AASHTOWare Bridge Management
User Manual

Br|M

Version 5.2.3

Table of Contents

Revision History

Change Date	Description

Getting Started

- The Getting Started section of the manual provides an overview of the AASHTOWare Bridge Management software and its available documentation.

Overview

AASHTOWare Bridge Management System (BrM - previously called Pontis) is a comprehensive bridge management system originally developed in 1989 for the Federal Highway Administration (FHWA). The software is currently licensed through the American Association of State Highway and Transportation Officials (AASHTO) to over 50 State Departments of Transportation and other agencies.

BrM is merely one product in the AASHTO BRIDGEWare product suite. BrM specializes in:

- Allocating scarce resources to protect infrastructure investments, ensuring safety and maintaining mobility.
- Storing inventory and inspection information about an agency's bridges and other structures.
- Supplying a rich set of modeling and analysis tools to support project development, budgeting, and program development.
- Formulating network-wide preservation and improvement policies for evaluation of each structure in a network, making recommendations for the projects an agency should include in their capital plan.
- Providing the capability to analyze the impact of different project alternatives on the performance of individual structures or of an entire network of structures.
- Defining and scheduling projects for individual structures or for groups of structures.

Software Characteristics

BrM is a web software that can be installed on a web server using Microsoft Internet Information Services (IIS). BrM can be configured in the following ways:

- **Workstation** - This configuration, sometimes referred to as "stand-alone," has both the database and the software on a local computer. BrM uses the Cassini web server to allow BrM to run locally and to look and feel like a desktop software.
- **Client-Server** - This configuration is a multi-user configuration with the database installed on a server and the software installed on client computers. Separate installations of BrM Workstation on different computers speak to the same database on a separate server. This configuration uses the same installation as the Workstation configuration.
- **Server (Enterprise)** - This configuration, sometimes known as a "thin-client," consists of BrM installed on a web server with users connecting to BrM via Internet Explorer. The database is usually on a separate database server that communicates with the web server. This configuration uses a different installation than the Workstation configuration.

BrM Modules

BrM is organized into eight modules:

- **Inspection Module** - Used to maintain inventory and inspection information about structures.
- **Reports Module** - Allows the user to select, view, and print various reports for structures in the database.
- **Admin Module** - Contains the administrative functions of BrM that create flexibility within the software by allowing the administrator to configure various settings to meet agency needs.
- **Gateway Module** - Provides the tools to import and export data between BrM and other systems.
- **Analysis Module** - Provides a detailed analysis of a selected bridge and its work candidates.
- **Projects Module** - Create and manage projects for work on specific bridges.
- **Programs Module** - Create and manage programs containing projects.
- **Tunnels Module** - Used exclusively for tunnel inventory and inspection.

Documentation Guide

BrM documentation consists of this user manual, an installation guide, the online help system, and examples documents.

- **User Manual** - The *BrM User Manual* provides instructions on using each of the BrM tasks. It is intended to serve as a self-contained reference for most BrM users.

- **Installation Guide** - The *BrM Installation Guide* provides instructions on installing the BrM system and properly setting up the server.

- **Online Help System** - The *BrM Online Help System* includes the same material as the *BrM User Manual* but it is accessible through the software for easy access to necessary information. Clicking on a page's ? icon within the application will send the user directly to that page's help section.

- **Examples Documents** - The *BrM Examples* documents provide real-world examples to help users understand how to use specific tasks in BrM and how multiple tasks work together to accomplish specific goals.

System Basics

- The System Basics section of the manual describes the process of logging in to BrM and explains BrM's layout and navigation.

In order to log in to your agency's BrM software, your system administrator must first:

- Set up the ODBC profiles for the BrM databases you will be using.
- Establish user names, passwords, and user privileges for each database.

*Note: The standard installation of BrM with the SQL Server sample databases sets up default profiles with a user under the user name and password "pontis."

1. Select the BrM software from the Window applications.
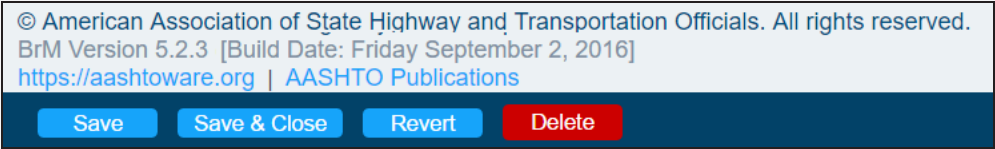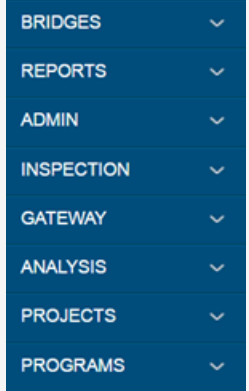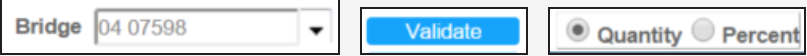
2. Select the desired database from the ***Database*** dropdown. This dropdown is only displayed if your agency has more than one database defined in BrM.
3. Enter your login credentials.
4. Click the ***Login*** button.

*Note: Contact your administrator if you consistently receive a database error.

BrM Navigation

While each page within the software is different, the basic format the user will see is always the same. On any given page, the user will see the BrM header, footer, tabs, tasks, groupings, and controls.

Object	Description	
Header	The header contains the AASHTOWare BrM logo (click to return to the Bridge List), displays the current user and database, and has buttons to take the user to the home page (Bridge List), the help system, account information, or to log the user out of the software. The top of each page also contains a "breadcrumb" representation of exactly which page the user is currently on and the path to get there, such as *Inspection > Inventory > Roads*. Some tasks will also contain headers specific to the content of the page.	
Footer	The footer displays the current version of BrM and the build date and time for the latest version. Most tasks also contain a footer with page controls such as save, cancel, delete, etc. © American Association of State Highway and Transportation Officials. All rights reserved. BrM Version 5.2.3 [Build Date: Friday September 2, 2016] https://aashtoware.org | AASHTO Publications Save Save & Close Revert Delete	
Tab	The tab is the main module that houses tasks, groups, and controls. The standard software contains 8 tabs that run vertically along the left of the software: Bridges, Reports, Admin, Inspection, Gateway, Analysis, Projects, and Programs.	BRIDGES REPORTS ADMIN INSPECTION GATEWAY ANALYSIS PROJECTS PROGRAMS

BrM Navigation	
Object	**Description**
Task	The tasks make up the menu options for each of the tabs. The tasks run vertically along the left side of the software. Tasks can contain subtasks which are listed underneath the tasks and only visible when the task is selected or expanded.
Grouping	The groupings are the sectioned-off parts of each of the task pages. The groupings typically have display names and their content is often wrapped in a grey outline.
Control	The controls are the fields within the groups: checkboxes, text fields, radio buttons, etc.

User Profile

After clicking on the user name in the header to reveal the header options, select the *User Profile* link to open the *User Profile* page:

To change the login password, select the *Change Password* button to reveal additional controls:

By default, all BrM passwords must contain at least 5 characters. When new password restrictions have been set by the administrator on the *Admin > Security > Password Rules* subtask, the rules will be different.

When the desired changes have been made, click the *Apply* button to save them.

To reject the changes, click the *Cancel* button.

Message Containers

Message containers are a new feature in BrM version 5.2.3 that display important save, error, or informational messages on specific pages throughout the software. Message containers will typically appear on a page after changes have been made and saved, a save has been attempted, or a required item is not currently completed.

The green message container will appear from the header if the page was saved successfully:

If the page does not save successfully or there is some other message the user needs to see, a message container will appear from the footer:

Bridges

- The Bridges section of the manual addresses each of the tasks in BrM's *Bridges* tab. The *Bridges* tab contains several options to manage the structures within the database.

The *Bridges > View List* task serves as the BrM homepage. The *View List* task is a complete list of all of the bridges in the system that can be filtered and customized in various ways and allows for the selection of bridges prior to performing other actions in the system.

Selecting a Bridge

The *View List* task's main function is bridge selection. Most functions in BrM require a bridge to be selected, and the *View List* task is the main location for this action.

There are two different ways to select a single bridge on the bridge grid:

1. **Checkbox Select** - Clicking the checkbox of the desired bridge will select it.
2. **Highlight Select** - When hovering the mouse's cursor over a bridge in the bridge grid, the bridge's row will be highlighted blue. Clicking anywhere on that row will darken and solidify that highlight and select the bridge, checking its box. The highlight select differentiates itself from the checkbox select because it reveals an inspection summary for the highlight selected bridge:

*Note: Regardless of how a bridge is selected, all selected bridges will remain selected until unselected. This is important because many of the functions in BrM take into account all of the currently selected bridges. Users must ensure that before they perform an action, such as generating a report, only the desired bridges are selected.

Highlighted Bridge Images

When a bridge is highlighted, the *Context* dropdown in the *Images* grouping can be used to determine which images to display. Selecting "Bridge Level" will display the images that have been added to the bridge, not a specific inspection. Selecting a specific inspection will display only the images for that inspection.

Highlighted Bridge Inspection Summary

When a bridge is highlighted, the *Inspection Summary* grouping will display information about the selected bridge's most recent inspection. The various tabs - Condition, Load Rating, Inventory, Roadway On, and Schedule - can be selected to view inspection information.

Filter

Due to the vast size of some users' systems, filters are necessary to sort and locate bridges based on specified criteria. Filters are created on the *Bridges > Manage Filters* and *Projects > Manage Filters* tasks.

There are two main ways to filter bridges:

1. **Filter Dropdown** - The *Filter* dropdown lists all of the relevant filters that have been created and edited on the *Manage Filters* task. By default, BrM comes with a set of various filters (labeled "BrM" in the dropdown), but new filters can be created. When a filter is selected from the dropdown, the bridge grid will automatically update with the filtered bridges.
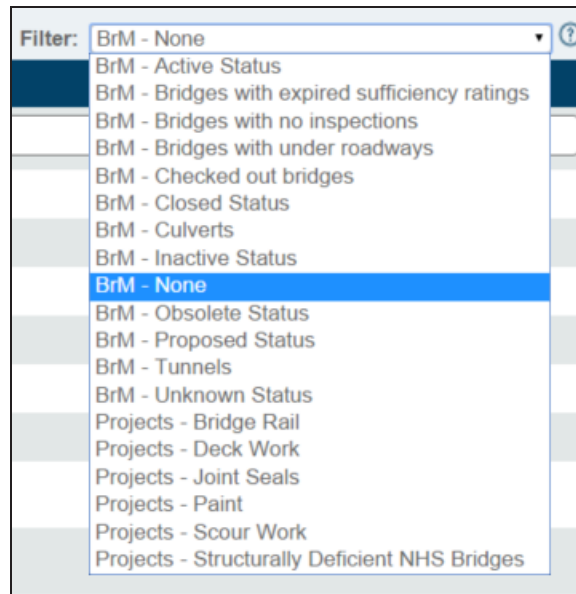
2. **Quick Filters** - Each column in the Bridge List has a quick filter that enables the user to filter the grid based on a condition. The user types into the *Quick Filter* textbox and then clicks the ▼ symbol to select a condition. Once the condition is selected, the grid will automatically be updated with the filtered bridges.

*Note: By default, filling in the *Quick Filter* textbox and then pressing Enter on the keyboard will automatically make use of the "Contains" quick filter condition.

The following table explains the various selectable quick filter conditions:

Quick Filter Conditions	
Condition	**Description**
NoFilter	No filter is applied - filter controls are cleared.
Contains	Returns results that contain the entered value. Same as: dataField LIKE '%value%'
DoesNotContain	Returns results that do not contain the entered value. Same as dataField NOT LIKE '%value%'
StartsWith	Returns results that start with the entered value. Same as: dataField LIKE 'value%'
EndsWith	Returns results that end with the entered value. Same as: dataField LIKE '%value'
EqualTo	Returns results that exactly match the entered value. Same as: dataField = value
NotEqualTo	Returns results that do not exactly match the entered value. Same as: dataField != value
GreaterThan	Returns results with a value greater than the entered value. Same as: dataField > value
LessThan	Returns results with a value less than the entered value. Same as: dataField < value
GreaterThanOrEqualTo	Returns results with a value greater than or exactly matching the entered value.

Quick Filter Conditions	
Condition	**Description**
	Same as: dataField >= value
LessThanOrEqualTo	Returns results with a value less than or exactly matching the entered value. Same as: dataField <= value
Between	Returns results with a value that falls between the two entered values. Same as: value1 <= dataField <= value2 ***Note:** Value1 and value2 should be separated by a space when entered into the quick filter.
NotBetween	Returns results with a value that does not fall between the two entered values. Same as: dataField <= value1 & dataField >= value2 ***Note:** Value1 and value2 should be separated by a space when entered into the quick filter.
IsEmpty	Returns results where the specific field is empty. Same as: dataField = "
NotIsEmpty	Returns results where the specific field is not empty. Same as: dataField != "
IsNull	Returns only null values.
NotIsNull	Returns only non-null values.

Layout

The *Layout* dropdown determines the bridge grid's columns. There is a default layout on the *View List* task, but new layouts can be created on the *Manage Layouts* task.
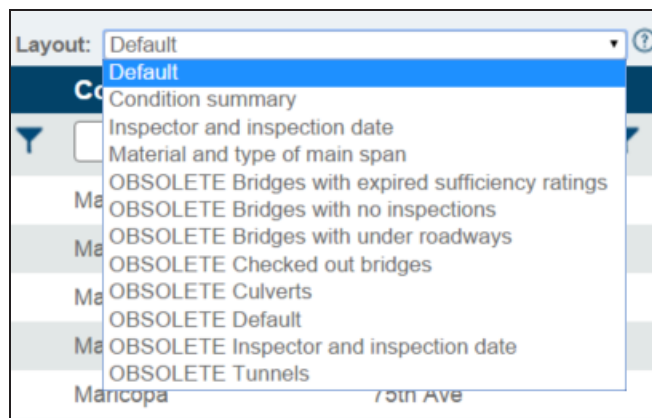
*Note: The *Layout* dropdown will not be available when certain custom filters (those that are either created or edited using the *Manage Filters > Edit SQL* subtask) are selected from the *Filter* dropdown.

Jump to Bridge

The *Jump to Bridge* control allows the user to search for and locate a specific bridge. The user can type the Bridge ID into the textbox or use the dropdown to find the bridge by clicking through the pages.

When typing into the textbox, the search will operate using either the "Contains" or "Starts With" function. The function used is determined by the BRIDGE_SELECTOR_SEARCH_TYPE option on the *Admin > General Config > Options* task.

When the bridge is selected, it will be highlighted and selected.
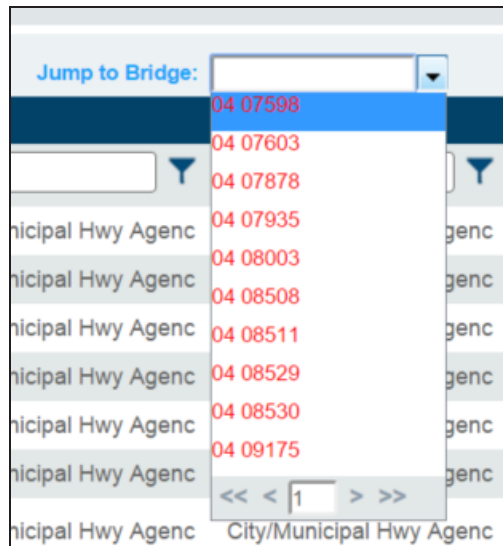
Export Options
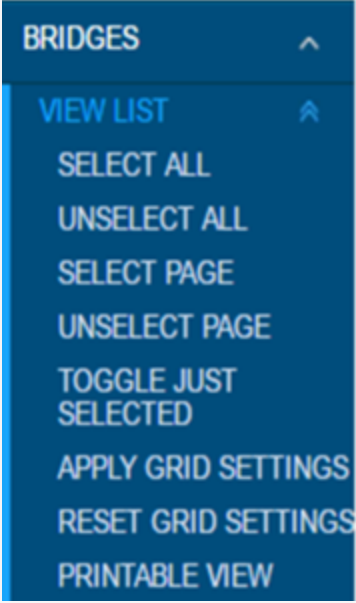
There are three export options located at the top left corner of the bridge grid: Adobe Acrobat Portable Document Format (PDF), Microsoft Excel Spreadsheet (XLS), and Google Keyhole Markup Language (KML). If one or more bridges are selected, only the information from the selected bridges will export. If no bridges are selected, all of the bridges in the current filter will be exported.
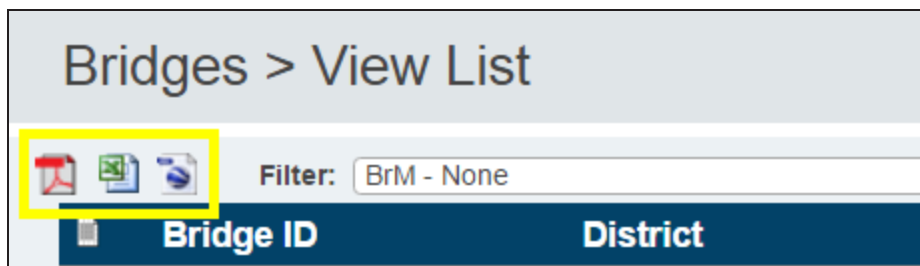
Side Menu Options

The side menu for a certain Tab > Task will typically contain subtasks, but for the *Bridge > View List* task the side menu contains various options that perform actions.

View List Options		
	Option	**Description**
	Select All	Selects all of the bridges within the current filter.
	Unselect All	Unselects all of the bridges currently selected.
	Select Page	Selects all bridges on the current page, regardless of how many bridges are in the current filter. **Example:** If there are 30 bridges in the current filter but only 10 bridges per page, only the 10 bridges shown on the current page will be selected.
	Unselect Page	Unselects all bridges on the current page, regardless of how many bridges are in the current filter.
	Toggle Just Selected	Toggles between showing all of the bridges in the current filter to showing only the bridges that have been selected. **Example:** If a user has 4 bridges selected, clicking *Toggle Just Selected* will display only the 4 selected bridges, regardless of the total number of bridges in the filter.
	Apply Grid Settings	The column headings of the bridge grid can be arranged in any order. The user can click and hold then drag and drop the column headings into any order desired. If the column headings order is changed and the user wants to permanently save it, *Apply Grid Settings* can be selected.
	Reset Grid Settings	As discussed above, the grid's column headings order can be changed. If the column headings order is changed and the user wants to revert back to the default column heading order, *Reset Grid Settings* can be selected.
	Printable View	The *Printable View* option opens a new web page with a printable view of all of the bridges in the current filter.

Left column image:

BRIDGES ^

VIEW LIST »

SELECT ALL

UNSELECT ALL

SELECT PAGE

UNSELECT PAGE

TOGGLE JUST SELECTED

APPLY GRID SETTINGS

RESET GRID SETTINGS

PRINTABLE VIEW

The *Bridges > Manage Layouts* task allows the user to create and edit layouts for the Bridge List as well as several other grids throughout the software. The selections made for the layout will determine the column headings for a given grid. This task is also accessible from the *Projects* tab with the same functionality.

Context

The *Context* dropdown determines the grid for which the layout is being created. When the *Manage Layouts* task is opened from the *Bridges* tab, the default context will be the Bridge List, however there are several other context selections:

- **Bridge Group Roadways** - The grid on the *Bridges > Manage Bridge Groups > Add/Remove Roadways* subtask.
- **Bridge Groups** - The grid on the *Bridges > Manage Bridge Groups > Bridge Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Project Bridge Needs** - The Bridge Needs grid on the *Projects > Create/Edit Project > Query* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Layout

The *Layout* dropdown lists all of the layouts that have been created or that automatically come with the system. The available options depend on the selection made:

- **BrM System Layout** - If the layout selected is a BrM system layout, it cannot be edited or deleted. A note will appear in red text under the dropdown indicating that the layout is a BrM system layout and may not be edited:

However, the user can copy the BrM system layout's settings by typing a new layout name into the textbox next to the *Save As* button and then clicking *Save As*. Once the copy is made, the newly created layout can be edited.

- **Non-BrM System Layout** - Any layout that, when selected, does not cause the red BrM system layout note to appear can be edited or deleted freely.
- **New** - Clicking the *New* button creates a new layout that can be edited or deleted freely. The new layout can be named by entering a name into the textbox next to the *Save As* button and then clicking *Save*.

Layout Info

The *Layout Info* grouping allows the user to enter a description of the currently selected layout. The user can also check the *Shared* checkbox if the layout should be available to other users.

Layout Columns

The *Layout Columns* grouping is where the user configures the selected layout. A selection must be made from the *Tables* listbox and, based on that selection, the *Fields* listbox will populate with options.

The options in the *Fields* listbox will be the column headings for the layout. An option can be added to the layout by selecting it from the *Fields* listbox and clicking the *Add* button. The multiple select ability of the CTRL and Shift keyboard keys is applicable.

The grid formed from the selection contains the table name, field name, heading text, and:

- **Use Parameters** - The *Use Parameters* checkbox indicates whether or not parameters will be used for the selected field. Parameters for the fields are set up in the *Admin > General Config > Parameters* task and designate text to a specific value.

  Example: A parameter may be established for a certain field so that any row within that column with the value "1" would present the text "District 1," any row within that column with the value "2" would present the text "District 2," etc.

- **Edit** - Clicking the ✎ symbol allows the user to edit the heading text and check/uncheck the *Use Parameters*

checkbox. To save the changes, click the ✔ symbol. To cancel changes, click the ✖ symbol.

- **Delete** - Clicking the ✖ symbol deletes the field from the layout.

The buttons to the right of the table - *Top*, *Up*, *Down*, *Bottom* - control the positioning of the fields in the layout. Because tables read left to right, the top field in the layout corresponds to the leftmost column of the table. Once an item is selected, The *Top* and *Bottom* buttons move it to the top and bottom of the layout grid, respectively. The *Up* and *Down* buttons move the selected item up and down by one increment, respectively.

Manage Layouts Page Controls

Save	Save As		Reset	Delete

The *Save* button saves the current layout.

The *Save As* button acts as a copier and copies the current layout's settings into a new layout that uses the name entered into the textbox next to the *Save As* button.

The *Reset* button resets any changes that were made to the current layout back to the last save.

The *Delete* button deletes the current layout.

The *Bridges > Manage Filters* task allows the user to create and edit filters for the Bridge List as well as several other grids throughout the software. The selections made for the filter will determine the bridges listed in the Bridge List upon filter use. This task is also accessible from the *Projects* tab with the same functionality.

Edit Filter

The *Bridges > Manage Filters > Edit Filter* subtask uses the BrM interface to create and edit filters for various grids within the system.

Context

The *Context* dropdown determines the grid for which the filter is being created. When the *Manage Filters* task is opened from the *Bridges* tab, the default context will be the Bridge List, however there are several other context selections:

- **Bridge Group Roadways** - The grid on the *Bridges > Manage Bridge Groups > Add/Remove Roadways* subtask.
- **Bridge Groups** - The grid on the *Bridges > Manage Bridge Groups > Bridge Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Filter

The *Filter* dropdown lists all of the filters that have been created or that automatically come with the system. The context must be selected before the filter because the context determines what filters are available. Below are the filter

options:

- **BrM System Filter** - If the filter selected is a BrM system filter, it cannot be edited or deleted. A note will appear in red text under the dropdown indicating that the filter is a BrM system filter and may not be edited:

However, the user can copy the BrM system filter's settings by typing a new filter name into the textbox next to the *Save As* button and then clicking *Save As*. Once the copy is made, the newly created filter can be edited.

- **Customized Filter**- Any filter created by the user can be edited or deleted freely.
- **New** - Clicking the *New* button creates a new filter that can be edited or deleted freely. The new filter can be named by entering a name into the textbox next to the *Save As* button and then clicking *Save*.

Filter Info

The *Filter Info* grouping allows the user to enter a description of the currently selected filter. The user can also check the *Shared* checkbox if the filter should be available to other users.

If the *Access Filter* checkbox is checked, the admin can use the current filter as an access filter for specified roles, displaying that filter as the users' default filter for the applicable context.

Criteria

The *Criteria* grouping is where the user configures the selected filter. A selection must be made from the *Tables* listbox and, based on that selection, the *Fields* listbox will populate with options.

Options can be added to the filter by selecting it from the *Fields* listbox and clicking the *Add Criteria* button. Multiple options can be added at once by holding down the CTRL key while selecting all of the desired options, then clicking the *Add Criteria* button.

Each field added to the filter will have additional options that must be determined.

Clicking the *Clear* button will clear the filter of all fields that have been added. Clicking the *Delete Selected* button will clear the filter of only the fields that have the *Delete* checkbox checked.

Edit Filter Page Controls

The *Save* button saves the current filter.

The *Save As* button copies the current filter's settings into a new filter that uses the name entered into the textbox next to the *Save As* button.

The *Reset* button resets any changes that were made to the current filter back to the last save.

The *Delete* button deletes the current filter.

Edit SQL

The *Bridges > Manage Filters > Edit SQL* subtask does not use the BrM interface to create and edit filters. It requires the user to write the SQL manually to create a custom filter.

There are several aspects that differentiate the filters in the *Edit SQL* subtask from the filters in the *Edit Filter* subtask:

1. The SQL filters must be written manually.
2. The SQL filters can only be edited within the *Edit SQL* subtask. They will not show up in the *Filter* dropdown of the *Edit Filter* subtask.
3. When an SQL filter is used on a page that has alternate layouts via a *Layout* dropdown, such as the Bridge List, the *Layout* dropdown will not be visible.

Select Context

The *Context* dropdown determines the grid for which the filter is being created. When the *Manage Filters* task is opened from the *Bridges* tab, the default context will be the Bridge List, however there are several other context selections:

- **Bridge Group Roadways** - The grid on the *Bridges > Manage Bridge Groups > Add/Remove Roadways* subtask.
- **Bridge Groups** - The grid on the *Bridges > Manage Bridge Groups > Bridge Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Select Filter

The *Filter* dropdown lists all of the filters that have been created or that automatically come with the system. The context must be selected before the filter because the context determines what filters are available.
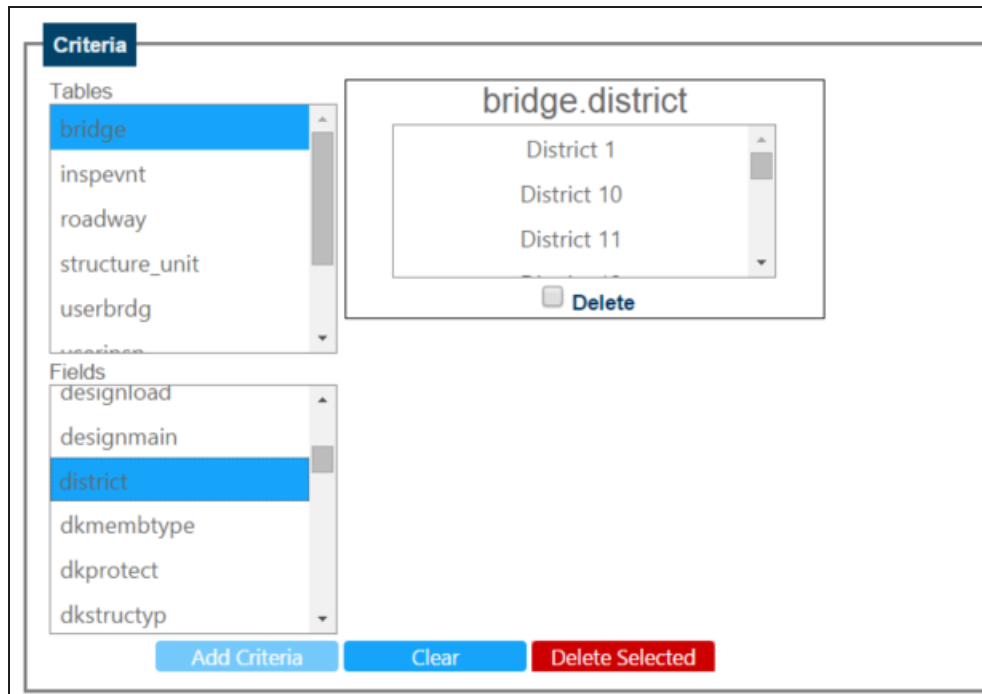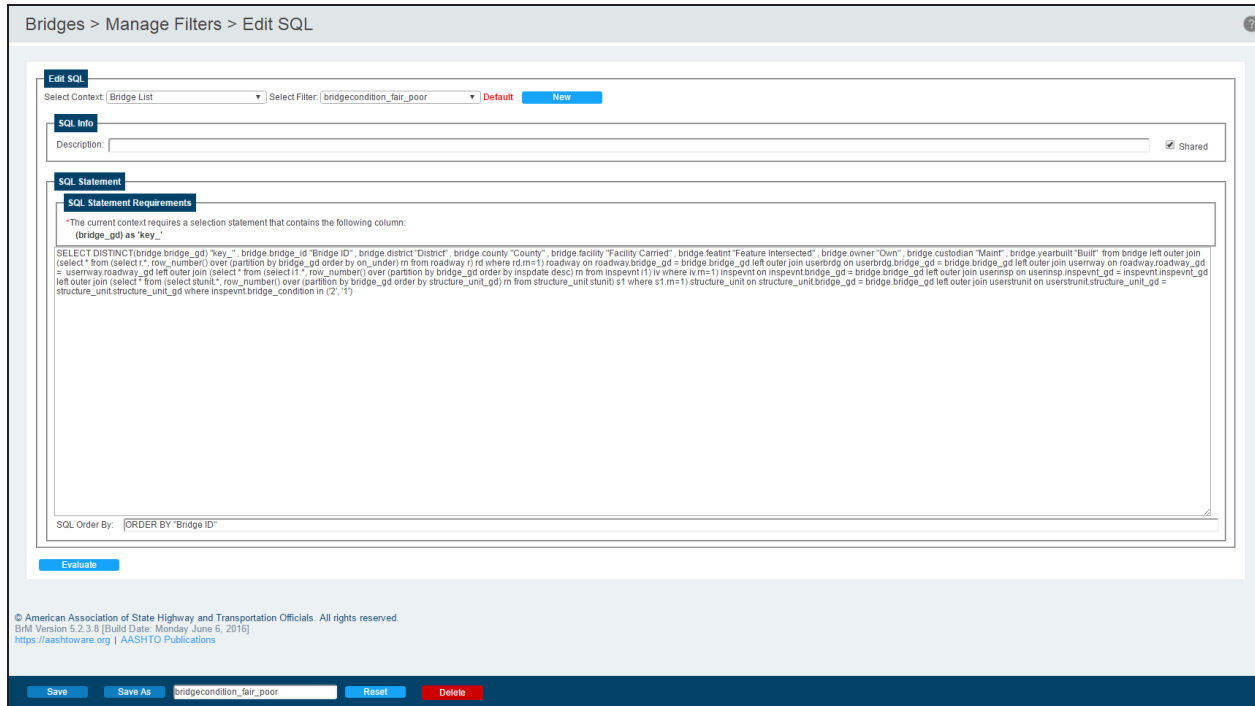
SQL Info

The *SQL Info* grouping allows the user to enter a description of the currently selected filter. The user can also check the *Shared* checkbox if the filter should be available to other users.

