

Field Data Collection & Analysis using Esri Applications

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Introduction

Field data collection has been revolutionized by computers, the internet, and now mobile devices. In many organizations, the primary data collection method relies on paper forms. GIS data and Esri's applications now enable organizations of all sizes to quickly build and deploy mobile GIS data collection applications to improve data collection and analysis.

Esri has developed many different applications that perform certain tasks to get specific pieces of a job done. These applications need to be tied together to fulfil the many requirements that an organization has.

Southern California Edison's Environmental Operations Division (EOD) was tasked with developing a program to collect data quickly and efficiently. Upon review and discussion, the department realized that collecting data on paper or in editable PDF would not provide them with the ability to effectively analyze data coming in from the field. EOD reached out to me to see what GIS tools and applications could be used to increase overall department efficiencies for data collection and analysis.

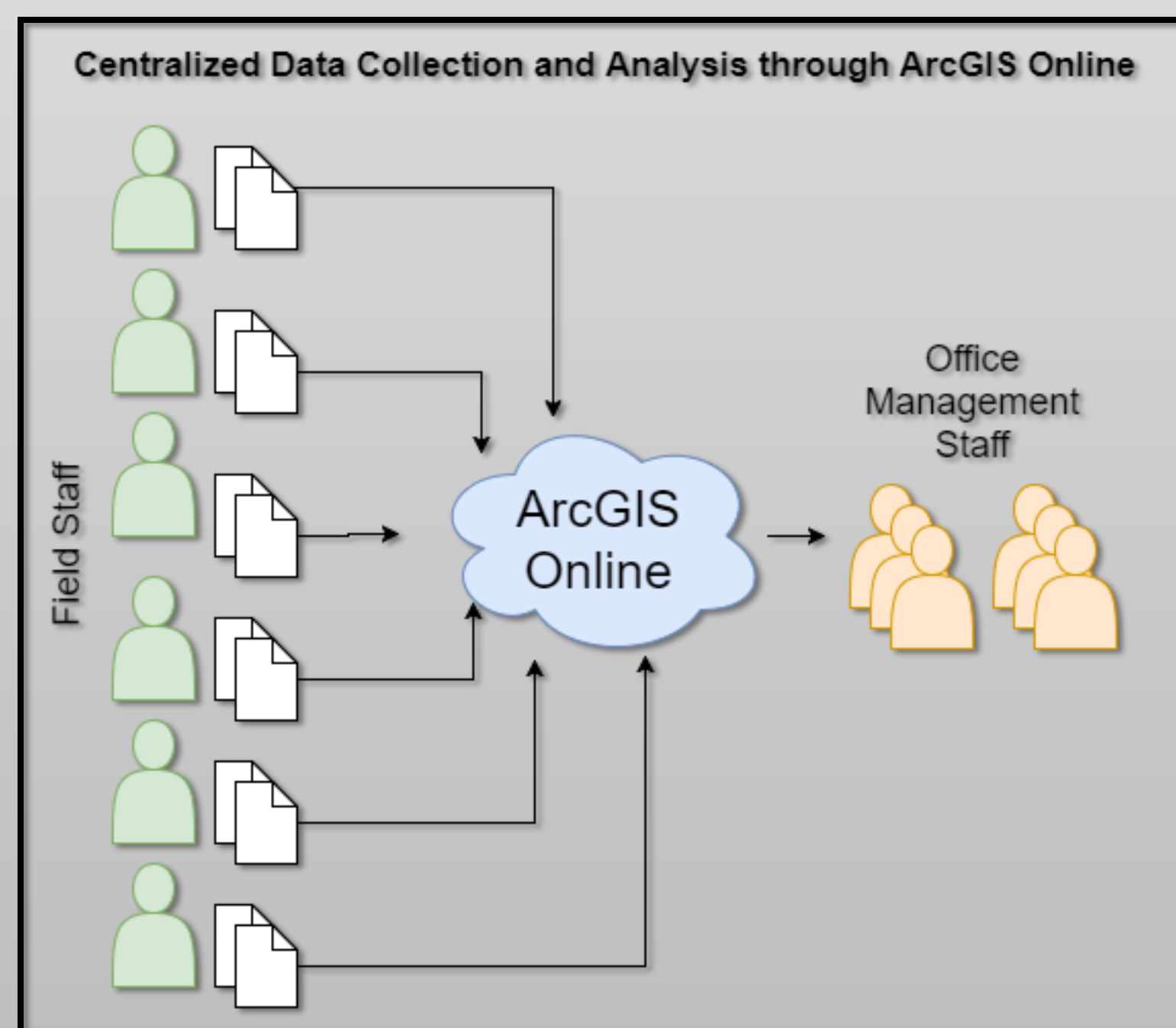


Figure 1. Centralized data collection and analysis through ArcGIS Online

Data and Data Sources

All data used for this project was captured in the field by SCE's Environmental Operations Division. These datasets were uploaded to ArcGIS Online where they are now regularly updated and maintained.

Table 1. List of data and data sources used in the project

Dataset	Source
Facilities GIS	Southern California Edison
Inspection Records	Field staff collected

Methodology

The methodology used was to research, design in test environment, deploy, and obtain feedback. These steps were used for analysis of the following applications:

Collector for ArcGIS

It was decided that Collector's map-based application was not the best use due to the lack of control over the attributes that the field users see. When editing, the users see a full list of all the attributes.

Survey123 for ArcGIS

Survey123 was chosen due to its simple to use, form-centric application as well as the ability to include form logic based on answers in the forms. Certain attributes or questions are hidden from the users based on their previous answers in the inspection.

Workforce for ArcGIS

Workforce for ArcGIS was reviewed, but not implemented due to its inability to integrate with Survey123 at the time. Workforce has since been enhanced to work with Survey123 and the application is now under review for implementation into a test environment.

ArcGIS Online

ArcGIS Online was used in two ways: the centralized data platform and for Web AppBuilder. All Survey123 data is stored and distributed through ArcGIS Online. The inspection result data was added through a web application created with Web AppBuilder. The web application is used for issue tracking.

Operations Dashboard for ArcGIS

Operations Dashboard was used due to the simple widgets and interface that allow staff to interact with the map, data, and widgets to obtain answers about what is happening in the inspections.

