

# Radiological Recovery Logistics Tool (RRLT) User Guide

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## Science and Technology



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Prepared by:

Douglas E. Johnson, Michael D. Kaminski, Scott Parent

Strategic Security Sciences Division

Argonne National Laboratory

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# Acknowledgments

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## Overview








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The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) National Urban Security Technology Laboratory (NUSTL) has funded Argonne National Laboratory (ANL) to develop a radiological recovery logistics tool (RRLT) that contains a database of common and specialty equipment available through local public works departments or commercial vendors that could be used to recover from an urban radiological release event. Developed in partnership with the Federal Emergency Management Agency (FEMA) and the Environmental Protection Agency (EPA), the RRLT helps the user understand what types of equipment might be available to accomplish general and specific recovery mission activities based on environmental and operational constraints. The purpose of the RRLT is to increase the resilience of communities by expediting recovery operations. The purpose of this guide is to familiarize users with this tool.




# Radiological Recovery Logistics Tool (RRLT)

## User Guide

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# Introduction

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The RRLT is a computer application that organizes information on equipment and assets that may be used to recover from a wide area release of radioactivity into the urban environment. The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) National Urban Security Technology Laboratory (NUSTL) funded Argonne National Laboratory (ANL) to build this Radiological Recovery Logistics Tool (RRLT, also “the Tool”), which contains a database of common and specialty equipment available through local public works departments or commercial vendors. Developed in partnership with the Federal Emergency Management Agency (FEMA) and the Environmental Protection Agency (EPA), the RRLT provides the user several approaches to understanding what types of equipment might be available to accomplish general and specific recovery mission activities, including mitigating doses to responders and recovery teams, surveying and monitoring the affected area during the recovery phase, decontaminating surfaces, handling and treating solid and liquid waste, and identifying issues related to critical infrastructure operations.

The RRLT database includes detailed information on the equipment’s everyday function, its effectiveness on different surfaces and forms of radioactive contaminants, the scale for which the equipment may be applied, the skill required of the operator, utility requirements, legal and environmental considerations, regional and local availability, waste generated, and cost. Other factors the Tool considers include prior uses in radiological environments, safety measures, and best practice guidance to ensure its effective use. Ultimately, a component of the Tool’s software called the “equipment recommendation wizard”<sup>1</sup> uses artificial intelligence (AI) to create output that lists and recommends equipment that could be used to help plan recovery operations. The Tool may be used in concert with applications previously developed by the EPA and DHS for radiological and nuclear response and recovery [e.g., the Rad Decon Tool within RadResponder (<https://www.radresponder.net/app/index>), the Waste Estimation Support Tool (<https://www.epa.gov/emergency-response-research/waste-estimation-support-tool-west>), as well as with prior international publications [e.g., the UK Recovery Handbooks for Radiation Incidents (<https://www.gov.uk/government/publications/uk-recovery-handbooks-for-radiation-incidents-2015>) and the Generic handbook for assisting in the management of contaminated inhabited areas in Europe following a radiological emergency (<https://eu-neris.net/library/handbooks/58-euranos-inhabited-areas-handbook-version-2/file.html>)].

This Tool is available as an installable Windows desktop application.

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<sup>1</sup> The equipment recommendation wizard is an autonomous software agent—a unit of artificial intelligence software that chooses actions based on its goals and percepts. The goal of this agent is to expedite the user’s arrival at a complete equipment list addressing the scenarios and conditions at hand.

# Methods

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The radiological equipment guidance information that populates the RRLT database is derived from a thorough literature review and collection of subject matter experts' opinions from workshops and interviews, as well as lessons learned from Japan's experiences with the Fukushima-Daiichi reactor accident.

The RRLT's hierarchically organized knowledge base is based on five top-level support goals that broadly define the types of activities that may be presented to emergency planners, emergency managers and response officials following a wide-area release of radioactivity in an urban environment. Each support goal is associated with one or more child *response scenarios*, specific missions to help accomplish that support goal. For example, the support goal of "Mitigation of dose to early responders" contains six response scenarios, including "move contaminated debris", "spray water", and "tarping and tenting".

Subsequently, each response scenario contains one or more *recovery methods*, more precise actions that can be performed to meet a response scenario. For example, the "spray water" response scenario listed above has eleven recovery methods associated with it, including "dust suppression", "high pressure washing", and "treatment of walls with ammonium nitrate".

Finally, each recovery method is associated with one or more equipment types that can be used to realize that recovery method. To illustrate, the "high pressure washing" recovery method has eight associated equipment types, including "mobile spray truck", "portable water trailer", and "pumps and piping".

The RRLT allows users to create an active plan to arrive at a list of recommended equipment based on the support goal(s), response scenario(s), recovery method(s), and other options selected by the user. This equipment list, the primary output of the Tool, contains equipment the user has added to the active plan based on the Tool's recommendations. Additional information about each selected equipment type is included in this equipment list, including its proper use, to support response officials and logisticians in understanding resource requirements.

# Key Concepts

## Knowledge Base

RRLT's knowledge base contains details on over 200 equipment types to facilitate the user's discovery and consumption of details most pertinent to a dynamically selected subset of recovery methods. The knowledge base organizes information hierarchically. At the top level of this hierarchy are the five *support goals*, such as "Mitigation of dose to first responders" and "Survey and monitoring of the contaminated area." Each support goal encompasses several *response scenarios*, for example, "Move Contaminated Debris" and "Track Contaminated Routes." Subsequently, each response scenario possesses one or more *recovery methods*, such as "Sediment Removal" and "Contamination Mapping." Finally, each recovery method contains one or more *equipment types* capable of realizing it. The type of facility affected is also addressed, since a particular facility type might present unique features that would affect the equipment or method chosen for a scenario or might impact the types of equipment to which the facility has access. See Figure 1 for a representation of this hierarchy.

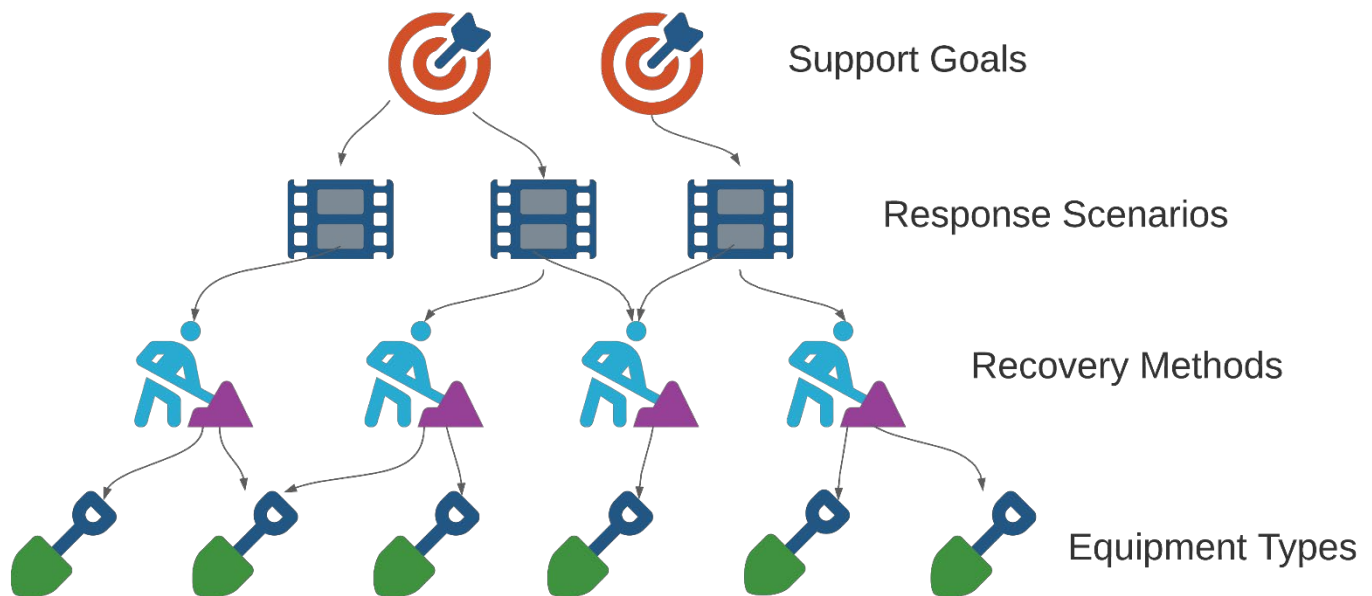


Figure 1 Hierarchical structure of the knowledge base

## Support Goals

The five support goals are the top-level items in the knowledge base. While these five are not intended to be exhaustive of all possible response, mitigation, and recovery efforts, they represent most potential categories of activities.

The five support goals are:

1. Mitigation of received dose to first responders
2. Containment of wastewater and other waste generated
3. Decontamination (gross and final) of building, vehicles, roadways, parks, and other surfaces
4. Waste management of solid waste
5. Survey and monitoring of the contaminated area

The purpose of the hierarchical structure of the knowledge base, starting with support goals, is to organize the potential sets of goals presented to the user into progressively more specific tasks or missions. This facilitates a user's ability to grasp the situation in a manageable form, and ultimately arrive at a list of equipment recommendations.

### Response Scenarios

Each support goal encompasses several response scenarios, which describe specific missions that require a response or recovery activity. Again, the scenarios included within each support goal are not exhaustive, but nonetheless cover most activities that would fall under that support goal category. Scenarios may be added in the future to better encompass response and recovery activities. Examples of response scenarios for the "wastewater containment" support goal include "prevent ingress to sewers", "store water", and "vertical surfaces".

The definition of specific response scenarios helps users to identify potentially important activities to expedite a response or recovery effort. These potential activities are listed in the RRLT as options to help select equipment or as concepts to help link other user-provided query options to relevant equipment types.

### Recovery Methods

Recovery methods define more precise actions that can be performed to address a response scenario. For instance, all equipment, tools, and methods related to excavation of earth are encompassed by the "dig", "dig and haul", "dig hole", and "dig trench" recovery methods.

## Equipment Types

The RRLT knowledge base groups equipment into types by form and function. The equipment types broadly encompass many pieces of equipment, and include equipment available through federal, state, local, or tribal or territorial (FSLTT), municipal, and private sector resources.

## Applicability

Applicability defines the utility of a particular type of equipment with respect to a given recovery method. Applicability includes information on the efficacy of the technique, references to technical information, the advantages and limitations of using the equipment, and best practices for equipment application. For example, applicability might provide information on how well a bulldozer can remove the recommended depth of grass and soil to achieve an expected decontamination level for contaminated earth.

## Observations

Depending on the selected support goals, the recommendation wizard will display observations, which are potentially impacted facility types. These major types are defined as areas with common physical characteristics that would require common recovery methods, e.g., buildings, living population, vehicle fleet. These facility type observations help the Tool's users craft inputs while creating an active plan. For instance, if the user adds the "Decontamination of buildings, vehicles, roadways ..." support goal to the active plan, the Tool's wizard will "observe" that this goal may include several facility types such as "Building Exterior" and "Continuous Outdoor Area." Observations prompt the user to add more specific information to the active plan and allow the wizard to recommend more useful tools and equipment options. That is, as user input includes impacted facility types, the Tool's AI *observations* have a direct impact on the plan options that are presented.

