to the ALDOT Coliseum Boulevard groundwater contaminant plume site in Montgomery Alabama. These sources comprise various consultants involved with the site including geotechnical companies, water testing labs, law firms, and management personnel from ALDOT/ADEM. The goal of this portal was to centralize information into a single location for easy access by all of these groups while also consolidating a number of activities in relation to data collection, verification, and preparation. The culmination of these goals resulted in a data-driven Plume Web map. The web map is able to display and query the numerous monitoring points and regions related to the site. On selection of these locations, the web map presents associated data and documents for download. In a similar manner, the property owner's parcels affected by the plume can be selected or queried and legal documents relating to that property displayed. For more robust data retrieval, there are several tools capable of querying data based on multiple locations, location types, and constituents. The Search Documents tool can perform similar functions for ascertaining files based on their type and associated location. Any data and documents can be uploaded to the portal through one of two easy to use tools. The Upload Documents tool allows user to upload a file and input related information into several fields for future acquisition. The Import Data tool accepts comma separated value sheets for well specific data (e.g., contaminant lab testing and groundwater elevation data). The lab data uploaded to the site is put through a verification process before final import to the database. Part of this verification process involves the data location names being potentially assigned through an alias list. This alias list is flexible with the Add Alias tool, which will allow for more versatile data import in case of future well name changes. Several layers can be toggled on the map as well such as groundwater velocity and elevation contour maps. These map layers (typically created for display in the Annual Report) can now be generated directly in the online portal with the Generate Annual Report Figures tool (beta-testing ongoing). Many of the data-based tables in the annual report are now available for generation in the Reports tool. These features contribute to a streamlined and unified environmental site management process. The portal is available for use with login credentials at https://plume.caps.ua.edu .			
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Executive Summary

A GIS-based online portal was developed to store, analyze, and display data from multiple sources pertinent to the ALDOT Coliseum Boulevard groundwater contaminant plume site in Montgomery Alabama. These sources comprise various consultants involved with the site including geotechnical companies, water testing labs, law firms, and management personnel from ALDOT/ADEM. The goal of this portal was to centralize information into a single location for easy access by all of these groups while also consolidating a number of activities in relation to data collection, verification, and preparation. The culmination of these goals resulted in a data-driven Plume Web map. The web map can display and query the numerous monitoring points and regions related to the site. On selection of these locations, the web map presents associated data and documents for download. In a similar manner, the property owner's parcels affected by the plume can be selected or queried and legal documents relating to that property displayed. For more robust data retrieval, there are several tools capable of querying data based on multiple locations, location types, and constituents. The Search Documents tool can perform similar functions for ascertaining files based on their type and associated location. Any data and documents can be uploaded to the portal through one of two easy to use tools. The Upload Documents tool allows user to upload a file and input related information into several fields for future acquisition. The Import Data tool accepts comma separated value sheets for well specific data like contaminant lab testing and groundwater elevation data. The lab data uploaded to the site is put through a verification process before final import to the database. Part of this verification process involves the data location names being potentially assigned through an alias list. This alias list is appendable with the Add Alias tool, which will allow for more versatile data import in case of future well name changes. Several layers can be toggled on the map as well such as groundwater velocity and elevation contour maps. These map layers (typically created for display in the Annual Report) can now be generated directly in the online portal with the Generate Annual Report Figures tool (beta-testing ongoing). Many of the data-based tables in the annual report are now available for generation in the Reports tool. These features contribute to a streamlined and unified environmental site management process. The portal is available for use with login credentials at <https://plume.caps.ua.edu>.

1.0 Introduction

The Coliseum Boulevard Plume refers to an area of contaminated groundwater in Montgomery, AL. The main plume constituent of concern is Trichloroethylene (TCE), but daughter-products and other chlorinated hydrocarbons are also present. ALDOT used TCE in asphalt testing and, as was standard at the time, disposed of the spent TCE into storm sewers. Failures in the sewer lines allowed the contaminants to escape into the immediate groundwater resulting in the extensive seepage observed today. ALDOT has investigated and managed the plume under the oversight of the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA), and the Alabama Department of Public Health (ADPH).