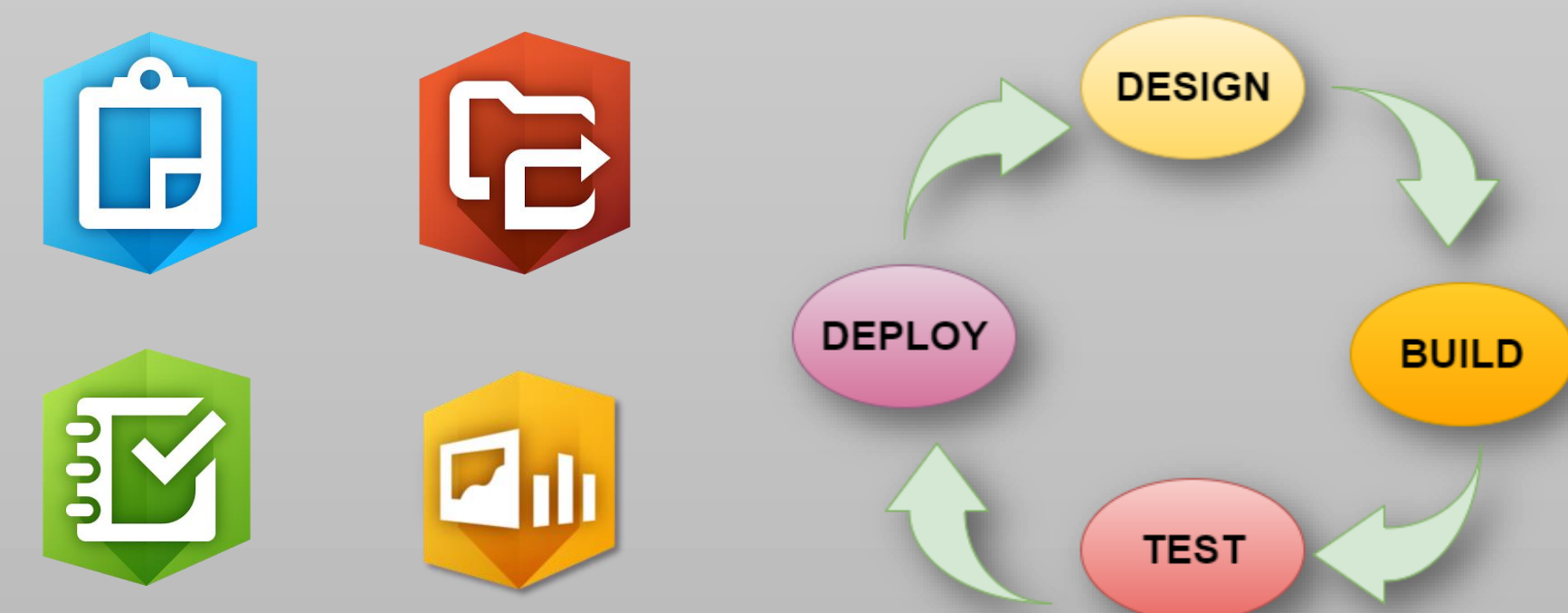


Figure 2. Methodology approach to each application analysis and deployment

Timeline

DATE	PROPOSED PROJECT WORK	ACTUAL PROJECT WORK
1/1/2017	Project Start: Data Collection Application Analysis	Project Start: Data Collection Application Analysis
1/8/2017	Survey123 Analysis, Design, and Implementation	Survey123 Analysis, Design, and Implementation
2/1/2017	Survey123 Version 1.0 Deployment and Feedback	Survey123 Version 1.0 Deployment and Feedback
3/1/2017	Survey123 Feedback and Redesign	Survey123 Feedback and Redesign
3/5/2017	ArcGIS Online Web Application and Operations Dashboard Design and Feedback	ArcGIS Online Web Application and Operations Dashboard Design and Feedback
4/1/2017	Survey123 Version 2.0 Deployment and Feedback	Survey123 Version 2.0 Deployment and Feedback
4/14/2017	Operations Dashboard Deployment	Operations Dashboard Deployment
4/21/2017	ArcGIS Online Web Application Deployment	ArcGIS Online Web Application Deployment
5/8/2017	Enhancements of Survey123, AGOL Web Applications, and Operations Dashboard	Enhancements of Survey123, AGOL Web Applications, and Operations Dashboard
5/15/2017	Review and Analyze Workforce for ArcGIS	Review and Analyze Workforce for ArcGIS
5/22/2017	Complete Test Implementation of Workforce for ArcGIS	Complete Test Implementation of Workforce for ArcGIS
5/29/2017	Complete Workforce for ArcGIS Implementation / Analyze and Review Navigator for ArcGIS	Complete Workforce for ArcGIS Implementation / Analyze and Review Navigator for ArcGIS
6/5/2017	Navigator for ArcGIS Proposed Implementation	Revisit Workforce for ArcGIS based on software enhancements
6/12/2017	Wrapping up Minor Updates for each Application	Wrapping up Minor Updates for each Application
6/17/2017	Completion of Project-related Work and Analysis	Completion of Project-related Work and Analysis

Results

The end results include Survey123 forms, Operations Dashboard, and ArcGIS Online web applications (Figures 3-5). Survey123 forms are used for simple field data collection. Field staff preferred its easy-to-use and logical interface. Operations Dashboard is used for inspection results analysis, staff accountability, and assuring that all inspections are completed per agency requirements. An ArcGIS Online web application summarizes outstanding issues as well as giving staff the opportunity to add additional comments about the issues through the *Smart Editor Widget*. These applications are tied together to effectively manage and maintain inspection records. Management is now able to have insights into field operations and take action to resolve outstanding issues that the field personnel are reporting.