SQL Statement

The user can use the large textbox to enter the SQL for the custom filter.

Important things to note:

1. The correct use of key_ within the statement is to use double quotes - "key_" - and this column will not actually display when the filter is run.
2. Use the identifying table name in the statement. For example, write "BRIDGE.BRIDGE_GD" not "BRIDGE_ GD."
3. Beginning with version 5.2.2, GUIDs took the place of primary keys. Filters written prior to version 5.2.2 should be reviewed for compliance.

The *SQL Order By* textbox allows the user to determine how the filter will be ordered, such as "Order By 'Bridge ID.'"

*Note: The *SQL Order By* textbox must contain "Order By" in order for the evaluation to operate successfully.

Once the SQL is entered, click the *Evaluate* button to view the filter results. If the SQL is invalid, an error will appear in place of the results:

Edit SQL Page Controls

The *Save* button saves the current filter.

The *Save As* button copies the current filter's settings into a new filter that uses the name entered into the textbox next to the *Save As* button.

*Note: If changes have been made to a new or existing SQL Filter, the *Save* and *Save As* buttons will not be available until the SQL statement passes an evaluation using the *Evaluate* button.

The *Reset* button resets any changes that were made to the current filter back to the last save.

The *Delete* button deletes the current filter.

The *Bridges > New Inspection* task allows the user to enter basic information for a new inspection of the currently selected bridge. If more than one bridge is selected on the Bridge List, the new inspection will be for the bridge selected most recently unless one of the bridges is highlighted.

Create New Inspection

Inspection Date

The *Inspection Date* field defaults to the current date. To change the date, enter a new date in the MM/DD/YYYY format or click the ⊞ symbol and select a date.

Primary Type

The *Primary Type* dropdown lists the primary type of inspection that will be performed. If a previous inspection was performed on the selected bridge, the primary type will automatically populate with the option used in the previous inspection but can be changed if desired.

Inspector

The *Inspector* dropdown will default to the current user. This can be changed, however the users available in the dropdown will depend on user roles and permissions.

Entered By

The *Entered By* dropdown will default to the current user. This can be changed, however the users available in the dropdown will depend on user roles and permissions.

Engineer of Record

The user can enter an engineer in the *Engineer of Record* textbox for internal use. This is an optional field.

If the textbox is left blank, the field will be populated with the engineer of record from the previous inspection on the next page. If the previous inspection did not have an Engineer of Record listed or if no previous inspection exists, the field will be blank on the *Inspection > Schedule* task.

Types of Inspection Performed

The user should check the boxes of the inspections that were performed on the bridge on the selected inspection date. The selected inspections will be assigned the selected inspection date on the *Inspection > Schedule* task. If necessary, this information can be edited later on the *Inspection > Schedule* task.

New Inspection Page Controls

Click the *Create* button to create the new inspection and automatically be taken to the *Inspection > Schedule* task to continue filling out the inspection information.

Click the *Cancel* button to cancel the new inspection and return to the *Bridges > View List* task.

_____

Control Name	Table Name	Column Name	Notes
Inspection > New Inspection **Control Information**			
Bridge	inspevnt	bridge_gd	The ID of the bridge being inspected.
Inspection Date	inspevnt	inspdate	The date the new inspection is created. By default, this will be the current date.
Primary Type	inspevnt	insptype	The primary type of inspection being performed.
Inspector	inspevnt	inspusrguid	The user performing the inspection.
Entered By	inspevnt	entered_by_gd	The user that enters the inspection into the system.
Engineer of Record	inspevnt	engineer_of_record	The engineer of record for the inspection.
Types of Inspection Performed **Grouping**			
Routine	inspevnt	nbinspdone	Checked if a routine inspection was performed.
Element	inspevnt	elinspdone	Checked if an element inspection was performed.
Fracture Critical	inspevnt	fcinspdone	Checked if a fracture critical inspection was performed.
Underwater	inspevnt	uwinspdone	Checked if an underwater inspection was performed.
Other Special	inspevnt	osinspdone	Checked if an other special inspection was performed.

Suff Rate

The *Bridges > Suff Rate* task is used to view and calculate bridge sufficiency ratings.

Sufficiency Rating Results

When the *Bridges > Suff Rate* task is selected, the sufficiency rating of all of the bridges currently selected on the Bridge List is calculated and displayed. If no bridges are selected, a bridge must be selected from the dropdown before the *Suff Rate* task can be viewed.
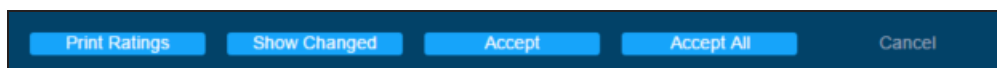

The Sufficiency Rating grid reveals the bridges' previous ratings and the newly calculated ratings based on the most recent inspection. Yellow highlights in the Sufficiency Rating grid columns reveal changes that have occurred between a bridge's previous and currently calculated ratings.

Sufficiency Rating Page Controls

Accept Changes

Click the *Show Changed* button to show only the bridges with changes between the previous and currently calculated ratings. To accept the currently calculated ratings, check the *Accept* checkboxes for the desired bridges or use the *Select Page* button to select an entire page of bridges.

Once the desired bridges are selected from the grid, click the *Accept* button to accept the changes and return to the Bridge List. To accept all of the changes (with or without their *Accept* checkboxes checked), click the *Accept All* button.

Sufficiency Rating Controls

Use the *Print Ratings* button to print the Sufficiency Rating grid.

Click the *Cancel* button to return to the *Bridges > View List* task.

		Bridges > Suff Rate **Control Information**	
Control Name	**Table Name**	**Column Name**	**Notes**
Brkey	inspevnt	brkey	One of the structure identifiers used in BrM.
Inspection Date	inspevnt	inspdate	The bridge's most recent inspection date.
Structure Rating	inspevnt	strrating	NBI Item 67: This is the structural evaluation rating of the bridge. This item is calculated by the specifications used in the NBI Coding Guide.
Deck Geometry	inspevnt	deckgeom	NBI Item 68: The overall rating for deck geometry includes two evaluations: the curb-to-curb or face-to-face of rail bridge width and the minimum vertical clearance over the bridge roadway. When an individual table lists several deck geometry rating codes for the same roadway width under a specific ADT, the lower code is used.
Under Clearance	inspevnt	underclr	NBI Item 69: This is the underclearance of the bridge. This item is calculated by the specifications used in the NBI Coding Guide.
Suff Prefix	inspevnt	suff_prefix	The sufficiency rating prefix.
Suff Rating	inspevnt	suff_rate	The sufficiency rating of the structure.
SD/FO Status	inspevnt	nbi_rating	The NBI rating (structurally deficient/functionally obsolete status).

The *Bridges* > *Validate* task is used to validate the accuracy and acceptability of many of the values recorded for a specific bridge.

Validate Bridges

The *Bridges* > *Validate* task will display all of the bridges currently selected on the Bridge List. If no bridges are selected, a bridge must be selected from the dropdown before the *Validate* task can be viewed.

To validate only the bridges currently selected, click the *Validate Selected Bridges* button. To validate all bridges in the database, click the *Validate All Bridges* button.

*Note: Validating bridges can take an extended period of time depending on the amount of bridges. Validating an entire system of bridges will likely take 5+ minutes to complete.

Click the *Cancel* button to return to the Bridge List.

Validation Results

Once the bridges are validated, the NBI and NBE validation results can be viewed. Use the *NBI Results* and *NBE Results* tabs to switch back and forth.
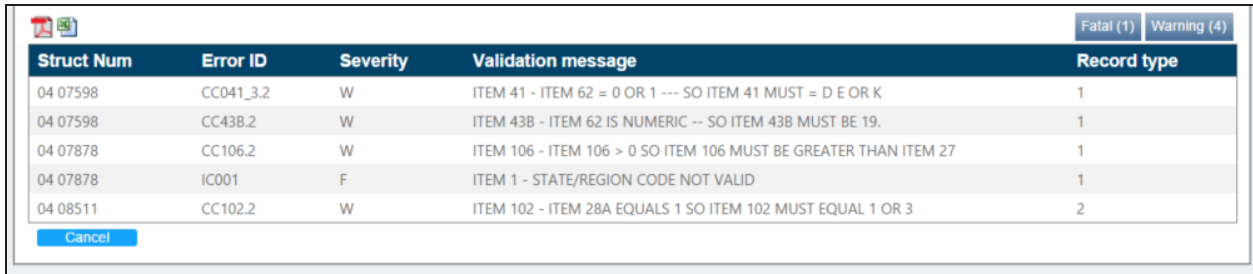
To view the validation results, click the checkboxes of the desired bridges in the selected grid (all checkboxes will be checked initially). Any errors for the selected bridge(s) will be revealed in the Validation Results grid.

Severity

Once the selected bridges are validated, the results will be labeled as "Fatal" or "Warning."

Struct Num	Error ID	Severity	Validation message	Record type
04 07598	CC041_3.2	W	ITEM 41 - ITEM 62 = 0 OR 1 --- SO ITEM 41 MUST = D E OR K	1
04 07598	CC43B.2	W	ITEM 43B - ITEM 62 IS NUMERIC -- SO ITEM 43B MUST BE 19.	1
04 07878	CC106.2	W	ITEM 106 - ITEM 106 > 0 SO ITEM 106 MUST BE GREATER THAN ITEM 27	1
04 07878	IC001	F	ITEM 1 - STATE/REGION CODE NOT VALID	1
04 08511	CC102.2	W	ITEM 102 - ITEM 28A EQUALS 1 SO ITEM 102 MUST EQUAL 1 OR 3	2

Fatal (1)   Warning (4)

Cancel

The buttons for each severity level can be used to filter the validation results.

Export Results

Use the 🔴📊 symbols to create a PDF or XLS of the current grid.

The *Bridges > Create Structure* task is used to create a new bridge in the system.

Create Structure Groupings

When completing the *Create Struct* task, it is recommended that the NBI items (fields containing red numbers in parenthesis - "**(002)**") be filled out. However, these items are not mandatory to save the new structure. If not filled out, the fields can completed later using the *Inspection > Inventory* task.

Structural Identification

The *Structural Identification* grouping contains the only mandatory controls on the task. Trying to save or proceed without entering an NBI Structure No., BRKEY, and/or Agency Bridge ID will activate an error message. By default, the text that is entered into the *NBI Structure No* textbox will populate in the *BRKEY* and *Agency Bridge ID* textboxes. It is recommended that the BRKEY be the same as the NBI Structure No. to ensure that NBI data imports correctly.

- **NBI Structure No.** - Required by FHWA to be a unique bridge identifier that remains constant over time.
- **BRKEY** - Field that links the bridge table with other related tables for roadways, structure units, inspections, etc.
- **Agency Bridge ID** - The ID shown on the default Bridge List and standard BrM reports.

Location and Administration

While not mandatory for the page, the structure's name, location, length, and other details can be added.

Spans

The bridge's span information does not need to be included to save the page or proceed, but as with the location and administration information it is recommended that the span information NBI items be included.

Inspection

The setup for a new inspection can be established in the *Inspection* grouping, but the structure's elements will still need to be added on the *Inspection > Condition* task.

Create Structure Page Controls
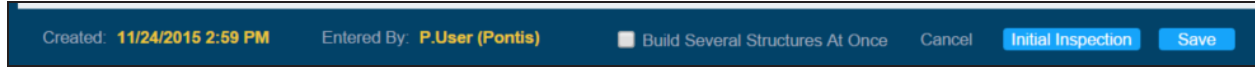
The *Save* button saves the new structure and sends the user back to the *Bridges > View List* task. The *Initial Inspection* button saves the new structure and sends the user to the *Inspection > Condition* task where the structure's elements can be added.

The *Build Several Structures At Once* checkbox ensures that once the current new structure is saved, the *Create Struct* task will refresh instead of sending the user to the *Bridges > View List* task.

Copy Structure

The *Bridges > Copy Structure* task is used to copy the structure information for the bridge currently selected in the Bridge List. If no bridge is selected, the user will be prompted to select a bridge.

When a bridge is selected, the following screen will appear:

Copying a structure copies the *Location and Administration* and *Spans* groupings of the selected structure. This includes the bridge record and the roadway record data tied to the bridge. As inspection and structure unit records will be unique to the new structure, they will not be copied but will be created anew for the new structure.

The *Bridges > Remove Struct* task is used to remove all bridges currently selected in the Bridge List from the system. Once removed, the structures will no longer be available for new inspection reports, analysis, etc.

When the *Remove* button is clicked a warning message will appear. If *OK* is clicked on the warning message, all bridges shown in the Selected Bridges grid will be removed.

Click the *Cancel* button to return to the Bridge List.

The *Bridges > Manage Bridge Groups* task allows the user to create and manage bridge groups for grouping together bridges by a certain criteria to be used in the *Projects* tab. The bridge groups can be created manually via the *Bridge Groups* subtask or automatically via the *Setup Bridge Groups* subtask.

Bridge Groups

The *Bridge Groups* subtask lists all of the groups for a specific filter, allows the user to edit the selected group from the grid, and starts the manual creation of a group.

Filter and Layout

The *Filter* and *Layout* dropdowns contain all of the filters and layouts created in the *Manage Filters* and *Manage Layouts* tasks relevant to the *Bridge Groups* task. The dropdowns are not dynamic, so the *Apply* button must be clicked once the desired selections are made.

Quick Filter Editor

Additional filters can quickly be created by expanding the *Bridge Group Quick Filter Editor*. Once the desired selections have been made, the results of the filter can be shown by clicking the *Filter Results* button. To save the filter, enter a name into the *Save As* textbox and click the *Save Filter* button. Check the *Share* checkbox if the filter should be made available to other users.

Bridge Groups Page Controls

The *Edit* button indicates that the most recently selected group in the grid will be edited and takes the user to the *Bridge Group Details* subtask.

The *Add* button indicates that a new group will be created and takes the user to the *Bridge Group Details* subtask.

The *Delete Selected* button deletes all of the selected groups.

Bridge Group Details

The *Bridge Group Details* subtask allows the user to view the details of a specific group and make changes.
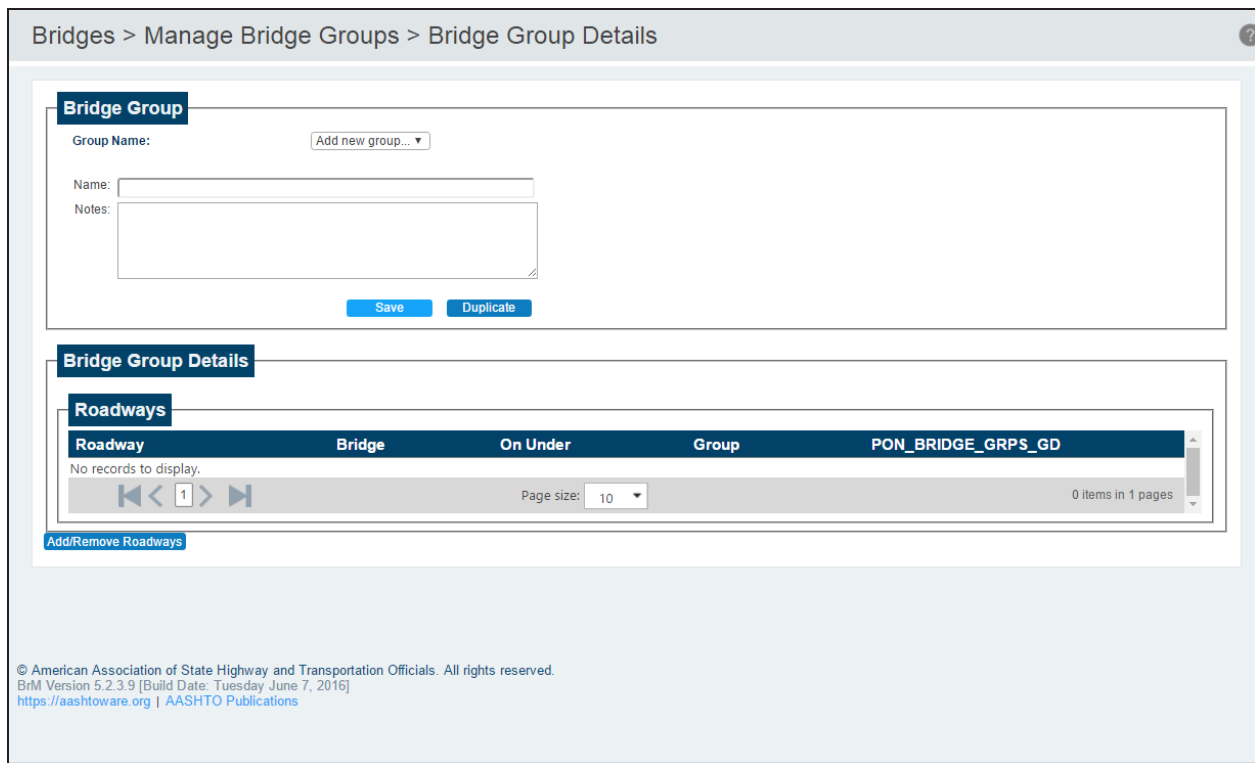
Bridge Group

The *Bridge Group* grouping contains the name and notes for the group currently selected in the *Group Name* dropdown. The name of the group can be changed at any time by typing a new name into the *Name* textbox and clicking *Save*.

A new group can be created from the *Bridge Group Details* subtask by selecting "Add new group..." from the *Group Name* dropdown, entering a name into the *Name* textbox, and clicking *Save*.

The *Duplicate* button makes a copy of whatever group is currently selected in the *Group Name* dropdown and adds a "_dp" to its name.

Example: If a group named "BrM" was duplicated, the duplicate would be named "BrM_dp."

Bridge Group Details

The *Bridge Group Details* grouping lists all of the roadways for the currently selected group. The *Add/Remove Roadways* button takes the user to the *Add/Remove Roadways* subtask to manage the roadways for the currently selected group.

Add/Remove Roadways

The *Add/Remove Roadways* subtask allows the user to add and/or remove roadways from the currently selected group. A new group can also be created from this page.

Filter and Layout

Similar to the *Bridge Analysis Groups* subtask, the *Add/Remove Roadways* subtask has *Filter* and *Layout* dropdowns that contain all of the filters and layouts created in the *Manage Filters* and *Manage Layouts* tasks relevant to the *Add/Remove Roadways* subtask. The dropdowns are not dynamic, so the *Apply* button must be clicked once the desired selections are made.

Quick Filter Editor

Additional filters can quickly be created by expanding the *Roadway Quick Filter Editor*. Once the desired selections have been made, the results of the filter can be shown by clicking the *Filter Results* button. To save the filter, enter a name into the *Save As* textbox and click the *Save Filter* button. Check the *Share* checkbox if the filter should be made available to other users.

Update Roadways

Roadways can be added to or removed from the currently selected group by checking/unchecking the checkbox of the desired bridges in the grid and then clicking the *Update Roadways* button. The group can be changed by using the drop-down to the left of the *Update Roadways* button. A new group can be added by entering a name in the textbox to the right of the *Add New Group* button, then clicking *Add New Group*.

Setup Bridge Groups

Unlike the 3-task combination of the *Bridge Groups*, *Bridge Group Details*, and *Add/Remove Roadways* subtasks to manually create groups, the *Setup Bridge Groups* subtask uses filter selections to automatically generate groups.

Bridges > Manage Bridge Groups > Setup Bridge Groups

All Roadway Filters

☐ On/under	☐ District	☐ On/off state system	☐ Kind of highway
☐ Action Defs	☐ Admin area	☐ NHS status	☐ Level of service
☐ County	☐ Bridge group	☐ Route	☐ Owner
☐ Functional class	☐ Directional suffix	☐ Custodian	☐ Roadway name

Stem of new bridge groups names: [＿＿＿＿＿＿] **Start grouping**

Bridge Groups

Bridge Groups	Bridge_Count	Roadway_Count	Description
BridgeGroup1	0	0	
BridgeGroup2	0	0	
BridgeGroup3	0	0	

⏮ ‹ 1 › ⏭   3 items in 1 pages

All Roadway Filters

The *All Roadway Filters* grouping lists all of the filters that can be used to create a group. The selected filters will filter the system's entire list of bridges. When the desired filter selections have been made, enter a name into the textbox to the left of the *Start Grouping* button, then click *Start Grouping*. Every possible version of the selected filters will be created as a group.

Example: If an agency containing 10 districts selects the District filter, 10 new groups will be created.

*Note: The max number of groups that can be created at one time from the *Setup Bridge Groups* subtask is 250.

Bridge Groups

The *Bridge Groups* grouping lists all of the current groups and their bridge counts, roadway counts, and descriptions.

Mapping

The *Bridges > Mapping* task allows users to view the positioning of selected bridges in Google Maps as well as map selected bridges that are currently unmapped.
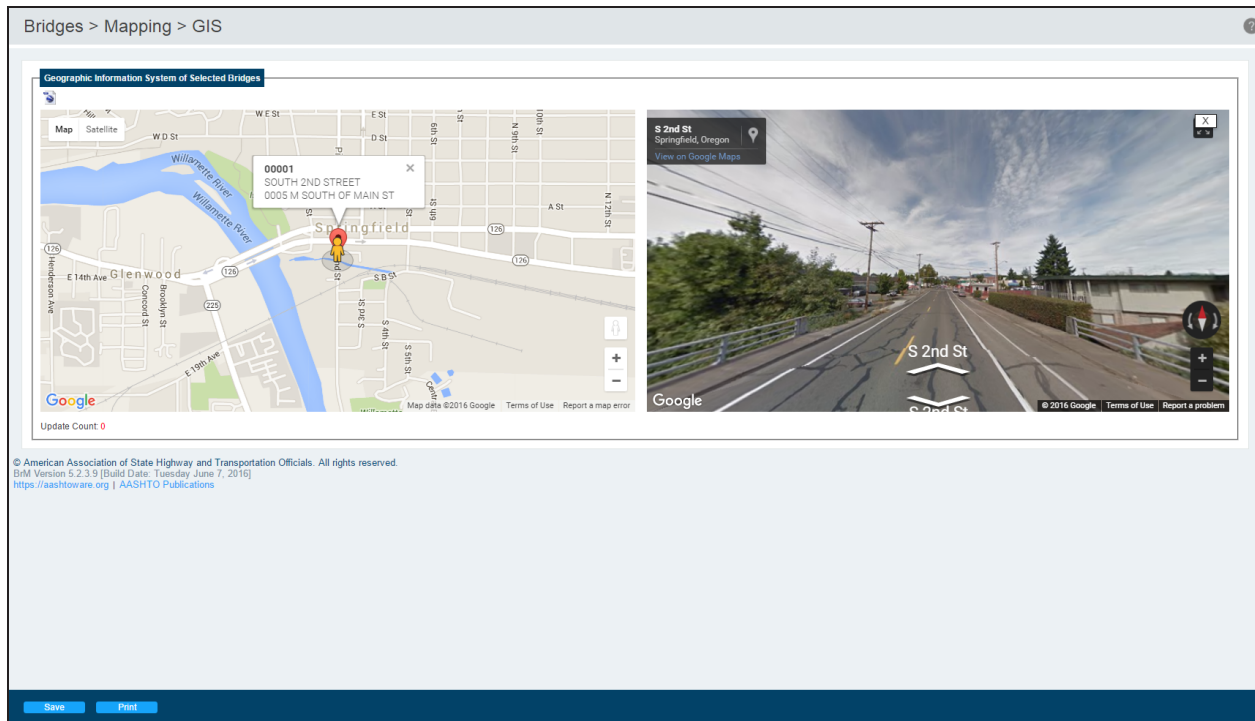
*Note: Google Maps is a product of Google and therefore BrM cannot control potential browser issues with its use.

*Note: No more than 100 bridges can be mapped at a time. If more than 100 bridges are selected, the following message will appear:
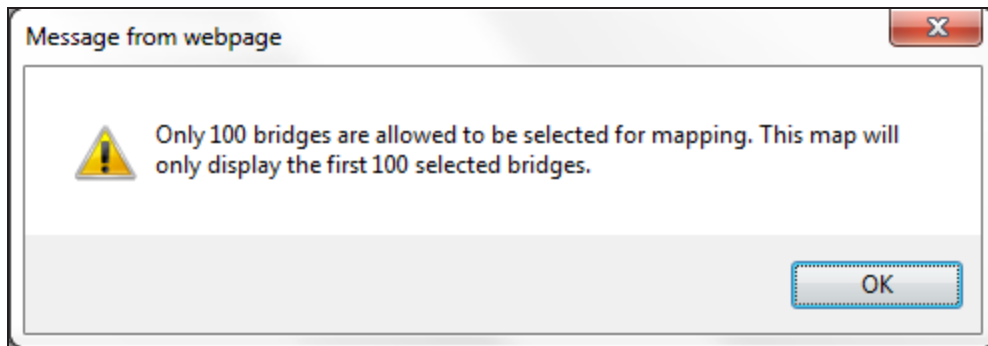
Mapped Bridges

All selected bridges with an established latitude and longitude (the values were entered on the *Bridges > Create Struct* or *Inspection > Inventory* tasks) or that have previously been mapped will be indicated with a red pin on the map. Clicking on the pin will activate a box with the structure's identifying information and a split view of the map and the structure's street view:
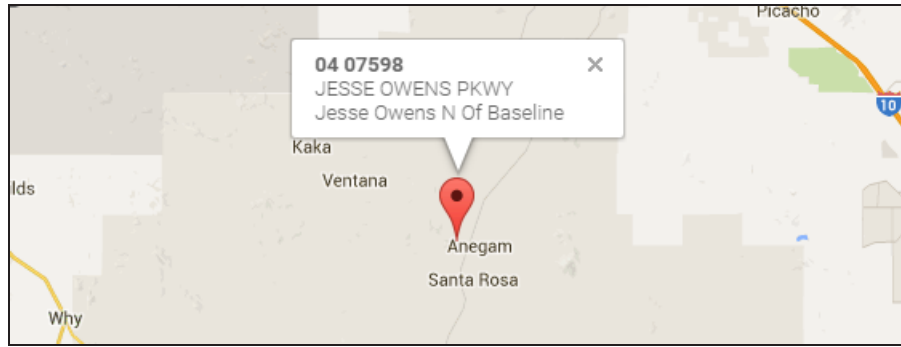
Unmapped Bridges

All selected bridges without an established latitude and longitude (the values were <u>not</u> entered on the *Bridges > Create Struct* or *Inspection > Inventory* tasks) will appear in a grid in the *Unmapped Bridges* grouping. The *Unmapped Bridges* grouping will only appear if a selected bridge is unmapped. Selecting a bridge from the grid in the *Unmapped Bridges* grouping (clicking on the bridge's row in the grid) changes the map's cursor from a white hand to a black crosshair that, when clicking on the map, pins the unmapped bridge to the map at the selected location. This will then update the bridge's latitude and longitude on the *Inspection > Inventory* task. Unlike the mapped bridges, this unmapped bridge's pin will be yellow until the *Save* button is clicked, at which point the pin will turn red. The Update Count number underneath the map will indicate how many map positions have been updated without being saved.

Changing a Mapped Bridge Location

To change the map location of a bridge with an established latitude and longitude or previously determined map location, the user can click and hold the bridge's map pin and then drag and drop it at a new location. As with plotting unmapped bridges, this will change the bridge's pin color to yellow until the *Save* button is clicked. The Update Count number underneath the map will indicate how many map positions have been updated without being saved.

Sync Mapping

Bridges that are plotted via the *Bridges > Mapping* task and not via the latitude and longitude fields of the *Bridges > Create Struct* or *Inspection > Inventory* tasks will not have their latitude and longitudes recorded/updated with the new map plot point.

In order for the latitude and longitude fields (NBI items 016 and 017) to record/update any changes made on the *Bridges > Mapping* task, the user must use the sync mapping feature of the *Admin > Mapping > Sync Mapping* task.

Reports

- The Reports section of the manual addresses each of the tasks in BrM's *Reports* tab. The *Reports* tab allows the user to select, view, and print various reports for all or selected structures in the database.

Generate

The *Reports > Generate* task allows the user to generate a selected report and view the results in a variety of formats. BrM comes with a default set of reports, but custom reports can be created on the *Reports > Register* task.

Report Generation

No options are available upon initial entry to the *Reports > Generate* task. Options do not become available until a report is selected from the *Report* dropdown. The available options will vary depending on the selected report.

Format

The *Format* radio buttons will be the same for every report. The selected report will be generated in the selected format once the *Generate Report* button is clicked.

Arguments

The controls that appear in the *Arguments* grouping will depend on the report selected in the *Report* dropdown. Most of the "insp" selections will have the following controls:

The radio buttons allow the user to determine exactly which structures to include in the report: all structures, the number of structures in the list, the selected structures, the one highlighted and selected structure (if one is), or a specific structure that can be indicated.

***Note:** If the mouse is hovered over the [#] Selected Structures radio button, a tooltip will appear displaying all of the Bridge IDs for the selected structures (up to 200):*

Once the desired selections have been made, click the *Generate Report* button at the bottom of the screen to generate the selected report.

Recently Generated

Once at least one report has been generated, the Recently Generated list will appear next to the *Report Generation* grouping. This provides easy access to reports that were recently generated.