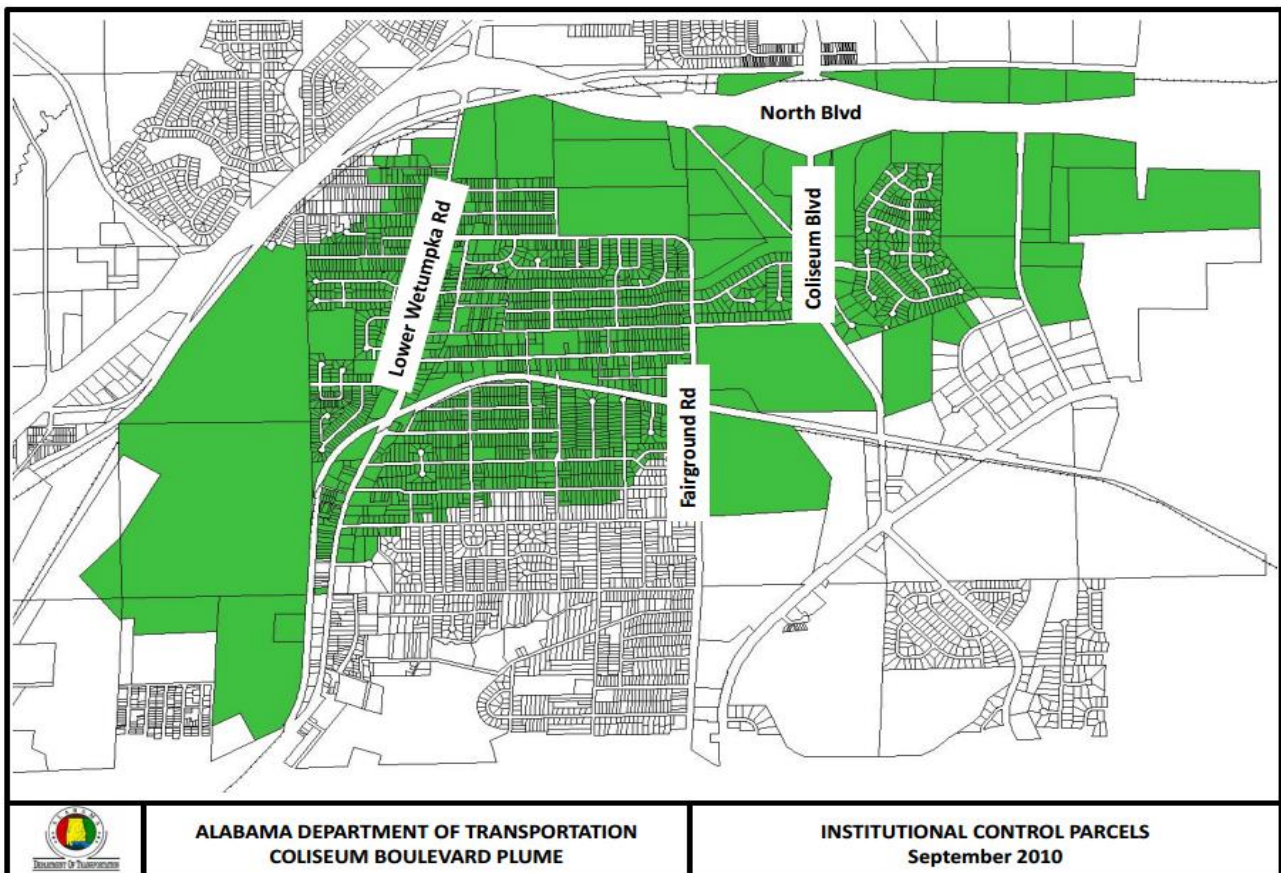


Figure 1. Coliseum Boulevard Plume Extent

The initial investigation's results sparked an expansion of activities involving further investigation as well as several remedial projects. Two of these projects remain a major part of monitoring practices today, namely the Southwest Treatment Area (SWTA) and Low-Lying Area. In these areas, wetlands were constructed to aid in the retention and mitigation of TCE-contaminants in surface water. These outfall areas and the remainder of the city within the Institutional Control Boundary (ICB) contain the majority of activities on the site (though some minor investigative work has been performed outside of this boundary). Present day activities are

described in ALDOT's "Long-Term Monitoring Plan" and mainly consist of normal monitoring procedures. These procedures include: ICB groundwater and surface water sampling, data verification and storage, outfall area inspections, and creation of an annual report detailing activities and results.

To perform these procedures, ALDOT has been working with several outside consultants to monitor the groundwater within the CBP area. These consultants have held responsibilities involving collecting, storing, and managing data and documents as well as producing reports. Dividing these responsibilities was the mandated project management solution at the time of the project's inception and through the years following. In recent time, ALDOT has become responsible for these monitoring-oriented tasks.

In 2017, the GIS-Based Plume Data Web Portal development began with a number of meetings, correspondences, and sharing of materials held by the various groups collaborating on the CBP. By the end of Phase I, a prototype Plume Web Portal had been developed, capable of data import, query, and export. Further information on these activities can be found in the Phase I Final Report.

2.0 Project Tasks

Task 1: Portal Population of New and Historic Data

As the primary function of this project is to facilitate efficient information management, continued collection and storage of the most recent Plume data and documentation would be necessary. Lab and groundwater gauging data will be uploaded through the web portal interface as it becomes available. Storing over 10,000 files, the majority of the historic documentation for the project has been transferred; one exception is a large collection of correspondences with the ADEM. These correspondences are presently uploaded and stored in ADEM's e-File system. These correspondences' management