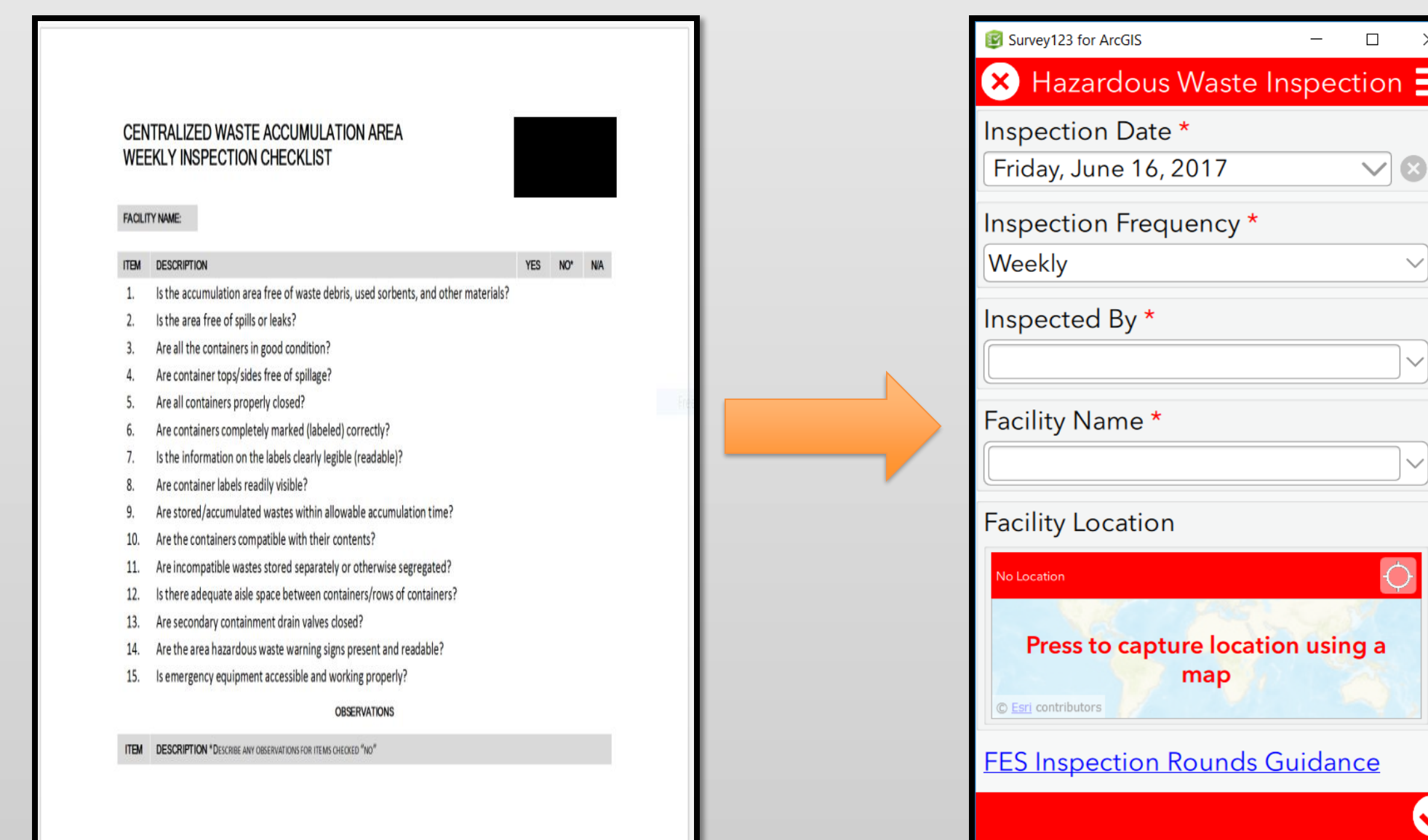


Figure 3A and B. Original inspection form and Survey123 inspection form on mobile device

