Project Title: WASTe: Waste Accumulation Storage Tracking electronically

Submitted by:

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Project Leaders:

- Cheryl Lloyd, Executive Sponsor, Chief Risk Officer, University of California Office of the President
- Erike Young, Director – Environmental Health & Safety, University of California Office of the President
- Safa Hussain, Director, Information Technology Services, UC Davis

Project Team Members:

The WASTe project’s success has been dependent upon the support of the Environmental Health and Safety community. As part of the development process at IT Services, numerous staff and faculty provided guidance, feedback, expertise, and insight contributing to the success of the project.

The team members listed below made up the core application development team:

- April Anstey, Product Owner UCSC
- Joe Bair, Quality Assurance Analyst
- Jay Ballinger, UC Systems and Integration Architect
- Charles Bookman, Lead System Administrator
- Joan Burg, Project Manager
- Donna Carrasco, UC ERM Service Desk Manager
- Christine Flanders, Service Desk Analyst
- Carolyn Germino, Developer
- Jennifer Knight, Quality Assurance Analyst
- Dave Mannion, Developer
- Dan Orovich, Co-Product Owner
- Suresh Pawar, Developer
- Walter Sysko, Developer
- Bow Vang, Designer
- Stacey Waller, Service Desk Analyst
- Alex Zanganeh-Azam, Designer

The team members listed below made up the functional workgroup:

- Bruce Carter, UCSB
- Justin Delemus, UCSC
- Richard Watson, UCR
- James Newman, UCD
- Tim Orozco, UCSF
- Michael O’Sullivan, UCLA
- Richard Snow, UCSD
- Karen Smith, UCM
- Kirk Matin, UCI
- Russell Vernon, UCR
- Kaila Benton-Vitz, UCDMC
- Amanda Grey, UCR
- Andrew Fletcher, UCD
Summary
Waste Accumulation Storage Tracking electronically or WASTe is a web based system that facilitates regulatory compliant labeling, tracking, collection and shipping of radioactive and hazardous wastes. The University of California Environmental Health and Safety application will provide an interface between Principal Investigators, lab staff and other generators of regulated wastes and the waste management staff for that campus.

Project Description

![WASTe Workflow Infographic](image)

**Features**
- Create and print tag in less than 60 seconds
- Easy to signal containers for pick up
- Creates tags for Chemical, Radiological and Universal wastes
- Meets regulatory requirements for labeling waste
- Provides inventory of containers in storage locations
- Tracks waste accumulation days
- Provides communication between generators and waste staff via embedded emailing system
- Pick up sheets can either be printed or electronic
- Scanning capabilities
- Reporting capabilities
- Uses SSO for security

Figure 1: WASTe Workflow Infographic
How It Works

The system allows a user to create and print a tag for hazardous waste in less than one minute. WASTe accommodates four types of hazardous waste: Chemical, Mixed, Radiological and Universal.

![New waste tag form](image1)

**Figure 2: New waste tag form**

Lab & Facility staff can share created tag profiles (templates) and administrators can create profiles for a single lab or for all users on their campus. Many labs always create the same type of hazardous waste. The ability to create a template of that waste stream saves researchers time.

![Waste profiles page](image2)

**Figure 3: Waste profiles (templates) page**
The system tracks container time in accumulation and automatically notifies Environmental Health and Safety staff when waste is ready for pickup.

Containers collected from labs are consolidated into shipping containers and moved offsite by vendors.

WASTe URLs

https://ehs.ucop.edu/waste-dev/#/devtool

Note that this is a demo site and any information entered should be considered temporary.

Project Benefits

Innovative

- Offers a spectrum of data-capture modes including data entry on electronic form via tablet, batch QR Code scanning and remote transmission of batch scanning files to WASTe server
- Mobile friendly Electronic Pickup function replaces paper and allows hazardous waste staff to streamline the process of retrieving containers and transitioning them to hazardous waste facilities
Includes a flexible two-tiered notification system that allows users to opt in or out of receiving emails, yet still receive those notifications on their home page

