Automation of Environmental Compliance Data Acquisition and Management – 15267

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ABSTRACT

Regulatory sampling for environmental compliance at the Savannah River Site (SRS), Aiken, South Carolina employs several different types of sampling techniques at various sampling frequencies. These sampling events result in the collection of large quantities of data and generate substantial data-related documents. The use of paper documents resulted in the need for manual input of data collected in the field and distribution of documents from one group to the next. To efficiently and effectively manage the extensive amounts of data and documents, elements of the sampling process were automated using handheld field tablets and an electronic application. The tablets allow for easier distribution of sampling documents, and the application allows for digital transfer of sampling information and collected field data. The transition to automated data acquisition and management has resulted in a more efficient and reliable manner for conducting business at SRS. This system benefits numerous organizations at SRS by utilizing a centralized database for efficient management of all environmental data collected.

INTRODUCTION

Regulatory sampling for environmental compliance at the SRS employs several different types of sampling techniques at various sampling frequencies. Sampling event types include water quality, water surveillance, fish, National Pollutant Discharge Elimination System (NPDES) samples, and many others. These sampling events result in the collection of large quantities of data and generate substantial data-related documents, especially when the sampling takes place on a weekly or biweekly basis. Previously, data acquisition had been performed using paper chain of custody forms and labels that samplers would transport to the field for each sampling event. The chain of custody forms and labels were printed when the sampling events were mobilized by the data management group, prior to sample work beginning, resulting in a need to distribute these paper documents to the samplers prior to sampling. Field measurement data was then recorded in 21 different log books and written on the chain of custody forms and labels. The field measurement data had to be recorded into 21 different log books in order to maintain specific data with its respective sampling objective. For example, there is river sampling and stream sampling, which resulted in two different log books that each contained all the sampling stations for that specific type of sampling. Once each sampling event was completed, the chain of custody forms with field measurement data would be transported back to the data management group, which is then manually transferred into the data management system. This process provides numerous opportunities for human performance errors due to the number of people handling the paper chains and log books and entering and reviewing the data, which ultimately impacts productivity. Additional issues with the former system of paper documents and manual input of field measurements include data availability and trend tracking. The main reason for these issues was the fact that data was in the 21 different log books instead of one centralized location.

DISCUSSION

Pre-Field Window

To address these issues, a new data acquisition process has been implemented at SRS allowing for automation of data collection and management. The data management group dictates the mobilization of sampling. When the sampling events are mobilized they become available in the application for the samplers to see and schedule which sampling events they need to complete for the week. The automated data acquisition application was created to link directly with the environmental data management system already in use at SRS. The application allows the sampler to download one or many mobilized sampling events to the tablet for data collection. Downloaded information includes multiple options and diverse methods of sampling to be used, depths of the samples, amount of sample to be collected, as well as frequency of sampling. Figure 1 shows the listing of the numerous sampling events that can be chosen and which are now stored within the application.