Report Types

Below are BrM's default reports and what is included in them:

BrM Default Reports	
Report	**Description**
23 Metrics Report v1.4	Reviews the selected bridges against the FHWA's list of 23 metrics and determines the level of compliance for each.
config001_elem_ states_actions	The Elements, States & Actions sheet for the selected element.
config002_config_ options_list	The User Configuration Options Listing including: • Configuration options • Option values/default values • Descriptions • Help IDs
config003_para- meter_report	The Parameter Report listing all of the parameters the user can modify.
config004_data_dic- tionary	The Pontis Data Dictionary lists and describes all of the columns available for the selected table.
config006_user_list	The User List displays all of the system's users including their ID, name, group, role, agency, and phone/email.
config007_misc_sys_ param	The Miscellaneous System Parameters listing.
config008_actions	The Actions sheet provides a list of all of the actions in the system that are used for the work candidates as well as in the Analysis and Projects tabs.
config009_ui_nav- igation	The User Interface Navigation sheet provides a navigation breakdown of every task for the selected tab.
config010_app_secur- ity	The Application Security report lists all of the selected role's permissions throughout the system.
insp001_inspection_ sia_metric	The Structure Inventory and Appraisal (SI&A) sheet in metric units. It contains: • All NBI SI&A information • Element-level condition data • Past inspection comments
insp002_inspect_ report_metric	The expanded SI&A sheet in metric units, including: • Notes about the bridge, inspection, and each element • Inspector work candidates • Summary information on past inspections
insp003_inspection_ schedule	The Inspection Scheduling Information report including: • Date and inspector for the most recent regular and special inspections • Scheduled frequency of regular and special inspections • Planned dates for the next inspections
insp004_inspection_ resource_req	The Inspection Resource Requirements report is used to plan resources for new inspections of bridges with special resource requirements. It contains: • Dates of the previous and next inspections • Hours for crew, flaggers, helpers, snoopers, special crews, and special equipment
insp005_bridge_	The Bridge Health Index Detail sheet displays the health index for the selected bridges

BrM Default Reports	
Report	**Description**
health_index_det	and provides detailed information about the element condition distributions used to calculate the health index.
insp006_network_elem_sum	The Network Element Summary Distribution report in metric showing the network-wide distribution of elements by environment and condition state.
insp007_inspection_sia_english	The English unit version of insp001_sia_metric.
insp008_inspect_report_english	The English unit version of insp002_inspect_report_metric.
insp009_network_elem_sum_english	The English unit version of insp006_network_elem_sum.
insp010_bridge_condition_summary	The Bridge Condition Summary report includes the facility carried, last inspection date, SD/FO status, sufficiency rating, and NBI condition ratings for deck, superstructure, substructure, culvert, and channel.
insp011_inspect_report_metric	Contains the same data as "insp002_inspect_report_metric" but the element inspection notes do not have their own grid. Instead, they sit below each element in the Element Inspection grid.
insp012_inspection_sia_english	Contains only SI&A information and element condition state data in English units.
insp014_inspect_report_english	The expanded SI&A sheet in English units, including: • Notes about the bridge, inspection, and each element • Inspector work candidates • Summary information on past inspections
insp015_inspect_report_metric	Contains the same data as "insp002_inspect_report_metric" as well as a section with any photographs attached to the selected bridge(s).
insp016_inspect_report_english	The English unit version of "insp015_inspect_report_metric."
insp017_inspect_element_report_english	Contains only a grid for element condition state data in English units.
insp018_inspection_sia_eng (Crystal)	Similar to the insp016_inspect_report_english report but additionally allows the user to select a specific inspection report if only one structure is selected.
Tunnel report v1	Contain the inventory, inspection, and element data from the last inspection of the selected tunnels.

Register

The *Reports > Register* task allows the user to create, edit, and delete the reports that will be generated on the *Reports > Generate* task.

BrM uses Crystal Reports as its reporting engine. BrM 5.2.3 is using Crystal Reports 2013. This allows users to run any of the predefined reports that come packaged with BrM or the flexibility to write their own custom reports to suit their needs. All BrM licensees are entitled to one (1) developer license of Crystal Reports. If you wish to receive your Crystal Reports developer license, please send a request to brm@bentley.com.

The available options will depend on the report selected, but the basics are the same for the registration of all reports. The following information will describe the creation of a new report, but the process of editing an existing report is very similar.

*Note: As of version 5.2.2, BrM utilizes globally unique identifiers (GUIDs) in place of many of the keys in the database, such as the INSPKEY. For non-GUID versions of the BRIDGE, INSPEVNT, PON_ELEM_INSP, ROADWAY, or STRUCTUNIT tables, use the View tables within the database. The View tables are read-only non-GUID tables that replicate and display the information as it would have existed prior to the switch to GUIDs.

To create a new report, click the *New Report* button:

Add RPT File

The *Add RPT File* grouping is used to upload new RPT files. The RPT files are Crystal Reports files that serve as the layout for the report.

To upload an RPT file, click the *Choose File* button and locate the file. Once the file has been selected, click the *Upload File* button to add the RPT file to the system. If the selected file is not valid, an error message will appear:
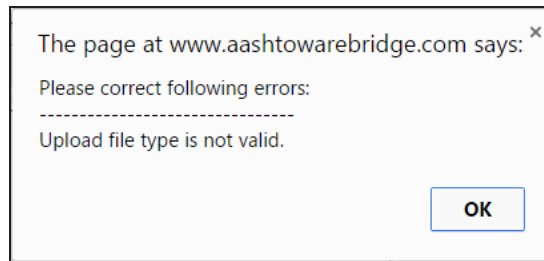
Crystal Report Registration
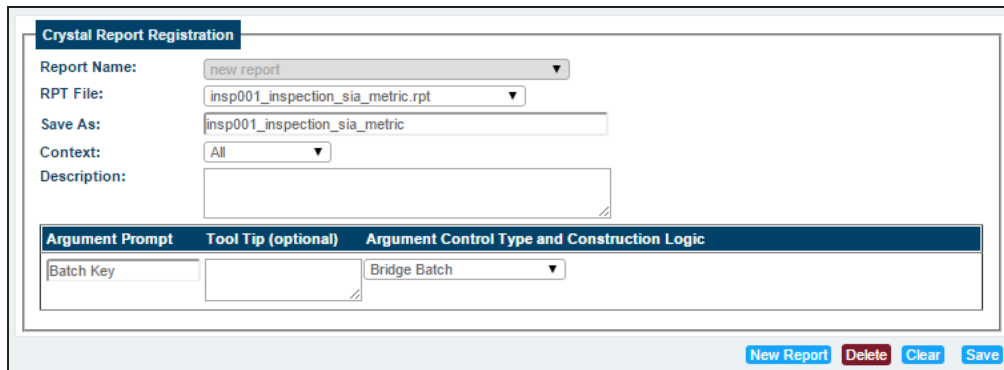
The *Crystal Report Registration* grouping determines the type of report that will be created.

Report Name

For a new report, the *Report Name* dropdown will read "new report" and will be greyed out because the report has not yet been created.

RPT File

The *RPT File* dropdown determines the rest of the options in the *Crystal Report Registration* grouping. When a selection is made, the grouping will expand with new options:

Crystal Report Registration Fields

The *Save As* textbox determines the name of the new report.

The *Context* dropdown is used to classify the report. The selection should be representative of the report.

The *Description* textbox allows the user to provide more information about the report.

Argument Options

The various argument options depend on the *RPT File* dropdown selection. The selections made here will be represented in the *Arguments* grouping of a selected report on the *Reports > Generate* task.

*Note: Not all *RPT File* dropdown selections will present argument options.

Argument Prompt

The *Argument Prompt* textbox is represented as a heading/identifier in the *Arguments* grouping of a selected report on the *Reports > Generate* task, and therefore should be indicative of the selections the user must make in the *Arguments* grouping.

Example: When the user must select the batch of bridges to include in the report, the ***Argument Prompt*** textbox typically reads "Batch Key."

Tool Tip (Optional)

The *Tool Tip* textbox is an optional field for entering helpful information about the selections being made in the *Arguments* grouping of a selected report on the *Reports > Generate* task. When the user hovers their mouse over the options, a message box will appear with the tip.

Example: When the user must select the batch of bridges to include in the report, hovering their mouse over the options could reveal a message such as "Choose the batch of bridges to include in the report."

Argument Control Type and Construction Logic

The options for the *Argument Control Type and Construction Logic* grouping are dependent upon the *RPT File* drop-down selection. These selections determine what options will be available to the user in the *Arguments* grouping of a selected report on the *Reports > Generate* task.

Register Page Controls

New Report   Delete   Clear   Save
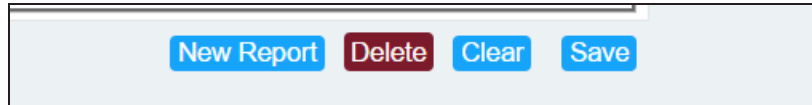
The *New Report* button creates a new report to be registered.

The *Delete* button deletes the currently selected report.

The *Clear* button clears any changes that have been made since a report's last save and takes the user back to the initial page of the *Reports > Register* task.

The *Save* button saves any changes that have been made to the currently selected report.

Tunnels

- The Tunnels section of the manual addresses each of the tasks in BrM's *Tunnels* tab. The *Tunnels* tab contains several options to manage the tunnels within the database.

The *Tunnels > Tunnel List* task is a complete list of all of the tunnels in the system that allows for the selection of tunnels prior to performing other actions in the *Tunnels* tab.

To create a new tunnel, click the *Create* button at the top of the Tunnel List. A popup will appear:

Use the *Tunnel Number* textbox to enter a unique number identifier for the tunnel.

Click the *Create* button to complete the tunnel creation.

Click the *Cancel* button to cancel the tunnel creation.

The tunnel number is the only detail determined on the *Tunnel List* task. The rest of the tunnel's details are completed on the *Tunnels > Tunnel Inventory* task.

Filters

Due to the vast size of some users' systems, filters are necessary to sort and locate tunnels based on specified criteria.

The *Filter* dropdown lists all of the relevant filters that have been created/edited on the *Bridges > Manage Filters* task (this can also be done on the *Projects > Manage Filters* task). The Tunnel List uses the "Tunnels" context on the *Manage Filters* task. When a filter is selected from the dropdown, the Tunnel List will automatically update with the filtered tunnels.

Layout

The *Layout* dropdown determines the Tunnel List's columns. There is a default layout on the *Tunnel List* task, but new layouts can be created on the *Bridges > Manage Layouts* task (this can also be done on the *Projects > Manage Layouts* task). The Tunnel List uses the "Tunnels" context on the *Manage Layouts* task.

Export Options

There are two export options located at the top left corner of the Tunnel List: XLS and KML. If one or more tunnels are selected, only the information from the selected tunnels will export. If no tunnels are selected, all of the tunnels in the current filter will be exported.
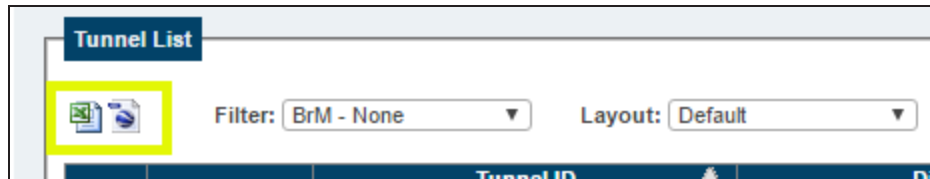
Selecting Tunnels

To select a tunnel, check the box in the Tunnel List for the desired tunnel. Multiple tunnels can be selected at once, but the last selected tunnel will be the one displayed when navigating to the other *Tunnels* tasks.

Tunnel List Controls

Within the Tunnel List are controls to edit, copy, and delete tunnels.

The ✎ icon takes the user to the *Tunnels > Tunnel Inventory* page to edit the details of the tunnel.

The 📄 icon makes a copy of the tunnel and all of its details. A popup will appear so that the user can give the copy a unique number identifier.

The ✕ icon deletes the tunnel.

Tunnel Inspection

The *Tunnels > Tunnel Inspection* task is used to record the tunnel inspection's schedule, general inspection data, and element conditions. The Specifications for the National Tunnel Inventory (SNTI) are marked by their item IDs with red text wrapped in parenthesis.

The header at the top of the page indicates the currently selected tunnel and inspection.

The *Tunnel* dropdown allows the user to select which tunnel's inspection to view. The user can also click the *Create* button next to the *Tunnel* dropdown to create a new tunnel.

The *Inspection* dropdown allows the user to change which inspection to view for the currently selected tunnel. The user can also click the *Create* button next to the *Inspection* dropdown to create a new inspection.

First Routine Inspection

The *First Routine Inspection* grouping only appears on the initial inspection of a tunnel in BrM. This grouping will be hidden for all subsequent inspection.

The *Routine Inspection Target Date* textbox is used to indicate the date on which the tunnel's first routine inspection in BrM is planned to be completed.

Summary

The *Summary* grouping contains the information established on the *Tunnels > New Tunnel Inspection* task. This information can be edited if desired.

Inspection Schedule

The *Inspection Schedule* grouping contains information about the various inspection for the tunnel.

The *Scheduled* checkboxes indicate a specific SNTI that must be recorded. The NTI requires that the user indicate whether an in-depth and/or special inspection is scheduled. The *Special Inspection* dropdown can be configured using the pon_tunnel_insp.SPECIAL_TYPE option in the *Admin > General Config > Parameters* task.

The *Inspector* dropdown/textboxes indicate the person who performed the specific inspection type. Mechanical, electrical, and fire suppression inspection types contain textboxes rather than dropdowns because these inspections are not typically done by BrM users but still need to be recorded.

The *Current Date* textbox displays the date of the most recent inspection for the selected tunnel based on type of inspection. This can be the inspection that is currently being performed or the last inspection that was performed, all depending on whether or not the inspection type is selected for the current inspection.

The *Frequency* textbox is used to determine the number of months between inspections based on type of inspection. The routine inspection will default to 24 months.

The *Damage Inspection* dropdown is an SNTI option necessary to indicate whether a damage inspection was performed since the last recorded inspection.

General Inspection Data

The *General Inspection Data* grouping contains general SNTI information specific to the current inspection.

Element Condition

The *Element Conditions* grouping is used to select which elements will be included in the inspection and then determine the condition states of each element.

This grouping works almost exactly like the *Inspection > Condition* task's *Element Conditions* grouping. For in-depth information about the controls, read the *Inspection > Condition* section of the user manual.

Tunnel Inspection Page Controls
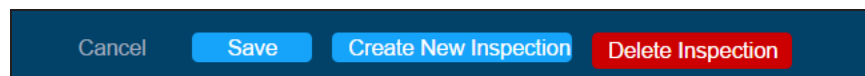
The *Save* button saves the changes made to the current inspection.

The *Create New Inspection* button creates a new inspection for the selected tunnel and takes the user to the *Tunnels > New Tunnel Inspection* task.

The *Cancel* button cancels the changes made to the current inspection and returns the user to the *Tunnels > Tunnel List* task.

The *Delete Inspection* button deletes the current inspection for the selected tunnel.

The *Tunnels > Tunnel Inventory* task contains all of the specific details for the selected tunnel as well as its structure units.

The *Tunnel* dropdown in the header allows the user to select which tunnel's details to edit.

The top portion of the task has several groupings to indicate the tunnel's location, age, route information, and more.

Structure Units

The *Structure Units* grouping allows the user to create/modify the selected tunnel's structure units. Structure units are groups of structures typically based on structural design and material. It is not necessary to have multiple structure units, but it can be helpful for inspections.

Click the *Add New* button to create a new structure unit:

The *Key* textbox is a simplified identifier for the structure unit that's displayed in the Str. Unit column of the Elements grid on the *Tunnel Inspection* task.

The *Structure Unit Name* textbox is used to indicate the name of the structure unit and should include specific information that clearly explains which area of the tunnel it covers.

The *Default* checkbox determines the default structure unit selected when a new element is added to a tunnel inspection on the *Tunnels > Tunnel Inspection* task. Only one structure unit can be the default.

The *Active* checkbox determines whether or not the structure unit is active and available to be utilized on the *Tunnels > Tunnel Inspection* task.

Tunnel Inventory Page Control

The *Save* button saves the changes made on the *Tunnels > Tunnel Inventory* task.

The *Save & Close* button saves the changes made on the *Tunnels > Tunnel Inventory* task and returns the user to the *Tunnels > Tunnel List* task.

The *Cancel* button cancels the changes made on the *Tunnels > Tunnel Inventory* task and returns the user to the *Tunnels > Tunnel List* task.

New Tunnel Inspection

The *Tunnels > New Tunnel Inspection* task is used to create a new inspection for the selected tunnel. This page is only accessible by selecting the *Create New Inspection* button on the *Tunnels > Tunnel Inspection* task.

Tunnels > New Tunnel Inspection

Inspection Schedule

Routine Inspection: Team Leader: USER, Pontis

Inspection Date (D.2): 10/18/2016

Types of Inspection Performed

Routine: ☐
In Depth: ☐
Damage: ☐
Special: ☐
Mechanical: ☐
Electrical: ☐
Fire Suppression: ☐

Cancel   Create

The *Team Leader* dropdown defaults to the current user but can be changed.

The *Inspection Date* textbox defaults to the current date but can be changed.

The *Types of Inspection Performed* grouping contains checkboxes to indicate specifically which inspection types will be performed during the newly created inspection.

New Tunnel Inspection Page Controls

The *Create* button creates a new inspection based on the selections made on the page and sends the user to the *Tunnels > Tunnel Inspection* task.

The *Cancel* button cancels the new inspection creation and returns the user to the *Tunnels > Tunnel List* task.

Admin

- The Admin section of the manual addresses each of the tasks in BrM's *Admin* tab. The *Admin* tab contains the administrative functions of BrM that create flexibility within the software by allowing the administrator to configure various settings to meet agency needs.

Security

The *Admin > Security* task allows the admin to set up the system's security structure. The admin can create and edit users, user groups, and user roles, as well as determine basic permissions for user roles, manage database setups, and determine user role report access.

BrM User Security	
Security Component	**Description**
User	Every person who uses BrM will have a user account to log in to the software using a user name and password. The user account is then tied to groups and roles to determine what a user can see and do within BrM.
Group	A user's group determines which structures are visible and accessible to the user in the system. **Example:** If a user works on bridges in district 1 and the admin only wants them to see district 1 structures, the user will be assigned to a group with an access filter that only permits access to district 1 structures.
Role	A user's role is typically designed around that person's function within their agency. Separate roles usually exist for inspectors, planners, admins, etc. The role determines a user's module access and permissions within each module. **Example:** If a user is an inspector, that user will mostly likely be assigned to an inspector role that grants both read and write access to the *Inspection* tab. However, that inspector role will probably be limited to read-only access for the *Analysis* tab.

Users

The *Users* subtask is used to create and edit users. The user's account information, user groups, user roles, and user status can all be changed.

User Account Info

In the *User Account Info* grouping, an existing user can be selected to edit from the *Select existing user* dropdown, or a new user can be created by clicking the *Add new user* button.

Edit Account Info

The *Edit Account Info* grouping contains all of the user's basic information. The mandatory fields are marked by a red asterisk (*). These fields must be completed in order to save the user.

*Note: Unlike other fields, the *User ID* <u>cannot</u> be edited after the initial creation. Be sure to verify the User ID is entered exactly as desired before saving the new user.

A password field may or may not be visible depending on the agency's database.

User Groups

All users must have at least one user group. To edit the user's user groups, click the *Edit* button in the *User Groups* grouping.
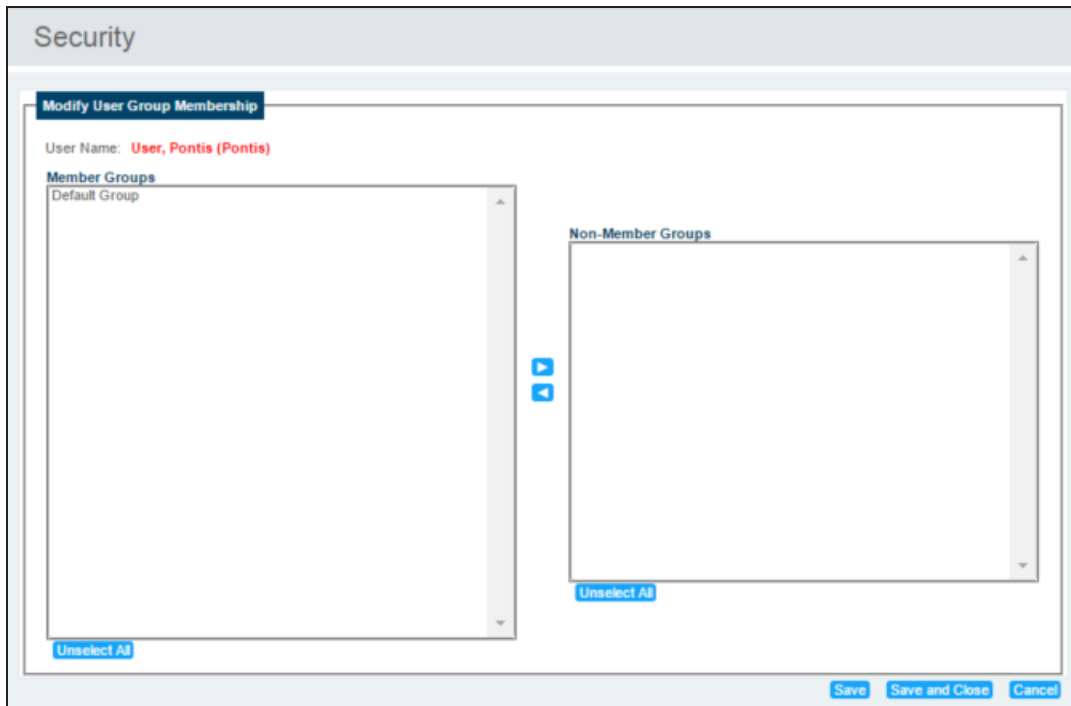
The user's current user groups are on the left in the *Members Groups* list, and the other existing user groups that the user is not a part of are on the right in the *Non-Member Groups* list.

To move one or more user groups from one list to the other, select all of the desired user groups and then click the right or left arrow - ▶ ◀ - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all user groups currently selected.

Users - User Groups - Page Controls

The *Save* button saves the changes that have been made to the user's user groups and keeps the user on the page.

The *Save and Close* button saves the changes that have been made to the user's user groups and exits back to the *Users* subtask.

The *Cancel* button cancels the changes that have been made to the user's user groups and exits back to the *Users* subtask.

User Roles

All users must have at least one user role. To edit the user's user roles, click the *Edit* button in the *User Roles* grouping.
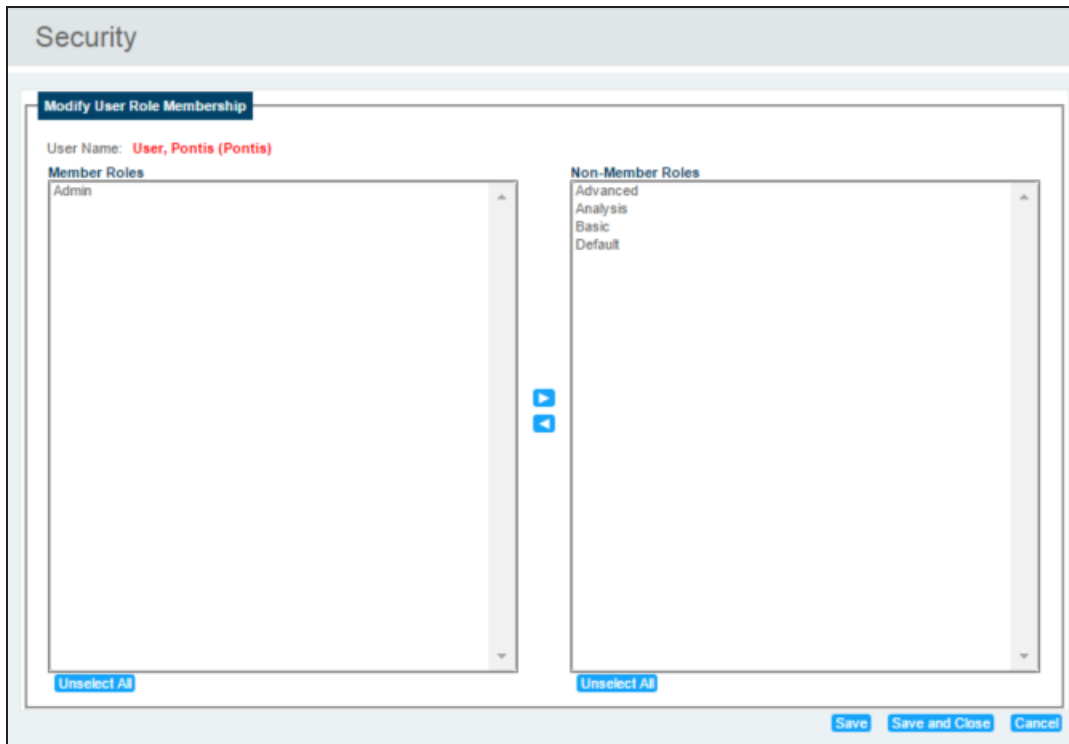
The user's current user roles are on the left in the *Members Roles* list, and the other existing user roles that the user is not a part of are on the right in the *Non-Member Roles* list.

To move one or more user roles from one list to the other, select all of the desired user roles and then click the right or left arrow - ▶ ◀ - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all user roles currently selected.

Users - User Roles - Page Controls

The *Save* button saves the changes that have been made to the user's user roles and keeps the user on the page.

The *Save and Close* button saves the changes that have been made to the user's user roles and exits back to the *Users* subtask.

The *Cancel* button cancels the changes that have been made to the user's user roles and exits back to the *Users* subtask.

User Status

The *User Status* grouping contains the *Account Disabled* checkbox that determines whether or not an account is accessible. If the box is checked, the currently selected user will not be able to log in to BrM.

Disabled user accounts are greyed out in the *Select Existing User* dropdown in the *User Account Info* grouping.

Change .dbadmin Password

The .dbadmin account controls the database. Clicking the *Change .dbadmin Password* button will allow the admin to change the .dbadmin password.

It is recommended that the .dbadmin password be changed from the initial password to ensure system security.

Import Pontis 5.1 Passwords

The *Import Pontis 5.1 Passwords* button allows the admin to import passwords from the previous version of BrM. By default, migrating to a new system resets all passwords.

Click the *Import Pontis 5.1 Passwords* button to proceed to the following page:

Click the *Choose File* button to locate the file containing the old passwords, then click the *Import* button.

Click the *Close* button to return to the *Admin > Security > Users* subtask.

Users Page Controls

The *Save* button saves the changes to the selected user.

The *Save and Close* button saves the changes to the selected user and returns the admin to the *Bridges > View List* task.

The *Revert* button cancels any unsaved changes to the selected user.

The *Delete* button deletes the selected user from the system. However, this is not a permanent deletion from the database. This marks the user as "inactive" in the Pon_App_Users database table.

Groups

The *Groups* subtask is used to create and edit groups. The admin can control the access filters for each group and the users within each group. The access filters created on the *Manage Filters* task determine to which structures the users in the group have access. Only the structures that meet the criteria established in the group's access filters will be visible and accessible to the users in the group.
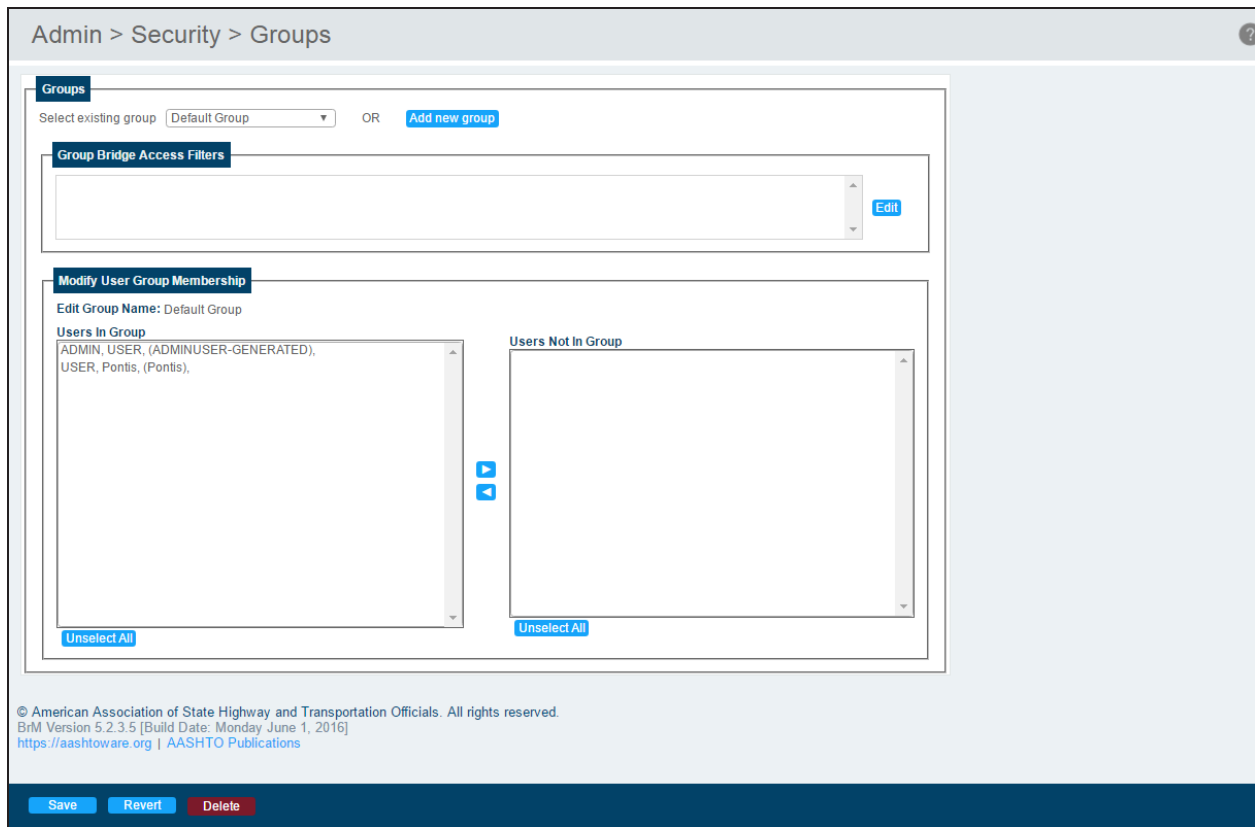
Existing and New User Groups

The *Select Existing Group* dropdown allows for the selection of an existing user group.

The *Add New Group* button creates a new user group.

