

Sealion Database: Tracking and Characterization of Legacy Wastes – 10133

Michel Hall*, Brady Orchard**, Brett Welty*, Reese Gannon**, James Rivera*, Paul Walker*
*Portage, Inc., Idaho Falls, Idaho 83402
**Idaho National Laboratory, Idaho Falls, Idaho 83415

ABSTRACT

The Radioactive Scrap and Waste Facility Liner-by-Liner Characterization Project was initiated to support waste management planning and disposition activities at the Materials and Fuels Complex located at the Idaho National Laboratory. The project scope consisted of a detailed examination of available historical records to consolidate information and eliminate discrepancies between sources. This information was captured in a new comprehensive searchable online database dubbed Sealion ([Searchable Liner Online](#)).

For each storage liner and associated waste container, Sealion tracks the physical configuration, radiological data (e.g., source term, transuranic content, fissile content, and direct gamma radiation reading), Resource Conservation and Recovery Act characterization data, contents descriptions, and a variety of other waste management data. Historical hard-copy records were scanned and are stored in the database for easy access. In addition to storing the consolidated data in a library for easy retrieval or linking, Sealion serves as a tool in the development of batching plans for retrieving, transporting, processing, and, ultimately, dispositioning the waste. An integral search function allows the user to query for a variety of parameters in order to plan custom batches and account for facility or regulatory limitations (e.g., U.S. Department of Transportation limits, hazard category determinations, and fissile gram equivalent limitations). Liners can be combined or batched together and the combined results displayed in real-time graphs and tables showing the cumulative characteristics.

The basic database architecture has proven to be adaptable to a variety of other similar applications. Sealion is capable of tracking segmented inventories (i.e., the liners can be replaced with storage drums, racks in a warehouse, or grids overlaid on a landfill). Additionally, the batching functions allow for the ability to combine inventory sub-locations into real-time graphs that summarize the characteristics of the contents for ease in comparison of characteristics to established thresholds or decision-making modeling needed to support waste-management operations.

INTRODUCTION

The Radioactive Scrap and Waste Facility (RSWF) at the Idaho National Laboratory (INL) Materials and Fuels Complex (MFC) is an interim storage facility for spent fuel and remote-handled (RH), mixed, and radioactive wastes. The wastes stored at the RSWF include transuranic (TRU) waste, mixed-TRU waste, low-level waste (LLW), and mixed low-level waste (MLLW) (including alpha-contaminated LLW and MLLW) subject to provisions of the 1995 Settlement Agreement with the State of Idaho and associated court order [1] and/or the *INL Site Treatment Plan* (STP) and associated consent order [2]. The Settlement Agreement requires the U.S. Department of Energy (DOE) to process and remove all TRU waste from the State of Idaho by a target date of December 31, 2015, and no later than December 31, 2018. The STP includes milestones for the management of mixed TRU-contaminated waste and alpha-MLLW, including

the implementation of the Remote-Handled Waste Disposition Project (RWDP) (formerly the Remote Treatment Project) [2]. The inventory also includes LLW subject to applicable DOE orders.

The RWDP was proposed to provide INL the capability to process RH waste for offsite disposal. At the RSWF, sealed carbon-steel pipe liners, set and buried vertically in the ground, are used to store containers of spent fuel and waste. The RWDP was initially designed to provide the capability to disassemble storage containers and/or entire waste liners; characterize, sort, and segregate the waste as necessary; treat and reduce the amount of waste as appropriate; and repackage the waste to meet the disposal facility's waste acceptance criteria. However, because of funding constraints, the DOE is accelerating retrieval of RH TRU waste from the RSWF, beginning with the retrieval of waste that would not require RWDP capabilities for disposal in an effort to ensure that Settlement Agreement and STP requirements are met. The path forward for the larger RWDP capability is not fully defined at this time.