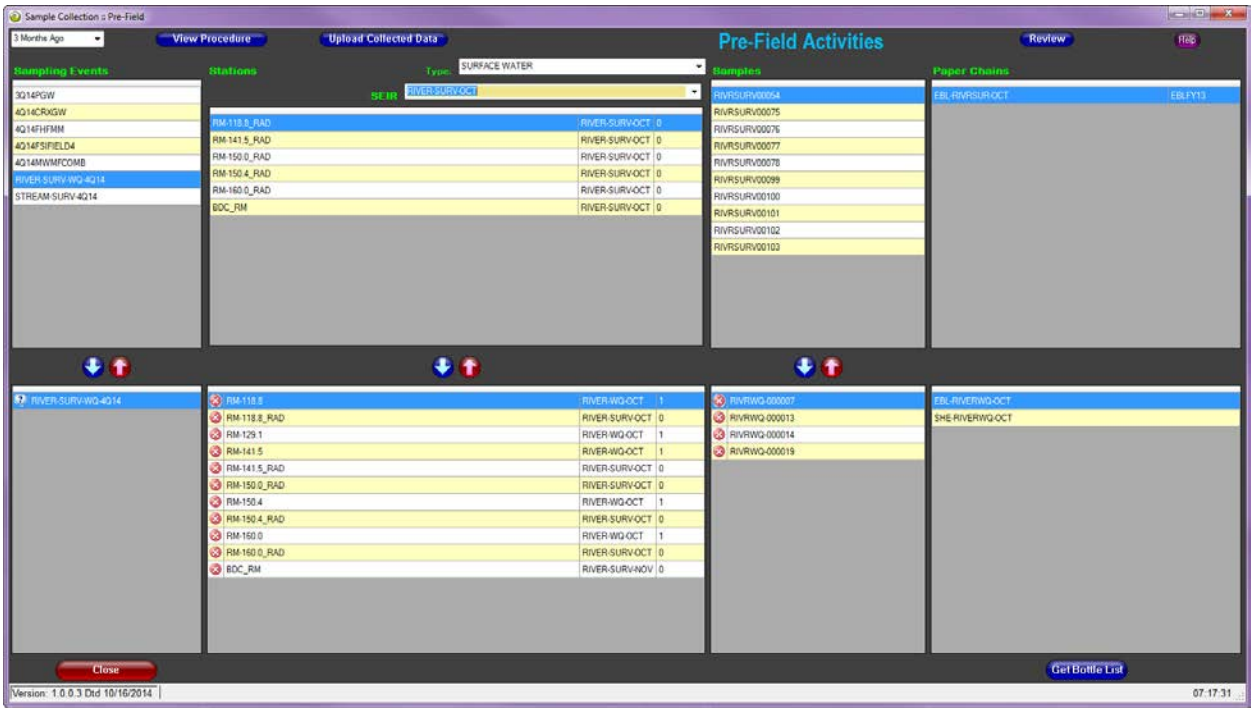

Fig. 1. The pre-field window allows for the selection of various types of sampling events, with the chosen sampling events showing up in the bottom half of the screen.

After selecting the specific sampling events, the sampler reviews a pre-populated bottle list appropriate for the required samples directly on the tablet. Having bottle lists pre-populated, eliminates preparation activities and expedites mobilization to the field. Figure 2 shows an example of a bottle list for a sampling event found in the tablet application.

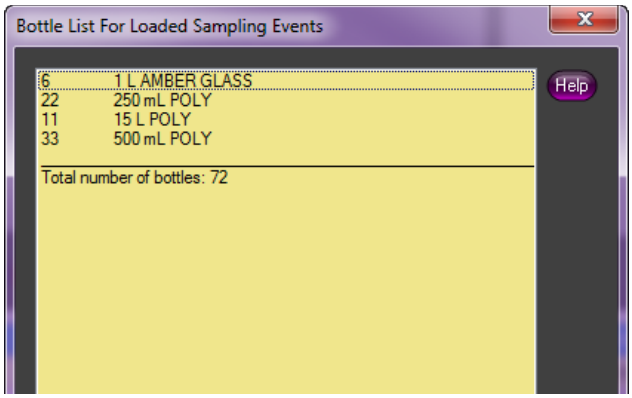

Fig. 2. An example of a bottle list for a loaded sampling event.

After sampling is completed for the day, collected field data is uploaded to the interim database tables and populated in the review report. Figure 3 shows an example of an interim database report for samples that are ready to be reviewed and moved to the permanent database tables.