Efficiencies

- Helps the researcher with an online tool that minimizes the level of effort to manage their hazardous waste and provide the researcher with the functionality to manage multiple labs (including all personnel, locations and hazardous waste) in one system
- The system is deployed centrally at the San Diego Super Computing Center and managed by the UC ERM Center of Excellence for Technology (ITS at UC Davis), resulting in savings in resources to maintain the system, as well as improving the security and availability of the system for all 10 UC Campuses
- One system manages multiple types of hazards; Chemical, Bio, and Radioactive hazards
- Tracks hazardous waste from creation in lab, to pick up by hazardous waste staff, to consolidation into shipping containers to shipment offsite
- Waste tags can be created and printed in less than 60 seconds
- Easy to signal that containers are ready for pickup
- Hazardous waste staff can view all campus inventories
- Automatically notifies waste staff when containers have reached accumulation time limit
- Adheres to regulations monitored by the Department of Toxic Substance Control
- Meets regulatory requirements for labeling hazardous waste
- Includes billing capability
- Replaces a paper process that is error-prone and labor intensive

Sharable and Interoperable

- System is easily implemented on a campus with minimal support needed from development team
- Integrated with Core Services data, currently drawing locations; full integration with Profile App will occur Summer 2014. This will result in major efficiencies for the end users as the data is entered once and propagates to all UC systems (over 13 systems will be leveraging the data from Core Services)
- Utilizes Single Sign-On by standardizing on UC Trust; UC Federated Authentication.

Collaborative

- Requirements for application came from multiple campuses and all user roles in system
- Leverages data from corresponding Environmental Health and Safety applications through Core Services

Measurable

- Currently in use at UC Davis, UC Davis Medical Center, UC Merced, UC San Francisco and UC Santa Cruz
- To be implemented at UC Riverside, UC Los Angeles and UC Santa Barbara in Summer 2014
- System currently has approximately 3,200 tags and 4,500 users
- Estimates indicate potential of 200,000 tags created annually by 2015

Technology Used

WASTe was developed in Java leveraging the Spring MVC framework and MySQL backend. The user interface is built with AngularJS framework and Twitter Bootstrap. The WASTe server hardware is hosted at the San Diego Supercomputer Center.

The backend uses the following technology stack:

- Java, JavaScript
- MySQL Relational Database
- Spring MVC Framework
- Hibernate/Spring Data
AngularJS

Project Timeline

Development on WASTe began in Mid-August of 2013. The system had beta users from UC Merced and UC Davis Medical Center entering real data in the system by November 2013. Additional features and functionality continued to be added to the application through the end of active development in February 2014.

The use of Agile development principles, which provided a bi-weekly rollout of features and functionality, provided a framework for a continuous feedback loop from system users. The development team met with early adopters in their local environment (lab, hazardous waste facility, etc.) in order to get the best quality input and suggestions about the usability of the application. This robust feedback cycle allowed the development team to provide improvements and enhancements to the application within weeks of requests, which increased user confidence.

Customer Satisfaction Data

“What we had: paper system with very predictable waste streams. The program reduces time spent by our hazardous waste pickup team. We no longer have to visit every site to see if waste is ready to be picked up and for those sites we do visit, we are better prepared to handle the volume of waste (i.e. we plan to bring the right size cart, the correct number of replacement supplies, etc.).

In addition, it allows us to trace a single unit (i.e. carboy from a specific lab) to its commingled drum, to pick up by the hazardous waste hauler, and beyond. Something we were not easily doing under our current system.

I like being able to see what my generators are doing from the comfort of my desk! I’ve caught labeling errors and saved money by helping Responsible Parties correctly identify their waste. I am looking forward to being able to track and trend data, for example, if our pharmacy institutes a sustainability practice, I will be able to easily determine if their waste volumes have gone down.”

Kaila Benton-Vitz CIH, CSP, Environmental Health & Safety, UC Davis Health System

Hazardous waste is a highly regulated waste stream and WASTe provides many of the features for waste generators (students, faculty, staff) and EH&S waste staff to easily manage hazardous waste online. WASTe tracks the day a container is generated and automatically moves the container into ready for pick-up status once it reaches its max accumulation time-frame; this helps the waste staff manage the waste to ensure it doesn’t stay onsite for longer than a year.

The system goes above and beyond regulatory compliance by providing an embedded emailing system between the waste generators and waste staff. Tag creators can email waste staff about one of the containers they created with a simple click of the mouse. WASTe is an easy to use, comprehensive online labeling and waste tracking tool that helps campuses maintain hazardous waste regulatory compliance.

April Anstey, CHMM, Hazardous Waste Manager, University of California, Santa Cruz

WASTe is the remarkable software that provides a tool for researchers to identify the contents of their hazardous waste containers, to print a legally compliant label and to communicate with Environmental Health & Safety who picks up and properly manages this material. The software allows efficient management of the waste and associated data.

Russell Vernon, PhD., Director, Environmental Health & Safety, University of California, Riverside