To support RH waste disposition, a detailed evaluation of the entire RSWF waste stream was necessary. Such an evaluation allowed the waste to be characterized to ensure that the appropriate treatment and disposal requirements are met. This characterization effort included the development of acceptable knowledge documentation and the identification of nuclear material safeguards characteristics. The Sealion (for Searchable Liner Online) database is a comprehensive database designed and developed as a tool to capture and consolidate RSWF liner information. The initial requirements for Sealion included the following:

- Organize available data into one source:
 - Hard-copy records
 - Safeguards custodians records
 - Legacy databases
- Make information easily readable to identify gaps and inconsistencies
- Organize information into functional and searchable groupings
- Provide the capability to batch data for informed decision-making
- Allow remote access using secure Web utilities.

This system was built to minimize the amount of hands-on data manipulation and maximize the speed and efficiency of decision-making. To this end, Sealion has proven to be a valuable tool in characterization and batching efforts.

SEALION DATA MANAGEMENT

Because of its flexibility, Sealion may be adapted to a variety of applications. In virtually any situation where inventory is placed in a segmented system, Sealion can be used to track and control data, while allowing the user to make informed decisions about inventory management strategies. The Sealion database is accessible online via a secure Internet site. The system administrator can allow users read-only, container-edit, and or Safeguards-edit access based on job requirements.

Sealion offers four key features:

- Container and materials characterization information
- Extensive search capabilities
- A reference library
- Batching information.

Characterization Information

The liner characterization information is structured according to a hierarchy. All data stored in Sealion are broken down into four basic categories and further broken into sub-categories:

- Liner characteristics:
 - Size
 - Shielding
 - Seal type
- Container characteristics:
 - Gross weight
 - Container type
 - Container shielding
 - Hot link to hard-copy information and technical reports from a document library
 - Radiation monitoring data
- Material Characteristics:
 - Date generated
 - Content weight
 - Material description
 - Radionuclide inventory
 - Sodium or sodium potassium alloy (NaK) quantities
 - RCRA waste codes

- Safeguards:
 - Enrichment percentage
 - Special nuclear material specific weight
 - Attractiveness level
 - Safeguards protection category.

These, along with other descriptors, allow the user to adequately characterize the waste container. Fig. 1 is a screenshot of a typical container listing. (Note: The figure shown represents fictional data for exhibition purposes only.)

Search Functions

Sealion has advanced search functions. These include the ability to identify any combination from a large selection of input parameters. Each search parameter acts as a filter, so users are able to narrow results by selecting more options. This allows the user to create lists unique to their specific situation. Fig. 2 shows the Sealion advanced search screen. Each liner may then be saved or printed. (Note: The figure shown represents fictional data for exhibition purposes only.)

Library

A linkable reference library is included as a central place to store reference material for easy access. Sealion has the ability to link reference files to specific liners and vice versa for easy retrieval from the liner page or library. The user may import files in Excel, Word, PDF, GIF, JPG, and other commonly used file formats. Fig. 3 shows the Sealion liner linked to the library file. (Note: The figure shown represents fictional data for exhibition purposes only.)

Batching

Sealion also includes the capability to develop batching plans for the liners. Use of the batching plan feature begins by conducting a search (basic or advanced) using search parameters. A list of liners that match the search category will result along with the option to select specific liners for inclusion in the batching plan.

The outputs of the batching tool are results that include the nuclear facility hazard category, fissile gram equivalent (FGE), and the safeguard category. See Fig. 4 for examples of the output using three sample liners. (Note: The figure shown represents fictional data for exhibition purposes only.)

A data table is generated that shows the individual liner's sum of ratios and hazard category determination (calculations performed in accordance with DOE-STD-1027-92 [3]), FGE, and safeguards information, for the combined liners being batched. A bar graph that provides a visual representation of the individual and combined liner amounts is also generated. The graphs are designed to show not only the current category of the liners as if they were combined into one facility or package, but they also give the user a visual representation of how much each liner contributes to the overall result. In the cases of the hazard category and safeguards graphs, the results not only show the current category that combined liners fall into, but also how close the combined result is to reaching the next category threshold. This enables users to quickly ascertain which liners should or should not be combined for waste-management activities based on applicable limits. To help with the selection of likely containers that would be processed

together, the batching plans screen contains the same liner search page available in other functions of the system.