## Measurement

Measurements allow users to specify, for example, the amount of rain that has fallen since an incident to inform the creation of an active plan. Certain measurements impact the options presented when constructing a plan.

## Inference

The wizard employs an *inference engine* that uses AI algorithms to combine rules and facts from the knowledge base with observations and decisions supplied by the user to produce further options for that user. The first decision supplied to the wizard by the user is the support goal they are pursuing. With each subsequent iteration of user inputs, then, the wizard produces more precise – and ideally more useful – options prompting the user for information about the target environment, the contamination incident impacting that environment, relevant resource constraints, and ultimately the user’s determination as to whether a given recovery method or type of equipment should be included or at least explored.

The facts and rules contained in the knowledge base include assessments of cost and effectiveness for equipment types and recovery methods. These elements enable the wizard to infer the relative utility of a particular option with respect to its observations and the user’s decisions. The Tool’s user interface, then, highlights and prioritizes options that it assesses as having greater utility.

# Tool Installation and Operation (desktop application)

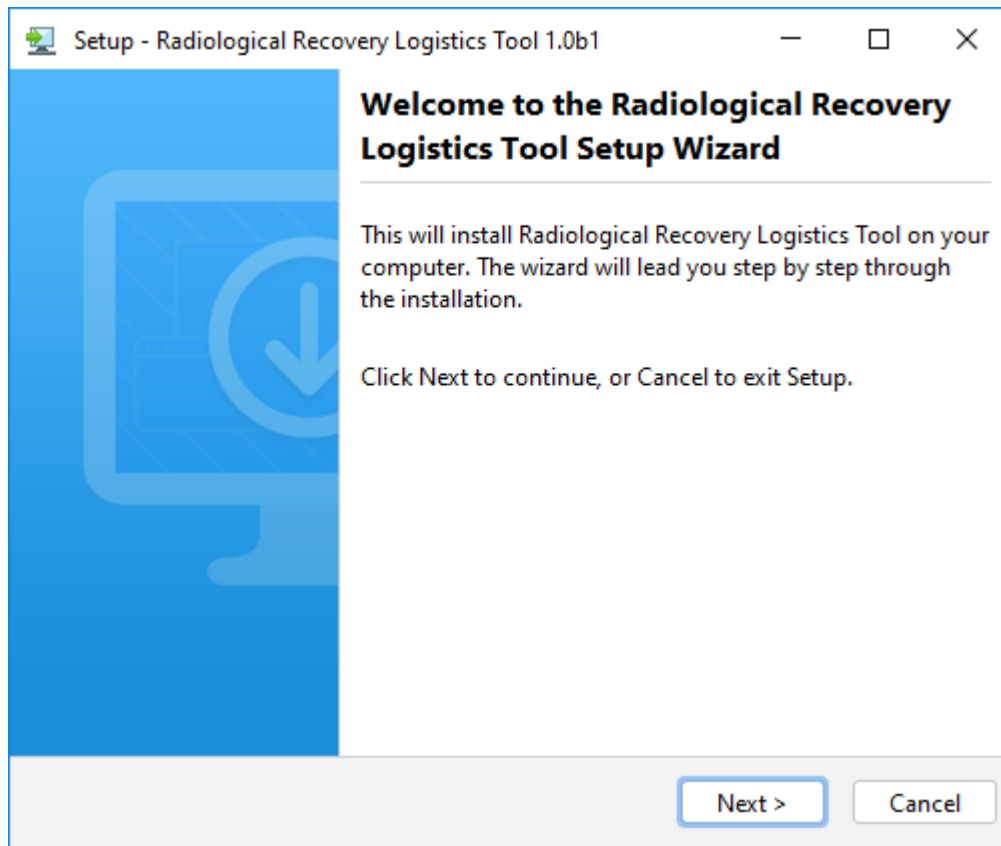
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This section applies only to installation and use of the Windows desktop application. Please note that there is a minimum hard drive space requirement of 521 MB.

## Installation

Follow these steps to install the Tool on a Windows machine.

1. Download the EXE installer package. For questions, contact [magnuson.matthew@epa.gov](mailto:magnuson.matthew@epa.gov)
2. Double-click the installer file
3. If displayed, click through the Windows security warning.
4. The following Setup screen is displayed. Click Next.



*Figure 2: Initial installation setup screen*

5. The next page of the setup wizard asks for the Tool's destination directory. A path in your user directory is selected by default, which bypasses the need for administrative credentials to install the program. Click Next after the preferred installation directory is specified.

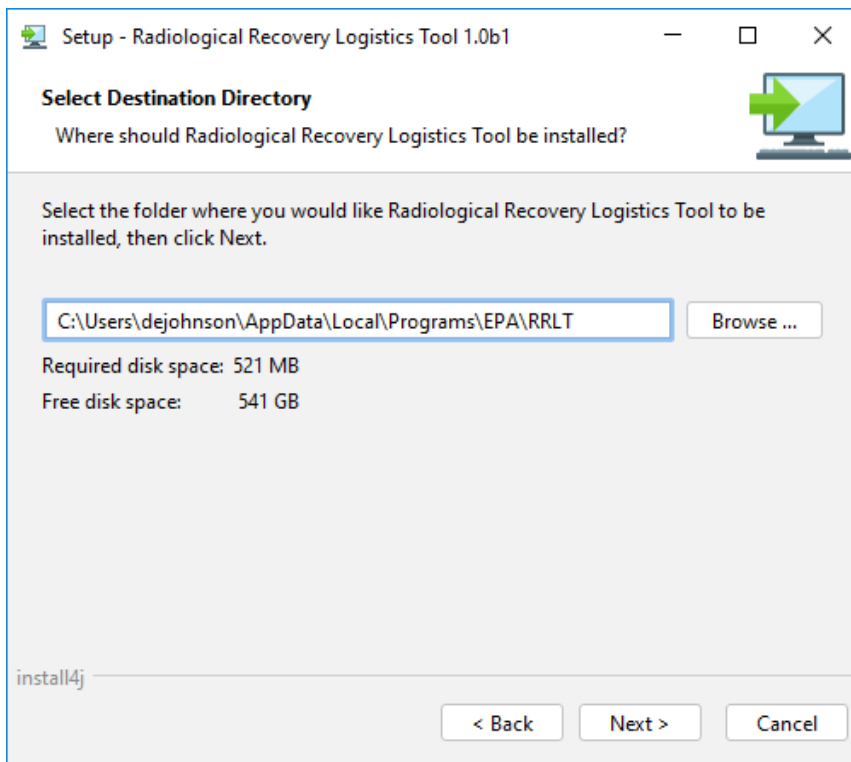


Figure 3: Setup destination directory screen

6. The following window indicates that the installation has completed. Click Finish.

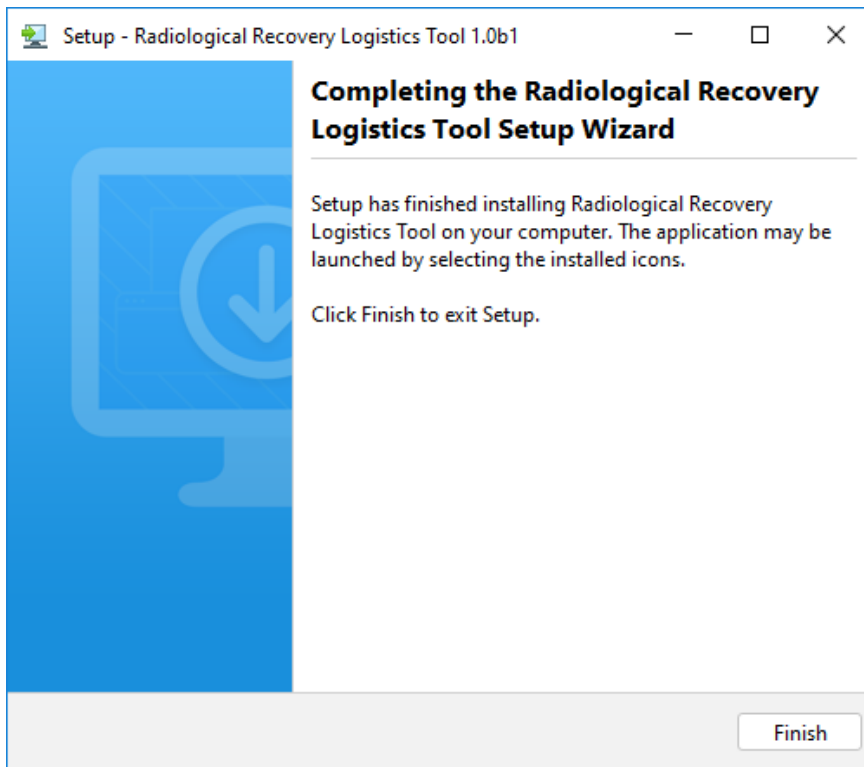


Figure 4: Installation completion screen

## Starting the Tool

1. After installation, the application may appear under “Recently added” in the Start menu. Performing a Start menu search for “Radiological” or “RRLT” will also find the application.
2. Clicking the application icon opens a Command window and a boot screen. The boot screen displays the application startup status in the upper left corner until the application is loaded. The boot screen is closed when startup is completed, and the desktop application splash page is opened in a new web browser tab or window. The Command window stays open in the background.

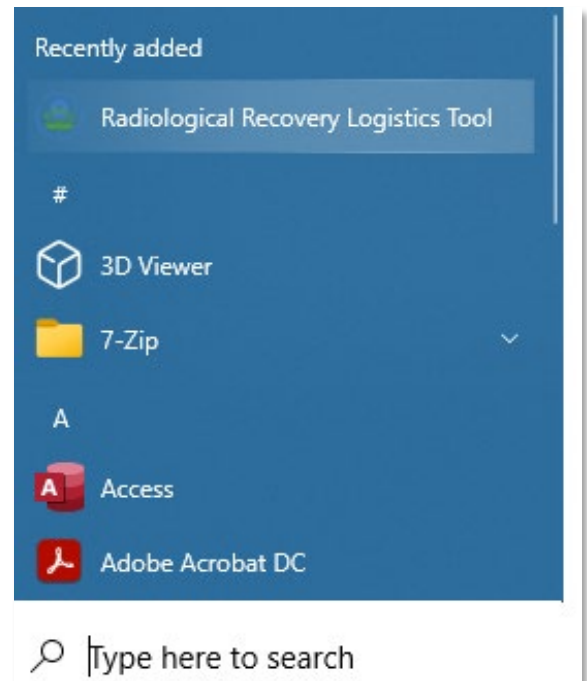


Figure 5: Windows Start menu



Figure 6: Boot screen

## Using the Tool

Most of the Tool's functionality is described elsewhere in this document. This section highlights a few key features of the desktop application.

### Splash Page

Because no authentication is needed to run the desktop application, the splash page only displays a "Click here to Start" button that, when clicked, opens the Tool's dashboard.