in the plume portal will be integrated into the file system already in the portal. A new system for tracking and organizing the numerous 811-calls and their corresponding forms will be explored. The system will have the ability to notify portal users of "open tickets" as well as query and export older ones. The corresponding 811 forms will be automatically completed and added to the portal-generated annual report materials.

Deliverables:

- Automated water quality data retrieval directly from testing laboratory.
- Increased collection and storage of historic documentation.
- Development of call log form and interface to search the call logs.

Task 2: User Training

A major focus of this phase and in the future of the portal is the adoption of the webmap by CBP personnel. While much of the site's interface may be updated, many of the functions are complete and adequate for personnel use. In order to facilitate this adoption, the UA team will hold User Training sessions to demonstrate the capabilities of the portal, and gather feedback to better tailor the portal to its users' needs.

Deliverables:

- Monthly meetings and training sessions as needed with project team personnel.

Task 3: Portal Functionality and Interface Improvements

With the core and structure of the portal complete in Phase I, the UA team will improve the already existing functions of the site, as well as add new functionality as needs arise. Specifically planned improvements include revisions to the Annual Report Table generation feature and implementation of a text-recognition software for historic documents (IronOCR). The data import procedure was updated to avoid duplicate data entering the database.

Deliverables:

- Implementation of user feedback into portal functionality and interface.

- Improvements to the portal site functionality including IronOCR, an All-Documents tool, and geospatial information display.

Task 4: Automatic Notification of Property Transfer

To simplify the process by which new CBP-affected property owners are “notified” of the environmental covenant on their property, an investigation into an automatic property transfer alert will be conducted. This alert would be sent to the plume legal team (Alvarez & Marsal) and remove the need for the manual search of said property transfers among the thousands of parcels on the site. To facilitate this alert, the portal would need access to the County Tax assessor’s database. An investigation into this access and the system of rules by which this “alert” should be sent will be conducted.