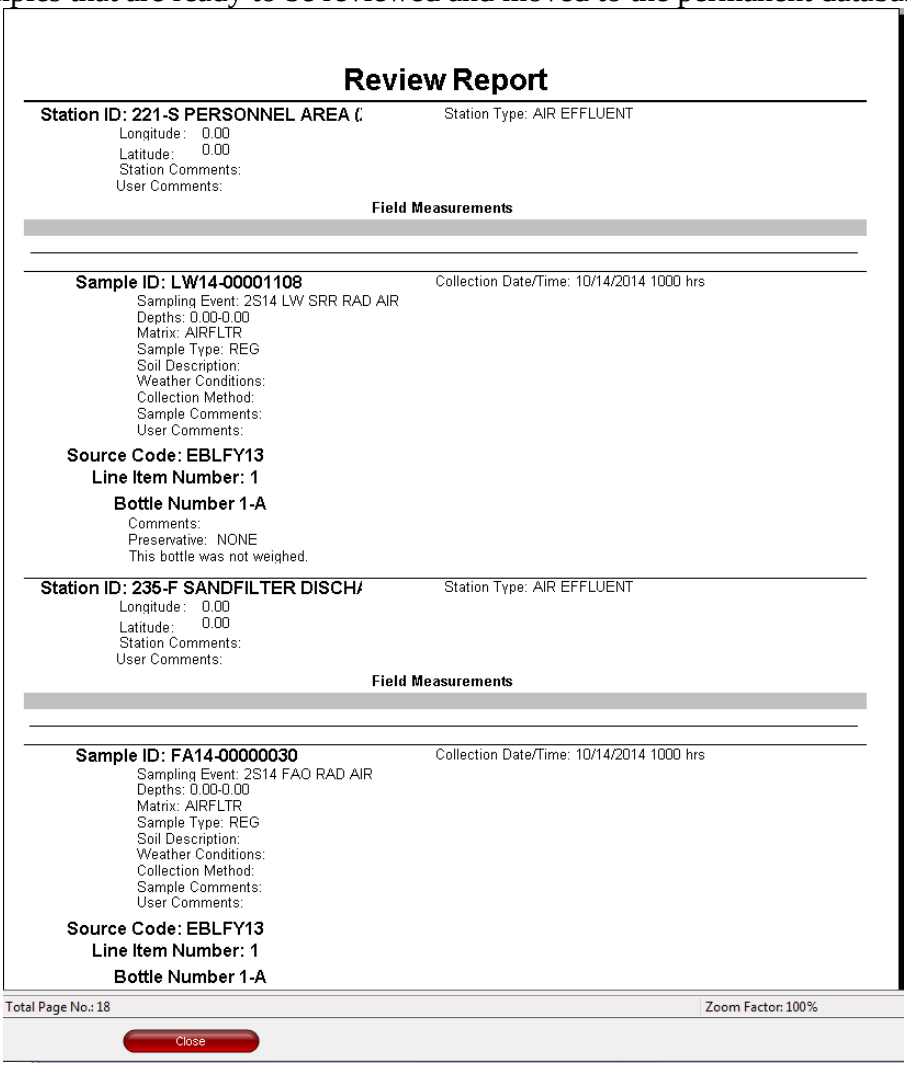

Fig. 3. An example of uploaded data in a review report.

Field Window

While in the field, the sampler has the ability to record field measurements directly into the application and print sample bottle labels on location as the sample is collected, instead of carrying multiple labels into the field. These options are available under the field section of the application, which can be run in the field or the office, as needed. The field measurements window prevents the sampler from recording duplicate information and consolidates the logbook and paper recordings into one application. Figure 4 is an example of the field measurements window for recording various types of measurements depending on the sampling requirements. Not all field measurement fields will be used for every sample, the sampler will determine which fields are needed for each sample based on the type of sampling and requested field measurements from the project owner.