Figure 7: Desktop Tool splash page

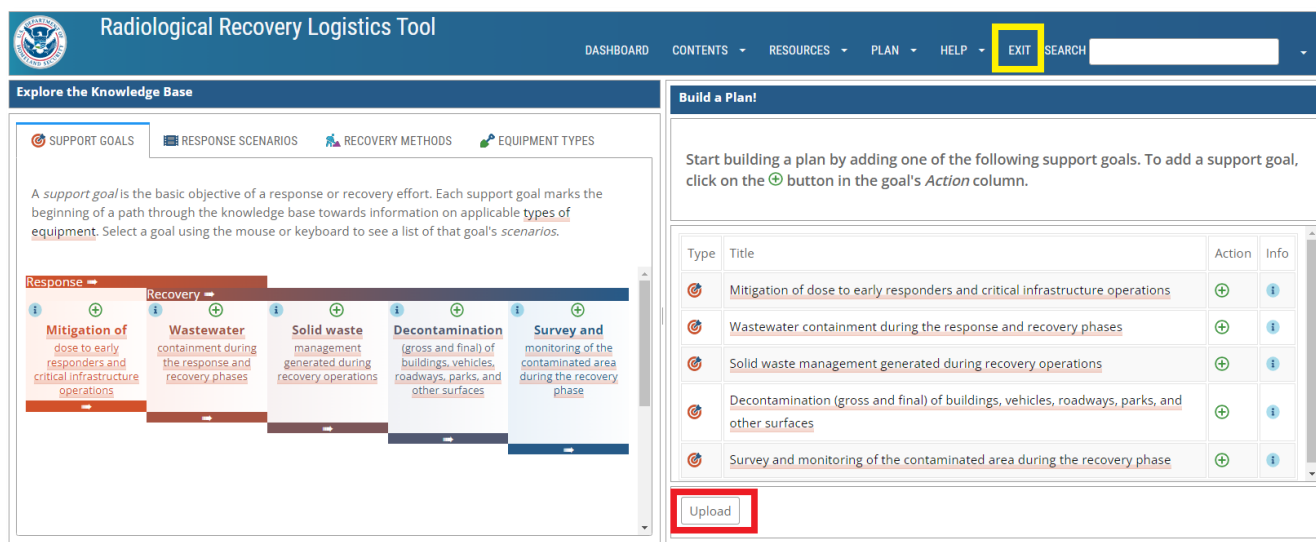


Figure 8: Desktop Tool Dashboard

## Plan Management

### Uploading a Plan

When launching the application, a single Upload button is displayed in the Active Plan Control Panel at the bottom right of the screen, which allows users to upload a previously downloaded plan. When clicked, Upload opens the Windows file browser to select a plan stored on the local computer to upload. Downloaded plans have an \*.rdf extension. When a plan is uploaded, the Active Plan screen shows the contents of the plan and the Subject Pane on the left side of the screen shows the plan Options.

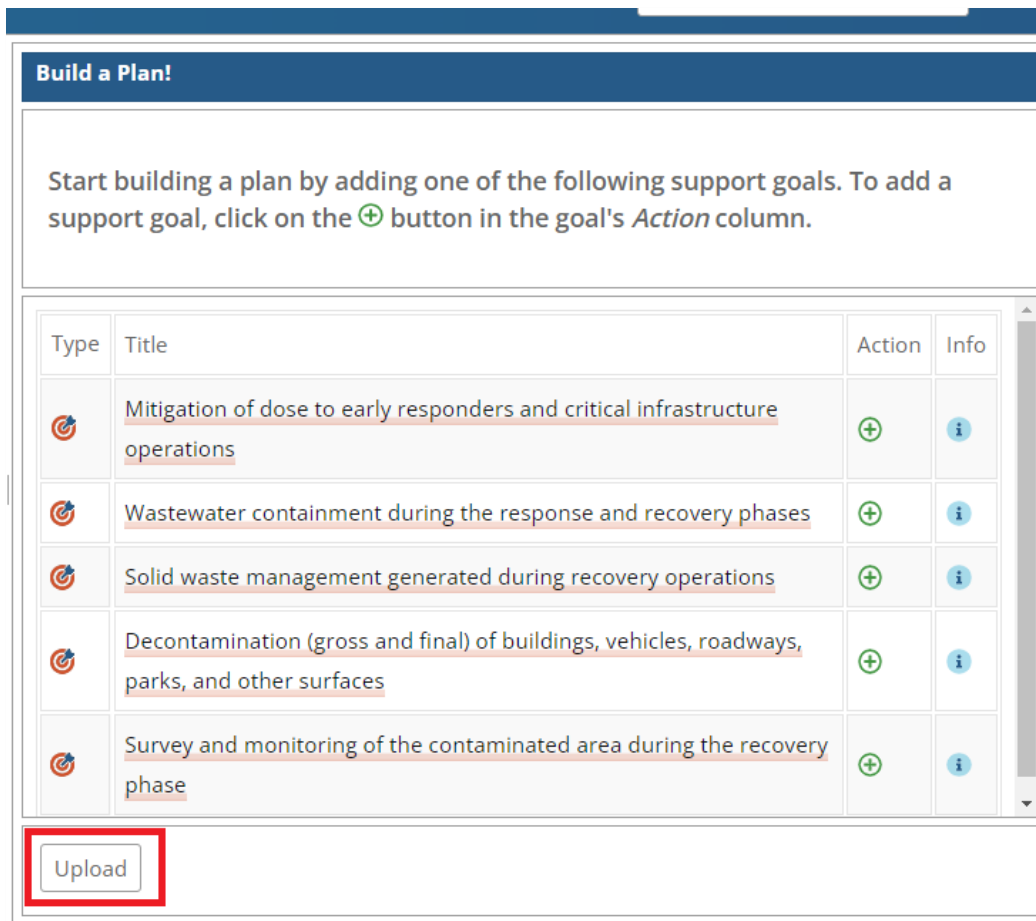


Figure 9: Default Desktop view of Active Plan and Active Plan Control Panel

### Downloading a Plan

When an Active Plan contains at least one item, the Active Plan Control Panel displays five buttons. Clicking the Download button will download the contents of the plan as an \*.rdf file to the browser's download directory.

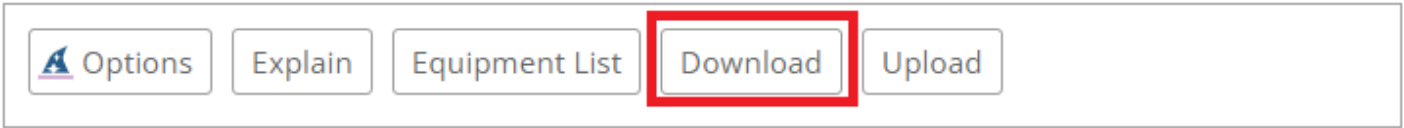


Figure 10: Active Plan Control Panel when plan has content

## Navigation Menu and Exiting the Application

The desktop application features an Exit menu option. When finished using the desktop application, select Exit from the navigation menu to ensure local resources are deallocated. Upon exiting the application, the Command window opened during launch will be closed automatically.



Figure 11: Exit option in navigation menu

## Site Dashboard

After successful authentication, the user is directed to the RRLT dashboard home page. This home page is comprised of four main sections, numbered in the diagram below.

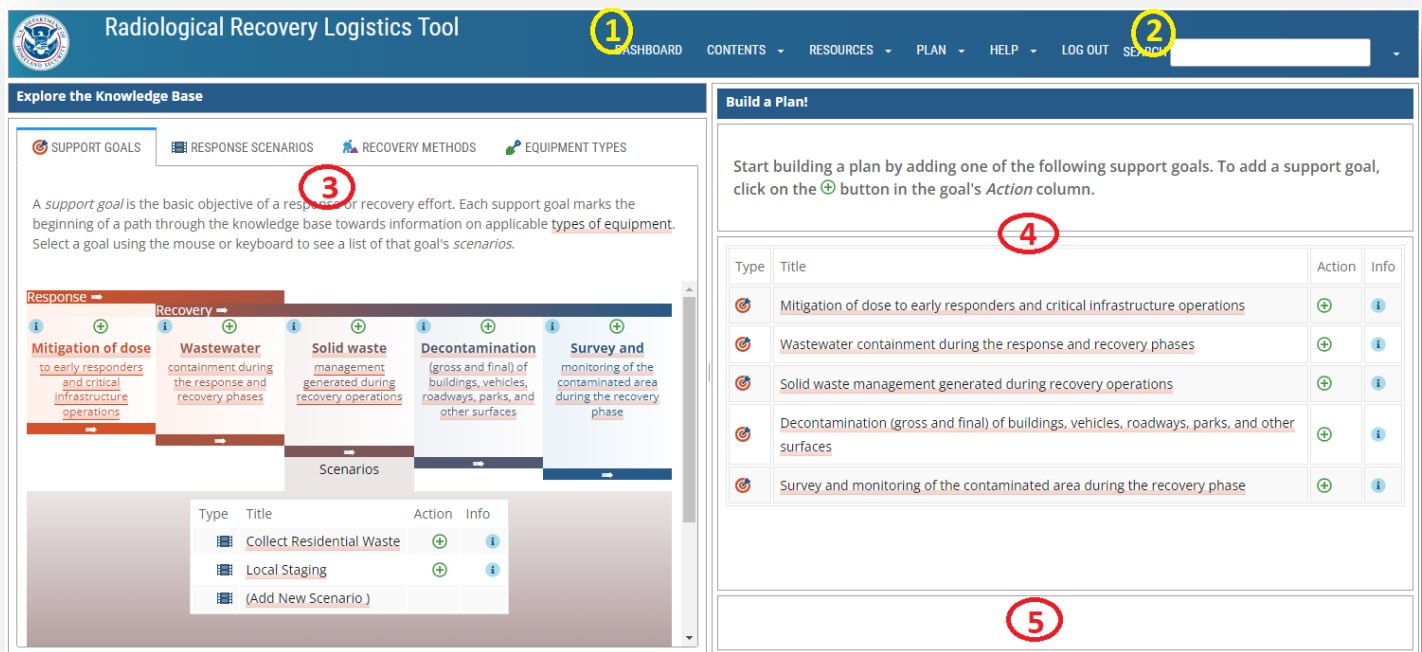


Figure 12: System Dashboard

These sections are:

- 1) **Navigation:** includes menus that expand to allow system navigation. These elements are detailed in this guide's *Navigation* section.
- 2) **Search:** The functionality of the search bar is detailed in this guide's *Searching the Knowledge Base* section.
- 3) **Subject Pane:** as the main view of the system this area displays a wide range of dynamic content based on user interaction. It displays search results, lists of items and their details, options to manage these items for the active plan, plan and inference explanations, and equipment lists. The default header "Explore the Knowledge Base" updates to reflect currently displayed content.
- 4) **Active Plan Pane:** located to the right, this area displays the contents of the active plan. If no plan is active, all five support goals are displayed, accompanied by instructions on how to start building a plan.
- 5) **Active Plan Control Panel:** at the bottom right of the screen, this displays four control buttons only when there is an active plan. "Options" allows the user to view options to select when creating or editing a plan. "Explain" displays decisions impacting the active plan. Buttons allowing users to view the equipment list and to save the active plan are also included in the Active Plan Control Panel.

# Navigation

The navigation bar at the top of the screen contains the following system navigation options: Dashboard, Contents, Resources, Plan, and Help. It also includes the search bar and the option to log out of the Tool.