Sealion Database

Searchable Liner Online

[Search](#) | [Liners](#) | [Batching Plans](#) | [Library](#) | [Change Menu](#) | [Change Password](#) | [User Management](#) | [Logout](#) | [Print Details](#)

IR 90 [Change History](#) | [Edit](#)

Current Location	Liner Size	Liner Shielding	Soil Type	Liner Attr. Level	Barrieraids Category	Hard Copy (PDF)	Stage
A-90	16	0.010E+00	TMS	5	NA	Not Available	1

PRIMARY CONTAINERS

IR 456 [Change History](#) | [Edit](#)

Container No.	JWTB Container No.	Originator No.	Secondary Container	Secondary Container Shielding	Secondary Container No.
IR 456	NA		IR 1000-1	Lead PLQ (0.1%)	
Generation Date	Original RSWF Placement Date	Translocation Date	Container Type	Container Attractiveness Level	
10/21/2004	1/7/2004	N/A	IR 1000-1	E-5	
Primary Volume (m ³)	Gross Weight (kg)	Content Weight (kg)	Content Type(s)	TRU Amount (mCi/kg)	Calculated TRU Amount
1.200	2,007	1,000	Mixed	0.000E+00	Calculated TRU Amount
Sodium Quantity (g)	Net Quantity (g)	EPA Hazardous Waste No(s)	Percent Combustible	Percent Metal	
		H01 - Soluble (Sd) H02 - Insoluble (Sd) H03 - Ac (Sd)	0.0%	0.0%	
Thermal Decay (W)	Total Curies	Source of Nuclide Information	Reported MAP	Reported MFP	
				3.7705E+001	
Reported Nuclide Distribution					
Nuclide	Amount (Ci)	Amount (g)	Decay Heat (W)		
Co-57	3.500E+002	4.8750E-023			
Co-58	3.000E+002	1.5077E-022			
Cr	4.000E+001	4.107E-025			
Fe-54	1.000E+001	1.007E-024			
Fe-56	1.000E+001	1.007E-024			
Fe-57	1.000E+001	1.007E-024			
Fe-59	1.000E+001	1.007E-024			
Fe-60	1.000E+001	1.007E-024			
Fe-64	1.000E+001	1.007E-024			
Fe-65	1.000E+001	1.007E-024			
Fe-66	1.000E+001	1.007E-024			
Fe-67	1.000E+001	1.007E-024			
Fe-68	1.000E+001	1.007E-024			
Fe-69	1.000E+001	1.007E-024			
Fe-70	1.000E+001	1.007E-024			
Fe-72	1.000E+001	1.007E-024			
Fe-74	1.000E+001	1.007E-024			
Fe-75	1.000E+001	1.007E-024			
Fe-76	1.000E+001	1.007E-024			
Fe-78	1.000E+001	1.007E-024			
Fe-79	1.000E+001	1.007E-024			
Fe-80	1.000E+001	1.007E-024			
Fe-81	1.000E+001	1.007E-024			
Fe-82	1.000E+001	1.007E-024			
Fe-83	1.000E+001	1.007E-024			
Fe-84	1.000E+001	1.007E-024			
Fe-85	1.000E+001	1.007E-024			
Fe-86	1.000E+001	1.007E-024			
Fe-87	1.000E+001	1.007E-024			
Fe-88	1.000E+001	1.007E-024			
Fe-89	1.000E+001	1.007E-024			
Fe-90	1.000E+001	1.007E-024			
Fe-91	1.000E+001	1.007E-024			
Fe-92	1.000E+001	1.007E-024			
Fe-93	1.000E+001	1.007E-024			
Fe-94	1.000E+001	1.007E-024			
Fe-95	1.000E+001	1.007E-024			
Fe-96	1.000E+001	1.007E-024			
Fe-97	1.000E+001	1.007E-024			
Fe-98	1.000E+001	1.007E-024			
Fe-99	1.000E+001	1.007E-024			
Fe-100	1.000E+001	1.007E-024			
Calculated Totals	1.7100E+002		3.0200E-001		
Radiological Readings					
Date of Reading	Level of Reading (mR/hr)	Location of Reading	Contact Reading?		
3/14/2005	0.1	Over Waste Liner	No		
3/14/2005	0	Over Open Area	No		
Containers Batch Pertains To	Batch Attractiveness Level	Description			
4-07-45-48	5	Form			
Net Weight (kg)	Category	Additional Isotopes			
5.250E+002	EV				
Total H (g): 1.100E+00	Total H (g): 1.100E+00				
Total U (g): 0.000E+00	Total U (g): 0.000E+00				
Total Pu (g): 0.000E+00	Total Pu (g): 0.000E+00				
Attr Level: 5	Attr Level: 5				
DI (kg):	DI (g):				
Res ID:					
Barrieraids Comments:					
Last Modified By: psalter		Last Modified Date: 3/13/2005 9:35:03 AM			