Deliverables:

- Investigation into the automatic notification of property ownership change.

Task 5: Automate Generation of Graphics and Visuals

Further generation of materials for the annual report will include the groundwater elevation and TCE concentration charts, as well as the ArcGIS map’s displaying spatially the results of the year’s data collection. These maps will be generated using the Arcpy module for python with the portal’s extensive database.

Deliverables:

- Generation of data-based trend graphics.
- Generation of initial groundwater shapefiles and polished shapefile upload ability.

3.0 Project Results

Task 1: Portal Population of New and Historic Data

Increased collection and storage of historic documentation has been completed. Import routines have been updated and all groundwater quality, groundwater elevation, lab data, and well gauging data are up to date in the portal, through quarter one of the 2021 sampling year. After organizational aid was provided by Ashley Cousins, all correspondences available for export in the eFile website were transferred to the Plume portal. These correspondences are now searchable in the Search Documents tool. The 811 Call Log Interface (Table 2-1 in annual report) will not be implemented into the Plume Portal at this time due to ALDOT personnel decisions. In addition, the automated retrieval of lab data into the portal will not be implemented due to restricted capabilities of Pace labs.

Task 2: User Training

Authorized users received training on portal interface, functions and capabilities and had access to various instructional documents, e.g., portal user guide. After planning during several monthly meetings with ALDOT, two user training sessions were held. The first (April 7, 2021) was to demonstrate the capabilities of the portal and web map; Proceeding a one week period for users to use the site, the second session (April 14, 2021) was held to answer questions and collect feedback in regards to the trial run. Some of the most essential feedback is incorporated in the Future Work section while some suggestions have been incorporated in this phase and are noted in the Task 3 results below.

Task 3: Portal Functionality and Interface Improvements

Revisions to the portal-generated annual report tables were implemented. These mainly involved formatting changes to these tables from Phase I. All PDF documents within the portal have been processed through the text-recognition software, IronOCR. These documents are now searchable via keyword in the Search Documents tool. In other words, any text within a PDF in the portal can be searched in order to accurately query that document. The data import procedure in the portal was updated to handle duplicate data, which had been problematic in the development process in Phase I. To further bolster the portal's data import, an Add Alias tool was developed and added to the sites interface. This tool allows users to add more than one name for a sampling location. While this won't affect data display in the portal, any lab data being imported under the new names will be reassigned to the proper location name in the portal database (e.g. if well MW-121A has a lab alias of MW-121 which has been added with the portal's Add Alias tool, then any lab data with either of the previous names will be assigned to MW-121A). A Locate Well tool was created to accompany the web map display features. Data display was simple as selecting a point or region on the web map, however finding a specific location was not possible for quick reference. The introduction of the Locate Well tool should help experienced and new CBP personnel quickly reference geographically the location of any of

the many project sampling locations. Additionally, a more detailed tool directions and error messages have been included when working within the site.

Task 4: Automatic Notification of Property Transfer

The Montgomery County Tax Assessor database has only recently been digitalized and a brief inquiry with that office confirmed the difficulty in connecting to their system. Later in this phase, an updated parcel map was requested from the County GIS department. A brief discussion with the mapping manager led to the conclusion that a map service with the county may be a more efficient alternative than direct access to the tax assessor database. This service would provide a daily-updated parcel map including the owner name, address, parcel number, geometry, and other information. Not only would the Plume Portal be able to import an updated parcel map for display and query on the site, but it could also provide the property transfer alert that had been desired from the tax assessor database albeit with a slight delay. The proxy investigation into the Map Service with County GIS is currently ongoing.

Task 5: Automate Generation of Graphics and Visuals

The TCE and groundwater elevation charts had a prototype development in Phase I. The formatting and the data selection for these charts were revised to accurately match the outputs in the annual report. A prototype script was completed that generates all figures in section three of the annual report. The ArcGIS code to generate these files has been completed and integration of the script into the site that will allow for generation of preliminary groundwater shapefiles and the ability to upload the polished/approved shapefiles will span into Phase III. Examples of the automated figures are shown in Figures 2-4.