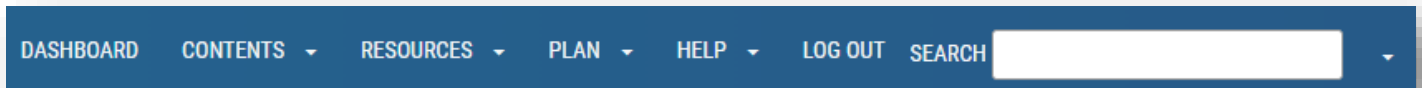


Figure 13: System navigation bar

## Dashboard

Clicking the Dashboard item in the navigation bar returns the user to the main dashboard, allowing the user to return to the home page at any time with just one click.

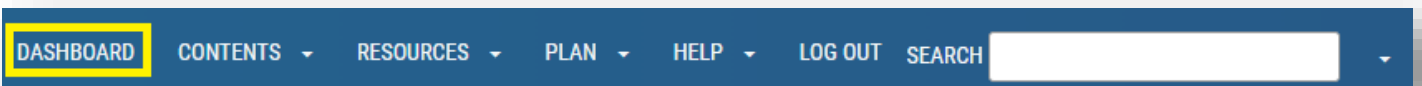


Figure 14: Dashboard menu item

## Contents

The Contents menu includes the following three items: Support Goals, Equipment Types, and Recovery Methods. Selecting each individual item will update the Subject Pane with corresponding content.

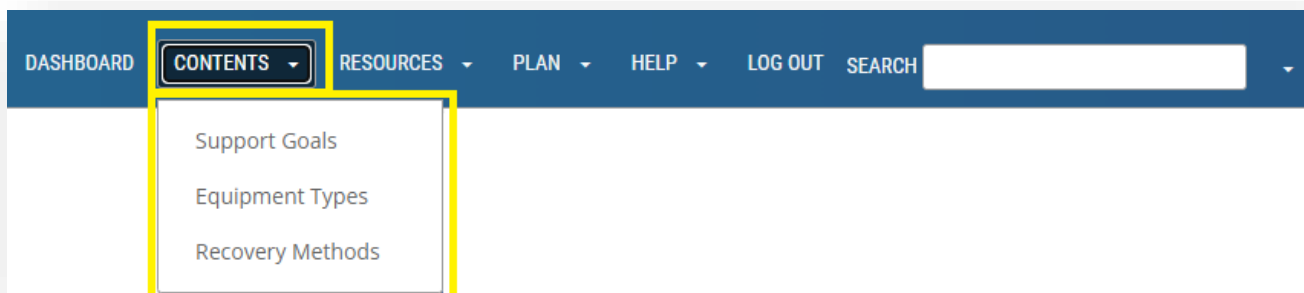


Figure 15: Contents menu items

## Support Goals

Selecting Support Goals from the Contents menu displays the support goals in the Subject Pane.
















Support Goals			
← Explore			
Type	Title	Action	Info
	Mitigation of dose to early responders and critical infrastructure operations		
	Wastewater containment during the response and recovery phases		
	Solid waste management generated during recovery operations		
	Decontamination (gross and final) of buildings, vehicles, roadways, parks, and other surfaces		
	Survey and monitoring of the contaminated area during the recovery phase		

Figure 16: Support Goals displayed in the Subject Pane

## Equipment Types

Selecting Equipment Types from the Content menu displays all equipment types contained in the RRLT knowledge base in the Subject Pane.



















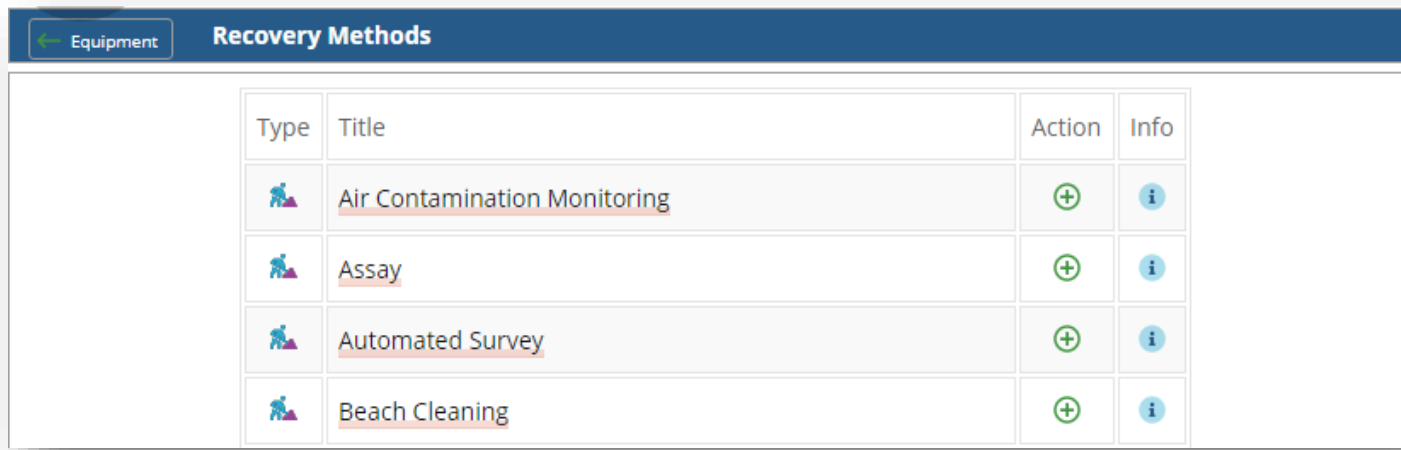
Equipment Types			
← Goals			
Type	Title	Action	Info
	1-ton waste bags		
	13.2-gallon/50-liter containers		
	55-gallon/200-liter drums		
	Ad hoc spray station		
	Agricultural aircraft		
	Agricultural sprayers		

Figure 17: Equipment Types displayed in the Subject Pane

## Recovery Methods

Selecting Recovery Methods from the Content menu displays all recovery methods contained in the RRLT knowledge base in the Subject Pane.















Recovery Methods			
<a href="#">← Equipment</a>	Type	Title	Action Info
		<a href="#">Air Contamination Monitoring</a>	 
		<a href="#">Assay</a>	 
		<a href="#">Automated Survey</a>	 
		<a href="#">Beach Cleaning</a>	 

Figure 18: Recovery methods displayed in the Subject Pane

## Resources

The Resources menu includes four items. The first three link to external resources: FEMA’s Incident Resource Inventory System, the WebEOC login page, and the RadResponder system. The final item, Model Basis Study, opens a 2018 document co-authored by DHS S&T NUSTL, the EPA’s National Homeland Security Research Center, and Argonne National Laboratory (ANL). This document describes much of the research and conclusions underpinning the functionality of the RRLT. Selecting any item from the Resources menu opens that resource in a new browser tab or window.

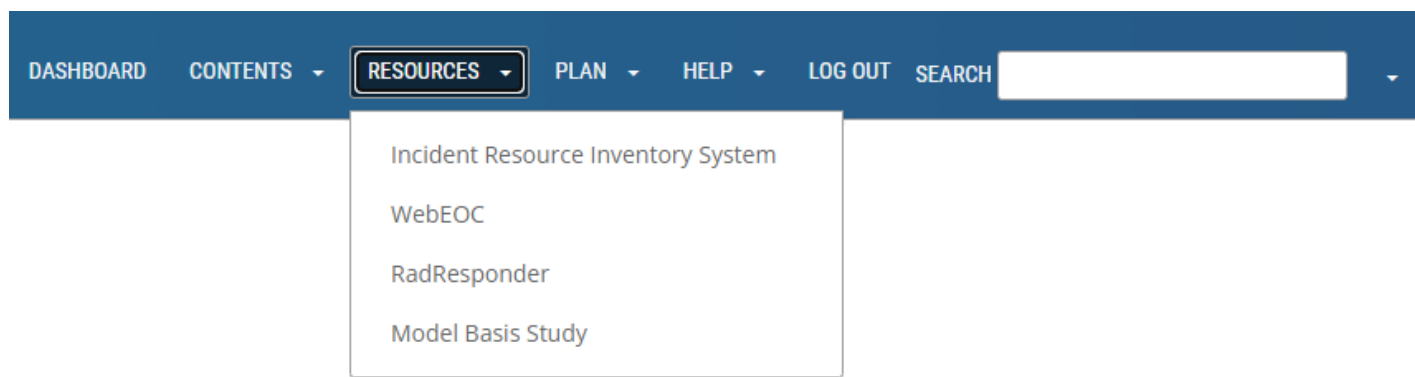


Figure 19: Resources Menu

## Plan

The Plan menu presents options for users to work on their active plan and to learn more about their equipment recommendations.

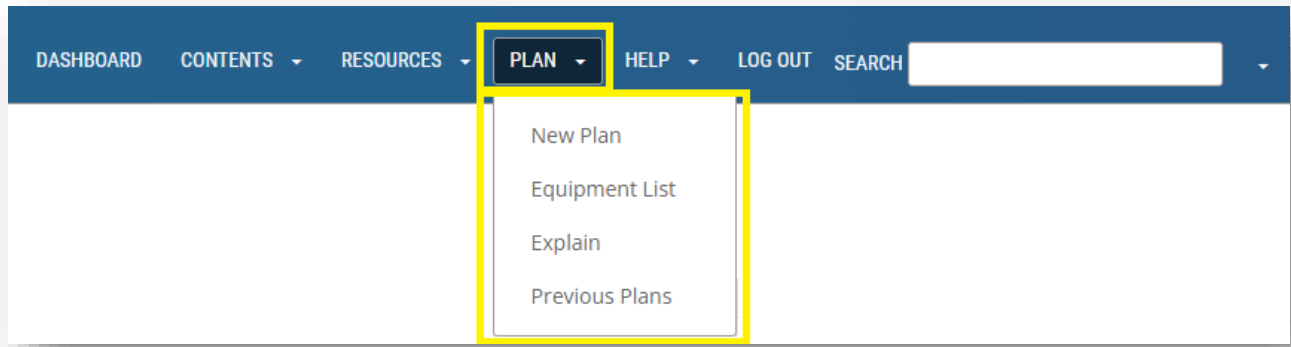


Figure 20: Plan Menu

## New Plan

Selecting the item New Plan will clear the Active Plan window (on right side of the home page) to start a new plan. The user can then begin adding support goals, response scenarios, recovery methods, observations, measurements, and equipment types to develop their new plan.

## Equipment List

Selecting Equipment List displays the selected equipment from the active plan in the Subject Pane on the left side of the screen.