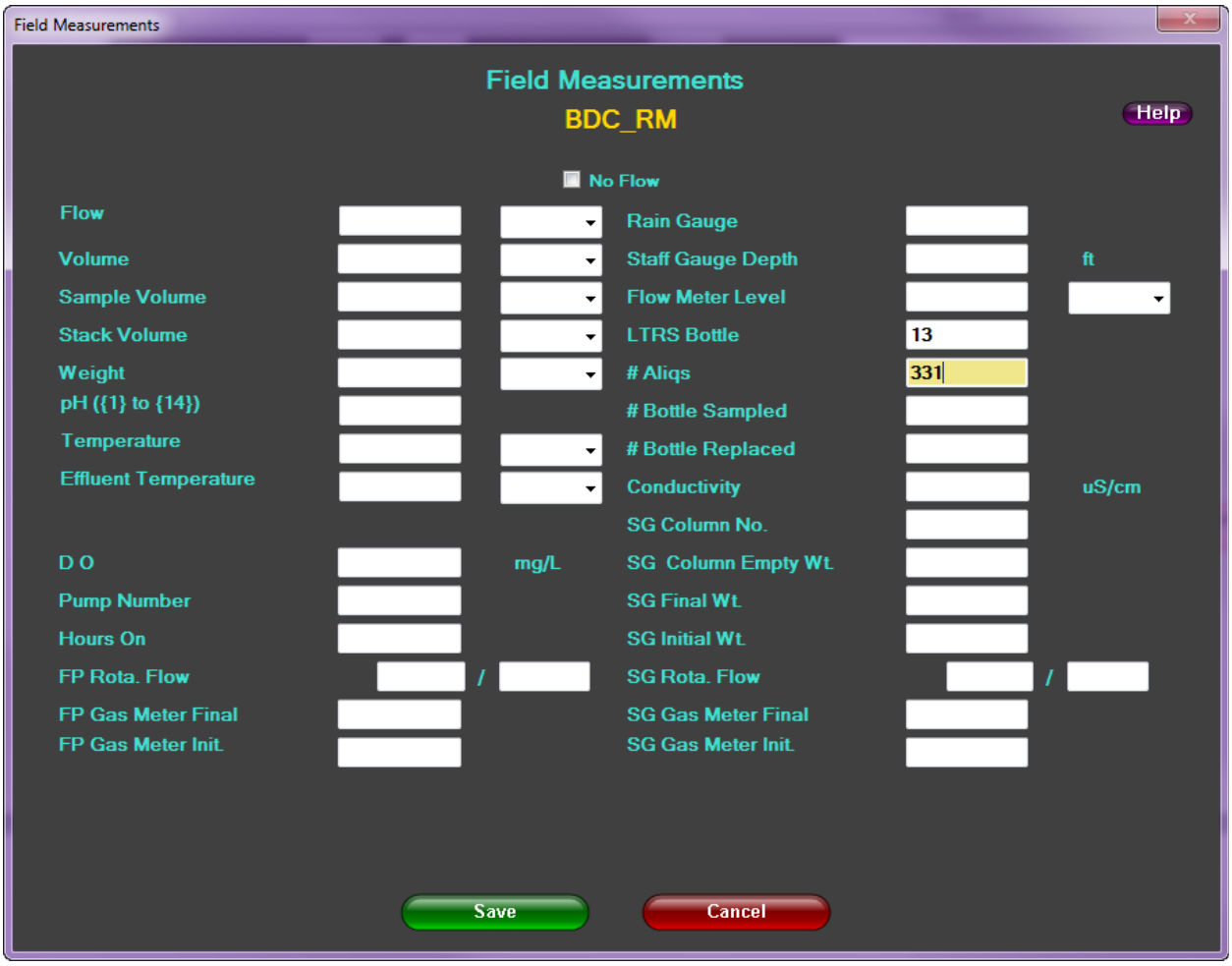

Fig. 4. The field measurement window is used by the sampler to record collected field data.

In order to ensure no accidental loss of data, the field measurements that are recorded into the field measurements window cannot be edited once the bottle label is printed. Additionally, the sampler will be notified that sample collection is completed when a green checkmark appears

next to the sample bottle, which signifies every aspect of the collection process has been completed. The sample bottle status will be shown with a red X indicating that the collection process is incomplete. Figure 5 shows an example of a station that has been completely collected (EBLFY13 1-A) and the bottle label printed and bottles that have not yet been collected (EBLFY13 2-A). The bottle window, located on the bottom left hand side of the screen, shows the green checkmark or red X next to the bottle number for the sample. The sample bottle status provides the sampler an opportunity for verifying that all samples have been collected and correctly labelled, thus ensuring data integrity.