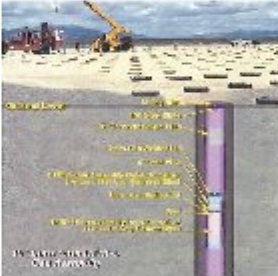


Fig.1. Sealion container detail screen.

5

Sealion Database

Searchable Liner Online

Search | Liner | Entering Data | Library | Change Mgmt | Change Password | User Management | Logout | Print Details

ADVANCED SEARCH

Liner Sizes <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="16"/> <input type="text" value="24"/> <input type="text" value="36"/>	Primary Container Types <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="AN Fiber"/> <input type="text" value="CMTLWR"/> <input type="text" value="Per. Can"/>
Seal Types <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="TED"/> <input type="text" value="Welded"/> <input type="text" value="Unaged"/>	Primary Container Attractiveness <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="A"/> <input type="text" value="B"/> <input type="text" value="C"/>
Liner Attractiveness <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="A"/> <input type="text" value="B"/> <input type="text" value="C"/>	Container Types* <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="TRJ"/> <input type="text" value="LWR"/> <input type="text" value="Insulated Hardware"/>
Liner Position <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/>	Spa Codes* <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="1"/> <input type="text" value="2001 - ignitable"/> <input type="text" value="2111 - flammable"/>
CFR# <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="2"/>	Datum Present <input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
Secondary Container Types <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="ANLE Outer"/> <input type="text" value="Original 2 Liner"/> <input type="text" value="IT-7-0-0-0"/>	Safeguards Designated <input type="radio"/> Setup <input type="radio"/> Manual	<input type="radio"/> Setup <input type="radio"/> Manual
Secondary Container Shielding Type* <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="Steel"/> <input type="text" value="Lead-Lin"/> <input type="text" value="Concrete Block"/>	Removable Materials Present <input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
Liner Sequence Category <small>(used only to select multiple values)</small>	<input type="text" value="All"/> <input type="text" value="1"/>	Original Number <input type="text" value=""/>	<input type="text" value=""/>
Container's Event Generation Date <input type="text" value="between"/> <input type="text" value="end"/>	<input type="text" value=""/>	TRJ amount (range) <input type="text" value=""/> <input type="text" value=""/>	<input type="text" value="between"/> <input type="text" value="end"/>
Description of Waste Contents <input type="text" value=""/>	<input type="text" value=""/>	TRJ amount Category <input type="radio"/> TRJ amount as Reported from LLD Form <input type="radio"/> TRJ amount Calculated <input type="radio"/> Calculated TRJ amount Substitute as Reported Value	<input type="radio"/> TRJ amount as Reported from LLD Form <input type="radio"/> TRJ amount Calculated <input type="radio"/> Calculated TRJ amount Substitute as Reported Value
Container's Event Generation Date <input type="text" value="between"/> <input type="text" value="end"/>	<input type="text" value=""/>	Inspected Container <input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
Empty Status <input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No

*Note: selecting "All" with asterisk means for secondary where container search is selected being "selected" with asterisk means for secondary where container include one or more of the selected items.

Box 2 Search

Fig. 2. Sealion advanced search screen.