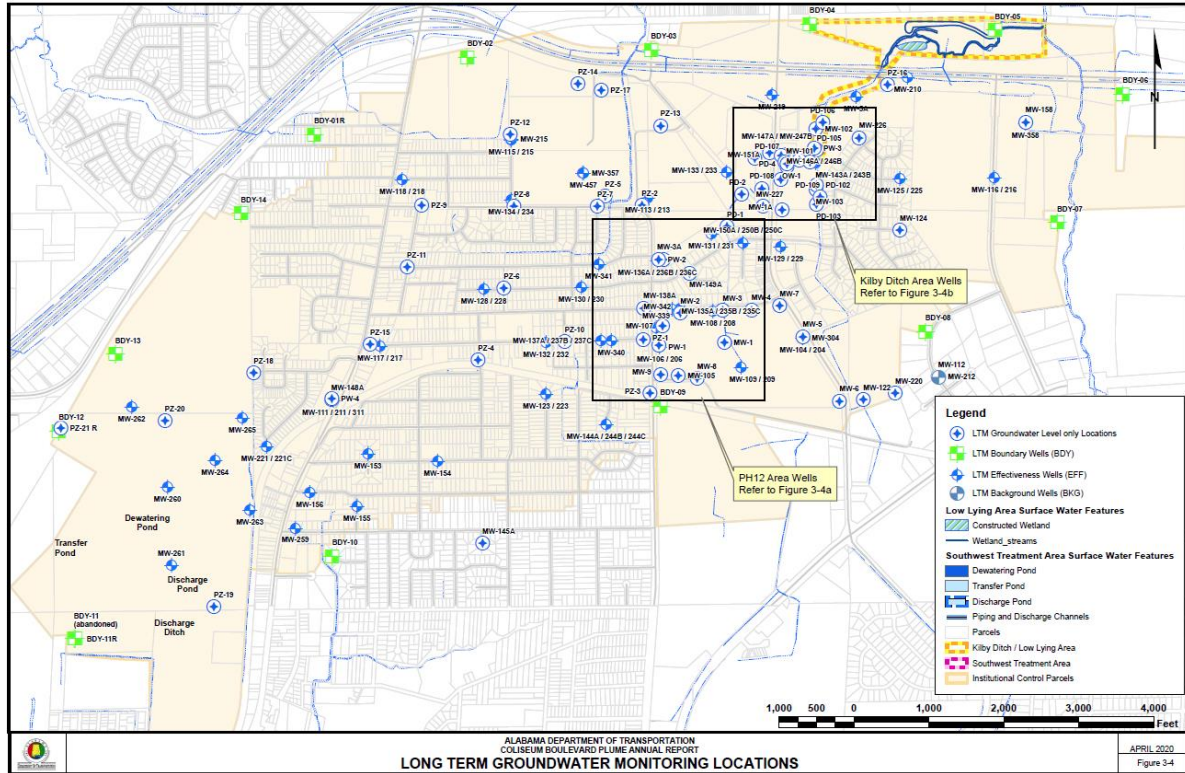


Figure 2 Groundwater Well Locations (Fig 3-4 in annual report)