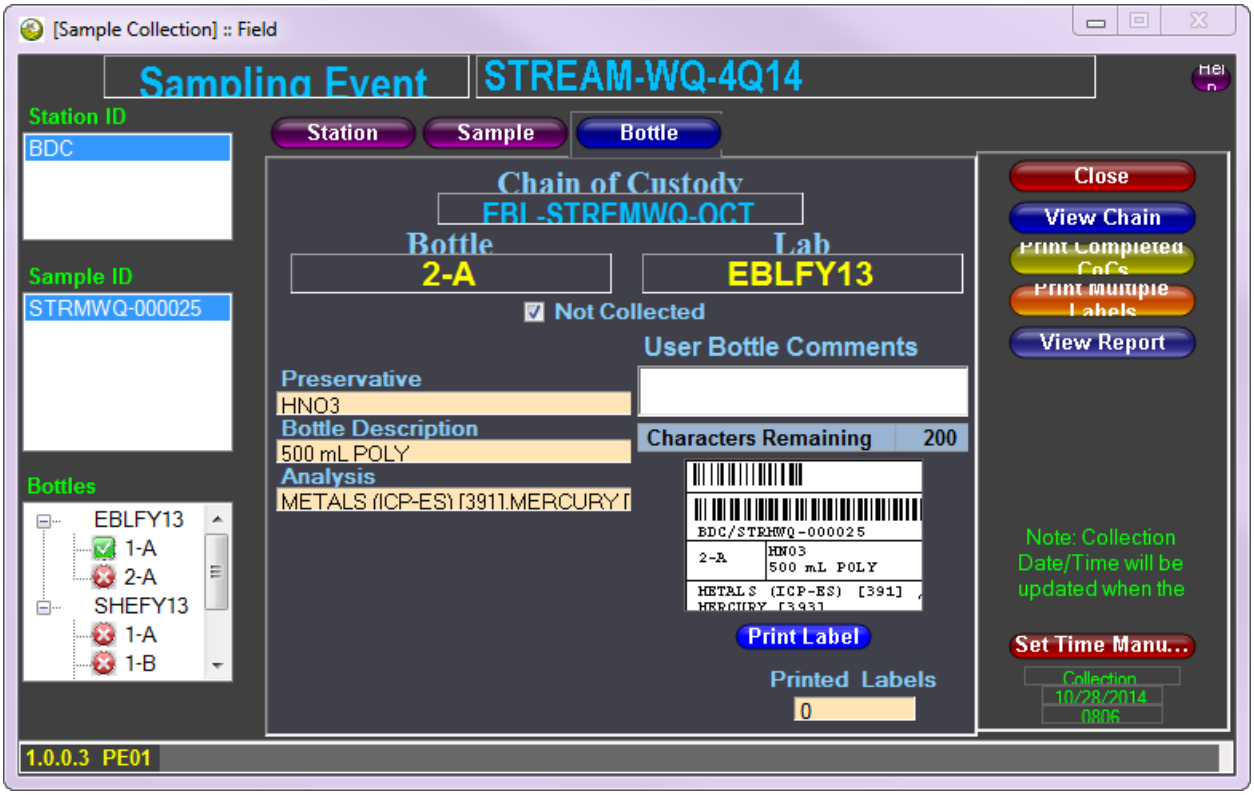

Fig. 5. An example of a collected sample with a printed label and samples with unprinted labels; the data record cannot be modified once the label is printed.

Once the sampling event is completed, the sampler returns to the office, prints out the chain of custody forms, and prepares the samples to be relinquished to the labs. The chain of custody forms are automatically filled in with the necessary data that was collected in the field. Data appearing on the chain of custody forms include start and stop times, collection dates, and the list of bottles collected. The chain of custody forms are signed by the sampler and then handed over to the lab with the samples to keep track of who handles each sample.

Review

The collected field measurement data is then uploaded to the interim database tables and populated in the review report. Any unused samples records will either remain loaded on the tablet to be collected the next day or unloaded from the tablet if sampling is not required. After

the data is reviewed by a manager, it is subsequently moved to the data management system, bypassing the need for manual data entry. This innovative automated process allows for improved management of sampling documents, expedites sample mobilization, provides each sampler electronic access to the 21 log books in one application, reduces data errors due to manual entry, enhances data integrity, allows for faster data availability, and increases productivity.

CONCLUSIONS

The transition to automated data acquisition and management has resulted in a more efficient and reliable manner for conducting business at SRS. This system benefits numerous organizations at SRS by providing a centralized database for efficient management of all environmental data collected. This database is universally available to personnel across the SRS as opposed to being accessible only to the sampling requester. Additionally, a centralized environmental database affords quicker response time to data requests from state and federal regulatory agencies, as well as any other stakeholders. Understanding and realizing the attainment of environmental goals and regulations is easier to achieve when environmental data is more readily available for tracking trends and comparing to historical data. Every aspect of environmental business at SRS has benefitted from the automation of environmental compliance data acquisition and management.