Group Bridge Access Filters

The *Group Bridge Access Filters* grouping determines the access filters for the selected user group. Clicking the *Edit* button takes the admin to the following page:
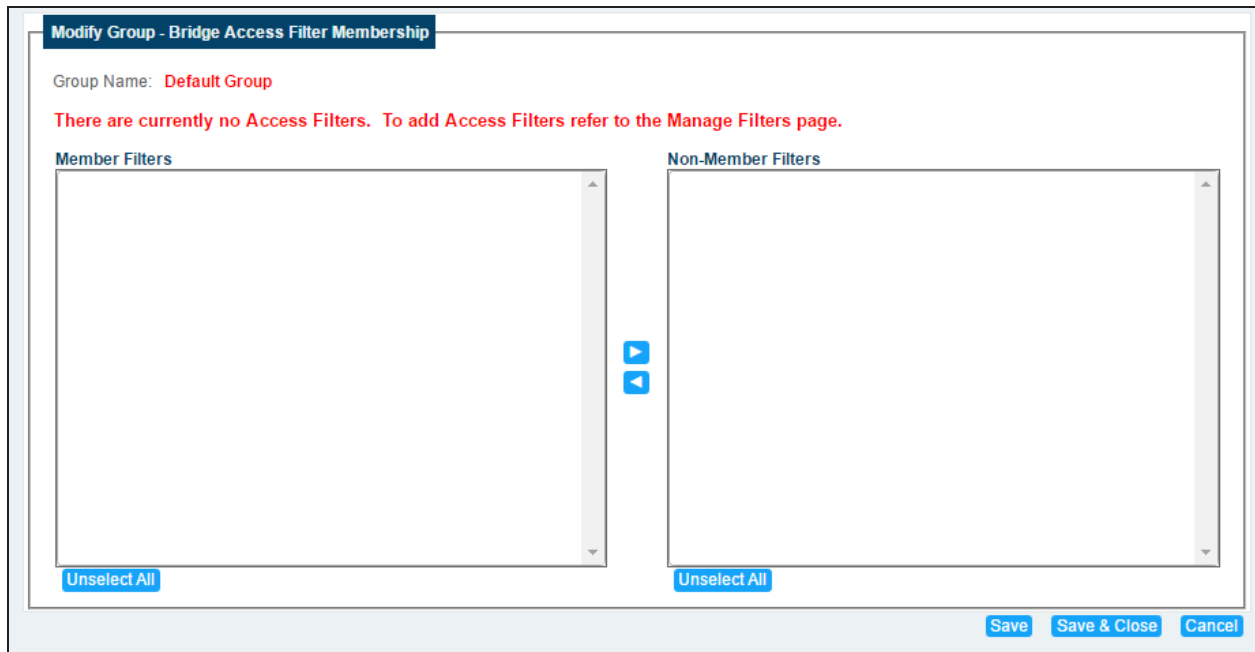
The user group's current access filters are on the left in the *Members Filters* list, and the other existing access filters are on the right in the *Non-Member Filters* list.

To move one or more access filters from one list to the other, select all of the desired access filters and then click the right or left arrow - - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all access filters currently selected for that list.

Groups - Access Filters - Save and Cancel Controls

The *Save* button saves the changes that have been made to the user group's access filters and keeps the user on the page.

The *Save and Close* button saves the changes that have been made to the user group's access filters and exits back to the *Groups* subtask.

The *Cancel* button cancels the changes that have been made to the user group's access filters and exits back to the *Groups* subtask.

Modify User Group Membership

The *Modify User Group Membership* grouping controls which users belong to the selected user group.

The *Edit Group Name* textbox is used to update the name of the existing user group or to name the new user group. User group names that are greyed out in the textbox cannot be edited.

The user group's current users are on the left in the *Users in Group* list, and the other existing users not in the user group are on the right in the *Users Not in Group* list.

To move one or more users from one list to the other, select all of the desired users and then click the right or left arrow - - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all users currently selected for that list.

Groups Page Controls
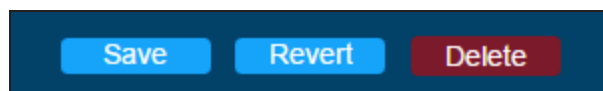
The *Save* button saves the changes made to the selected user group.

The *Revert* button cancels any unsaved changes made to the selected user group.

The *Delete Group* button deletes the selected user group from the system.

*Note: User groups can only be deleted if they do not contain users. Attempting to delete a user group that contains users will prompt the following message:

"Group cannot be deleted. Please remove all users from the group first."

Roles

The *Roles* subtask is used to create and edit user roles and determine which users will be in each role. Once the roles are created, the *Admin > Security > Permissions* subtask and the *Navigation and Field Security* tasks can be used to establish the role's access and permissions within the system.
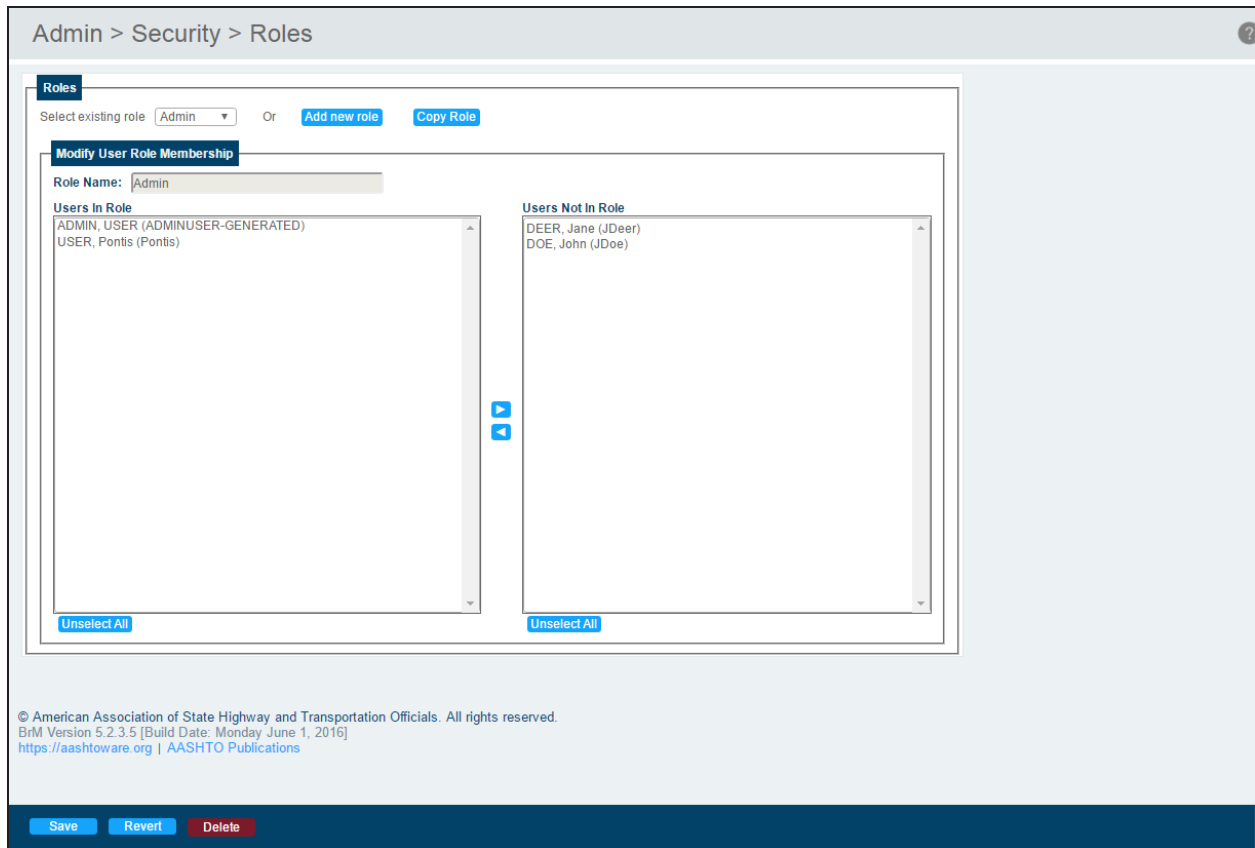
BrM comes with default roles available to the user with varying degrees of security permissions and access. Those roles include:

- **Default** - The lowest access level of all default roles. Users in this role have read-only access to only the *Bridge* and *Inspection* tabs.
- **Basic** - This role grants users access to the *Bridge*, *Reports*, *Inspection*, and *Gateway* tabs in a limited capacity. They can view inspections, run reports, export data, and make changes to NBI fields, but cannot create new inspections or modify element data in existing inspections.
- **Analysis** - This role is for users working on the analytical side of BrM. Users assigned to this role have access to the *Bridge* and *Analysis* tabs in BrM and read-only access to Inspection tab.
- **Advanced** - This role grants access to all non-admin functionality. This role removes access to the *Admin* tab and admin functions (such as filter and layout creation). This is the role an average user entering inspection data would be assigned to in BrM.
- **Admin** - Top level user access role. Users in this role have access to every page and function in BrM. This is the only role with access to the *Admin* tab.
- **AdminAnalysis** - A planner role that has read-only access to the *Inspection* tab, full access to the *Analysis*, *Projects*, and *Programs* tabs, and access to modify certain *Admin* tasks.

The following table displays the default BrM roles and the access to each task in the system:

*Note: "X" indicates full access to the task. "RO" indicates read-only access to the task.

BrM Default Roles and Permissions						
	Default	**Basic**	**Analysis**	**Advanced**	**Admin**	**AdminAnalysis**
Bridges						
View List	X	X	RO	X	X	X
Manage Layouts					X	
Manage Filters > Edit Filter					X	
Manage Filters > Edit SQL					X	
New Inspection				X	X	
Suff Rate		X		X	X	
Validate		X		X	X	
Create Struct				X	X	
Copy Struct				X	X	
Remove Struct				X	X	
Manage Bridge Groups > Bridge Groups					X	X
Manage Bridge Groups > Bridge Group Details					X	
Manage Bridge Groups - Add/Remove Roadways					X	
Manage Bridge Groups > Setup Bridge Groups					X	
Mapping					X	
Reports						
Generate		X		X	X	X
Register				X	X	X
Tunnels						
Tunnel List	By default, all roles have full access to the *Tunnels* tasks. The admin can establish permissions for the tasks on the *Admin > Security > Permissions* subtask.					
Tunnel Inspection						
Tunnel Inventory						
Admin						
Security > Users					X	
Security > Groups					X	
Security > Roles					X	
Security > Permissions					X	
Security > Databases					X	

	Default	Basic	Analysis	Advanced	Admin	AdminAnalysis
BrM Default Roles and Permissions						
Security > Reports					X	
Security > Password Rules					X	
General Config > Parameters					X	
General Config > Options					X	X
General Config > Export Options					X	X
General Config > Data Dict					X	X
General Config > Checked Out Bridges					X	X
General Config > Logging					X	X
General Config > Standard					X	X
General Config > Agency					X	X
General Config > Visual Form Editor					X	X
General Config > Page Export					X	
General Config > Equation Editor					X	
General Config > Set Editor					X	
General Config > Validation Editor					X	
Mapping > Sync Mapping					X	X
Mapping > Map Options					X	
Modeling Config > Element Spec					X	X
Modeling Config > Element-Child Linking					X	
Modeling Config > Project Categories					X	
Modeling Config > Deterioration Profiles					X	

BrM Default Roles and Permissions						
	Default	**Basic**	**Analysis**	**Advanced**	**Admin**	**AdminAnalysis**
Modeling Config > Elements					X	X
Modeling Config > Assessment					X	X
Modeling Config > Benefit Groups					X	X
Modeling Config > Action Defs					X	X
Modeling Config > Cost Index					X	X
Modeling Config > Network Policies					X	X
Modeling Config > Advanced Formulas					X	X
Modeling Config > Utility					X	X
Modeling Config > Weights Profile					X	X
Modeling Config > Subdivision Profiles					X	X
Modeling Config > Executive Summary					X	X
Modeling Config > NBI Deterioration Models					X	X
Modeling Config > NBI Conversion Profiles					X	X
Modeling Config > Preservation and Replacement Policy					X	X
Modeling Config > LCCA Policy Rules					X	X
Modeling Config > LCCA Assign Policies					X	X
Tunnels > Asset Element Definitions					X	X
Tunnels > Asset Element-Child Linking					X	X
Inspection						
Condition	RO	RO	X	X	X	RO

BrM Default Roles and Permissions						
	Default	**Basic**	**Analysis**	**Advanced**	**Admin**	**AdminAnalysis**
Appraisal	RO	RO	X	X	X	RO
Inventory > Admin	RO	RO	X	X	X	RO
Inventory > Design	RO	RO	X	X	X	RO
Inventory > Roads	RO	RO	X	X	X	RO
Inventory > Agency Items	RO	RO	X	X	X	RO
Schedule	RO	RO	X	X	X	RO
Work > Work Candidates	RO	RO	X	X	X	RO
Work > Project Inform-ation	RO	RO	X	X	X	RO
Multimedia	RO	RO	X	X	X	RO
Assessments	RO	RO	X	X	X	RO
Element Condition Rat-ings	RO	RO	X	X	X	RO
Gateway						
Export		X		X	X	X
Import		X		X	X	X
Check Out				X	X	X
Check In				X	X	X
Override				X	X	X
Analysis						
Work Candidates > Bridge Analysis				X	X	X
Work Candidates > Reverse Calculation				X	X	X
Work Candidates > Needs List				X	X	X
Work Candidates > Comparison Groups				X	X	X
Utility Value				X	X	X
LCCA					X	X
Projects						
Project List					X	X
Manage Layouts					X	X
Manage Filters > Edit Fil-ter					X	X

BrM Default Roles and Permissions						
	Default	**Basic**	**Analysis**	**Advanced**	**Admin**	**AdminAnalysis**
Manage Filters > Edit SQL					X	X
Create/Edit Project > Query					X	X
Create/Edit Project > Summary					X	X
Create/Edit Project > Analysis					X	X
Create/Edit Project > Management					X	X
Upload Project					X	X
Combine Projects					X	X
Split Project					X	X
Manage Funding > Funding List					X	X
Manage Funding > Create/Edit Funding Sources					X	X
Programs						
Program List					X	X
Create/Edit Programs					X	X
Assign Projects					X	X
Performance Measures					X	X
Funding Allocation					X	X
Program Planning					X	X
Program Results					X	X
Executive Summary					X	X
Create/Edit Scenarios					X	X
Scenario Explorer					X	X

Existing and New User Roles

The *Select Existing Role* dropdown allows for the selection of an existing user role.

The *Add New Role* button creates a new user role.

A role can also be copied using the *Copy Role* button. This creates a copy of the currently selected role and adds all of the selected role's users to the copy.

Modify User Role Membership

The *Modify User Role Membership* grouping controls which users belong to the selected user role.

The *Role Name* textbox is used to update the name of the existing user role or to name the new user role. User role names that are greyed out in the textbox cannot be edited.

The user role's current users are on the left in the *Users in Role* list, and the other existing users not in the user role are on the right in the *Users Not in Role* list.

To move one or more users from one list to the other, select all of the desired users and then click the right or left arrow - - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all users currently selected for that list.

Roles Page Controls
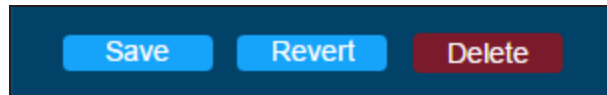
The *Save* button saves the changes made to the selected user role.

The *Revert* button cancels any unsaved changes made to the selected user role.

The *Delete Role* button deletes the selected user role from the system.

Permissions

The *Permissions* subtask allows the admin to determine the basic site permissions for user roles, including permissions related to bridges, tunnels, elements, and inspections.

Modify Role Permissions

To modify the permissions granted to each user role, click the *Modify Role Permissions* button to be taken to the following page:
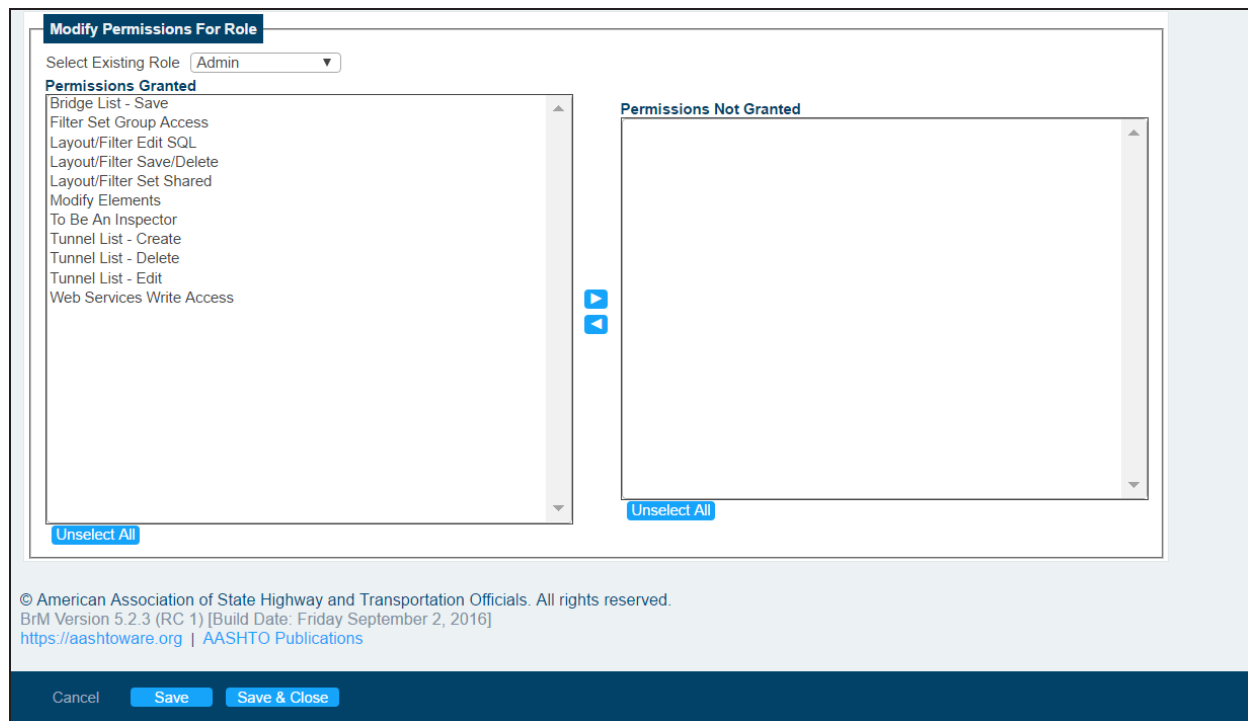
Choose the desired user role from the *Select Existing Role* dropdown.

The user role's current permissions are on the left in the *Permissions Granted* list, and the other available permissions are on the right in the *Permissions Not Granted* list.

To move one or more permissions from one list to the other, select all of the desired permissions and then click the right or left arrow -   - to move the selections to the desired list.

The *Unselect All* buttons below each list can be used to unselect all permissions currently selected for that list.

Permissions Page Controls

The *Save* button saves the changes to the selected user role.

The *Save and Close* button saves the changes to the selected user role and returns the admin to the *Admin > Permissions* task.

The *Cancel* button cancels any changes made to the selected user role and returns the admin to the *Admin > Permissions* task.

Databases

The *Databases* subtask is used to set up and edit system databases. It is recommended that only the .dbadmin account user access this task.

*Note: Database creation and management is discussed in greater detail in the *BrM Installation Guide*.

The *Select existing database* dropdown is used to select an existing database, or a new database can be added by clicking the *Add new database* text link.

Configure Database Connection

The *Configure Database Connection* grouping enables the admin to set up the database and verify the connection.

Vendor

The *Vendor* dropdown is used to select the proper database vendor. Oracle and Microsoft SQL Server are the only options.

ODBC Data Source

The *ODBC Data Source* dropdown is for selecting the desired data source.

The data source should have been created during your agency's initial installation of BrM. For more information, consult the *BrM Installation Guide*.

Description
The *Description* textbox will automatically populate with the *ODBC Data Source* dropdown selection, but it can be changed as desired.

Authentication Method
Select one of the three *Authentication Method* radio button options based on your agency's needs and/or policies.

The selection made will determine whether or not the *ID* and *Password* textboxes are present below the radio buttons.

Connection
A connection string will form based on the authentication method selected. That string can be edited using the *Edit Connection String* button.

To verify the connection, click the *Verify Connection* button. If approved, a message will appear in green text that reads "Connection string is valid!" If the verification fails, a red error message will appear explaining why the verification failed.

Save As
The *Save As* textbox names the database connection. By default, the name will be the same as the *ODBC Date Source* dropdown selection, but it can be changed as desired.

Update Optimizer Configuration File
The *Update Optimizer Configuration File* checkbox determines whether or not to update the optimizer's configuration file when a database connection is saved. This process is descibed in detail in the Program Optimizer section of the *BrM Installation Guide*.

*Note: The *Update Optimizer Configuration File* checkbox is always checked by default upon visitng the *Databases* subtask. Therefore, be sure to uncheck it if the configuration file should not be updated when the database connection is saved.

## Databases Page Controls
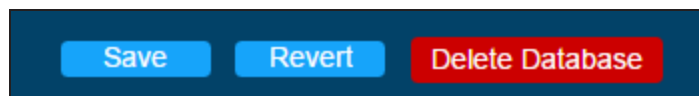
The *Save* button is used to save new databases and apply the changes that have been made to existing databases.

The *Revert* button cancels the unsaved changes that have been made to the selected database.

The *Delete Database* button deletes the currently selected database.

Reports

The *Reports* subtask is used to determine which reports are visible for each user role.
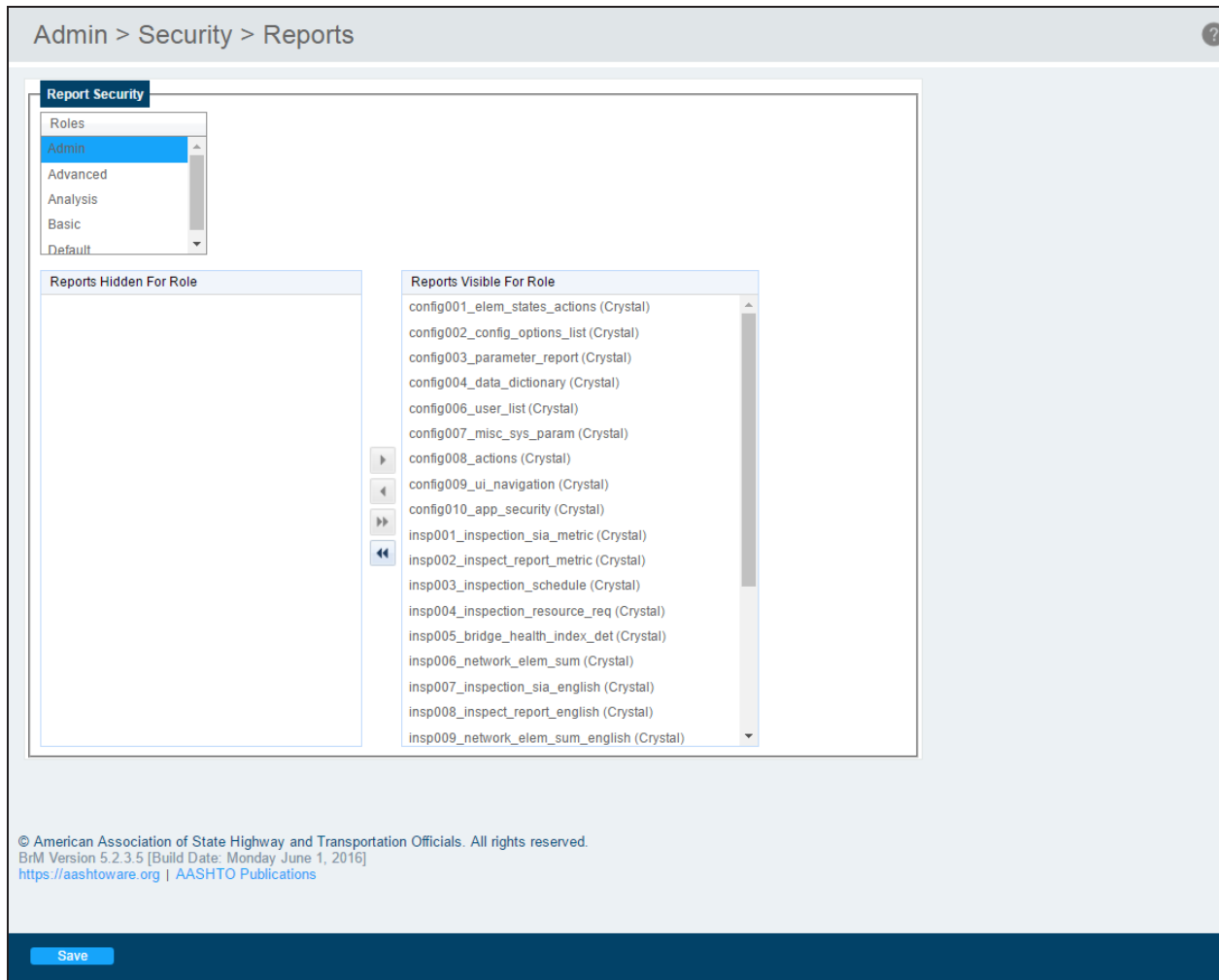
Report Security

Use the *Roles* listbox to select the role to be edited.

The *Reports Hidden For Role* list displays the reports that the role cannot see. The *Reports Visible For Role* list displays the reports that the role can view.

To move one or more reports from one list to the other, select all of the desired reports and then click the single right or left arrow - ▶ ◀ - to move the selections to the desired list.

To move all of the reports from one list to the other, click the double right or left arrow - ▶▶ ◀◀ - to move all of the reports to the desired list.

*Note: Regardless of the reports made available to a specific role, only the bridges available to a user based on their groups' access will appear in the reports.

Reports Page Controls

The *Save* button saves the changes made to the report security for the selected role.

Password Rules

The *Password Rules* subtask is used to set the complexity rules for an agency's BrM login passwords.

The ***Enable Password Complexity Rules*** checkbox applies the password rules to the system's users. If left unchecked, the checkboxes in the *Password Validation Rules* grouping will be read-only and the default password rule - **minimum of 5 characters** - will take effect.

Password Validation Rules

Use the ***Required*** checkbox to determine which of the settings are required for user passwords, then determine the specifics of those settings using the ***Minimum*** textbox.

If the password expiration window (in days) is being utilized, all users will have different expiration dates depending on when their user accounts were created. To align all of the user accounts to have a "Password Last Updated" date of the current date, click the ***Reset the Password Expiration Window for All Users***.

Click ***Save*** to ensure that the updated settings take effect.

Parameters

The *Admin > General Config > Parameters* task allows the admin to manipulate the values for the various controls throughout the system including dropdowns, grids, and other data-bound value controls. The admin can also add new parameters from this task.

Parameters

The *Parameters* grouping lists all of the controls available to be manipulated. The combination of the Table Name and Field Name columns determines where the parameter is located within the system.

If tooltips are enabled, a control's table and field name can be found throughout the software by hovering the mouse over the desired control and viewing the Table & Column Name line.

Example: In the following screenshot, the mouse is hovering over the *District* field on the *Bridges > Create Struct* task and the Table & Column Name line can be seen:
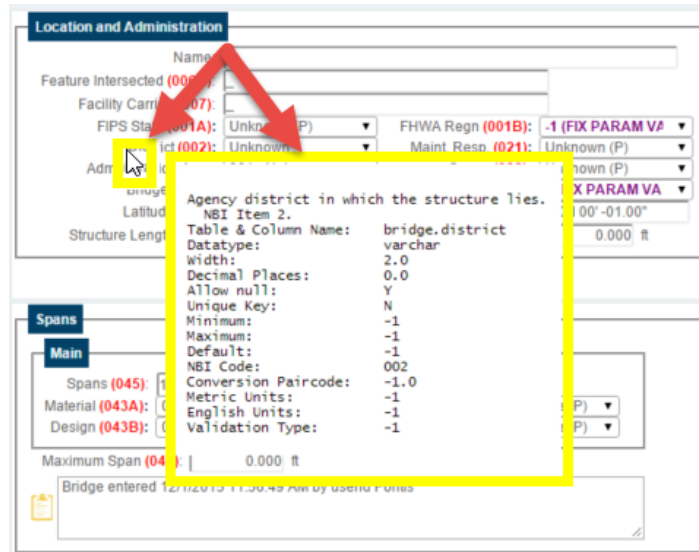
The Table & Column Name line corresponds to the Table Name and Field Name columns within the *Parameters* grouping of the *Admin > General Config > Parameters* task.

Add New Parameter

To add a new parameter, fill in the *Table Name* and *Field Name* textboxes and click the *Add New Parameter* button.

*Note: In order for a new parameter to be added, the Table Name and Field Name must already exist in the *Admin > General Config > Data Dict.* task.

Parameter Values and Labels

The *Parameter Values and Labels* grouping lists the values and their labels and descriptions for the selected parameter.

The *Value* field is the number or key that appears in the field called by the Field Name. The *Short Label* field is what will be visible to the user when making a selection from the control. The *Description* field is used mainly as an explanation of the value.

Delete

The ✕ symbol deletes the value. If a value is deleted, it will no longer appear in the parameter control where it is located in the system.

*Note: For previous selections of the deleted value, the value will contain "(FIX PARAM VALUES)" to indicate that it was previously selected but is no longer defined.

Example: If the inspevnt.dkrating value "6 - Satisfactory" is deleted, all previous inspection reports that had a deck rating of "6 - Satisfactory" will read as "6 (FIX PARAM VALUES)." For all future inspections, the deck rating of "6 - Satisfactory" will not be present.

isActive

The *isActive* checkbox is similar to deleting a value, but deactivating a value is not permanent and can be changed back at any time.

If the *isActive* checkbox is checked, the value will be visible in the parameter control where it is located in the system. If the *isActive* checkbox is unchecked, the value will no longer appear in the parameter control.

*Note: For previous selections of the deactivated value, the value will be greyed out and contain "[Inactive]" to indicate that it was previously selected but is no longer active.

Example: If the inspevnt.dkrating value "6 - Satisfactory" is deleted, all previous inspection reports that had a deck rating of "6 - Satisfactory" will read as "6 - Satisfactory [Inactive]." For all future inspections, the deck rating of "6 - Satisfactory" will not be present.

Parameters Page Controls

The *Save* button saves all of the changes that have been made on the *Admin > General Config > Parameters* task. Changes can be made to multiple parameters before the *Save* button is clicked and all of the changes will be saved.