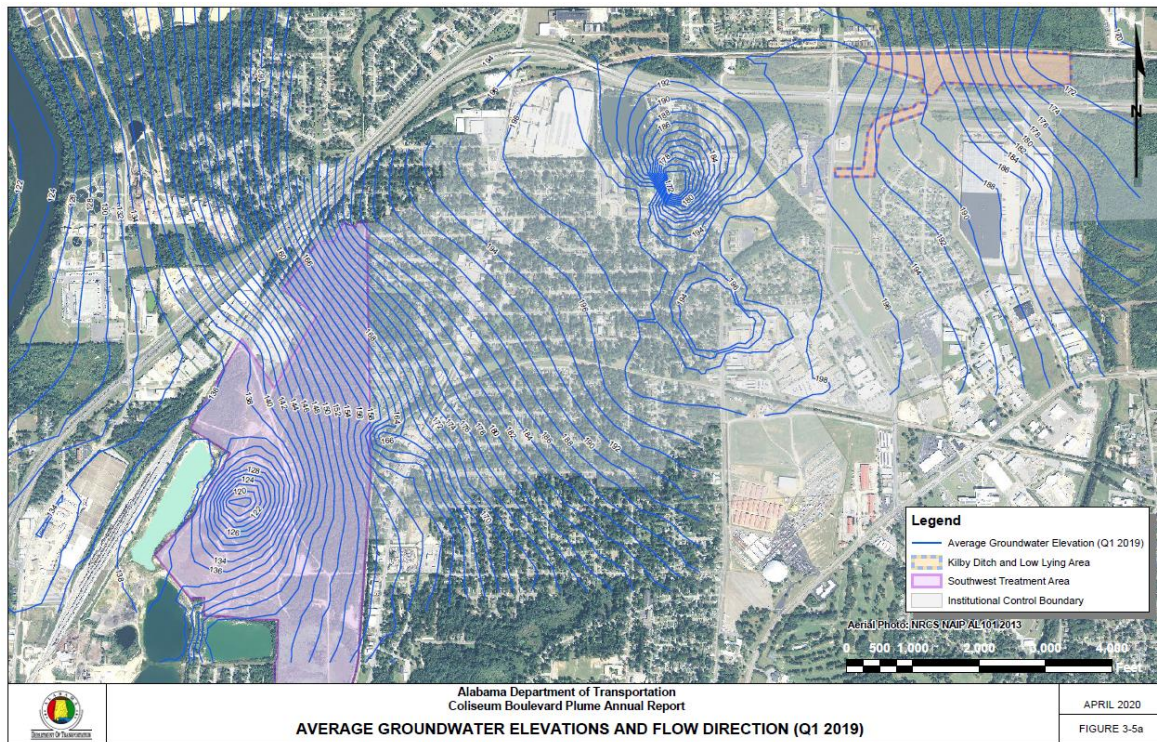


Figure 3 Groundwater Elevations (Fig 3-5a in annual report)