## Explain

Selecting Explain populates the Subject Pane with an explanation of the decisions, observations, and inferences that inform the active plan. This can be viewed at any point during the development of the plan. An example of a plan explanation

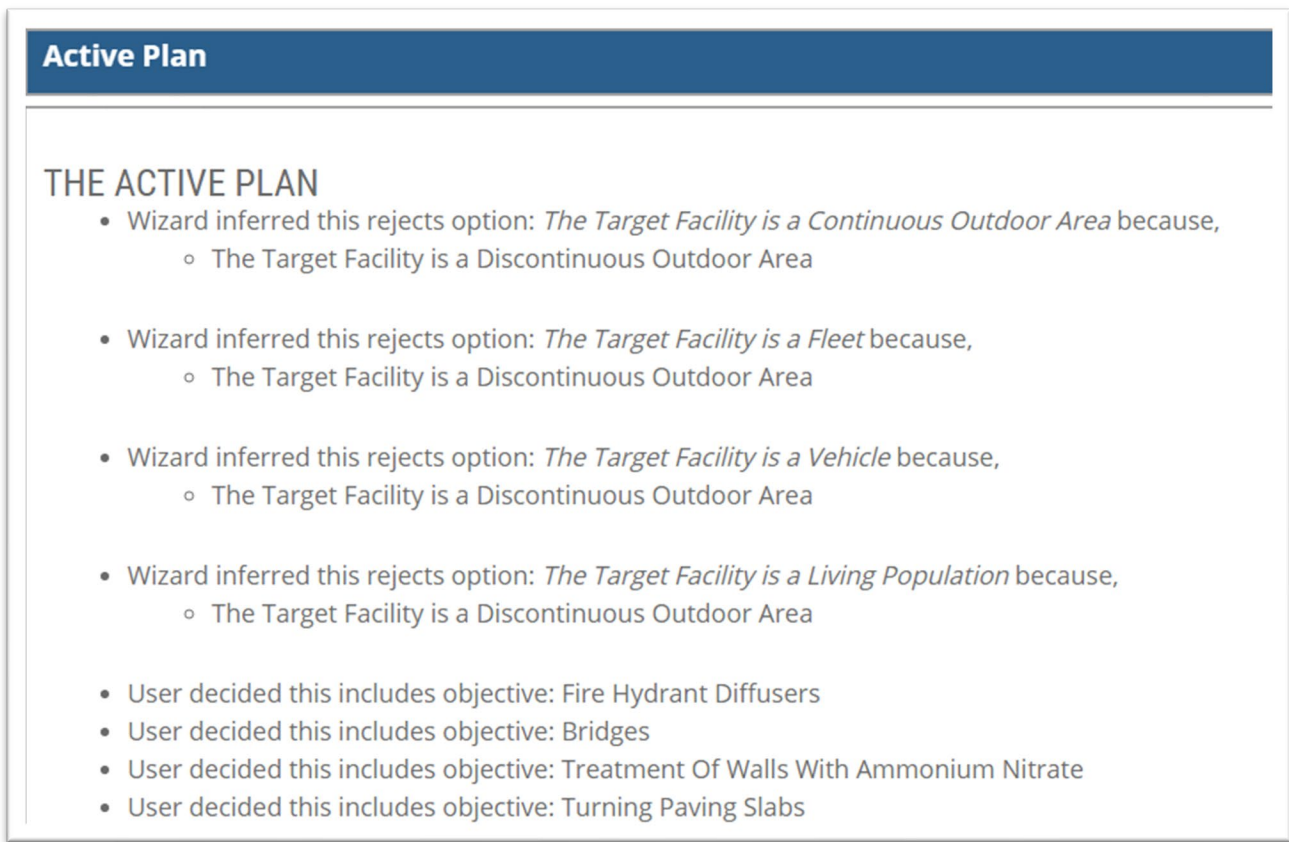


Figure 21: Plan explanation shown in Subject Pane

## Previous Plans

Selecting Previous Plans populates the Subject Pane on the left side of the screen with a list of plans the user has previously created. If the user has not previously created any plans, a message to that effect will be displayed.

## Help

The Help menu includes information about the RRLT and includes the following items: User Guide (which accesses this document), Contact Us, Security and Privacy Notices, Legend, and About. Selecting Contact Us, Legend or About displays the corresponding content in the Subject Pane. Depending on your browser settings, the User Guide will either be displayed in a new tab or downloaded to your computer. Selecting Security and Privacy Notices will display those respective notices from Argonne National Laboratory (<https://www.anl.gov/privacy-security-notice>) in a new window or tab.

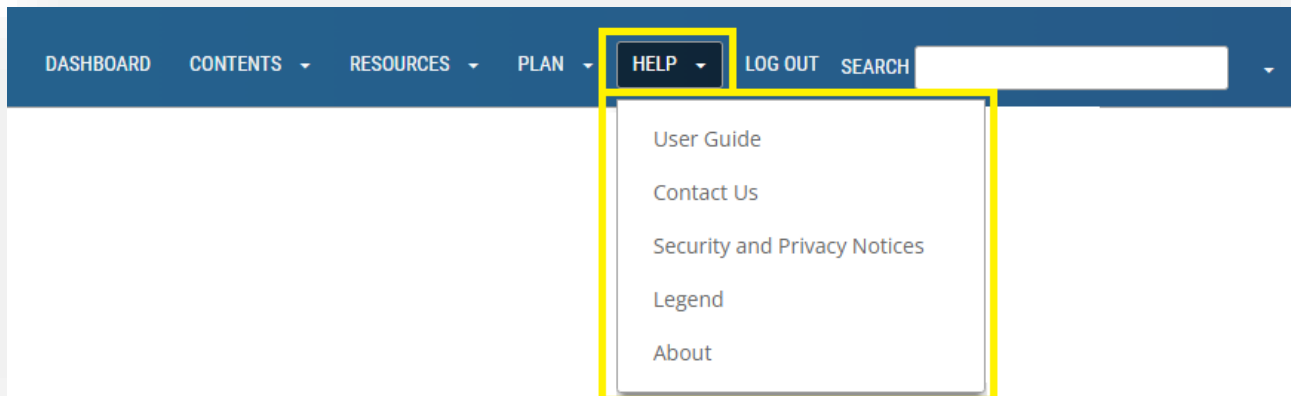


Figure 22: Help Menu

## User Logout

Logging out of the system is done by selecting Log Out from the menu.

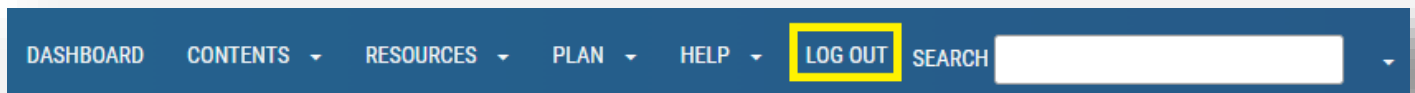


Figure 23: User Menu and Logout

# Searching the Knowledge Base

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## Main Search

The search box in the Navigation Bar supports simple and advanced searching of the entire knowledge base.

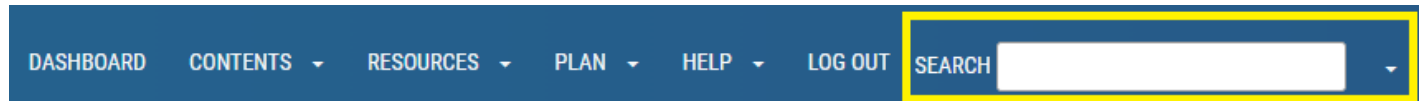


Figure 24: Main Search in the Navigation Bar

## Simple Term Search

To search for a single term, type the term into the search box. The search for **recovery** will return all items with a field value containing the text “recovery.”

## Phrase Search

To search a phrase, type the phrase into the search box surrounded by quotes. For example, typing **“radiation dose”** into the main search box will return matches for items with field containing the text “radiation dose.” It will not match items containing only one of those words or items where both appear but not in that order.

## Simple Term Search with AND

To use a simple term search with an AND operator, where multiple search conditions must be met for an item to be included in the results, add the text **AND** or **&&** between search terms. A search for **recovery AND method** will return items containing both “recovery” and “method” in one of its fields. Another way to express the same query is **recovery && method**.

## Phrase Search with AND

Using quoted phrases with an AND operator will return all items containing both target phrases. For example, **“radiation dose” AND “recovery method”** returns all items containing “radiation dose” in at least one field that also have “recovery method” in at least one field.

## Simple Term Search with OR

A simple term search using OR returns all items that contain any one of the conditions specific in the query. This search uses the operators **OR** or **||** (vertical bars). An example search is **active OR plan**, which can also be expressed as **active || plan**; both queries will return matches that contain either “active” or “plan.”

Searching multiple words *not* surrounded by quotes will also perform an OR search, where any entry matching at least one of the words will be returned.

### Phrase Search with OR

Using quoted phrases with the OR operator returns results containing specific parameter. For the search **“radiation dose” OR “recovery method,”** items in the result list may contain either search phrase in one of their fields.

### Simple Term Search with NOT

A negation search identifies content that should not appear in the search results and uses the operator **NOT**. For example, typing **radiation AND NOT dose** into the search will return all items matching “radiation” that do not include the word “dose.” A search for **radiation OR NOT dose** will return all items with a field matching “radiation” as well as items that do not contain “dose” in any metadata field.

### Phrase Search with NOT

Negation here works the same as it does with a simple search. Searching for **“radiation dose” AND NOT “recovery method”** returns all items containing “radiation dose” in a field that also do not contain “recovery method” in any field. A search for **“radiation dose” OR NOT “recovery method”** returns all items that either have “radiation dose” in a field or do not have “recovery method” in a field.

### Single Term Search Including Numbers

A single term search including numbers matches an alphanumeric term to an item’s field. A search for **abc123** would match items containing the text “abc123”.

### Phrase Search Including Numbers

A phrase search including numbers is formatted the same as a normal phrase search. For example, **“55 gallon”** will return all items containing the text “55 gallon.” Numeric values with decimals should also be surrounded by quotes, e.g., “0.062”.

### Faceted Search

There is also a faceted field search available by clicking the down arrow to the right of the main search box. This allows more targeted searches based on the fields presented: Name, Description, Alias, and Advantages. Each entry typed into a field will function as a phrase search for that field; terms like AND, OR, and NOT cannot be used in the faceted search. Each category and any combination of categories can be searched. Results of a search will appear in the Subject Pane. The Reset clears the search fields for the input of new criteria.

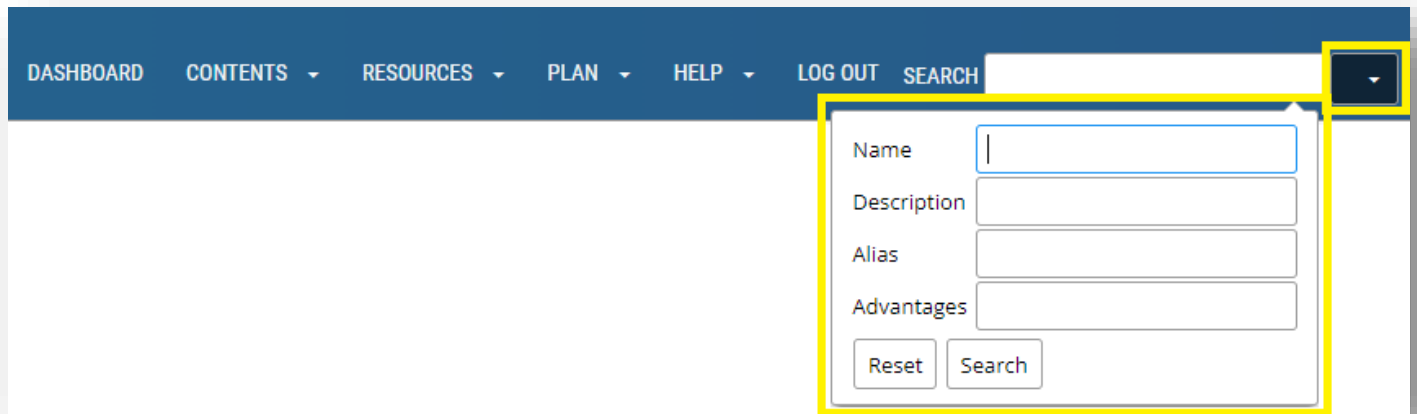


Figure 25: Faceted Search Fields

## Exploring the Knowledge Base

In addition to menu-based navigation, the Tool supports users directly exploring the underlying knowledge base. Clicking the Dashboard menu option (Figure 17) returns users to the default dashboard view, which displays four tabs: Support Goals, Response Scenarios, Recovery Methods, and Equipment Types. Clicking on each tab will display associated entries and/or information for that aspect of the knowledge base. Each item that appears in the panel is hyperlinked, allowing the user to explore further details for that item and its hierarchy.