Options

The *Admin > General Config > Options* task allows the admin to configure various options throughout BrM.
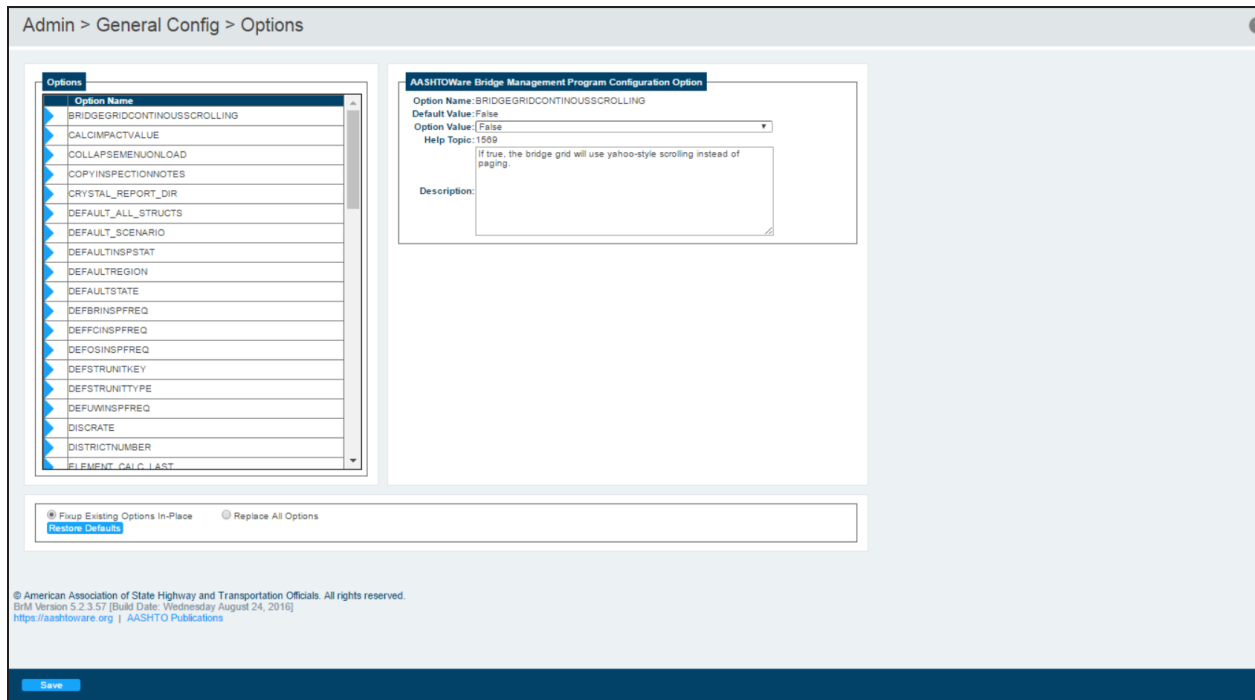
Options

The *Options* grouping contains the Options list with all of the configuration options. To select an option, click the desired ▶ icon.

Configuration Option

The *Configuration Option* grouping contains the information and configurable values for the option selected from the Options list. The Options table at the end of this section provides an explanation of each of the available options.

Restore Defaults

The *Restore Defaults* grouping contains the *Restore Defaults* button that can perform two functions based on the radio button selected:

- If the *Fixup Existing Options In-Place* radio button is selected, clicking the *Restore Defaults* button will restore any *Option Value* text fields that have been left blank back to their default value.

- If the *Replace All Options* radio button is selected, clicking the *Restore Defaults* button will restore all options back to their default values.
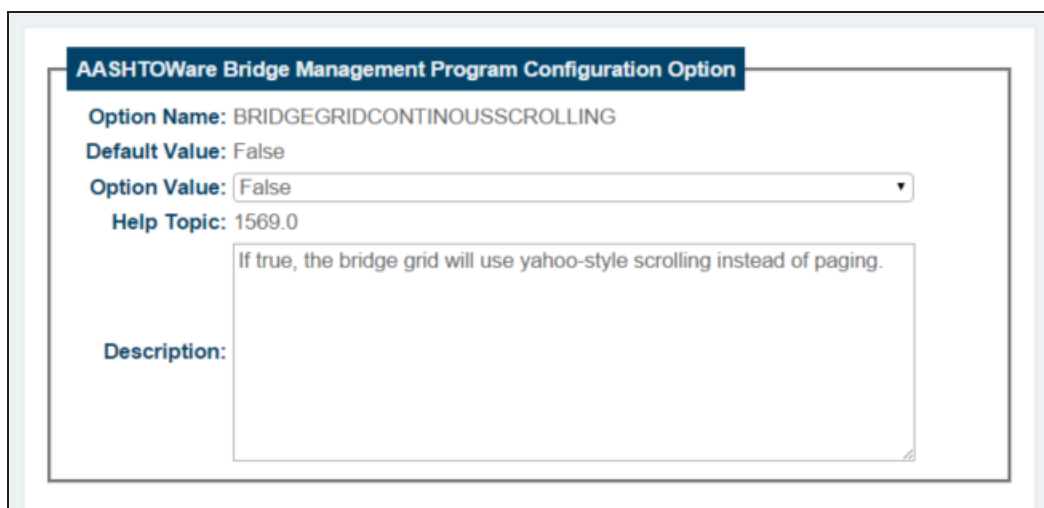
Options Page Controls

Click the *Save* button to save the changes made to the selected option.

Description of Options

Options		
Option	**Description**	**Default Value**
BRIDGEGRIDCONTIN-UOUSSCROLLING	Distinguishes the Bridge List as either a paging or scrolling list. If "True," all of the structures in the Bridge List will be viewable in one continuous scroll. If "False," only a certain number of structures will be viewable per page of the Bridge List.	False
CALCIMPACTVALUE	Determines the calculation used for the impact value of assessments.	1 / (1 + 0.00223732 * e - 1 * (1.16588 * loge (roadway.BYPASSLEN * roadway.ADTTOTAL * .00000006))) * 100
COLLAPSEMENUONLOAD	Determines if the tab menu bar is collapsed by default upon logging in to the system.	False
COPYINSPECTIONNOTES	Determines if the inspection notes from the INSPVNT and ELEMINSP tables will be copied. If "Yes" is selected, a structure's old inspection notes will be copied over to the new inspection.	Yes
CRYSTAL_REPORT_DIR	Determines the location on the user's computer where the Crystal Reports files are saved.	~/pontismodules/crystal_reports/
DEFAULT_ALL_STRUCTS	Determines the default setting of the *Structure* dropdown on the *Inspection > Condition* task.	True

Options		
Option	**Description**	**Default Value**
	If "True" is selected, the dropdown will default to "All Structures."	
DEFAULT_SCENARIO	This was used in older versions of BrM but is no longer used in version 5.2.3.	
DEFAULTINSPSTAT	Determines the default status of the structure. It is used for new structures created in the inspection module (not by file import). The value pulls from the "inspevnt.inspstat" parameter in the *Admin > General Config > Parameters* task. A value of "1" indicates that the sufficiency rating needs to be recalculated.	1
DEFAULTREGION	Determines the default region for newly created structures. The value pulls from the "bridge.fhwa_regn" parameter in the *Admin > General Config > Parameters* task.	-1
DEFAULTSTATE	The option selected will be the default state for newly created structures.	-1
DEFBRINSPFREQ	Determines the default NBI inspection frequency (in months) for scheduling future inspections.	24
DEFFCINSPFREQ	Determines the default fracture critical inspection frequency (in months) for scheduling future inspections.	24
DEFOSINSPFREQ	Determines the default other/special inspection frequency (in months) for scheduling future inspections.	24
DEFSTRUNITKEY	Determines the default structure unit key. Must be an integer. Keys will increment by one from this starting number for additional structure units on a bridge.	1
DEFSTRUNITTYPE	Determines the default structure unit used when a new structure is created. Once created, the structure unit can be changed on the *Inspection > Inventory > Design* subtask, if desired. The value pulls from the "structure_unit.strunittype" parameter in the *Admin > General Config > Parameters* task.	M
DEFUWINSPFREQ	Determines the default underwater inspection frequency (in months) for scheduling future inspections.	24
DISCRATE	This was used in older versions of BrM but is no	

Options		
Option	**Description**	**Default Value**
	longer used in version 5.2.3.	
DISTRICTNUMBER	Determines the default district for new structures. The value pulls from the "bridge.district" parameter in the *Admin > General Config > Parameters* task.	-1
ELEMENT_CALC_LAST	Used to override default functionality of calculating last element insp date. To override, enter a SQL statement that returns a date. To substitute values from current report to be used in SQL statement use $ColumnName.	Last_insp
ELEMENTMANUALPATH	Determines the file path for the element manuals in the application.	~/elemguidemanuals/
ELEMINSPDEFAULTENV	Determines the default environment value (1 through 4) when adding a new element on the *Inspection > Condition* task.	1
ELEMINSPGRIDEXPANDALL	Determines how the element inspection grid is displayed on the *Inspection > Condition* task. If "True" is selected, all of the elements in the grid will be expanded to reveal their protective systems and defects. If "False" is selected, only the parent elements will be shown and will need to be expanded to reveal the protective system and defect child elements.	False
EXPORT_BUFFER	Determines the amount of memory that BrM uses while exporting via the *Gateway > Export* task. The amount will determine the speed of the export (in MB).	10
EXPORT_NBI_008_PAD_LEFT	Determines whether or not NBI item 08 is left padded for NBI/NBE exports.	False
GATEWAY_USE_SYNC	Determines whether or not to include a "_sync" file in the *Gateway > Export* task that allows an agency to export/import between multiple databases (same version on different computers/environments). Selecting "Y" will include the "_sync" file in exports, selecting "N" will exclude the "_sync" file.	Y
GOOGLE_MAPS_CLIENT_ID	If an agency has purchased their own license for Google Maps it can be entered here. The default Option Value of -1 will use a Client ID shared by all BrM users. A Client ID can be acquired from Google. If the Client ID specified is not	-1

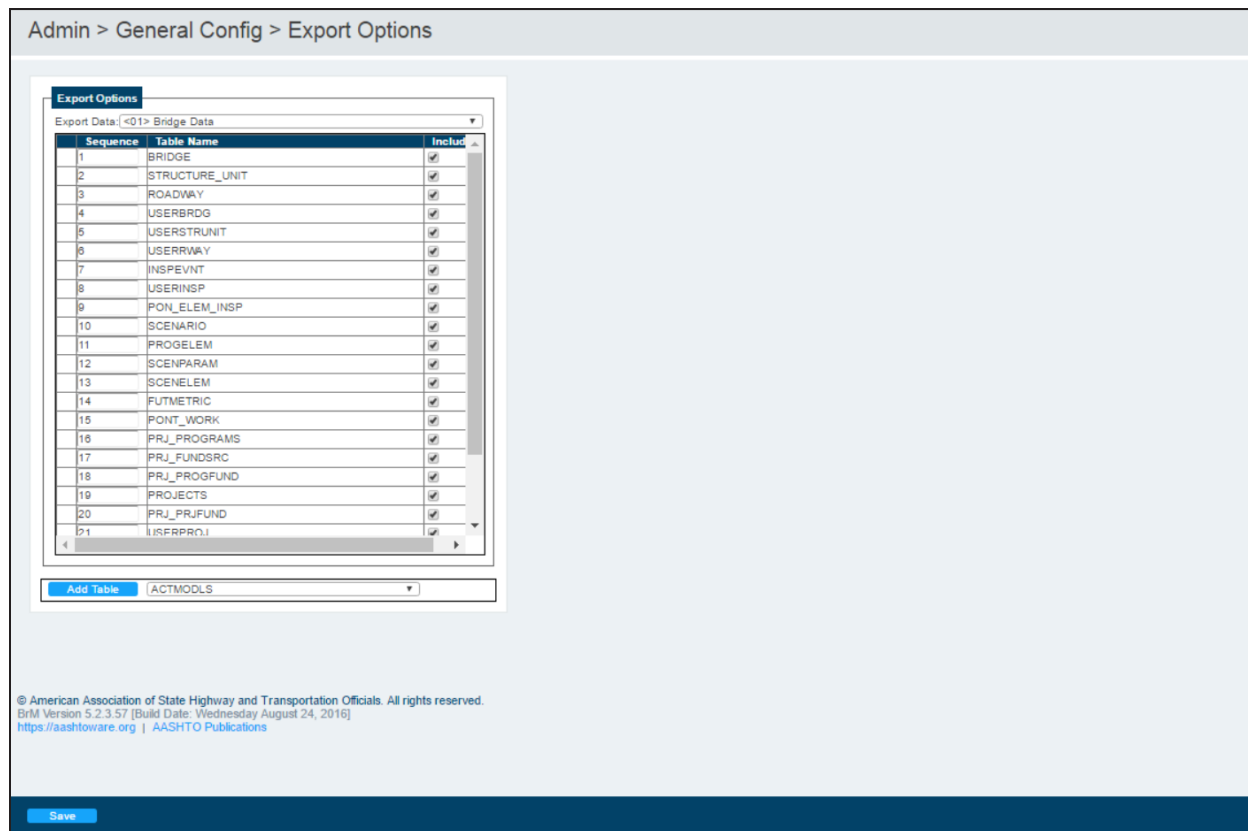| Options		
Option	**Description**	**Default Value**
	valid Google will disable Maps.	
IMPORTCHUNKSIZE	Determines the amount of memory that BrM uses while importing via the *Gateway > Import* task. The amount will determine the speed of the import.	20000
INSPECTIONOUTOFDATE	BrM issues a warning if the user attempts to set an inspection date that is X amount of days prior to the current date. X = the value entered into the *Option Value* text-box (in days).	90
INSPEVNT_INSPSTAT_-LOCK_KEY	Determines whether an inspection can be locked or not.	Locked
INSPTABLE1	Determines whether or not the inspevnt table in the database contains inspection data. This would be changed if an agency is not using the default, out of the box inspevnt table.	Inspevnt
INSPTABLE2	Defines whether or not the userinsp table in the database contains inspection data. This would be changed if an agency is not using the default, out of the box userinsp table.	Userinsp
INSPUSERDFLT	Determines the default user inspection report. This report is selected in the report selection field when the user views the user reports from the Inspection Module.	Insp003_inspection_schedule
JUMP_TO_BRIDGE_-SEARCH_TYPE	Determines the type of search used by the *Jump to Bridge* control on the Bridge List when text is entered. "Contains" checks all bridges to find those that contain what was typed into the *Jump to Bridge* control. "Starts With" checks all bridges to find those that start with what was typed into the *Jump to Bridge* control and is therefore a more limiting option than "Contains."	Contains
LOADTASKONTABCLICK	Determines if the default task for a tab will be loaded upon clicking the tab in the tab menu bar.	True
LOGCALCULATIONS	Determines whether or not to log intermediate sufficiency rating and NBI-translator calculations.	N
MAXBRIDGEGROUPS	Determines the maximum number of bridge	250

Options		
Option	Description	Default Value
	groups that a user may generate at one time on the *Bridges > Manage Bridge Analysis Groups* task. The larger the number, the more likely that it may cause performance issues on the *Setup Bridge Analysis Groups* subtask.	
MAXMRRACTIONS	Determines the maximum number of actions allowed for each state of an element.	4
MULTISERVER	This was used in older versions of BrM but is no longer used in version 5.2.3.	
MULTISERVER5	Specifies the root directory path to multimedia documents on the server. Specify either a qualified http address (i.e. http://server/virtualdir) or as relative to the webserver using tilda (~) as a placeholder for the root directory of the web site.	C:\
NBI_CALC_LAST	Used to override default functionality of calculating last NBI date. To override, enter a SQL statement that returns a date. To substitute values from current report to be used in SQL statement use $ColumnName.	Last_insp
OTHER_SPECIAL_CALC_LAST	Used to override default functionality of calculating last OS date. To override, enter a SQL statement that returns a date. To substantiate values from current report to be used in SQL statement use $ColumnName.	Last_insp
PON_UNITS	The application-wide unit of measurement for BrM. It is "metric" by default, but "English" can be selected.	Metric
PON5_APP_LOGGING_-LEVEL	Determines the amount of log detail to be written in the logs. 0 = Turned off - nothing will be logged 1 = Only Fatal messages logged 2 = Fatal and Error messages logged 3 = Fatal, Error, and Warning messages logged 4 = Fatal, Error, Warning, and Info messages logged 5 = All messages - Fatal, Error, Warning, Info, and Debug - logged	5
PON5_DEFAULT_SHOW_QUANTITY	Determines whether the Element Conditions grid on the *Inspection > Condition* task will default to displaying element conditions as quantities or percentages.	N

Options		
Option	**Description**	**Default Value**
	Selecting "Y" is for quantity, and selecting "N" is for percentage.	
PROJECTGRIDCONTINOUS-SCROLLING	Distinguishes the Project List as either a paging or scrolling list. If "True," all of the structures in the Project List will be viewable in one continuous scroll. If "False," only a certain number of structures will be viewable per page of the Project List.	False
SYNC_BRIDGEWARE	Determines the database's ability to sync with BrD and BrR. Selecting "Y" allows this sync, selecting "N" prevents it.	N
TEMP_FILE_AGE_IN_-DAYS	Defines how many days a file will stay in the temporary folder before it is deleted.	30
TOOLTIPDELAY	Determines the time (in seconds) before a tooltip will appear when the mouse cursor is hovering over an item. "0" will display the tooltip immediately. "-1" will disable tooltips.	0
UPDATEKEYINPLACE	Determines whether or not changes to the value of a primary key can be made without using an insert/delete on the affected row.	Yes
WARNONEDITFORCHECKED-OUTBRIDGE	Determines whether or not a warning message will be displayed if a user tries to edit a checked out bridge. This also controls whether or not the checked out bridge symbol will appear in the *Inspection* module header.	N
XTRNBRDGTABLE	Defines the user bridge table.	userbrdg
XTRNBRDGTABLEKEY	Defines the key in the user bridge table.	bridge_gd
XTRNINSPTABLE	Defines the user roadway table.	userinsp
XTRNINSPTABLEKEY	Defines the key in the user inspection table.	inspevnt_gd
XTRNRWAYTABLE	Defines the user roadway table.	userrway
XTRNRWAYTABLEKEY	Defines the key in the user roadway table.	roadway_gd
XTRNSTRUNITTABLE	Defines the structure unit table.	userstrunit
XTRNSTRUNITTABLEKEY	Defines the key in the structure unit table.	structure_unit_gd

Export Options

The *Admin > General Config > Export Options* task allows the admin to control the various options for the exports that are performed on the *Gateway > Export* task.

Export Options

The *Export Options* grouping contains the *Export Data* dropdown with all of the export options. When a selection is made from the dropdown, the list will update with the tables that are included in the selected export option.

The *Sequence* field determines the order in which the information will be presented in the export.

The *Include* checkbox determines whether or not the table will be included in the export. The ✖ icon is used to delete a table from the export option, but the default tables included in each of the export options cannot be deleted and will not have ✖ icons. Only additional tables not in the default export can be deleted. However, default tables do not necessarily need to be included in the export because the *Include* checkbox can be unchecked.

Add Table

The *Add Table* grouping contains the *Add Table* button and dropdown. This control adds the selected table to the export option currently selected in the *Export Data* dropdown.

*Note: Altering preset exports is only recommended for experienced admins due to possible foreign key violations during the import. There are no restrictions built-in to the software to prevent invalid key combinations.

Export Options Page Controls

Click the *Save* button to save the changes made to the selected export option.

Data Dict.

The *Admin > General Config > Data Dict* task allows the admin to modify various rules for the columns of all of the tables in the database.

*Note: Modifying a table's column rules is only recommended for experienced administrators due to the major changes that can occur in the system.
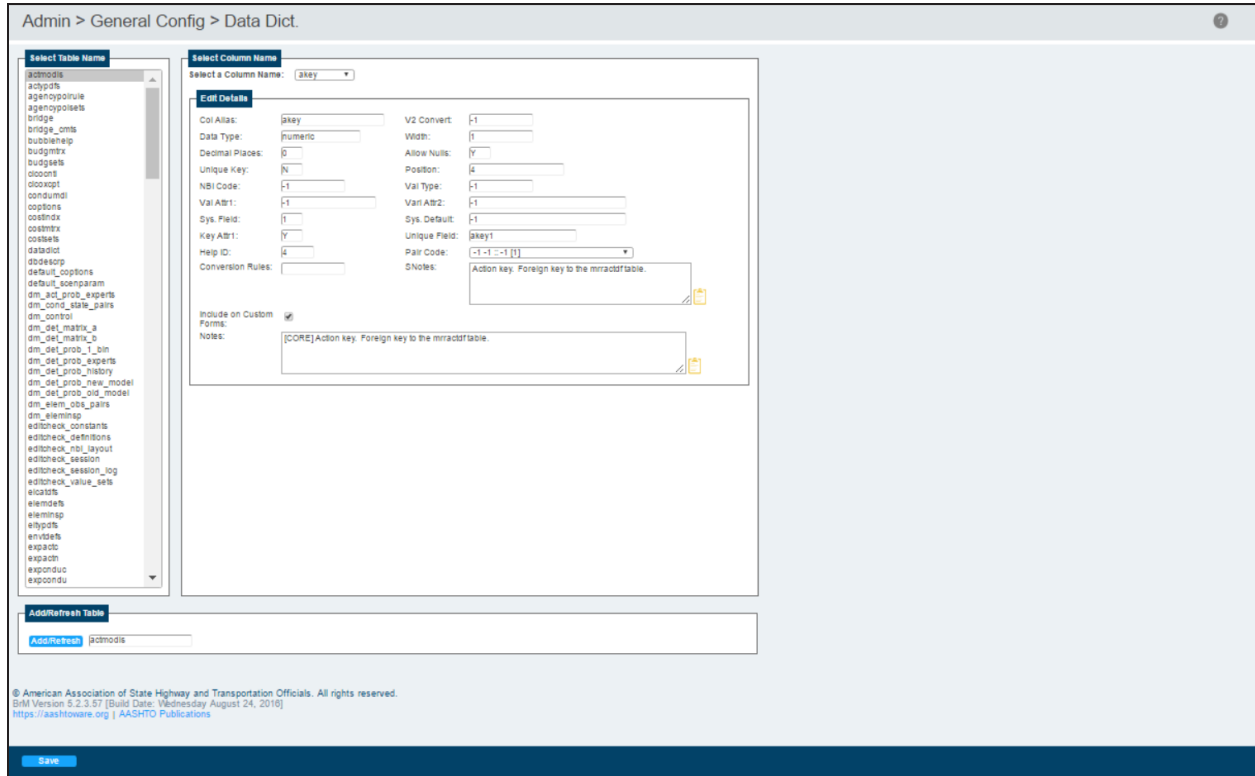
The *Select Table Name* grouping contains a list of all of the tables in the system. Select a table to modify its columns' rules.

Select a Column Name

The *Select a Column Name* dropdown contains all of the columns in the currently selected table. Selecting a column will present that column's rules in the *Edit Details* grouping.

Edit Details

The *Edit Details* grouping contains all of the rules for the selected column.

Column Rules	
Field Name	**Description**
Col Alias	The alias of the selected column. This does not change the column name.
V2 Convert	The .Net data type.
Data Type	The SQL data type.
Width	The available field length for storage and display.
Decimal Places	The maximum number of decimal places - if applicable.

Column Rules	
Field Name	**Description**
Allow Nulls	Y or N - Indicates whether nulls (field left blank) are allowed.
Unique Key	Y or N - Indicates whether or not the field must be unique.
Position	The column's position in the database.
NBI Code	The NBI code or "-1" if not applicable.
Val Type	Indicates whether there will be a range (such as 1-9) or list of values (such as steel bridge, wood bridge, concrete bridge, etc.) for the field.
Val Attr1	If there is a range, this is the minimum value permitted.
Val Attr2	If there is a range, this is the maximum value permitted.
Sys. Field	Indicates whether the field is a default system field or a custom agency field.
Sys. Default	The default entry for the column if nulls aren't allowed and the column is left blank.
Key Attr1	Y or N - Indicates whether or not the column is a primary key.
Unique Field	Gives the field a distinct alias.
Help ID	This was used in older versions of BrM but is no longer used in version 5.2.3.
Pair Code	The metric/English unit conversion factor.
Conversion Rules	Defines the rule used to perform metric/English conversions.
SNotes	Short notes limited to 255 characters.
Include on Custom Forms	If checked, the column will be available for custom forms on the *Admin > Navigation & Field Security* task.
Notes	Notes limited to 3999 characters.

Add/Refresh Table

The *Admin > General Config > Data Dict.* task does not update automatically, therefore the *Add/Refresh Table* grouping is used to update the data dictionary with new tables or table updates.

Add/Refresh Table

Table bridge is up to date!

Add/Refresh   bridge

To add a new table, enter the table's name into the textbox and then click the *Add/Refresh* button.

To update an existing table, select the table from the *Select Table Name* grouping and click the *Add/Refresh* button.

Data Dict. Page Controls

Changes can be made to multiple tables and columns before saving. All changes will be saved as long as the *Save* button is clicked before exiting the *Admin > General Config > Data Dict.* task.

Checked Out Bridges

The *Admin > General Config > Checked Out Bridges* task allows the admin to view and remove the bridges that have been checked out on the *Gateway > Check Out* task.

All of the bridges listed in the Checked Out Bridges grid can be considered to be in a locked state. Changes can still be made to those bridges in the software, but those changes must then be approved when the bridge is checked in on the *Gateway > Check In* task. This can help to ensure that no unwanted changes are made.

*Note: If WARNONEDITFORCHECKEDOUTBRIDGE is set to "Y" on the *Admin > General Config > Options* task:

When entering the *Inspection* module with a checked out bridge selected, a popup message will notify the user of the bridge's status and a ✅ symbol will appear next to the bridge's ID in the *Inspection* module header.

Ioflag column

The Ioflag column indicates whether or not that particular entry of the bridge is in a checked out or checked in state. Rather than automatically be removed when a bridge is checked back in, the checked out entry remains until removed. A checked out bridge will have an Ioflag value of "O". A checked in bridge will have an Ioflag value of "I."

As long as the PDI is retained for each entry, the bridge can be reverted back to the state it was in for any entry.

Atrigger column

The Atrigger column indicates whether or not the bridge has been modified since it was checked out. The original check out of the bridge will have an Atrigger value of "0." If the bridge is modified while checked out, the grid will automatically create another entry for the bridge with an Atrigger value of "1." This indicates the bridge has been modified.

Checked Out Bridges Controls

The *Remove* button removes the selected bridges from the Checked Out Bridges grid. This is meant to be used in cases where the user wants to remove the read-only status of the checked out bridge without having to check it back in.

The *Cancel* button returns the user to the *Bridges > View List* task.

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Logging

The *Admin > General Config > Logging* task allows the admin to generate logs to investigate errors, bugs, etc. that are difficult to understand or reproduce.
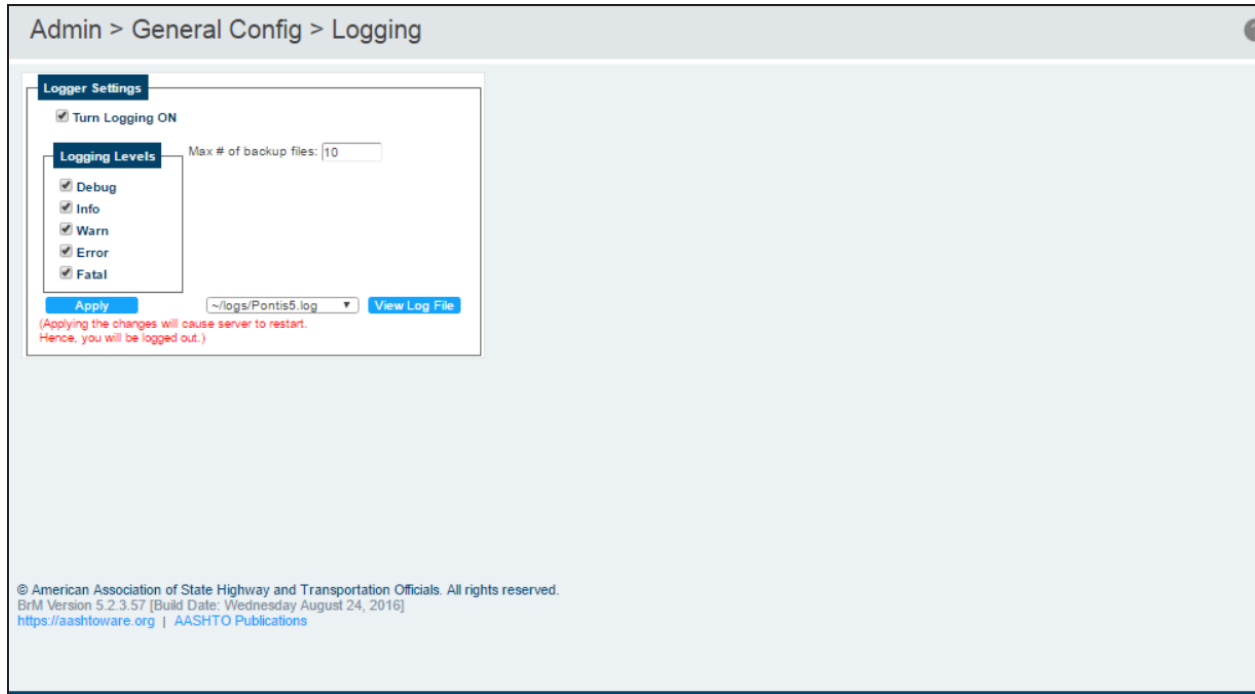
Logger Settings

The *Turn Logging On* checkbox determines whether or not the system will create a log while in use. In some cases, unchecking the box to turn logging off may improve the software's performance, however there will no longer be logs available for use in examining issues within the software.

The *Max # of Backup Files* textbox determines the maximum number of backup logs that are kept on file before the oldest is deleted.

Logging Levels

The *Logging Level* checkboxes determine what information will be included in the logs. The levels move from least critical - **Debug** - to most critical - **Fatal**. When a level is checked, all levels more critical than the selected level will automatically be checked to ensure that the most important information is included in the logs. Similarly, when a level is unchecked, all levels less critical than the unchecked level will automatically be unchecked.

Example: If the *Warn* checkbox is checked, the *Error* and *Fatal* checkboxes will automatically be checked because they are more critical than - *Warn*.

Logging Page Controls

The *Apply* button saves any of the changes that have been made to the logger settings.

As the message below the *Apply* button indicates, clicking the *Apply* button will cause the server to restart and log the admin out of the software.

The *View Log File* dropdown and button are used to select a log file and view it. The dropdown will include the current log file as well as all of the existing back up files.