Sealion Database

Searchable Liner Online

Search | Liner | Entering Data | Library | Change Mgmt | Change Password | User Management | Logout | Print Details

Show Help/Link Lock Liner for Editing

[Change History](#) | [LDL](#)

A 28	Current Location	Liner Size	Liner Shielding	Seal Type	Liner Attr. Level	Safeguards Category	Hard Copy (PDF)	Stage
A 28		24"	Concrete Plug	Flanged	N/A	N/A	Not Available	0
Library Files Linked to This Liner: test - Copy.txt								

Fig. 3. Sealion liner linked to library file.

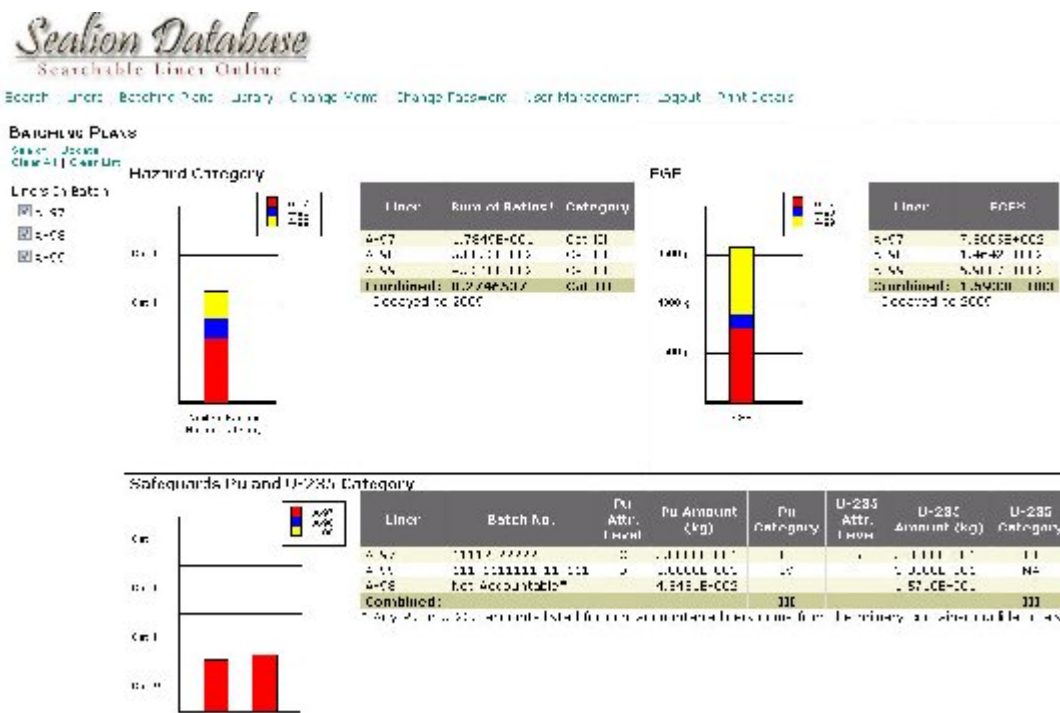


Fig. 4. Sealion batching plan output screen.

CHANGE HISTORY

Because of the importance of the information that has been entered into the database, tracking any changes that may have occurred is of the utmost importance. To this end, the system was developed to save a snapshot of the information that was on the edit screen and log the active user's identity every time the "Save" button is clicked. This ensures the integrity of the data and provides a way of reviewing who has made the changes as well as quickly viewing the fields that were changed.

CONCLUSION

Sealion may be configured to handle a wide range of situations and to display and track many different aspects of data. With its segmented container tracking capability, user-friendly data entry, and batching utility, Sealion is an ideal tool for waste-management applications.

REFERENCES

1. STATE OF IDAHO, U.S. DEPARTMENT OF ENERGY, AND U.S. DEPARTMENT OF THE NAVY, *Settlement Agreement*, October 16, 1995.
2. IDAHO NATIONAL LABORATORY, *INL Site Treatment Plan*, October 31, 2008.
3. U.S. DEPARTMENT OF ENERGY, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," DOE-STD-1027-92, December 1992.