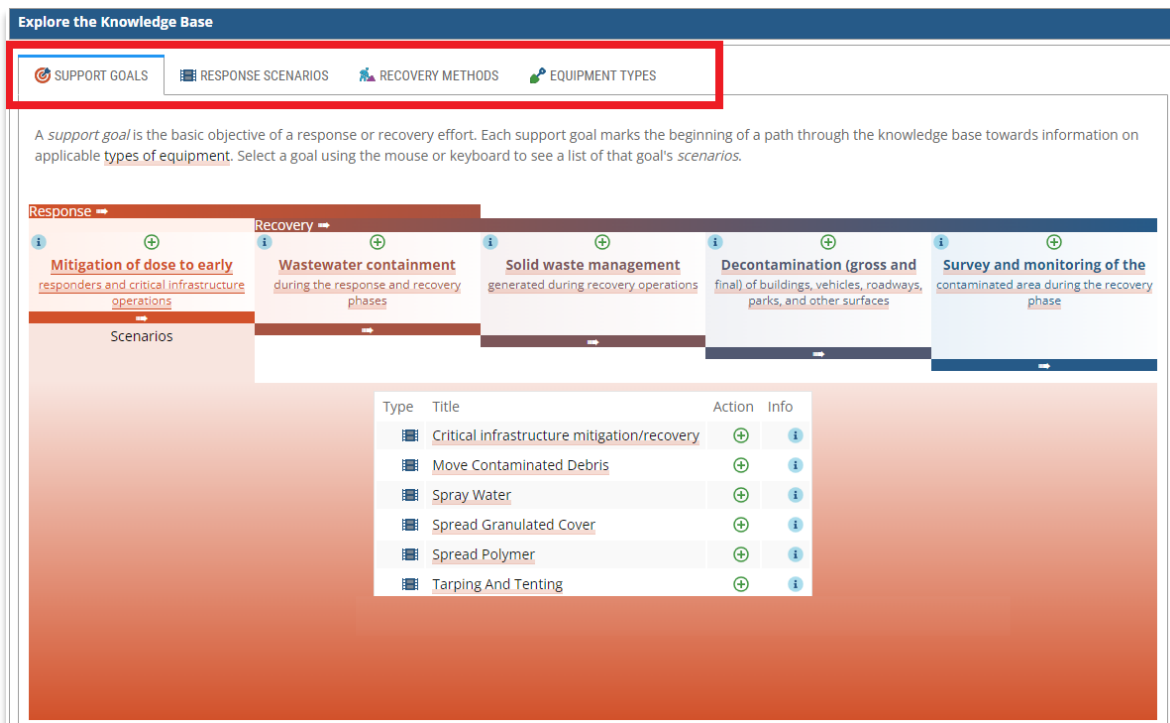
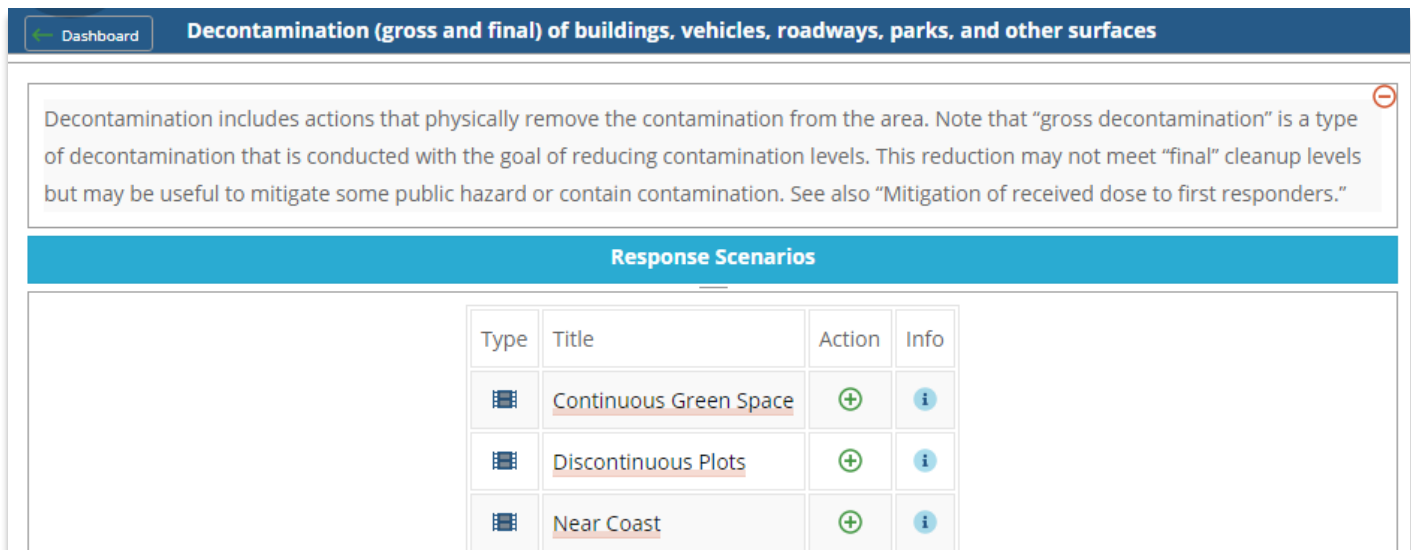


Figure 26: Dashboard Tabs

## Exploring a Support Goal

Clicking a hyperlinked Support Goal will display its definition and the list of Response Scenarios associated with it.



Decontamination includes actions that physically remove the contamination from the area. Note that "gross decontamination" is a type of decontamination that is conducted with the goal of reducing contamination levels. This reduction may not meet "final" cleanup levels but may be useful to mitigate some public hazard or contain contamination. See also "Mitigation of received dose to first responders."










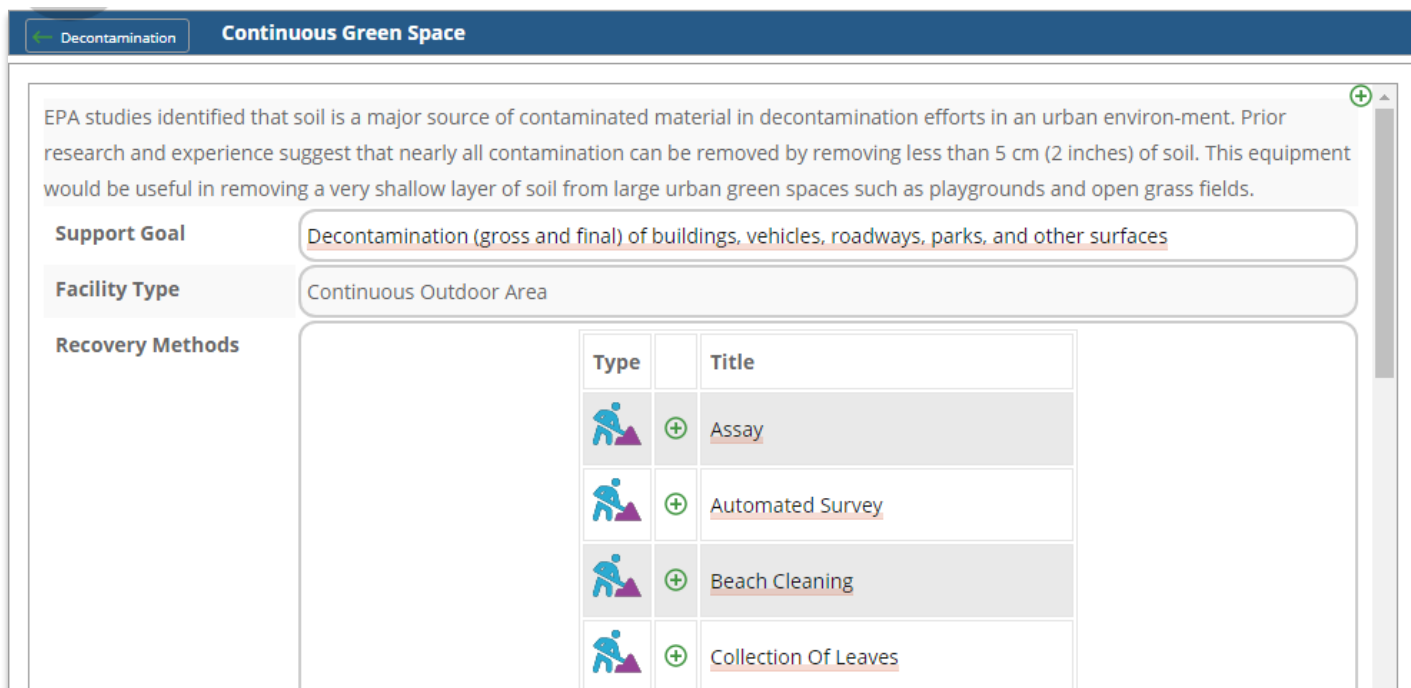
Response Scenarios			
Type	Title	Action	Info
	<a href="#">Continuous Green Space</a>		
	<a href="#">Discontinuous Plots</a>		
	<a href="#">Near Coast</a>		

Figure 27: Exploring a Support Goal

## Exploring a Response Scenario

Clicking a hyperlinked Response Scenario will display its definition, the Support Goal it belongs to, and the list of Recovery Methods associated with it.



EPA studies identified that soil is a major source of contaminated material in decontamination efforts in an urban environment. Prior research and experience suggest that nearly all contamination can be removed by removing less than 5 cm (2 inches) of soil. This equipment would be useful in removing a very shallow layer of soil from large urban green spaces such as playgrounds and open grass fields.

**Support Goal** [Decontamination \(gross and final\) of buildings, vehicles, roadways, parks, and other surfaces](#)

**Facility Type** Continuous Outdoor Area

**Recovery Methods**





Type	Title
	<a href="#">Assay</a>
	<a href="#">Automated Survey</a>
	<a href="#">Beach Cleaning</a>
	<a href="#">Collection Of Leaves</a>

Figure 28: Exploring a Response Scenario











## Exploring a Recovery Method

Clicking a hyperlinked Recovery Method will display its definition, the Equipment Types associated with it, and the Response Scenarios with which it is associated.