Standard

The *Admin > General Config > Standard* task allows the admin to modify the navigation and security options for the tabs, tasks, groupings, and controls within the out-of-the-box version of BrM. Limits have been placed on the editing possibilities to maintain the core of the software.
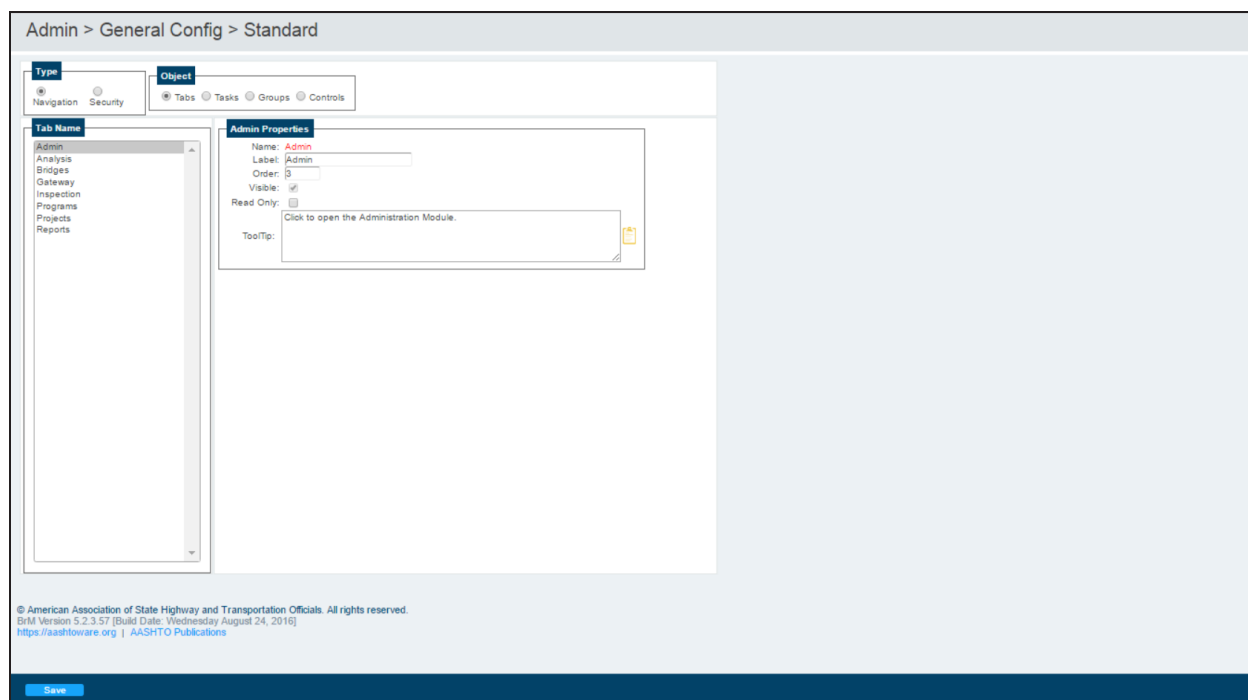
Selecting the *Navigation* radio button allows the admin to make changes to the way the software looks and operates.

Selecting the *Security* radio button allows the admin to make changes to the visibility and access that each role has to the objects.

*Note: In some cases, the *Navigation* radio button will not be accessible. This is to ensure that the core of the software is maintained.

Navigation

When *Navigation* is selected, an object must also be selected. The selection will determine what options will be available to modify. The selectable objects are: *Tabs*, *Tasks*, *Groups*, and *Controls*.

Tabs

When *Tabs* is selected, the available groupings will be *Tab Name* and *[Tab] Properties*.

Tab Name

The *Tab Name* grouping is used to select the tab navigation to modify.

[Tab] Properties

The *[Tab] Properties* grouping is used to modify the navigation details of the selected tab.

- **Label:** The name of the tab cannot be changed for internal database purposes, but the *Label* textbox allows the admin to change the name that the users see.
- **Order:** Determines what order the tab will appear in on the tab bar, with the top-most tab being "1."
- **Visible:** Determines if the tab is visible or hidden.
- **Read Only:** Determines whether or not everything contained in the tab will be read only.
- **Tool Tip:** The text entered into the *Tool Tip* textbox will be shown when the user hovers the mouse over the selected tab.

Tasks

When *Tasks* is selected, the available groupings will be *Task Name* and *[Task] Properties*. The admin will also have to select a tab in the *Select* grouping.

Task Name

The *Task Name* grouping is used to select the task navigation to modify. Only the tasks of the tab selected in the *Select* grouping will be shown.

[Task] Properties

The *[Task] Properties* grouping is used to modify the navigation details of the selected task.

- **Label:** The name of the task cannot be changed for internal database purposes, but the *Label* textbox allows the admin to change the name that the users see.
- **Visible:** Determines if the task is visible or hidden.
- **Read Only:** Determines whether or not everything contained in the task will be read only.
- **Code Module:** Code modules allow a certain level of programmatic extensibility to tasks created with the form builder without having to create agency custom forms. If desired, select an available code module from the *Code Module* dropdown.
- **Tool Tip:** The text entered into the *Tool Tip* textbox will be shown when the user hovers the mouse over the selected task.

Groups

When *Groups* is selected, the available groupings will be *Group Name* and *[Group] Properties*. The admin will also have to select a tab and task in the *Select* grouping.

*Note: Only certain tabs can have their group navigations modified. If the tab's group navigations cannot be modified, the tabs either will not appear in the dropdown of the *Select* grouping or the *Navigation* radio button will no longer be accessible in the *Type* grouping for the selected tab.

Group Name

The *Group Name* grouping is used to select the group navigation to modify. Only the groups within the tab-task combo selected in the *Select* grouping will be shown.

[Group] Properties

The *[Group] Properties* grouping is used to modify the navigation details of the selected group. The available options may vary depending on the selection.

- **Visible:** The *Visible* checkbox determines if the task is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the task will be read only.

Controls

When *Controls* is selected, the available groupings will be *Control Name* and *[Control] Properties*. The admin will also have to select a tab, task, and group in the *Select* grouping.

*Note: Only certain tabs can have their control navigations modified. If the tab's control navigations cannot be modified, the tabs either will not appear in the *Tab* dropdown of the *Select* grouping or the *Navigation* radio button will no longer be accessible in the *Type* grouping for the selected tab.

Control Name

The *Control Name* grouping is used to select the control navigation to modify. Only the controls within the tab/task/-group combo selected in the *Select* grouping will be shown.

[Control] Properties

The *[Control] Properties* grouping is used to modify the navigation details of the selected control. The available options may vary depending on the selection.

- **Label:** The name of the task cannot be changed for internal database purposes, but the *Label* textbox allows the admin to change the name that the users see.
- **Visible:** The *Visible* checkbox determines if the task is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the task will be read only.
- **Height in Rows:** The value selected in the *Height in Rows* dropdown determines the size of the control.
- **Tool Tip:** The text entered into the *Tool Tip* textbox will be shown when the user hovers the mouse over the selected task.

Security

When *Security* is selected, an object must also be selected. The selection will determine what options will be available to modify. The selectable objects are: *Tabs*, *Tasks*, *Groups*, and *Controls*.

Regardless of the object selected, the *Roles* grouping will always be present. A role must be selected and then that role's security will be determined for the selected object.

Tabs

When *Tabs* is selected, role security for tabs can be determined.

Tab Security

The *Tab Security* grouping is used to determine the security of the selected tab-role combo.

- **Visible:** The *Visible* checkbox determines if the tab is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the tab will be read only.

Tasks

When *Tasks* is selected, role security for specific tasks can be determined. The admin will also have to select a tab in the *Select* grouping.

Type

○ Navigation   ● Security

Object

○ Tabs   ● Tasks   ○ Groups   ○ Controls

Select

Tab: Inspection ▼

Roles

Admin
Advanced
Analysis
Basic
Default

Task Security

Selected Role: Admin

Name	Visible ☑	Read Only ☐
Accomplishments	☑	☐
AddNewAsmt	☑	☐
Appraisal	☑	☐
Assessments	☑	☐
Brdg Notes	☑	☐
Calendar	☑	☐
Calendar	☑	☐
Condition	☑	☐
Element Condition Add New PopUp	☑	☐
Element Condition Edit PopUp	☑	☐
Inv. Admin	☑	☐
Inv. Agency Bridge Items	☑	☐
Inv. Design	☑	☐
Inv. Roads	☑	☐
Inventory	☑	☐
Multimedia	☑	☐
New Inspection	☑	☐
No Caption	☑	☐
Notes	☑	☐
Project Information	☑	☐
Roads Notes	☑	☐
Roadway Create	☑	☐
Schedule	☑	☐
StructUnit Notes	☑	☐
Suff Rate	☑	☐
Translate	☑	☐
Validate	☑	☐
Work	☑	☐
Work Candidates	☑	☐

Save

Task Security

The *Task Security* grouping is used to determine the security of the selected task within the tab-role combo.

- **Visible:** The *Visible* checkbox determines if the task is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the task will be read only.

Groups

When *Groups* is selected, role security for specific groups can be determined. The admin will also have to select a tab and task in the *Select* grouping.

Type	Object	Select
○ Navigation ⦿ Security	○ Tabs ○ Tasks ⦿ Groups ○ Controls	Tab: [Inspection ▼] Task: [Condition ▼]

Roles

Admin
Advanced
Analysis
Basic
Default

Group Security

Selected Role: Admin

Name	Visible ☑	Read Only ☐
Agency Group	☑	☐
Condition Ratings	☑	☐
Condition Ratings -Subgroup 1	☑	☐
Condition Ratings -Subgroup 2	☑	☐
Condition Ratings -Subgroup 3	☑	☐
Condition Ratings -Subgroup 4	☑	☐
Element Conditions	☑	☐
FooterSub1 - status	☑	☐
FooterSub2 Save Btns	☑	☐
FooterSub3 - Ex key lock	☑	☐
HeaderSub1 - brkey	☑	☐
HeaderSub2 Eng.Metric	☑	☐
HeaderSub3 - Report Btn	☑	☐
Inspection Footer	☑	☐
Inspection Header	☑	☐
No Caption	☑	☐
Notes	☑	☐

Save

Group Security

The *Group Security* grouping is used to determine the security of the selected group within the task-tab-role combo.

- **Visible:** The *Visible* checkbox determines if the group is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the group will be read only.

Controls

When *Controls* is selected, role security for specific controls can be determined. The admin will also have to select a tab, task, and group in the *Select* grouping.

Control Security

The *Control Security* grouping is used to determine the security of the selected control within the group-task-tab-role combo.

- **Visible:** The *Visible* checkbox determines if the control is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not the control will be read only.

Standard Page Controls

Click the *Save* button to save the changes made to the navigation and field security.

Agency

The *Admin > General Config > Agency* task allows the admin to create and edit custom agency tabs and tasks. BrM version 5.2.3 now allows administrators to visually create and edit custom agency tabs and tasks using the *Visual Form Editor*, but the *Agency* task can still be used if desired.

Selecting the *Navigation* radio button from the *Type* grouping allows the admin to make changes to the way the software looks and operates.

Selecting the *Security* radio button from the *Type* grouping allows the admin to make changes to the visibility and access that each role has to the objects.

Navigation

When *Navigation* is selected, an object must also be selected. The selection will determine what options will be available to modify. The selectable objects are: *Tabs*, *Tasks*, *Groups*, and *Controls*.

Tabs

When *Tabs* is selected, the available groupings will be *Add New Tab*, *Tab Name*, and *[Tab] Properties*.

Add New Tab

If no custom agency tabs exist or to create an additional custom agency tab, type the name of the new tab into the *Tab Name* textbox and click the *Add New & Save* button.

Tab Name

The *Tab Name* grouping is used to select the tab navigation to modify.

[Tab] Properties

The *[Tab] Properties* grouping is used to modify the navigation details of the selected tab.

- **Label:** The name of the tab cannot be changed for internal database purposes, but the *Label* textbox allows the admin to change the name that the users see.
- **Order:** Determines what order the tab will appear in on the tab bar, with the top-most tab being "1."
- **Visible:** Determines if the tab is visible or hidden.
- **Read Only:** Determines whether or not everything contained in the tab will be read only.
- **Tool Tip:** The text entered into the *Tool Tip* textbox will be shown when the user hovers the mouse over the selected tab.

Click the *Save* button to save the changes made to the tab properties.

Tasks

When *Tasks* is selected, the available groupings will be *Add New Task*, *Task Name* and *[Task] Properties*. The admin will also have to select a tab in the *Select* grouping.

Add New Task

If no custom agency tasks exist for the tab or to create an additional custom agency task, type the name of the new task into the *Task Name* textbox, use the *Parent Task* dropdown to select a parent task for the created task (if applicable and desired), and click the *Add New & Save* button.

Task Name

The *Task Name* grouping is used to select the task navigation to modify. Only the tasks of the tab selected in the *Select* grouping will be shown.

[Task] Properties

The *[Task] Properties* grouping is used to modify the navigation details of the selected task.

- **Label:** The name of the task cannot be changed for internal database purposes, but the *Label* textbox allows the admin to change the name that the users see.
- **Visible:** Determines if the task is visible or hidden.
- **Read Only:** Determines whether or not everything contained in the task will be read only.
- **Code Module:** Code modules allow a certain level of programmatic extensibility to tasks created with the form builder without having to create agency custom forms. If desired, select an available code module from the *Code Module* dropdown.
- **Tool Tip:** The text entered into the *Tool Tip* textbox will be shown when the user hovers the mouse over the selected task.

Click the *Save* button to save the changes made to the task properties.

Groups

When *Groups* is selected, the available groupings will be *Add New Group*, *Group Name*, and *[Group] Properties*. The admin will also have to select a tab and task in the *Select* grouping.

Add New Group

If no custom agency groupings exist for the tab and task combo or to create an additional custom agency grouping, the *Add New Group* grouping can be used.

Use the *Group Name* textbox to enter the name of the grouping.

The *Parent Group* dropdown is used to nest the created grouping inside an existing grouping within the task.

The *Group Type* dropdown determines what type of grouping is being created. In most cases, newly created groupings will use the "Content Group" group type.

The *Desktop URL* dropdown is used to select a custom control to be included in the grouping.

Click the *Add New & Save* button once the desired selections have been made.

Group Name

The *Group Name* grouping is used to select the group navigation to modify. Only the groups within the tab-task combo selected in the *Select* grouping will be shown.

[Group] Properties

The *[Group] Properties* grouping is used to modify the navigation details of the selected group. The available options may very depending on the selection.

[Group] Properties	
Control	**Description**
Label	The text that appears within the grouping label on the form.
Hide Label	If checked, all of the controls within the grouping remain contained but are no longer surrounded by an outline with a label.

[Group] Properties	
Control	**Description**
Visible	Determines if the grouping is visible or hidden.
Read Only	Determines whether or not everything contained in the grouping will be read only.
Span Across	If checked, the grouping will span across the entire page. If unchecked, the grouping will only span as far as the controls inside require.
Collapsible	If checked, the grouping's label changes and adds a minimize symbol so that it can be collapsed.
Horizontal Alignment	Determines how the grouping will be horizontally aligned.
Vertical Alignment	Determines how the grouping will be vertically aligned.
Repeat Direction	Indicates whether the items in the grouping will repeat horizontally or vertically.
Repeat Count	Used to repeat the items in the grouping the entered number of times in the selected direction. This is a method used to help organize the grouping a specific way.
SkinID	A pre-defined style applied to the grouping.
Height	Determines the height of the grouping. If not set, the grouping will conform to the overall height of its inner controls. The dropdown is used to select the units for the height.
Width	Determines the width of the grouping. If not set, the grouping will conform to the overall width of its inner controls (except for the main grouping, which spans the width of the page). The dropdown is used to select the units for the width.
Cell Spacing	Determines the space between the groupings on the form.
Cell Padding	Determines the space between the controls in the grouping.

Click the *Save* button to save the changes made to the group properties.

Controls

When *Controls* is selected, the available groupings will be *Add New Control*, *Control Name*, and *[Control] Properties*. The admin will also have to select a tab, task, and group in the *Select* grouping.

Add New Control

If no custom agency controls exist for the tab, task, and group combo or to create an additional custom agency control, the *Add New Control* grouping can be used.

Use the *Control Name* textbox to enter the name of the control.

The *Control Type* dropdown is used to determine what type of control is being created.

The *Table Name* dropdown indicates the table in the database associated with the control.

The *Column Name* dropdown indicates the column within the selected table in the database associated with the control.

Click the *Add New & Save* button once the desired selections have been made.

Control Name

The *Control Name* grouping is used to select the control navigation to modify. Only the controls within the tab-task-group combo selected in the *Select* grouping will be shown.

[Control] Properties

The *[Control] Properties* grouping is used to modify the navigation details of the selected control. The available options may very depending on the selection.

[Control] Properties	
Control	**Description**
Order	Determines the location of the control on the form. Changing the order will move the control left or right within its grouping. "1" represents the left-most position within the containing grouping.

[Control] Properties	
Control	**Description**
Label	The label that sits to the left of the control and indicates its purpose.
Postback Event ID	Used in custom code modules. Identifies the control when a postback event is occurring.
Control GUI ID	Used in custom code modules. The name used to search for the control in a custom code module.
Show Label Colon	Determines whether or not to include the colon ":" between the label and the control.
Visible	Determines if the control is visible or hidden.
Read Only	Determines whether or not the control will be read only.
ValueBoldInd	If checked, the value within the control will be bold.
Text Alignment	Determines how the text of the control is aligned.
Value Color	Determines the color of the control's value.
Field Width	Determines the width of the field. The dropdown is used to select the units for the field width.
Label Width	Determines the width of the label. The dropdown is used to select the units for the label width.

Click the *Save* button to save the changes made to the control properties.

Security

When *Security* is selected, an object must also be selected. The selection will determine what options will be available to modify. The selectable objects are: *Tabs*, *Tasks*, *Groups*, and *Controls*.

Regardless of the object selected, the *Roles* grouping will always be present. A role must be selected and then that role's security will be determined for the selected object.

Tabs

When *Tabs* is selected, role security for tabs can be determined.

Tab Security

The *Tab Security* grouping is used to determine the security of the selected tab-role combo.

- **Visible:** The *Visible* checkbox determines if the tab is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the tab will be read only.

Tasks

When *Tasks* is selected, role security for specific tasks can be determined. The admin will also have to select a tab in the *Select* grouping.

Task Security

The *Task Security* grouping is used to determine the security of the selected task within the tab-role combo.

- **Visible:** The *Visible* checkbox determines if the task is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the task will be read only.

Groups

When *Groups* is selected, role security for specific groups can be determined. The admin will also have to select a tab and task in the *Select* grouping.

Group Security

The *Group Security* grouping is used to determine the security of the selected group within the task-tab-role combo.

- **Visible:** The *Visible* checkbox determines if the group is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not everything contained in the group will be read only.

Controls

When *Controls* is selected, role security for specific controls can be determined. The admin will also have to select a tab, task, and group in the *Select* grouping.

Control Security

The *Control Security* grouping is used to determine the security of the selected control within the group-task-tab-role combo.

- **Visible:** The *Visible* checkbox determines if the control is visible or hidden.
- **Read Only:** The *Read Only* checkbox determines whether or not the control will be read only.

Agency Page Controls

Click the *Save* button to save the changes made to the navigation and field security.

Visual Form Editor

The *Admin > General Config > Visual Form Editor* task is a way to visually make new forms and edit existing forms. The Visual Form Editor makes form editing significantly easier by allowing the admin to see in real time exactly what the form looks like and how changes affect it.

There are five main components that make up the Visual Form Editor: Toolbox, Properties, Security, Parameters, and the form itself.
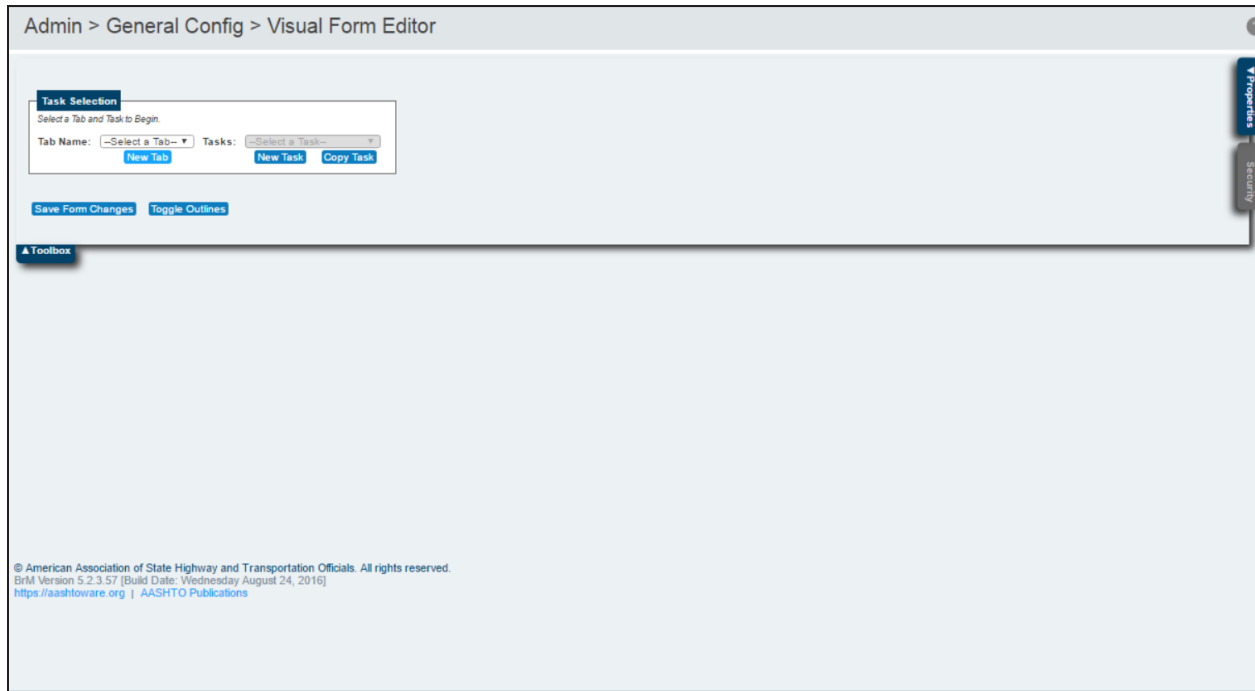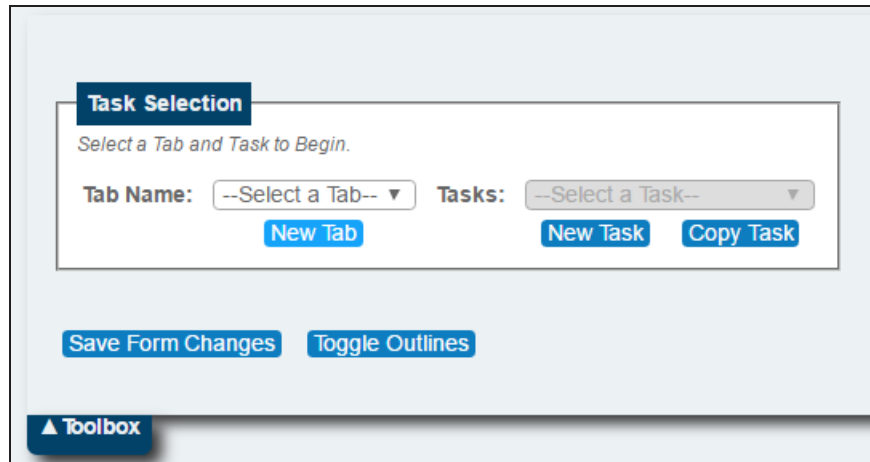
Toolbox

The Toolbox tab is used to determine which form to edit and contains all of the available controls for the form.

*Note: BrM version 5.2.3 only allows existing tasks within the Inspection, Projects, and Programs modules to be edited. In addition, the standard forms for those modules cannot currently be edited. For instance, to make a change to the *Inspection > Condition* task, the task must be copied and then changes can be made to the copied version of the form.

Task Selection

The *Task Selection* grouping allows the admin to select which form to edit within the software using the *Tab Name* and *Tasks* dropdowns.

New Tab

To create an entirely new tab, click the *New Tab* button:

The *Name* textbox is the label used to display the new tab in the tab/task menu panel on the left side of the software

*Note: The *Label* textbox is not currently utilized in BrM version 5.2.3.

Use the *Visible* checkbox to determine whether the new tab will be visible.

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Use the *Read Only* checkbox to determine whether the new tab's forms will be read only.
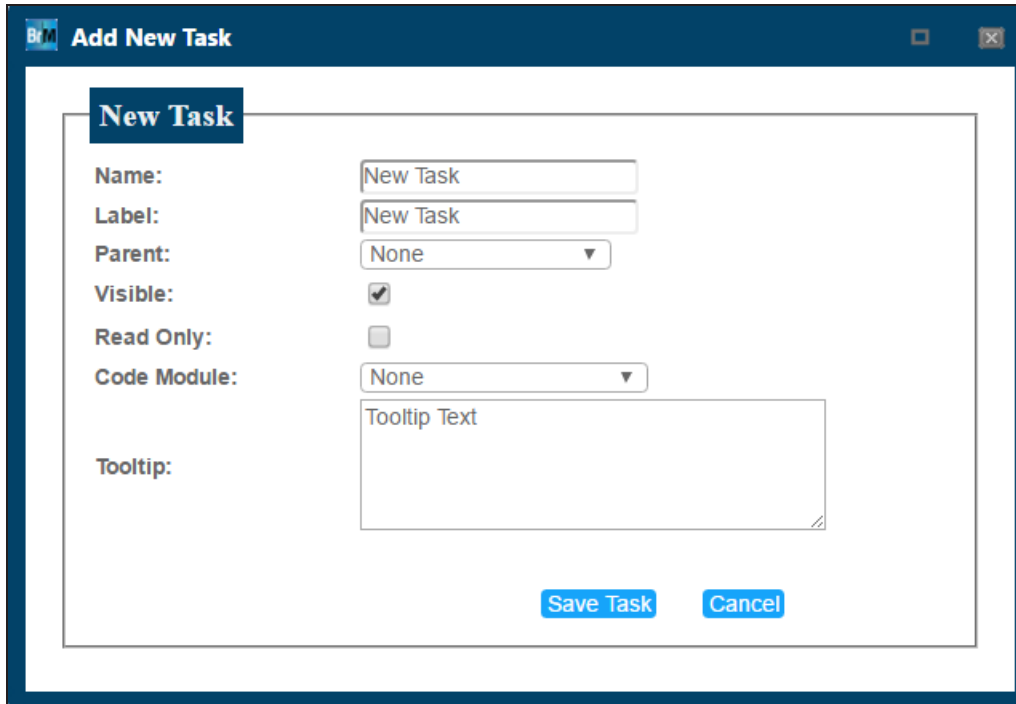
*Note: The *Enabled* checkbox is not currently utilized in BrM version 5.2.3.

The *Tooltip* textbox allows the admin to enter the tooltip message that will appear when the user hovers their mouse over the tab's name in BrM's tab/task panel (if tooltips are enabled).

Click *Save Tab* to save the newly created tab or click *Cancel* to cancel the tab creation.

New Task

To create a new task, select the tab from the *Tab Name* dropdown where the new task will be contained and then click the *New Task* button:

The *Name* textbox is the name of the task that will appear in the header at the top of the page when the task is selected in the system.

The *Label* textbox is the label used to display the task in the tab/task menu panel on the left side of the software.

The *Parent* dropdown allows the admin to indicate whether the new task will be a subtask of an existing task.

Use the *Visible* checkbox to determine whether the new task will be visible.

Use the *Read Only* checkbox to determine whether the new task's forms will be read only.

The *Code Module* dropdown lists the pieces of custom C# code that have been created to allow for capabilities outside of the scope of the Visual Form Editor. Code modules can be made available in the *Code Module* dropdown by deriving a class from DynamicFormModuleBase and adding it to the APP_CODE/DynamicFormModules/ folder in the web application.

The *Tooltip* textbox allows the admin to enter the tooltip message that will appear when the user hovers their mouse over the task's name in BrM's tab/task panel (if tooltips are enabled).

Click *Save Task* to save the newly created task or click *Cancel* to cancel the task creation.

Copy Task

Another way of creating a new task is to copy an existing task. To copy a task, select the desired tab and task from the *Tab Name* and *Tasks* dropdowns. The task that is selected will be copied when the *Copy Task* button is clicked:

The *Tab* dropdown indicates in which tab the newly copied task will exist. The copied task does not have to have the same tab as the original task.

The *Name* textbox is the name of the task that will appear in the header at the top of the page when the task is selected in the system.

The *Label* textbox is the label used to display the task in the tab/task menu panel on the left side of the software.

The *Parent* dropdown allows the admin to indicate whether the copied task will be a subtask of an existing task.

Use the *Visible* checkbox to determine whether the new task will be visible.

Use the *Read Only* checkbox to determine whether the new task's forms will be read only.

The *Code Module* dropdown lists the pieces of custom C# code that have been created to allow for capabilities outside of the scope of the Visual Form Editor. Code modules can be made available in the *Code Module* dropdown by deriving a class from DynamicFormModuleBase and adding it to the APP_CODE/DynamicFormModules/ folder in the web application.

The *Tooltip* textbox allows the admin to enter the tooltip message that will appear when the user hovers their mouse over the task's name in BrM's tab/task panel (if tooltips are enabled).

Click *Save Task* to save the newly created task or click *Cancel* to cancel the task creation.