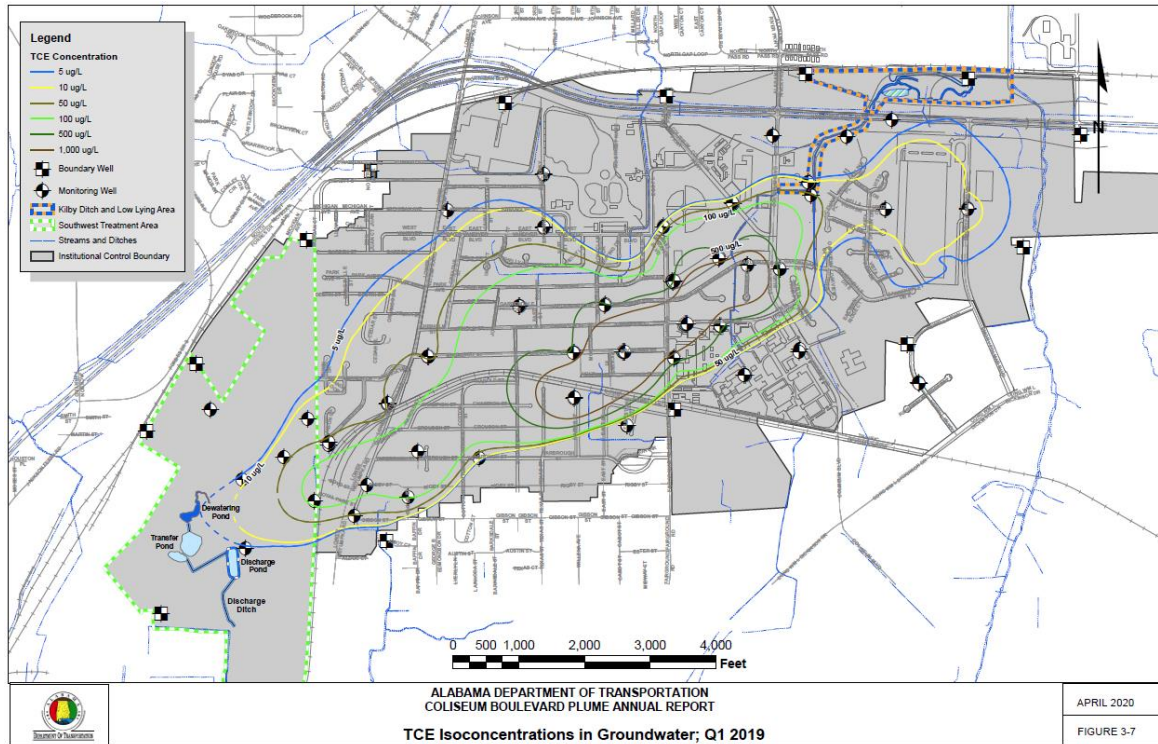


Figure 4 TCE Quarter 1 2019 contour (Fig 3-7 in annual report)

4.0 Future Work

Future development of the plume portal will address many of the requests of the CBP personnel who provided feedback during the Phase II user trainings. Future work include a variety of enhancements and tasks. First, user-levels will need to be established and confirmed, specifically, four user types: General User, Lab/Consultant, ALDOT engineer, and administrator. A significant function will be the editing of data and documents in the portal, thus these capabilities will be allowed only under certain user-levels. Previous discussions have laid the groundwork for this user-level structure, however final deliberation and execution must be performed and CAPS has the capabilities to add user levels and better user management for Phase III (unavailable in Phase I and II). Second, another user-level-based function to be developed, is the adding of a well point or location. Requested by both Arcadis and Southern Earth Sciences personnel, this function will give project managers the flexibility to handle the dynamics of long-term monitoring. Third, another request from the previous two parties is well-category functionality within tools. For example, a category of 'Long-Term Monitoring Wells' might be input into the Locate Well tool and the many wells in that category would be selected rather than a single input and output. Similar results would be implemented in the reports and search documents tool. Fourth, Arcadis requested that their most recent location symbology be used in the web map. Layer files will be provided by Arcadis to complete this task. Fifth, further work on the web map may include export of location coordinates or whole shapefile export features. Sixth, improvement of the Parcel search feature to include more robust query capabilities (e.g., address search in relation to parcels) will be prioritized in the next phase. Seventh, continuation of the proxy investigation into the Map Service with County GIS is suggested as future work to aid in the transfer of property transfer notification. Overall, much work has been completed over Phase I and II of the portal, yet a Phase III is needed to further enhance the portal user-ability and function.

5.0 Conclusions

This phase of the Plume Web Portal saw further development and investigation of existing features, new functionality, and potential future capabilities. These developments will bolster the original goal of the portal: to facilitate efficient management of the CBP's vast array of activities and datasets. Of primary importance to the future of the portal, is the adoption of the site by CBP personnel (Arcadis, Southern Earth Sciences, Ashley Cousins Environmental Strategies and Solutions (AC ESS), and ALDOT). The site's core functions were complete in Phase I, and Phase II revision and additions has enhanced the site for greater utilization by the CBP managing parties. With this utilization and further review by said managing parties, the plume portal can be better tailored to suit the needs of its users. Future tasks for the portal may include the generation of more figures to be used in the annual reports and other official documentation. Continued outreach to site users, will aid in creating an optimal experience with the Plume Web Portal.

6.0 ACKNOWLEDGEMENTS

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