[← Continuous](#) **Collection Of Leaves**

Collect leaves by manual or mechanical means.

**Equipment Types**

Type		Title
		<a href="#">Crop duster or mobile spray for defoliation</a>
		<a href="#">Current city resources for fallen tree removal</a>
		<a href="#">Hand Sweeping/Raking</a>
		<a href="#">Lawn sweeper vacuum</a>
		<a href="#">Vacuum trucks</a>

**Scenarios**







Type		Title
		<a href="#">Continuous Green Space</a>
		<a href="#">Debris</a>
		<a href="#">Discontinuous Plots</a>

Figure 29: Exploring a Recovery Method

## Exploring an Equipment Type

Clicking a hyperlinked Equipment Type will display its definition, the Recovery Methods with which it is associated, and details specific to using this equipment for recovery operations. Those details may include:

- Identifier
- Name
- Alias
- Description
- Guidance
- Advantages
- Limitations
- Target
- Counter Indications
- FEMA Resource Type ID
- Availability
- Cost Rating
- Cover Material Distribution
- Coverage Rate (ft<sup>2</sup>/h)
- Depth Control
- Material Transfer Capacity
- Reduction in Contamination on the Surface
- Reduction in Resuspension
- Reduction in Surface Dose Rates
- Required Skill Rating
- Scale of Application (square miles)
- Waste Material Containment Capacity
- Water Control
- Applications
- Applicable Surface
- Photographs

Back

Bulldozer

Large engine powered wheel or tractor system with lift arms and blade attachment for flattening the ground by moving dirt, sod, and debris usually for larger area and volume applications.

Advantages	Larger coverage with less-precise control than smaller shovel trucks.								
Limitations	Depth control. Less effective at removing shallow layers than smaller diggers.								
Target	Grass, soil, shrubs, small trees, medium trees, large trees								
FEMA Resource Type ID	7-508-1087								
Cost Rating	\$\$\$								
Depth Control	★☆☆								
Reduction In Contamination on the Surface	95.00%								
Reduction In Resuspension	0.00%								
Reduction In Surface Dose Rates	95.00%								
Required Skill Rating	☑☑☑								
Scale of Application (square miles)	1								
Applications	<table> <thead> <tr> <th>Type</th> <th>Title</th> </tr> </thead> <tbody> <tr> <td>+</td> <td>Cover Contamination</td> </tr> <tr> <td>+</td> <td>Debris Collection</td> </tr> <tr> <td>+</td> <td>Dig And Haul</td> </tr> </tbody> </table>	Type	Title	+	Cover Contamination	+	Debris Collection	+	Dig And Haul
Type	Title								
+	Cover Contamination								
+	Debris Collection								
+	Dig And Haul								

Images

Figure 30: Exploring an Equipment Type

# Active Plan Controls

---

Active plan controls are used to manage and view information about entries in the Active Plan. Some controls only appear on the left of the page in the Subject Pane, while others appear in both the Subject Pane on the left and the Active Plan Pane on the right side of the page.

## Subject Pane

### Add

Adds an item to the active plan. This action is only available in the Subject Pane for items not currently part of the active plan. Clicking this icon will add that item to the Active Plan Pane and will refresh the list of options displayed in the Subject Pane to account for the latest addition.

### Edit

The Edit icon allows the user to enter or edit measurement values. It appears when the user is presented with options in the Subject Pane. After the value is saved, that measurement is added to the active plan.

### Reject

The Reject icon is displayed for options presented in the Subject Pane. Clicking this icon next to an option that is in the Active tab moves it to the Rejected tab, which only appears if at least one option has been rejected. Rejecting items not applicable to the active plan streamlines the options presented, removing not only the rejected option but any of its associated suggestions and inferences.

### Defer

The Defer icon appears when a user is presented with options in the Subject Pane. Clicking the defer icon next to an option in the Active tab moves it to the Deferred tab, which only appears if at least one option has been deferred. Like Reject above, using Defer reduces the options presented, but can also be used set aside specific items to revisit later in the plan's development.

### Reinstate

The Reinstate icon is displayed for those options a user has rejected or deferred. Clicking this icon moves the associated option back to the Active tab.

## Subject and Active Plan Panes

### Delete

Only available for items in an active plan, clicking this icon in either the Subject or the Active Plan Pane removes an item from the active plan and refreshes the list of options displayed in the Subject Pane to account for the deletion. The Active Plan Pane is also refreshed to reflect the change.

## Information

The Information icon displays additional details for associated items when the user hovers over it with the mouse. Additionally, when plan options are presented to the user in the Subject Pane, clicking an information icon will open a new window that explains why the associated item appears in the options list.

## Recommendation

A light bulb with an exclamation mark appears next to options recommended by the system based on inference. The degree of the icon's opacity corresponds to the system's certainty of the recommendation with a darker icon indicating a stronger recommendation. Recommendations in the Options view are ordered by default from highest certainty to lowest.

# Creating an Active Plan


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## Active Plan Pane

The RRLT allows users to create an active plan to arrive at a list of recommended equipment based on the support goal(s), response scenario(s), recovery method(s), and other options selected by the user. The Active Plan Pane appears on the right-hand side of the screen and is continually refreshed as options are added and removed from the plan.

The starting Active Plan window (shown in Figure 34) is displayed when first logging in to the Tool or when a user selects Plan/New Plan from the navigation bar. This starting view of an active plan displays brief instructions for getting started and all five support goals from which to choose to begin creating the plan.

Active Plan

Start building the active plan by adding one of the following support goals. To add a support goal, click on the  button in the goal's *Action* column.







































Type	Title	Action	Info
	<u>Containment of wastewater and other waste generated during the response and recovery phases</u>		
	<u>Decontamination (gross and final) of buildings, vehicles, roadways, parks, and other surfaces</u>		
	<u>Mitigation of received dose to first responders</u>		
	<u>Survey and monitoring of the contaminated area</u>		
	<u>Waste management of solid waste generated during recovery operations</u>		

Figure 31: Active Plan Pane starting view

## Active Plan Control Panel

The Active Plan Control Panel is displayed whenever an active plan is open. This control panel, comprised of four buttons, is displayed on the right side of the page below the Active Plan Pane.

**Active Plan:** 

Type	Title	Actions	Info
	<u>Collection Of Leaves</u>		
	<u>Mitigation of dose to early responders and critical infrastructure operations</u>		
	<u>Rake</u>		
	Plan Urgency % is 41.0		
	<u>Pressure washer</u>		
	<u>Move Contaminated Debris</u>		
	<u>Vacuum Cleaning</u>		
	The Target Facility is an Area		


 Options Explain State Equipment List Save

Figure 32: Active Plan Control Panel

Active plan options are displayed in the Subject Pane on the left side of the screen. These options are continually updated as the plan is built, as the user's cumulative selections guide the system to identify, filter, and present relevant options and inferences. Any time an active plan is open, the Options button in the Active Plan Control Panel at the bottom right of the page will load that plan's options on the left side of the screen.

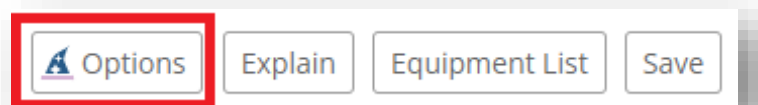



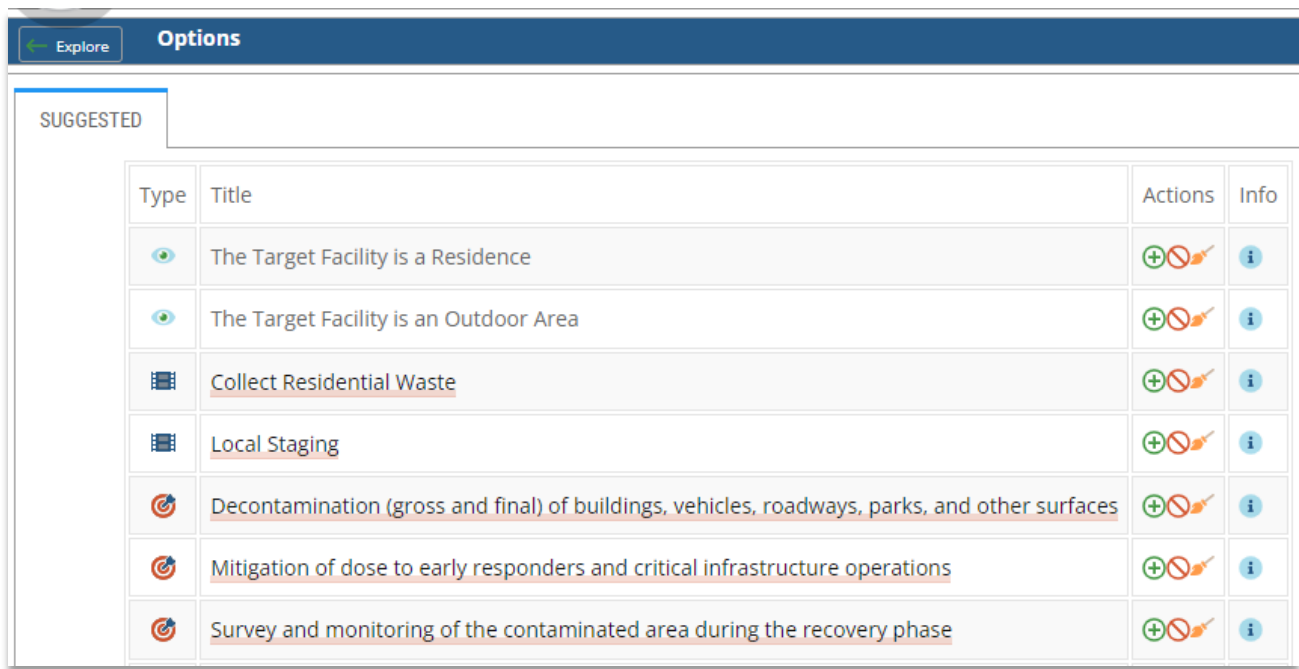


Figure 33: Options button in the Active Plan Control Panel

Figure 37 shows the options presented after the support goal “Solid waste management generated during recovery operations” is added to the plan. In this case, three types of items are displayed: “Observations,” “Response Scenarios” and “Support Goals.”

- Clicking the green plus sign  adds that option to the plan
- Clicking the red “Reject” icon  moves the option to a “Rejected” tab in the “Options” pane
- Clicking the “Defer” icon  moves the option to a “Deferred” tab in the “Options” pane.

Rejecting and deferring unneeded items keeps the Options view uncluttered and provides additional information to the system for presenting relevant content.






































Type	Title	Actions	Info
	The Target Facility is a Residence	  	
	The Target Facility is an Outdoor Area	  	
	<u>Collect Residential Waste</u>	  	
	<u>Local Staging</u>	  	
	<u>Decontamination (gross and final) of buildings, vehicles, roadways, parks, and other surfaces</u>	  	
	<u>Mitigation of dose to early responders and critical infrastructure operations</u>	  	
	<u>Survey and monitoring of the contaminated area during the recovery phase</u>	  	

Figure 34: Active plan options are displayed right after a Support Goal is selected

Only when using the Options view does the Information icon work in two different ways: hovering the mouse over the icon shows details about the option and clicking the icon displays an explanation for why the system presented this option.