Form Elements

The *Form Elements* grouping contains all of the controls and elements that the admin can add to a form.
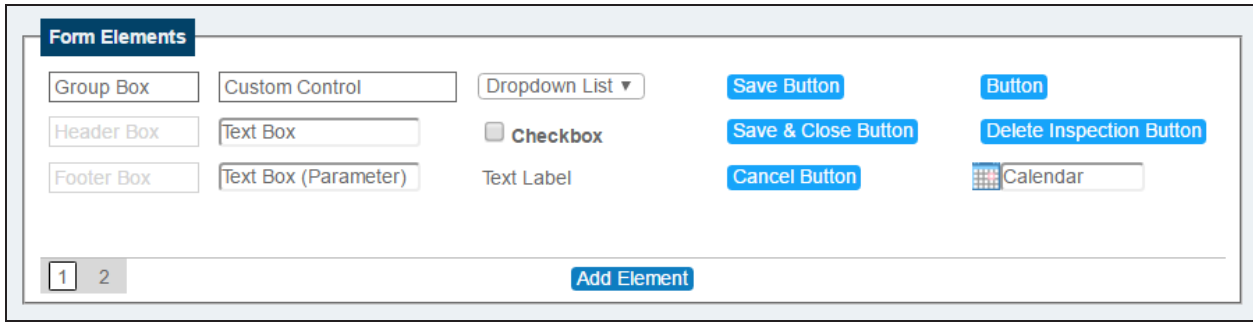
To add an element, first select the location on the form where the element will be placed. To do so, click the **_Toggle Outlines_** button within the Toolbox component. This will display blue outlines around each of the available areas in the form:
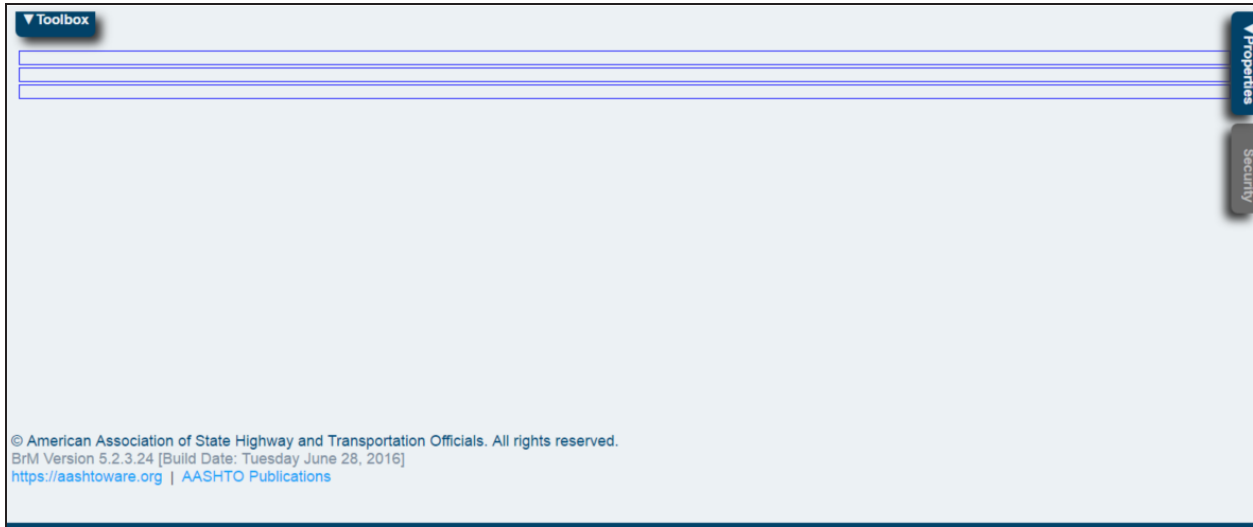
A new, empty form will look like the above screenshot with a header box, body box, and footer box. Copies of existing tasks will have much more complex outlines with boxes nested within other boxes:

Using the blue outlines, click within the area that the control will be placed. This will highlight that area blue. Then, select the desired control from the *Form Elements* grouping and click the ***Add Element*** button to add the element to the selected location on the form.
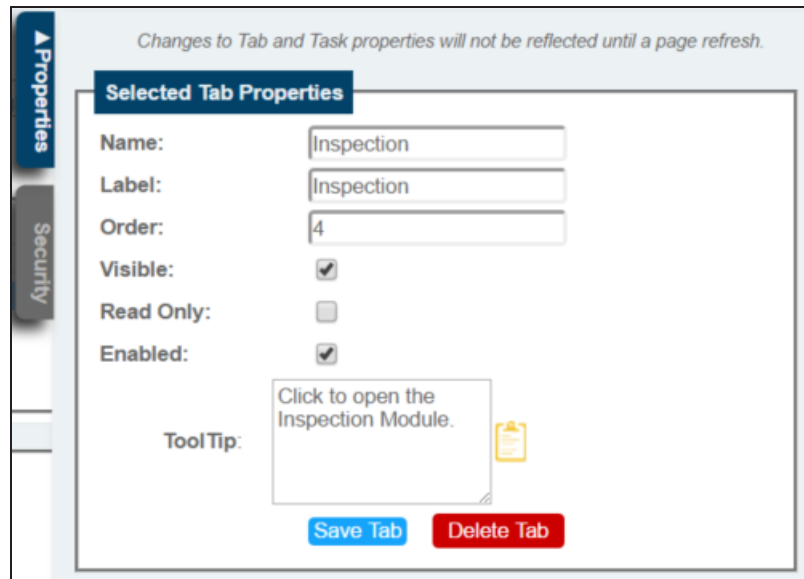
Properties

Every item on the form, be it a single control or an entire grouping, has properties that can be edited in the Properties tab. The Properties tab can also edit the properties of the overall tab and task/subtask selected.

Tab and Task Properties

Before an individual item is selected from the form, the Properties tab will populate with the properties for the selected tab and task/subtask:

Selected Tab Properties

The *Name* textbox is the label used to display the tab in the tab/task menu panel on the left side of the software

*Note: The *Label* textbox is not currently utilized in BrM version 5.2.3.

Use the *Visible* checkbox to determine whether the tab will be visible.

Use the *Read Only* checkbox to determine whether the tab's forms will be read only.

*Note: The *Enabled* checkbox is not currently utilized in BrM version 5.2.3.
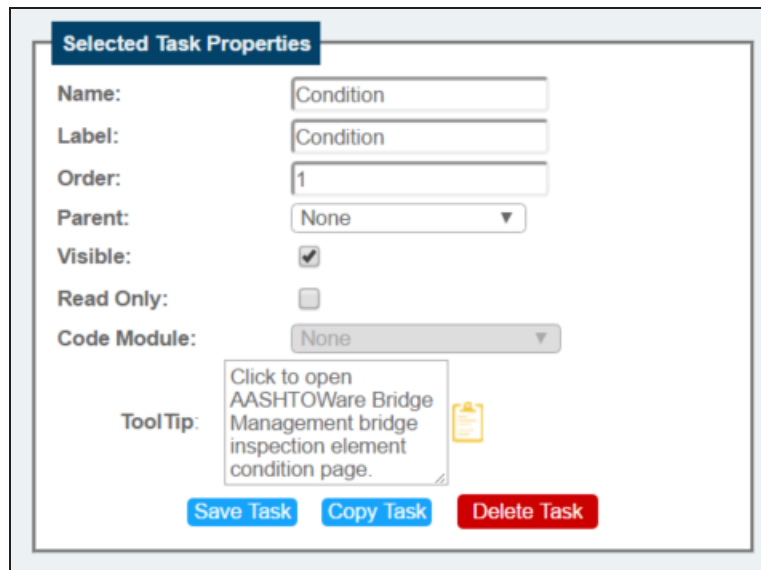
The *Tooltip* textbox allows the admin to enter the tooltip message that will appear when the user hovers their mouse over the tab's name in BrM's tab/task panel (if tooltips are enabled).

Click *Save Tab* to save the changes to the tab's properties.

Click *Delete Tab* to delete the tab.

*Note: The *Delete Tab* button will not be functional for standard tabs. Only custom tabs can be deleted.

Selected Task Properties

The *Name* textbox is the name of the task that will appear in the header at the top of the page when the task is selected in the system.

The *Label* textbox is the label used to display the task in the tab/task menu panel on the left side of the software.

The *Parent* dropdown allows the admin to indicate whether the task is a subtask of another existing task within the tab.

Use the *Visible* checkbox to determine whether the task will be visible.

Use the *Read Only* checkbox to determine whether the task's forms will be read only.

The *Code Module* dropdown lists the pieces of custom C# code that have been created to allow for capabilities outside of the scope of the Visual Form Editor. Code modules can be made available in the *Code Module* dropdown by deriving a class from DynamicFormModuleBase and adding it to the APP_CODE/DynamicFormModules/ folder in the web application.

The *Tooltip* textbox allows the admin to enter the tooltip message that will appear when the user hovers their mouse over the task's name in BrM's tab/task panel (if tooltips are enabled).

Click *Save Task* to save the changes to the task's properties.

Click *Copy Task* to make a copy of the currently selected task.

Click *Delete Task* to delete the task.

*Note: The *Delete Task* button will not be functional for standard tasks. Only custom tasks can be deleted.

Group Properties

When a grouping within the form is selected, the grouping's properties can be edited:
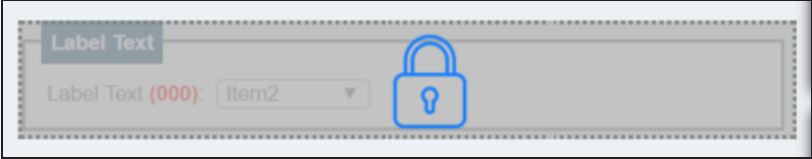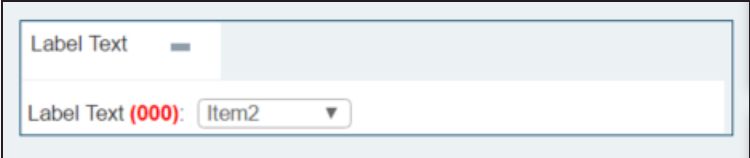
Controls for Selected Group Properties	
Control	**Description**
Name	The name of the grouping. This is not the grouping's label.
Group Type	Determines what type of grouping is being created. In most cases, newly created groupings will use the "Content Group" group type.
Desktop URL	Used to select a custom control to be included in the grouping.
Label	The text that appears within the grouping label on the form.
Hide Label	If checked, all of the controls within the grouping remain contained but are no longer surrounded by an outline with a label.
Visible	If unchecked, the entire grouping will not be visible on the form. Invisible items on the form have the following appearance in the Visual Form Editor:
Read Only	If checked, the entire grouping will be read only on the form. Read-only items on the form have the following appearance in the Visual Form Editor:

Controls for Selected Group Properties	
Control	**Description**
Span Across	If checked, the grouping will span across the entire page. If unchecked, the grouping will only span as far as the controls inside require.
Collapsible	If checked, the grouping's label changes and adds a minimize symbol so that it can be collapsed:
Order	Determines the location of the grouping on the form. If it is the main grouping (the body of the form), changing the order will not change the location. However, if it is a grouping within a grouping, changing the order will move it up or down within the main grouping. "1" represents the top of the main grouping.
Horizontal Alignment	Determines how the grouping will be horizontally aligned.
Vertical Alignment	Determines how the grouping will be vertically aligned.
Repeat Direction	Indicates whether the items in the grouping will repeat horizontally or vertically.
Repeat Count	Used to repeat the items in the grouping the entered number of times in the selected direction. This is a method used to help organize the grouping a specific way.
Height	Determines the height of the grouping. If not set, the grouping will conform to the overall height of its inner controls. The dropdown is used to select the units for the height.
Width	Determines the width of the grouping. If not set, the grouping will conform to the overall width of its inner controls (except for the main grouping, which spans the width of the page). The dropdown is used to select the units for the width.
Cell Spacing	Determines the space between the groupings on the form.
Cell Padding	Determines the space between the controls in the grouping.
Skin	A pre-defined style applied to the grouping.
Delete Group	Deletes the selected group from the form.

Control Properties

When a control within the form is selected, the control's properties can be edited:

Controls for Selected Control Properties	
Control	**Description**
Name	The name of the control. This name will display inside of the control on the Visual Form Editor form to make it easily identifiable.
Label	The label that sits to the left of the control and indicates its purpose.
Tooltip Label	The tooltip message that will appear when the user hovers their mouse over the control in the software.
Table Name	Indicates the table in the database associated with the control.
Column Name	Indicates the column within the selected table in the database associated with the control.
Order	Determines the location of the control on the form. Changing the order will move the control left or right within its grouping. "1" represents the left-most position within the containing grouping.
Default Value	If entered, this value will be the default value for the control upon opening the form in the software.

Controls for Selected Control Properties	
Control	**Description**
Postback Event ID	Used in custom code modules. Identifies the control when a postback event is occurring.
Control GUI ID	Used in custom code modules. The name used to search for the control in a custom code module.
Show Label Colon	Determines whether or not to include the colon ":" between the label and the control.
Show NBI Code	Determines whether or not to show the NBI code (in red parenthesis) next to the control's label. ***Note:** If the control is not an NBI field, this checkbox has no function and no NBI code will be displayed regardless of whether the checkbox is checked.
Visible	If unchecked, the entire grouping will not be visible on the form. Invisible items on the form have the following appearance in the Visual Form Editor:
Read-Only	If checked, the entire grouping will be read only on the form. Read-only items on the form have the following appearance in the Visual Form Editor:
Bold Value	If checked, the value within the control will be bold.
Label Color	Determines the color of the control's label.
Value Color	Determines the color of the control's value.
Field Width	Determines the width of the field. The dropdown is used to select the units for the field width.
Label Width	Determines the width of the label. The dropdown is used to select the units for the label width.
Delete Control	Deletes the selected control from the form.

Security

The Security tab allows the admin to specify the role-based security for the tab, task, grouping, or control. Each role in the system (including non-default roles) can have its security set for each item.

Tab and Task Security

The tab and task security is available when first selecting a form in the Visual Form Editor or when no specific item is selected on the form. If an item is selected on the form, such as a dropdown control, simply clicking on that item will unselect it and allow the tab and task security to be edited.

If the *Visible* checkbox is unchecked for a role, users of that role will not be able to see the tab and/or task.

If the *Read Only* checkbox is checked for a role, users of that role will not be able to make changes to any of the information in the tab or task.

Group Security

When a grouping is selected on the form, the grouping's security can be edited in the Security tab.
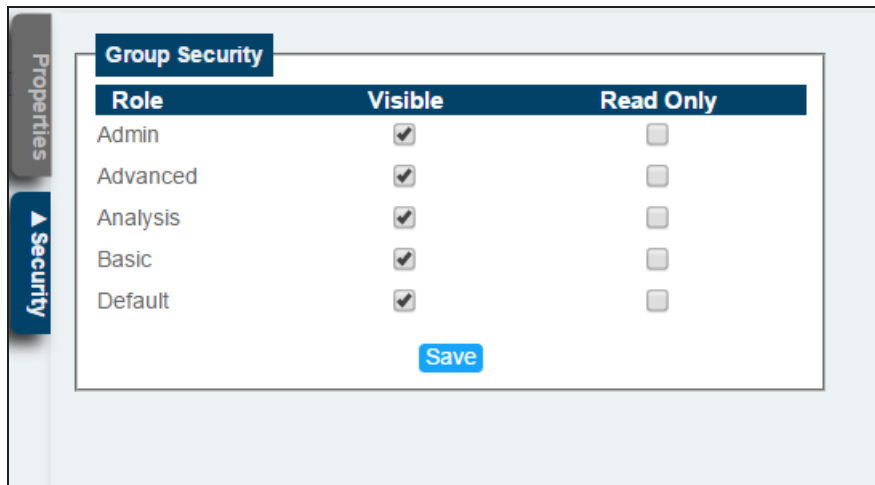
If the *Visible* checkbox is unchecked for a role, users of that role will not be able to see the grouping or anything within it when accessing the form.

If the *Read Only* checkbox is checked for a role, users of that role will not be able to make changes to any of the information in the grouping.

Control Security

When a control is selected on the form, the control's security can be edited in the Security tab.
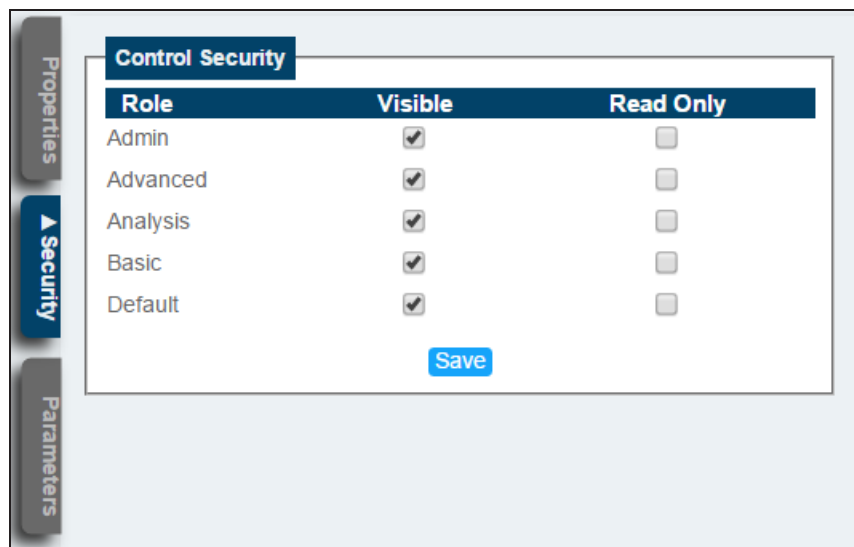
If the *Visible* checkbox is unchecked for a role, users of that role will not be able to see the control when accessing the form.

If the *Read Only* checkbox is checked for a role, users of that role will not be able to make changes to the control.

Parameters

Any of a form's controls that have information stored on the *Admin > General Config > Parameters* task can be selected on the Visual Form Editor and have its parameters edited from the Parameters tab.

Any of the controls can be edited for the existing parameters:

The *Value* textbox is the number or key that appears in the field called by the Field Name.

The *Short Label* textbox is what will be visible to the user when making a selection from the control.

The *Description* field is used mainly as an explanation of the value.

The *Active* checkbox indicates whether the specific parameter value will be available as a selectable option in the control on the form.

To add a new parameter, complete the controls in the *Add Parameter* grouping and click the *Add* button.

Click the *Save* button to save any changes made to the parameters.

Click the *Reset* button to cancel any changes made to the parameters. Only items changed since the last save will be reverted.

Page Export

The *Admin > General Config > Page Export* task is used to import/export certain components of the BrM software. This allows agencies to share items they've created amongst each other, including custom filters, layouts, and forms.
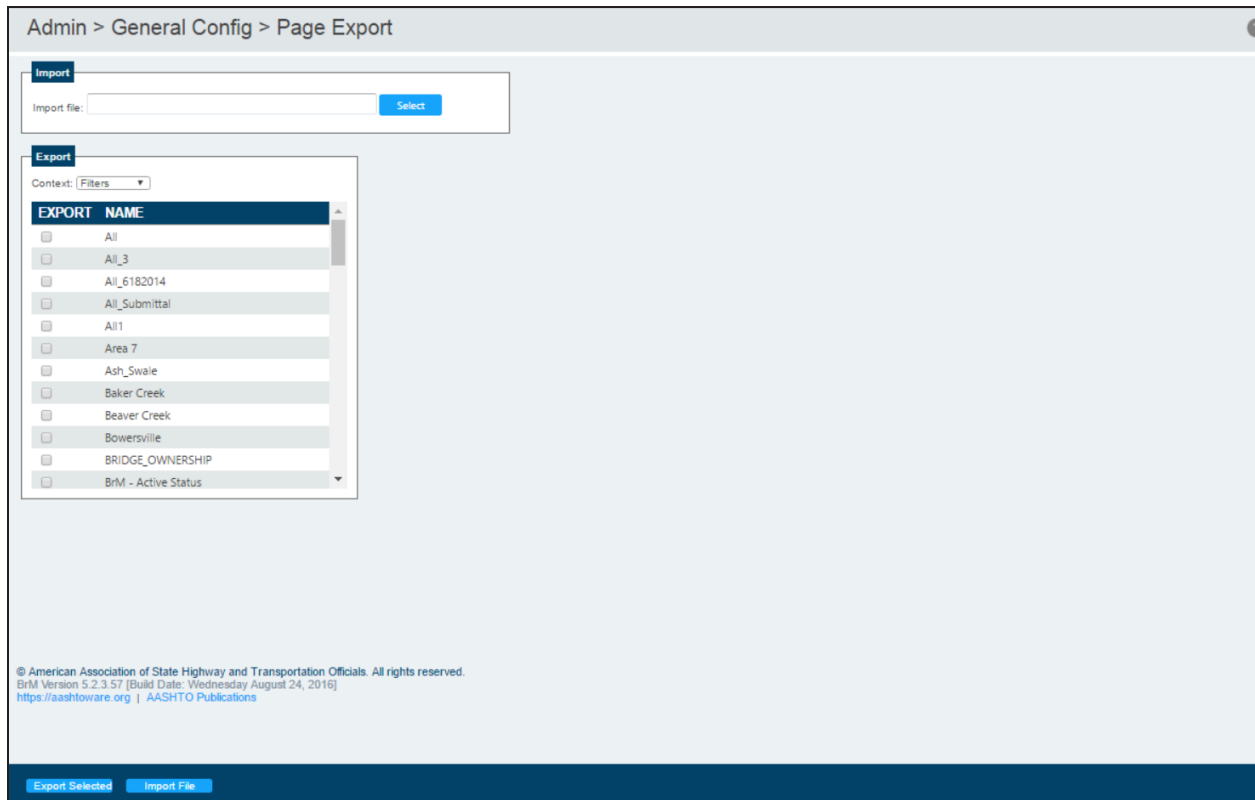
The available components come from the following database tables:

- Filters: Pon_Filters
- Layouts: Pon_Layouts
- Forms: Various Pon_Nav tables

Import Component Package

To import a component package, click the *Select* button in the *Import* grouping to locate the .JSON file within the computer's files. Once the file is located, click the *Import File* button in the footer to import the selected file. Once imported, the new components should be present in their various locations in the software.

Export Component Package

To export a component package, use the *Context* dropdown in the *Export* grouping to switch between "Filters," "Layouts," and "Navigation." All custom filters, layouts, and forms will appear in the list to be selected.

Check the boxes of all of the desired components to include, then click the *Export Selected* button. This will create a .JSON file that can then be shared with other agencies.

Equation Editor

The *Admin > General Config > Equation Editor* task allows the administrator to create the specific conditions for a validation rule. Validation rules are used to impose additional NBI and NBE rules when validating bridges. Default validation rule equations can be viewed but cannot be changed.

Equation Summary

The *Summary* grouping displays an English representation of the equation established for the validation rule. This can be very useful in helping the admin understand exactly what the equation he/she has created will search for when the validation is run.

Establish Equation for New Validation Rule

For new validation rules, the *Equation Editor* subtask will start with the following screen:

The same note from the *Validation Editor* subtask will be present at the top of the *Equation Editor* grouping until at least one condition is added to the validation rule.

Conditions are the individual equations that make up the overall validation rule.

Groups are containers for multiple related conditions. Groups can exist within other groups.

Click the *Add Condition* button to begin creating the validation rule's equation. Click the *Add Group* button if more than one condition will be grouped together. The following screenshot displays a lone condition and conditions within a group.
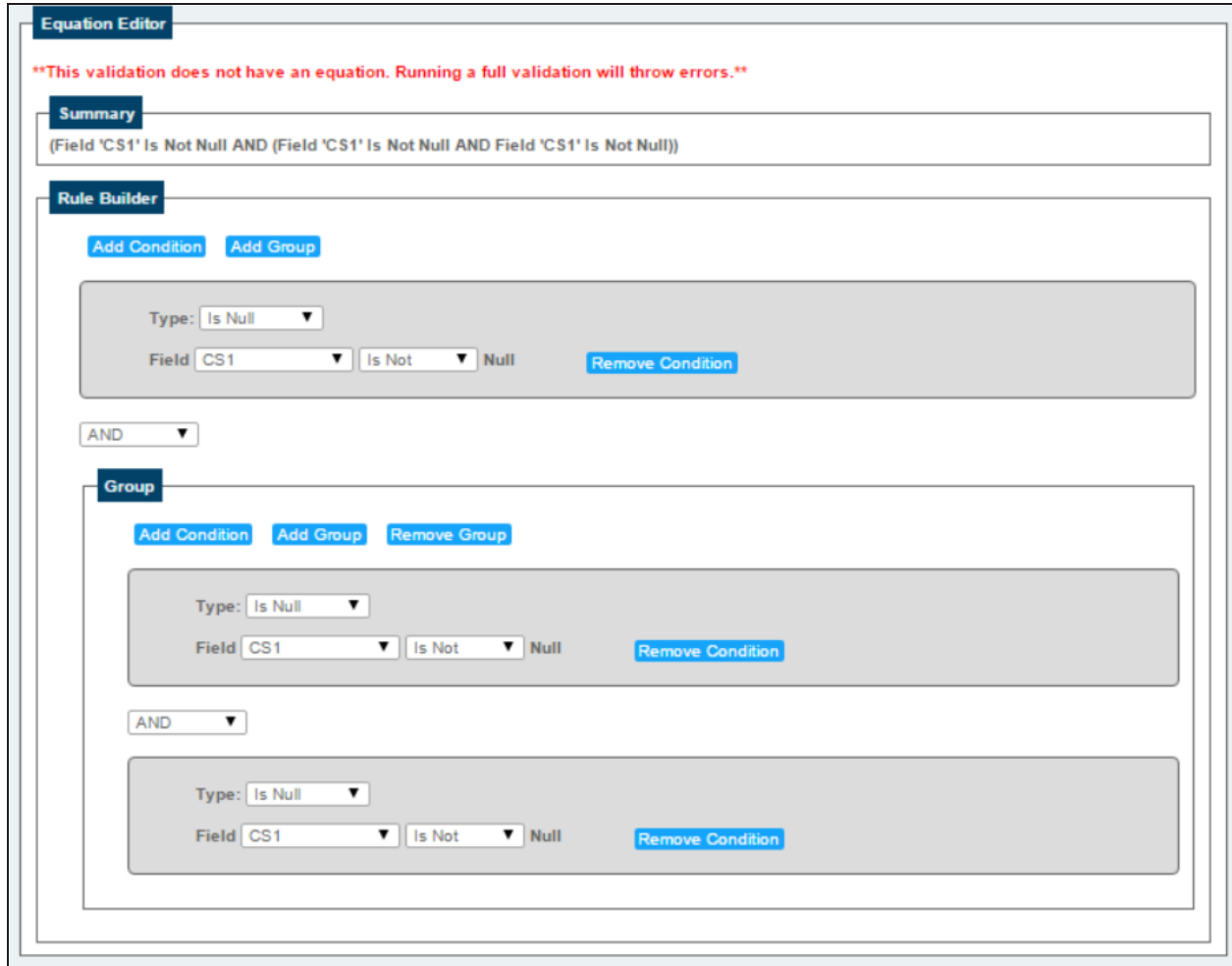
Use the *Type* dropdown to establish the type of equation:

Type	Description
Is Null	Equations indicating whether or not the condition has a value.
Is Numeric	Equations indicating whether or not the condition is a numerical value.
In Set	Equations indicating whether or not the condition's value exists within the boundaries of a specific set. The set is established on the *Set Editor* subtask.
Num	Equations indicating specific rules for numerical values, including greater than, less than, equal to, etc.
Length	Equations comparing the length (in characters) of two fields.
Min	Equations comparing the minimum value between two fields with another field.

The available controls will be dependent on the selection made from the *Type* dropdown. The following screenshots indicate the possibilities:

*Note: Fields that have been established as numeric only will not appear in the *Field* dropdown. Users cannot enter anything other than a numerical value in those fields, therefore no numerical validation check is needed on those fields.

When multiple conditions are added to the equation, whether inside a group or not, the equation conditions operate under an "And/Or" system. This means that equation conditions can work in tandem with each other or as alternatives to each other, but it cannot be a mixture. Once a selection is made from the *And/Or* dropdown, all other conditions added will operate under the same selection. The only exception is that individual groups of conditions can have a different selection than the overall equation. The following screenshots display the possibilities:

Summary

(Field 'CS1' Is Not Null AND Field 'ElemConvert' Is Numeric)

Rule Builder

Add Condition   Add Group

Type: Is Null ▼

Field: CS1 ▼   Is Not ▼ Null   Remove Condition

AND ▼
AND
OR

Type: Is Numeric ▼

Field: ElemConvert ▼   Is ▼ Numeric   Remove Condition

Summary

(Field 'CS1' Is Not Null AND Field 'ElemConvert' Is Numeric AND Field 'CS2' Is Not Null)

Rule Builder

Add Condition   Add Group

Type: Is Null ▼

Field: CS1 ▼   Is Not ▼ Null   Remove Condition

AND ▼

Type: Is Numeric ▼

Field: ElemConvert ▼   Is ▼ Numeric   Remove Condition

AND

Type: Is Null ▼

Field: CS2 ▼   Is Not ▼ Null   Remove Condition

To remove a condition, click the *Remove Condition* button for the desired condition.

To remove a group, click the *Remove Group* button for the desired group. All conditions within the group will also be removed.

Once the desired selections have been made, click the *Save* button at the bottom of the screen to save the validation rule's equation.

Set Editor

The *Admin > General Config > Set Editor* task allows the admin to create sets of values to be used in the validation equations on the *Equation Editor* task. When the "In Set" type is selected for a condition on the *Equation Editor* task, the admin can then establish a validation that checks whether or not a value matches one of the values included in the set.

Create a New Set

To create a new set, select "NBI" or "NBE" from the *Type* dropdown and then click the *Add Set* button.

To create a new set based on a copy of an existing set, click the ▶ icon for the desired set and then click the *Copy* button.

Use the *Set Name* textbox to provide a name for the set. This is the name that will be displayed when selecting a set on the *Equation Editor* subtask.

Click the *Add Set Value* button as many times as desired to generate new entries for the set:

Enter the desired values into the new textboxes, or click the ✕ icon next to an entry to delete it.

To remove all of the entries from the set, click the *Clear* button.

When the desired entries have been added to the set, click the *Save* button at the bottom of the page to save the set.

Validation Editor

The *Admin > General Config > Validation Editor* task is used to create and/or modify the basic information for a validation rule as well as determine its dependency rules. Validation rules are used to impose additional NBI and NBE rules when validating bridges. The default rules cannot be changed, deleted, or disabled.

If an existing validation rule is selected, the *Summary* grouping will be visible. The *Summary* grouping displays an English representation of the equation established for the validation rule.

Create New Validation Rule

To create a new validation rule, click the *Create New* button in the footer at the bottom of the screen.

Validation Details

The *Validation Details* grouping allows the admin to establish the basic information for the validation rule.

The *Name* textbox determines the name for the validation rule that will be used when selecting the rule later.

The *Type* dropdown is used to indicate whether the rule is for NBI or NBE elements.

The *Severity* dropdown determines at what level of severity the rule will return results.

Checkboxes

The *Enabled* checkbox determines whether or not the validation rule is active. The validation process will only check the rule if the *Enabled* checkbox is checked.

The *Include in Results* checkbox determines whether the validation results will display the currently selected rule's failures after a validation is performed on the *Bridges > Validation* task. If left unchecked, a structure can fail the validation rule but the result will not be displayed on the *Bridges > Validation*.

Use the *Description* and *Notes* textboxes to provide additional information on the validation rule. The *Description* textbox is a mandatory entry because it is the message that displays on the *Bridges > Validation* task if the validation rule is failed.

Validation Dependencies

The *Validation Dependencies* grouping allows the admin to select rules for which the currently selected rule is dependent. By establishing dependencies, admins can greatly reduce the time necessary to perform a validation.

Example: If the validation rule being established only deals with numerical values, a dependency could be added that checks whether the value is numeric before running the selected validation rule. If the dependency rule passes, the selected validation rule will run. If it fails, the selected validation rule will not run. The establishment of a dependency like this could save significant time for large validations.

Use the *Dependency* dropdown to select a rule, then click the *Add Dependency* button.

Use the *Run Selected If* dropdown to determine how the currently selected rule will be dependent on the dependency:

Ruling	Description
Passes	The validation rule will run if the structure passes the dependency's rule.
Fails	The validation rule will run if the structure fails the dependency's rule.
Doesn't Run	The validation rule will run if the dependency's rule does not run. This would most likely occur if the dependency validation rule has its own dependencies that cause it not to run.
Passes or Doesn't Run	The validation rule will run if the structure passes the dependency's rule or the dependency's rule does not run.
Fails or Doesn't Run	The validation rule will run if the structure fails the dependency's rule or the dependency's rule does not run.

To delete the dependency from the validation rule, click the ✕ icon for the desired dependency.

Validation Editor Page Controls

For validation rules being newly created:

- Click the *Save* button to save the new validation rule.
- Click the *Cancel* button to cancel the creation of the new validation rule.