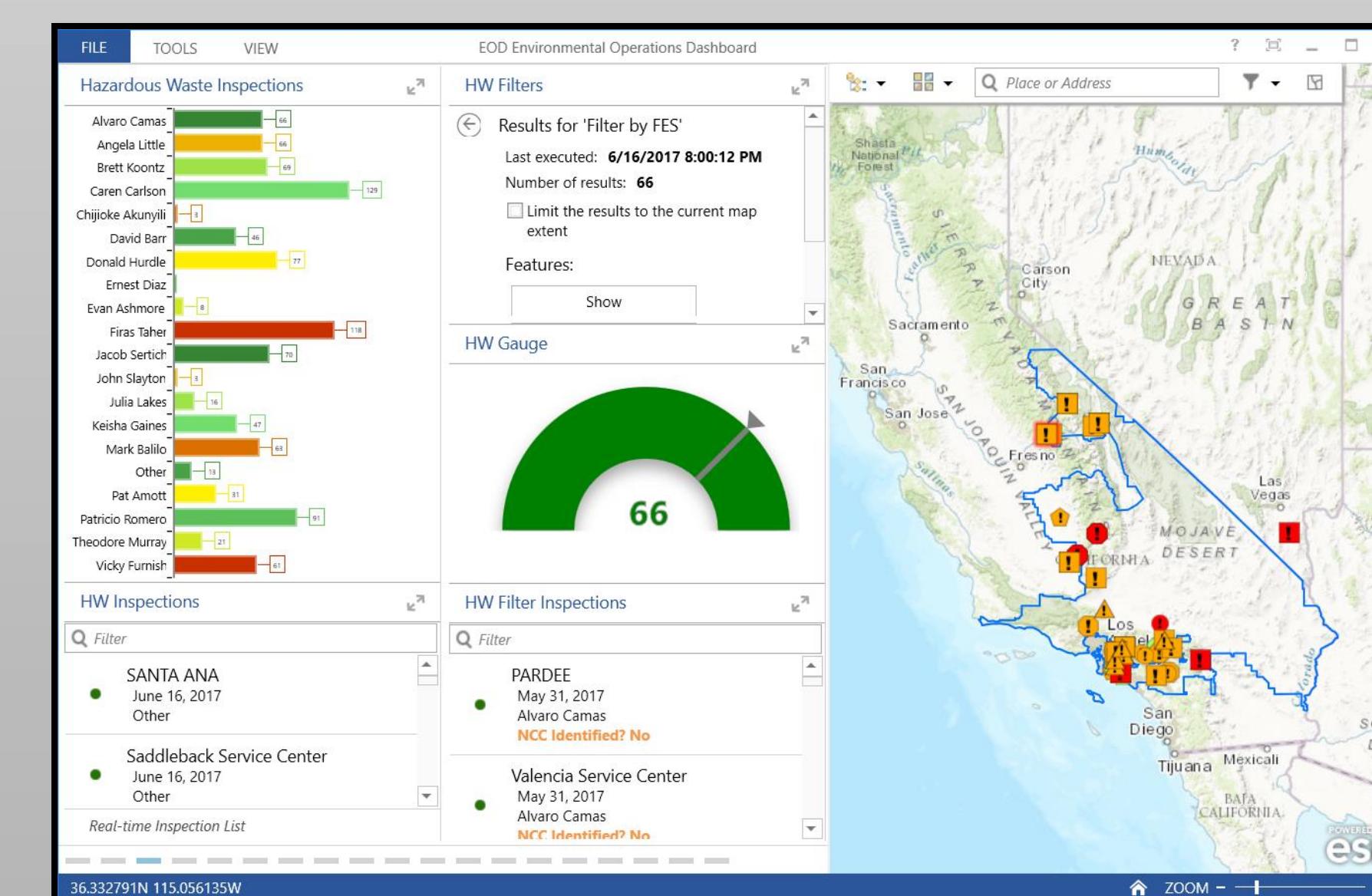


Figure 4. Operations Dashboard and widgets describing inspection results

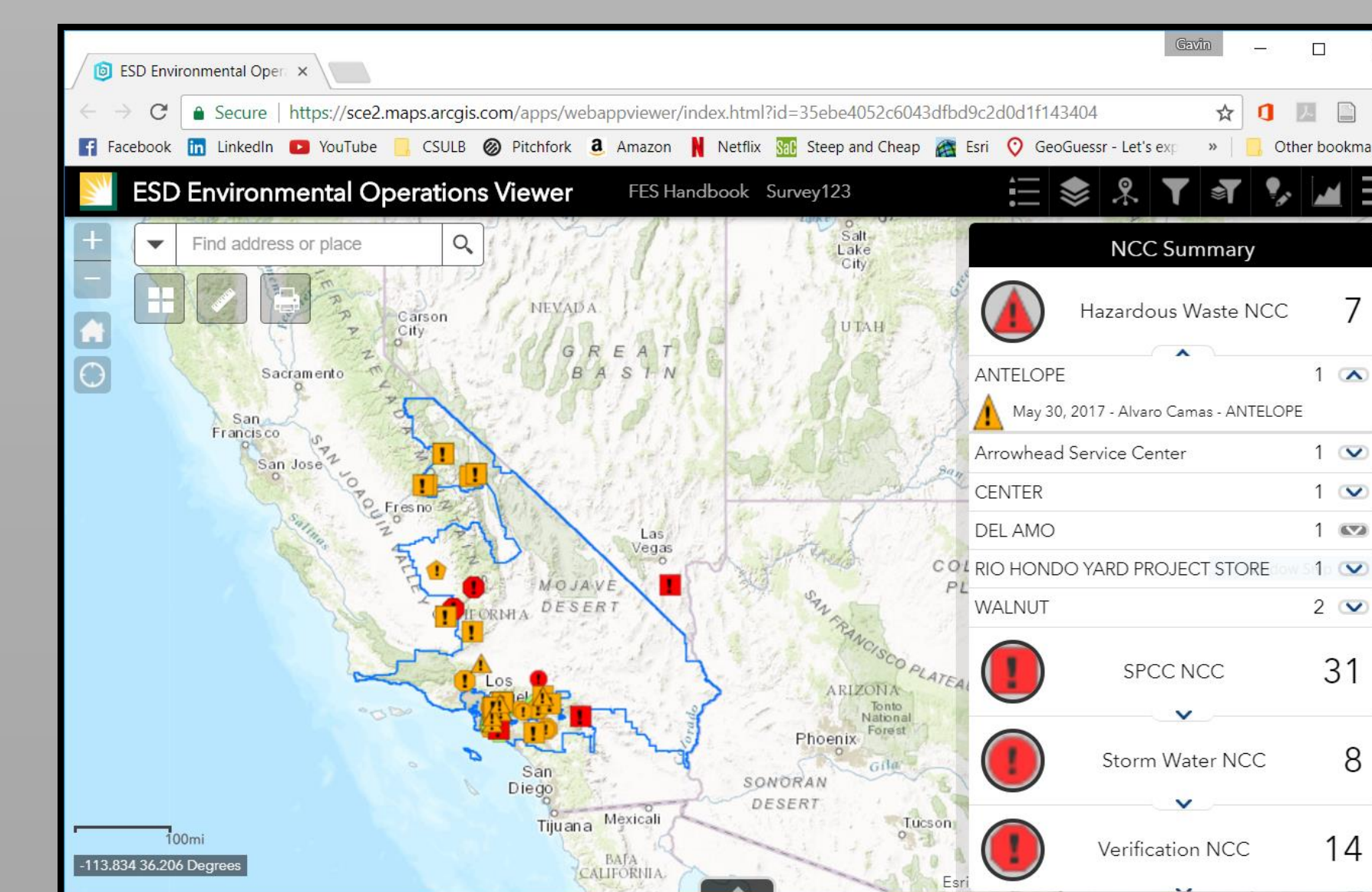


Figure 5. ArcGIS Online web application and the Summary Widget summarizing outstanding issues that require follow up

Discussion

The end result is actively being used by SCE's EOD team to collect, manage, and analyze facility environmental inspections throughout the service territory. Rather than collecting data using a paper form and reviewing each inspection individually, Survey123's mobility and easy-to-use application enable staff to quickly and efficiently collect data using their cell phones, tablets, or laptops. ArcGIS Online and Operations Dashboard are used to analyze the inspection results for completion and accountability as well as understanding outstanding issues that need to be addressed.

Results could have been improved with more front-end testing before full user deployment. Based on project requirements and timelines, there was limited time for testing before the first version of the Survey123 form was deployed. Another way to improve the methodology developed through this project would be to utilize an RDBMS to manage the data more effectively.



Figure 6. An RDBMS can be used to increase data storage, sharing, and management efficiencies

Conclusion

Each application that was researched was found to provide some benefit when collecting and analyzing data. Although not all applications are used or fully deployed at this time, Survey123, AGOL, and Operations Dashboard are currently being used for data collection and analysis and are actively providing benefit to SCE.

Future work includes system enhancements based on new requests such as deploying Workforce and Navigator, implementing SAP HANA, and creating new forms and processes. Now that the system is in use at SCE, there are more team members that would like additional functionality to help them in their workflows.

The analysis performed can now be used within other departments within Southern California Edison and can assist other organizations that face similar problems. This project has effectively shown that GIS and Esri applications increase efficiencies and communication between field and office staff and provide the necessary information to make better decisions.

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