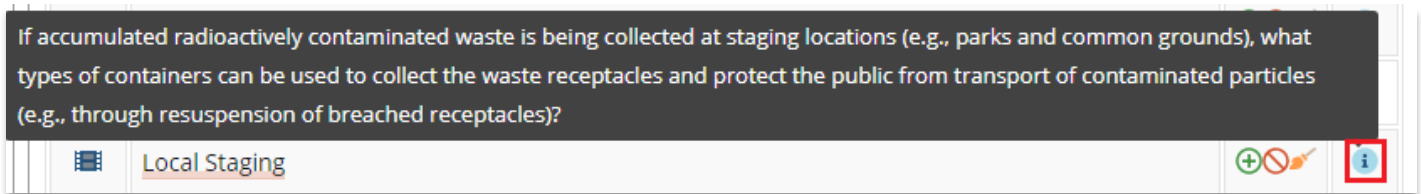


Figure 35: Hovering over Information Icon

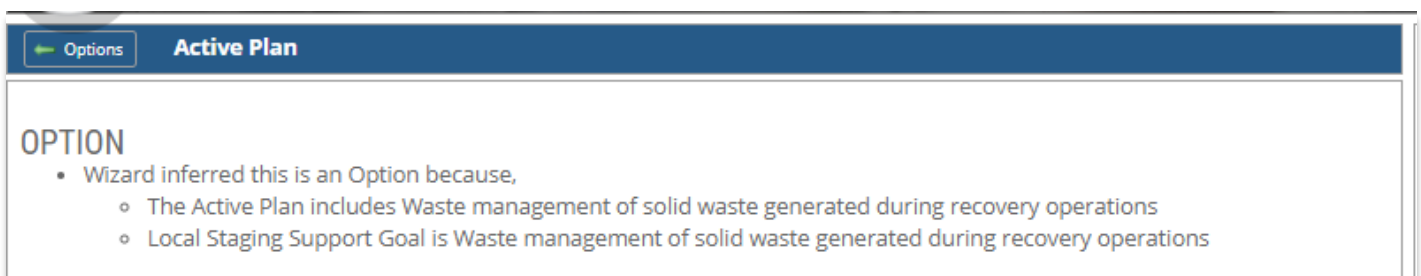


Figure 36: Clicking Information icon

## Adding Additional Items to the Plan

In addition to selecting from amongst options presented by the Tool, the user may explore the knowledge base independently and add content as needed by clicking the green plus icon next to any options presented.

# Viewing Plan Details

Figure 40 is a sample of a final active plan. Various options were added from the Options pane, as described above.
























Active Plan: 			
Type	Title	Actions	Info
	<u>Pressure And Fire Hosing</u>		
	<u>Mobile spray truck</u>		
	<u>Decontamination (gross and final) of buildings, vehicles, roadways, parks, and other surfaces</u>		
	<u>Decon Building Exterior</u>		
	<u>Existing high-pressure hoses (e.g., firefighting hoses) and personnel</u>		
	The Target Facility is an Area		
	The Target Facility is a Composite Area		
	The Target Facility Estimated Number of Commercial Units is 20		
	The Target Facility is a Building Exterior		
<div> Options</div> <div>Explain State</div> <div>Equipment List</div> <div>Save</div>			

Figure 37: Sample Final Active Plan

## Viewing the Plan Explanation

The Explain button on the Active Plan Control Panel allows a user to view the plan explanation in the Subject Pane on the left side of the screen.

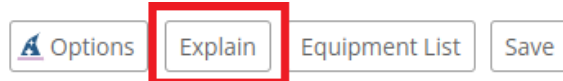


Figure 38: The Explain button

**Active Plan**

### PLAN

- Wizard inferred this rejects option: *The Target Facility is a Discontinuous Outdoor Area* because,
  - The Target Facility is a Building Exterior
- Wizard inferred this rejects option: *The Target Facility is a Fleet* because,
  - The Target Facility is an Area
- Wizard inferred this rejects option: *The Target Facility is a Vehicle* because,
  - The Target Facility is an Area
- Wizard inferred this rejects option: *The Target Facility is an Outdoor Area* because,
  - The Target Facility is a Building Exterior
- Wizard inferred this rejects option: *The Target Facility is a Continuous Outdoor Area* because,
  - The Target Facility is a Building Exterior
- Wizard inferred this rejects option: *The Target Facility is a Living Population* because,
  - The Target Facility is an Area
- User decided this includes objective: Pressure And Fire Hosing
- User decided this includes objective: Mobile spray truck
- User decided this includes objective: Decontamination (gross and final) of buildings, vehicles, roadways, parks, and other surfaces
- User decided this includes objective: Decon Building Exterior
- User decided this includes objective: Existing hoses (e.g., firefighting hoses) and personnel

### THE TARGET FACILITY

- Wizard inferred this is an Area because,
  - The Target Facility is a Composite Area
  - Composite Area is a kind of Area
  - Area is a kind of Facility
- Wizard inferred this is a Composite Area because,
  - The Target Facility is a Building Exterior
  - Building Exterior is a kind of Composite Area
  - Composite Area is a kind of Facility

Figure 39: Plan Explanation

Viewing the Equipment List

The Equipment List button below the Active Plan allows a user to view the final equipment list in the Subject Pane on the left side of the screen.

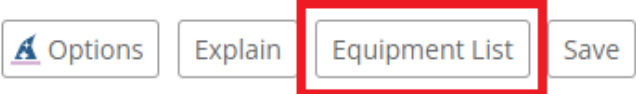


Figure 40: The Equipment List button

Active

Active Plan

MOBILE SPRAY TRUCK

Alias

truck-mounted fogging units, fogging truck, truck-mounted sprayer, mosquito control spray truck, insect fogger, Spray truck, mosquito truck, insecticide fogger

Applications

Pressure And Fire Hosing

Description

Truck mounted spray system can be modified to spray defoliation agents to promote dropping of contaminated leaves.

Guidance

Use the mobile spray trucks to spray defoliation agents/chemical sprays to induce leaf falls prior to them being collected UK 146). Use polythene sheeting/netting under tress to isolate falling leaves from the ground and air in the collection of leaves (UK 146).

Target

Follage

Cover Material Distribution

Above Average

☆☆☆

Required Skill Rating

Basic Skill

☒☐☐☐

short training sessions recommended

Cost Rating

Moderate

\$\$\$

\$1K-\$10K

EXISTING HIGH-PRESSURE HOSES (E.G., FIREFIGHTING HOSES) AND PERSONNEL

Applications

Pressure And Fire Hosing

Existing firefighting equipment (e.g., hoses, pumps, nozzles, and monitors) and

Figure 41: RRLT-generated Equipment List

Exporting the Equipment List

Two icons displayed in the upper right corner of the equipment list allow a user to:

- export the equipment list to Excel
- create a PDF version of the equipment list



Figure 42: Equipment List export option icons

# Plan Management

There are several options for managing plans within the Tool, including the ability to save, rename, delete, reload, and search plans.

## Saving a Plan

The Tool allows plans to be saved for later viewing and editing. When an active plan is loaded and can be saved, a Save button is displayed in the Active Plan Control Panel on the bottom right side of the screen.

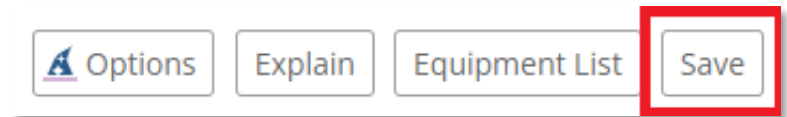


Figure 46: Active Plan Save button

A saved plan's default title is the date (year first) and time that plan was first saved, followed by the word "Plan," for example "2022-01-21 13:53 Plan." Saved plans are not visible to other tool users and remain in the tool until deleted by the plan's creator.

## Renaming a Plan

For untitled plans, a pencil icon is displayed next to the Active Plan in the panel header.

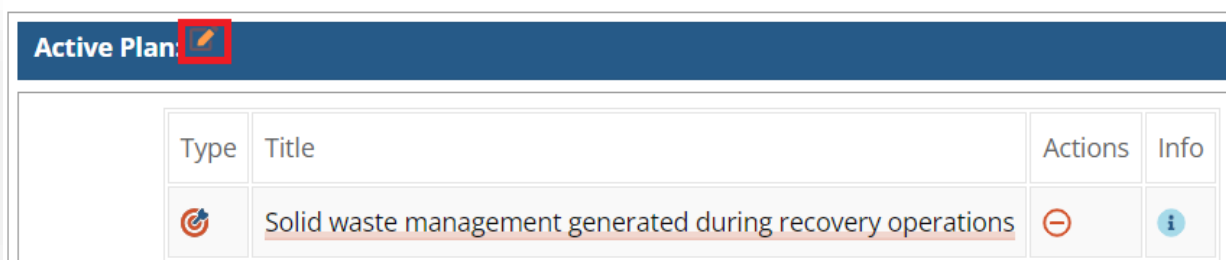


Figure 43: Icon for editing Active Plan title

Clicking the Pencil icon displays an edit box, allowing the user to enter a plan title. **For the new plan title to persist, users must click the Save button at the bottom of the screen.**

To rename a plan that already has a name, clicking the existing title in the panel header will enable the user to update it. As before, the Save button must be clicked to save the change.



Figure 44: A plan's existing title displayed in the panel header



Figure 45: Editing a plan's existing title in the panel header

## Viewing Previous Plans

By selecting the Plan menu, then Previous Plans on the Navigation Bar, a user can see a list of their previously saved plans, which shows their most recent modification dates by hovering over the Information icon associated with each plan. This list is displayed in the Subject Pane on the left side of the screen.

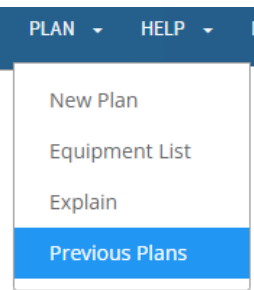


Figure 46: Previous Plans in the Navigation menu

Type	Title	Action	Info
	<a href="#">2022-01-21 13:53 Plan</a>		
	<a href="#">DEJ Decon Plan</a>		
	<a href="#">DEJ Washing Plan</a>		

Figure 47: A list of previously saved plans

## Loading a Previous Plan

Clicking the hyperlinked title of a saved plan in the Previous Plans list (above) displays that plan's Equipment List in the Subject Pane. Additionally, a series of icons are displayed in the upper right corner of the pane. The Delete (trash bin) and Open (folder) icons are always displayed, and the Excel and PDF icons are displayed if the plan contains at least one equipment type.



Figure 48: Plan options icons

A user can click the "Open" icon to continue refining a plan. A confirmation dialog will appear, warning that the current active plan would be replaced. After clicking through, the Tool will load the selected plan into the Active Plan Pane on the right side of the page.



Figure 49: Icon to Open a saved plan

## Deleting a Previous Plan

To delete a previous plan, click its hyperlinked title in the Previous Plans list, then click the Delete icon. The system will present a dialog box for the user to confirm their choice before then deleting the plan.



Figure 50: Icon to Delete a saved plan

## Searching for Previous Plans

Previously saved plans can be found by title using the search features in the Navigation Bar.