Once the new validation rule has been saved, the following note will display at the top of the grouping:

At least one condition must be applied to the validation rule on the *Equation Editor* subtask in order for the validation rule to run properly.

For existing validation rules:

- Use the *Type* dropdown to determine whether the validation rule being selected is for NBI or NBE items.
- The *Create New* button is used to create a new validation rule.
- Click the *Copy>>* button to copy the selected validation rule. This will reveal the *Copy Name* textbox. Enter a name and click the *Copy* button to complete the copy, or click the *<<* button to cancel the copy.

Sync Mapping

The *Admin > Mapping > Sync Mapping* task allows the admin to sync the unmatched official and geographic information systems (GIS) coordinates of selected bridges. If the official and GIS coordinates of a bridge are unmatched, it is typically because the bridge's map pin has been moved from its official location.

Official Coordinates: The official latitude and longitude of the structure as indicated when the structure was created on the *Bridges > Create Struct* task, *Bridges > Copy Struct* task, or imported through the *Gateway* tab.

GIS Coordinates: The latitude and longitude of the structure's pin location on the *Bridges > Mapping* task.

Compound Range

The *Compound Range* dropdown is used to determine which bridges will be displayed in the grid. It compares the official and GIS coordinates based on the selection made in the *Compound Range* dropdown. The selected compound range is the allowed difference between the official and GIS coordinates.

Example: If a bridge's official latitude is 100.005, and the GIS latitude is 100, the difference is .005. If the selected compound range is .001, the bridge will appear in the grid. If the selected compound range is .01 or .1, the bridge will not appear because the difference between the official and GIS latitude is less than the selected compound range.

The more decimal places selected in the compound range, the more bridges that will appear in the grid. However, these small differences are typically unrecognizable on the GIS map.

Sync and Revert Controls

The *Sync* button changes the official coordinates to match the GIS coordinates. This might need to be done if the official coordinates were never entered or were entered incorrectly.

The *Revert* button changes the GIS coordinates to match the official coordinates. This might need to be done if the GIS pin on the *Bridges > Mapping* task was moved from its official location.

Map Options

The *Admin > Mapping > Map Options* task allows the admin to determine what information will be displayed when a user selects a structure's map pin when viewing a map:
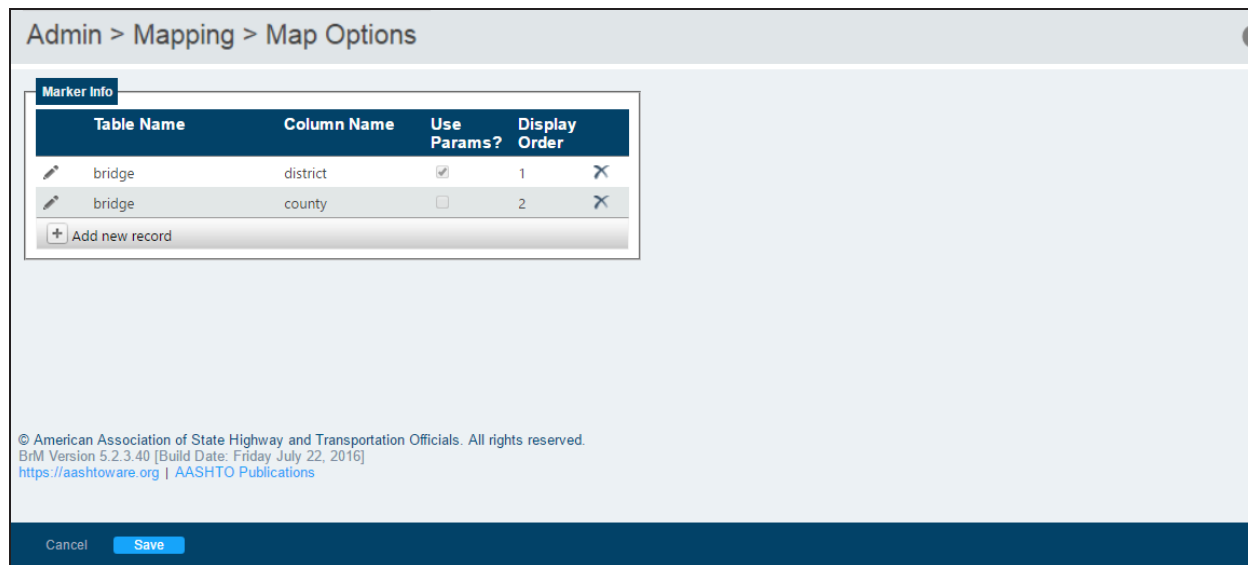
Click the ➕ symbol to add a new option:
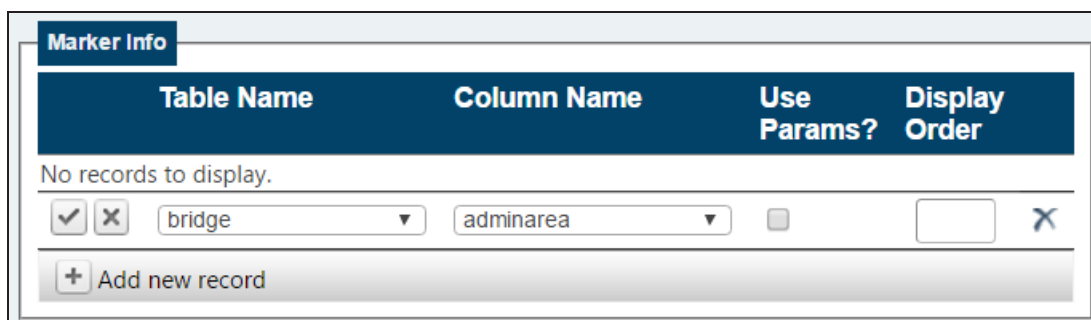
Use the *Table Name* and *Column Name* dropdowns to select the field.

Check the *Use Parameters* checkbox if the marker should display information pulled from the *Admin > General Config > Parameters* task for the selected table-column. Otherwise the marker will simply use the value in the database.

The *Display Order* textbox is used to determine where in the map pin's information box the field information will be displayed. "1" will be the topmost setting for the information.

Click the ✔ symbol to complete the addition of the new map option.

Click either the ✖ or ✕ symbol to cancel the addition of the new map option.

*Note:** Up to 10 map options can be added. Once 10 are added, the admin will be unable to make new additions until an existing option is deleted.

Existing map options can be edited by clicking the ✎ symbol or deleted by clicking the ✕ symbol.

Click the *Save* button in the footer to accept the changes made on the page.

Click the *Cancel* button in the footer to cancel the changes made on the page.

Element Specifications

The *Admin > Modeling Config > Element Specifications* task is used to create elements and define the specifications for existing elements.
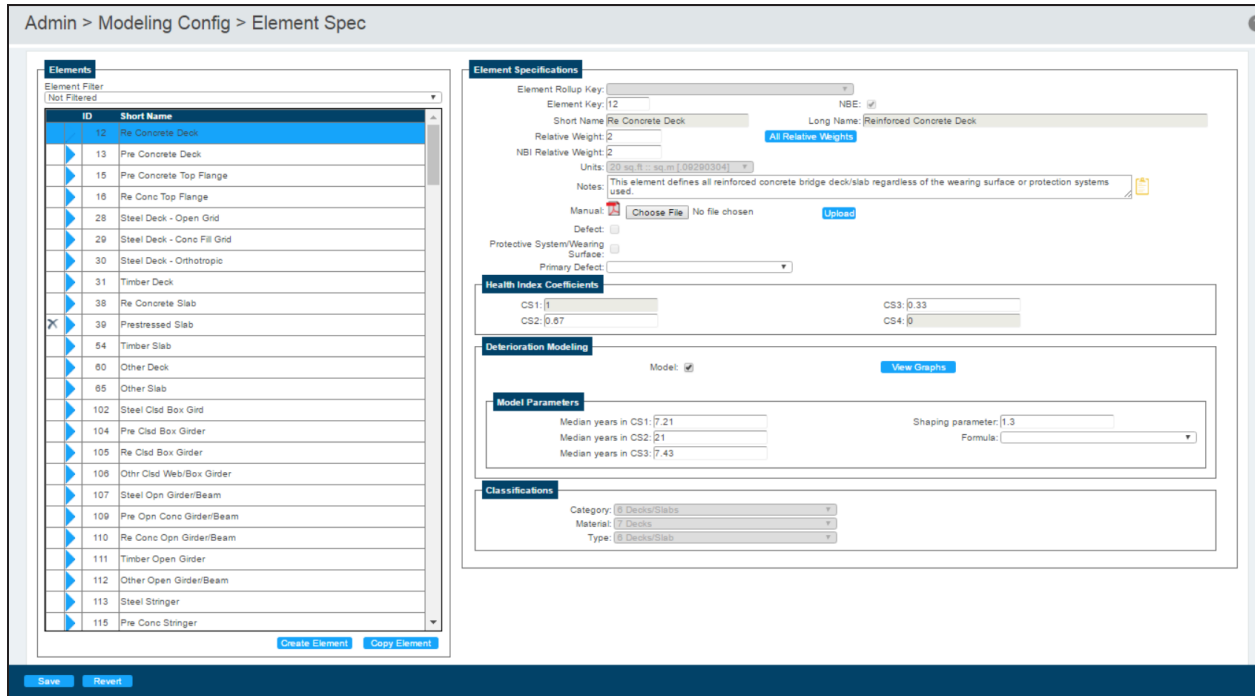
Elements

The *Elements* grouping contains the Element list. In order to view and edit an element's specifications, it must be selected from the Element list. To select an element, click the ▶ symbol. The selected element's information will then appear in the *Element Specifications* grouping.

The National Bridge Elements (NBEs) determined by the Federal Highway Administration (FHWA) are mandatory in the system and cannot be deleted. Much of the basic information and classifications of the NBEs will also be read only for all users.

If the element has an ✕ next to the ▶ in the Element list, the element is not an NBE and can be edited and deleted freely.

Create or Copy Element

The *Create Element* button creates a new element with blank specifications that must be completed.

The *Copy Element* button creates a copy of the currently selected element with matching specifications other than the Element Key, Short Name, and Long Name.

By default, the element key progresses in sequential order. Therefore, if the Element List's last element has an element key of 1000, a newly created or copied element will have an element key of 1001. The key can be changed once created, but only one element key is permitted per number.

Element Specifications

The *Element Specifications* grouping includes the specifications of the selected element, its deterioration modeling, and its classifications.

Element Rollup Key

The *Element Rollup Key* dropdown is used for non-NBEs. The Federal Government only requires the information from NBEs, but non NBE information can be "rolled up" into the NBEs. Therefore, the currently selected element's information will be included in the information from whatever NBE is selected from the dropdown.

When an NBE is selected from the Element List, the *Element Rollup Key* dropdown is read only.

Element Key and Name

The *Element Key* textbox is the element's ID. For NBEs the element key is determined by the FHWA, however it can be changed in the system as long as it is changed to a unique number. For non-NBEs, the element key can be any number as long as it is unique.

The *Short Name* and *Long Name* textboxes provide a description of the element. NBE short and long names are read only.

Relative Weights

The *Relative Weight* textbox is used for a bridge's health index. Because elements have varying degrees of impact on the overall structure of a bridge, the relative weight determines how vital an element is to the bridge and therefore how it should be weighted. The higher the relative weight, the greater the impact of the element on the bridge.

The *All Relative Weights* button provides a grid of the recommended relative weight for a given element:

Admin - Element Spec Page

Element Key	Short Name	Relative Weight
12.0	Re Concrete Deck	6.0
13.0	Pre Concrete Deck	6.0
15.0	Pre Concrete Top Flange	6.0
16.0	Re Conc Top Flange	6.0
28.0	Steel Deck - Open Grid	6.0
29.0	Steel Deck - Conc Fill Grid	6.0
30.0	Steel Deck - Orthotropic	6.0
31.0	Timber Deck	6.0
38.0	Re Concrete Slab	9.0
39.0	Prestressed Slab	6.0
54.0	Timber Slab	9.0
60.0	Other Deck	6.0
65.0	Other Slab	9.0
102.0	Steel Clsd Box Gird	10.0
104.0	Pre Clsd Box Girder	10.0
105.0	Re Clsd Box Girder	10.0
106.0	Othr Clsd Web/Box Girder	10.0
107.0	Steel Opn Girder/Beam	10.0
109.0	Pre Opn Conc Girder/Beam	10.0
110.0	Re Conc Opn Girder/Beam	10.0

Page 1 2 3 4 5 6 7 8 9 10 | Page size: 20 | 200 items in 10 pages

The *NBI Relative Weight* textbox is used in conjunction with the NBI converter on the *Inspection > Condition* task. It determines how the selected element is weighted in the average when an NBI converter profile is used.

Units

The *Units* dropdown determines how the element is measured. NBE units are read only.

Notes

The *Notes* textbox can be used to enter a description of the element. This is particularly useful when creating new elements that may not be universally recognized by their short and long names.

Manual

A PDF can be added for any element to provide more information. To add a PDF, click the *Choose File* button and locate the desired file. Once selected, click the *Upload* button to add the PDF to the element.

*Note: When upgrading to a new version of BrM, previously uploaded custom agency element manuals will be lost during the uninstall of the old version. In order to ensure the manuals are maintained and added into the new version, the ElemGuideManuals subdirectory must be copied prior to uninstalling the old version. Then, after installing the new version, the ElemGuideManuals subdirectory can be returned to its folder location. **When completing this process, only copy over the custom agency element files. The new install of BrM will contain the latest manuals for the standard elements.**

Defect and Protective System

The *Defect* and *Protective System* checkboxes are used to indicate whether or not the selected element is a defect or a protective system.

If the *Defect* checkbox is selected, the *Condition State Definitions* grouping will appear below the *Classifications* grouping.

The *Condition State Definitions* grouping allows the admin to specify the name and description of the 4 condition state levels.

Primary Defect

*Note: BrM 5.2.3 does not currently utilize the *Primary Defect* dropdown. This control's functionality may be implemented in future versions of the software. If used, it would help the system determine the rate of an element's deterioration.

Health Index Coefficient

The *Health Index Coefficient* grouping allows the admin to change the weight of the condition states to better represent the selected element's deterioration. By default, the health index coefficient uses the following equation:

$$HI_e = \frac{3}{3}y_1 + \frac{2}{3}y_2 + \frac{1}{3}y_3$$

y_i is the forecasted percentage of element e in state i

CS1 is always equal to "1" in the equation, so the *CS1* textbox is read only. CS4 is always equal to 0 (therefore not shown in the equation), so the *CS4* textbox is read only.

The *CS2* and *CS3* textboxes can be changed from their default values to any value between "1" and "0."

Deterioration Modeling

Due to its complexity, an extended user manual section has been created to explain deterioration modeling at length. This portion can be found at the *Admin > Modeling Config > Deterioration Modeling* section of the *BrM User Manual*.

However, if a defect is selected, there is only one available control:

If the *Exclude Defect from Deterioration* checkbox is checked, the selected defect will not be included in the deterioration modeling on the *Analysis* tab.

Classifications

The *Classifications* grouping is used to classify the selected element. Only non-default elements can have their classifications edited.

Use the *Category*, *Material*, and *Type* dropdowns to classify the element.

Element Spec Page Controls

Click the *Save* button to save the changes made to the selected element.

Click the *Revert* button to cancel the changes made to the selected element.

Element-Child Linking

The *Admin > Modeling Config > Element-Child Linking* task is used to link elements, defects, and protective systems. The elements must be linked together in order to be used together throughout the software on pages such as the *Inspection > Condition* task.

By default, links have been established based on the AASHTO Manual for Bridge Element Inspection. Additional links for the existing elements as well as links for custom elements must be performed by the admin.
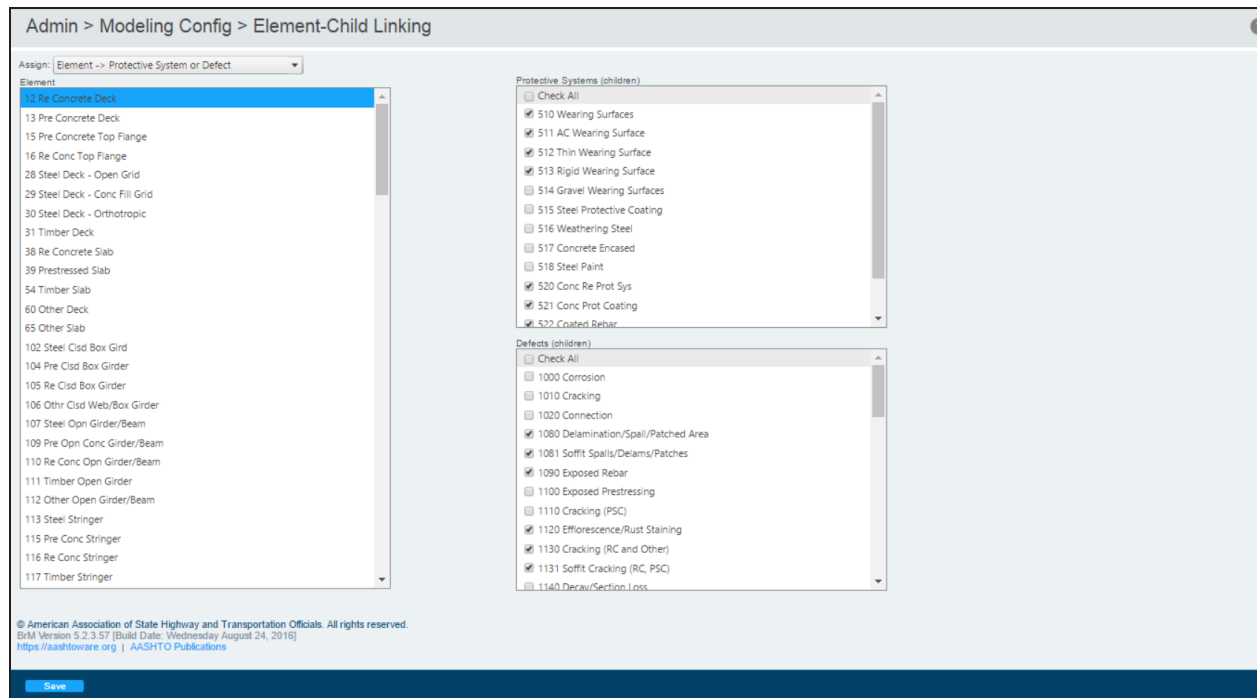
Assigning Element Relationships

The *Assign* dropdown is the key to the element relationships. When a selection is made using the *Assign* dropdown, the links are for that type of element only.

Elements can have:

- Protective Systems (children)
- Defects (children)

Protective Systems can have:

- Elements (parents)
- Defects (children)

Defects can have:

- Elements (parents)
- Protective Systems (parents)

Element-Child Linking Page Controls

Click the *Save* button to save the changes made to the assigned element.

Project Categories

The *Admin > Modeling Config > Project Categories* task is used to create project categories for use in the *Projects* tab. Project categories are linked to specific actions, filters, and layouts that help the users identify bridges with various needs. There are six project categories by default: Bridge Rail, Deck Work, Joint Seals, Paint, Scour Work, and Structurally Deficient NHS Bridges. However, these categories can be modified and additional categories can be created.

*Note: Project categories are not mandatory, as "No Category" is a selectable option on the *Projects > Create/Edit Project > Query* subtask, but they are recommended to help the user narrow down search results to specific needs.
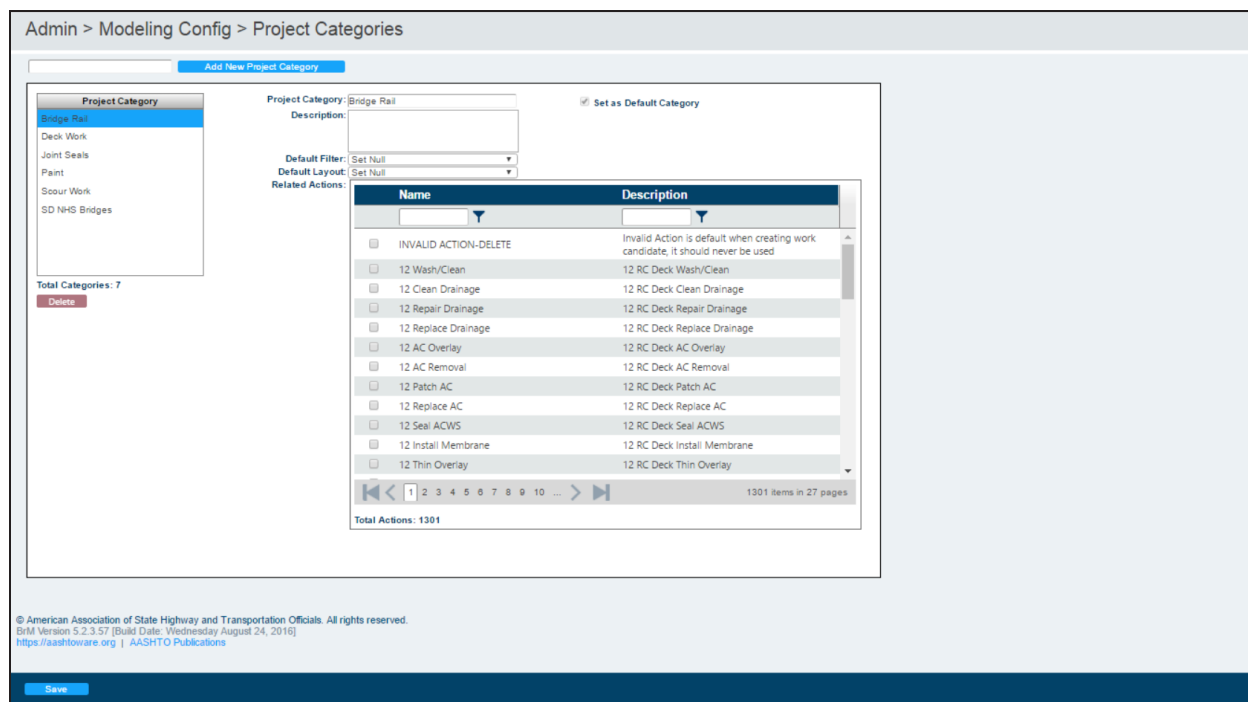
Project Category Selection

To choose a project category to manage, select one from the *Project Category* listbox or create a new one by typing a name into the textbox next to the *Add New Project Category* button and then click the button.

To set the selected category as the default category, click the *Set as Default Category* checkbox. This determines which project category will be the default selection in the *Project Category* dropdown on the *Projects > Create/Edit Project > Query, Summary*, and *Management* subtasks.

Default Filter and Layout

Use the *Default Filter* and *Default Layout* dropdowns to select the project category's default filter and layout. These settings will be used on the *Create/Edit Project* task of the *Projects* module.

*Note: In order for filters and layouts to appear in the above dropdowns, the following must be true:

Filters - The filter's context on the *Manage Filters* task must be set to "Bridge List" and the filter must be set to "Shared."

Layouts - The layout's context on the *Manage Layouts* task must be set to "Project Bridge Needs" and the layout must be set to "Shared."

Related Actions

The Related Actions grid shows all of the actions that can be associated with the selected project category.

Related Actions:		Name	Description
	☐	Paint Sub - Network	First Painting
	☐	Paint Super - Network	First Painting
	☐	Place Wearing Surface - Network	First Wearing Surface
	☐	Preserve Deck - Network	Thin-Bonded / Repair Joints
	☐	Rehab Culvert - Network	Rehab culvert, parapets, approaches
	☐	Rehab Deck - Network	Repair deck, joints and parapets
	☐	Rehab Sub - Network	Repair Columns, Piers, Abutments, Piles, Walls
	☐	Rehab Super - Network	Repair beams, paint and bearings
	☐	Repaint Super/Sub - Network	Repair Paint
	☐	Replace Deck - Network	Replace Deck
	☐	Replace Structure - Network	Replace Structure
	☐	Replace Super - Network	Replace Super Elements

Total Actions: 22

Check the boxes of the actions that should be linked to the project category, and use the *Name* and *Description* filters to search for specific actions.

Project Category Page Controls

Click the *Save* button to save the changes made to the selected project category.

Deterioration Profiles

The *Admin > Modeling Config > Deterioration Profiles* task allows the admin to create deterioration profiles that make changes to the default deterioration parameters. The deterioration profiles are then used within program scenarios to compare program performance with different deterioration circumstances.
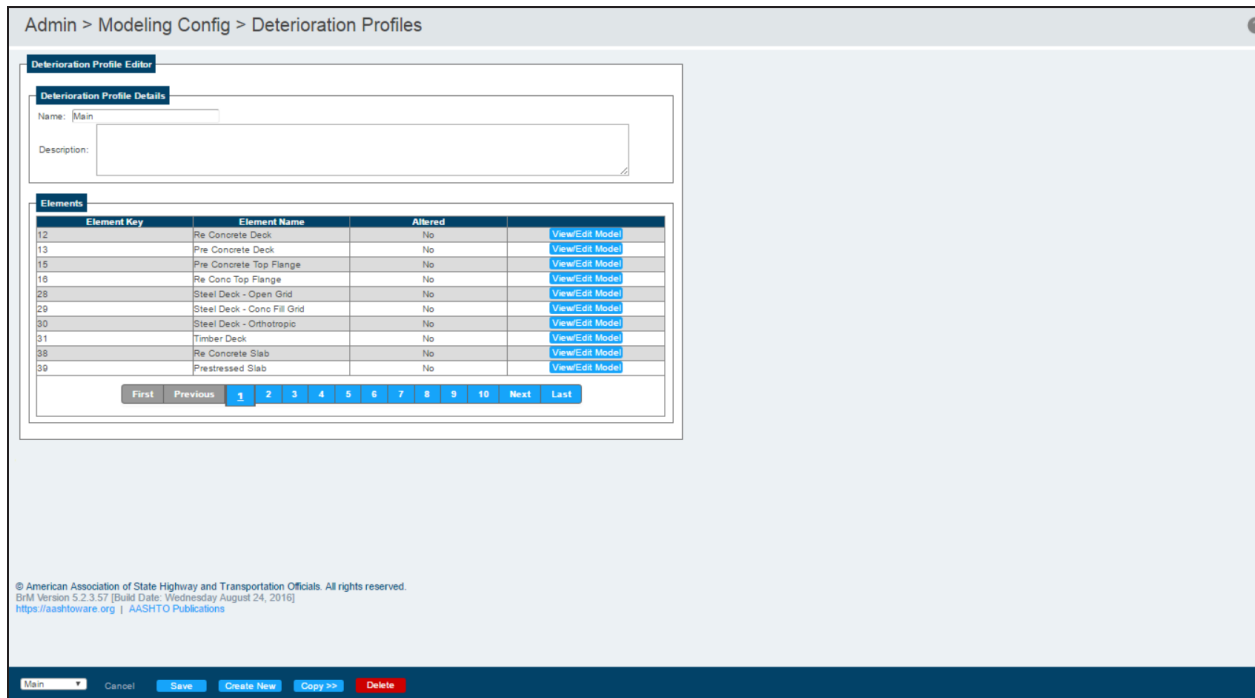
Use the dropdown in the footer to select the desired deterioration profile to view, or click the *Create New* button to create a new deterioration profile.

Deterioration Profile Details

The *Deterioration Profile Details* grouping is used to establish the basic information for the deterioration profile.

The *Name* textbox indicates the name of the deterioration profile and is used in the *Deterioration Profile* dropdown of the *Programs > Create/Edit Scenarios* task.

The *Description* textbox can be used to add notes and information on the specific settings of the deterioration profile.

Elements

The Elements grouping displays a grid of the National Bridge Elements (NBEs). Each element has its own default deterioration curve based on the four condition states. To edit the deterioration parameters of an element, click the *View/Edit Model* button of the desired element.

The *Model Parameters* and *Element Assumptions* groupings can be used to modify the deterioration parameters of the selected element. For more information on how to make changes to the deterioration parameters, read the *Deterioration Modeling* section of the user manual that directly follows this section.

Once a change has been made and the admin returns to the main *Deterioration Profiles* page, that element's line will be red in the grid and the Altered column will read "Yes."

To revert the parameter changes back to the default settings, click the *(Use Default)* link in the Altered column for the desired element.

Deterioration Profile Page Controls
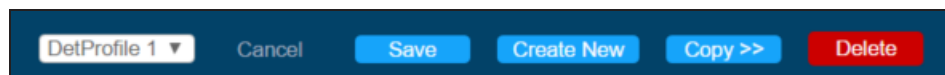
The dropdown allows the user to select an existing deterioration profile to view and edit.

The *Save* button saves the changes made to the selected deterioration profile.

The *Create New* button creates a new deterioration profile.

The *Copy>>* button copies the selected deterioration profile. This will reveal the *Copy Name* textbox. Enter a name and click the *Copy* button to complete the copy, or click the *<<* button to cancel the copy.

The *Delete* button deletes the selected deterioration profile.

Deterioration Modeling

Bridge deterioration modeling is designed to forecast the future conditions of bridges and aid the user in developing optimal actions to take on the bridge in a given period of time.

The element deterioration models are managed on the *Admin > Modeling Config > Element Spec* task. BrM includes the default model definitions for the standard AASHTOWare Bridge Elements. The parameters for the elements can be modified and the parameters for new elements can be specified, but all elements (excluding defect elements) must have a deterioration model defined.

Modify Element's Deterioration Model Parameters

To modify an element's deterioration model parameters, select an element from the element list to reveal the selected element's parameters.

The parameters can then be modified using the controls in the *Model Parameters* grouping or by using the element's deterioration model graphs:

- Use the *Model Parameters* grouping:
    1. **Median Years in CS1, CS2, CS3** - The median number of years in which a unit of element stays respectively in state 1, state 2, and state 3.

2. **Shaping Parameter** - Specifies how quickly an element begins to deteriorate.
3. **Formula** - Additional formula defined on the *Admin > Modeling Config >Advanced Formula* subtask.

*Note: If a protective system is the selected element, the *Protection Factors* grouping will appear within the *Deterioration Modeling* grouping.

The protection factors model the effect that the protective system has on the deterioration of a base element.

The *Max. Protection Parameter* textbox indicates the factor by which the protective system effects the transition state of the base element.

Example: If the *Max. Protection Parameter* textbox is set to "2," the transition times from one condition state to the next for the base element will be doubled. However, the max. protection parameter only applies when the protective system is in perfect condition. As the protective system deteriorates, so does its influence on the transition times of the base element.

Once the protective system is no longer in perfect condition and cannot utilize the max. protection parameter, the *CS1* through *CS4* textboxes indicate the effectiveness of the protective system on the base element when the protective system is in that condition state. The *CS1* and *CS4* textboxes are read-only controls and will always be set to "1" and "0" respectively.

OR

- Use the element's deterioration model graph page:
  1. Select *View Graphs* to proceed to the following page:
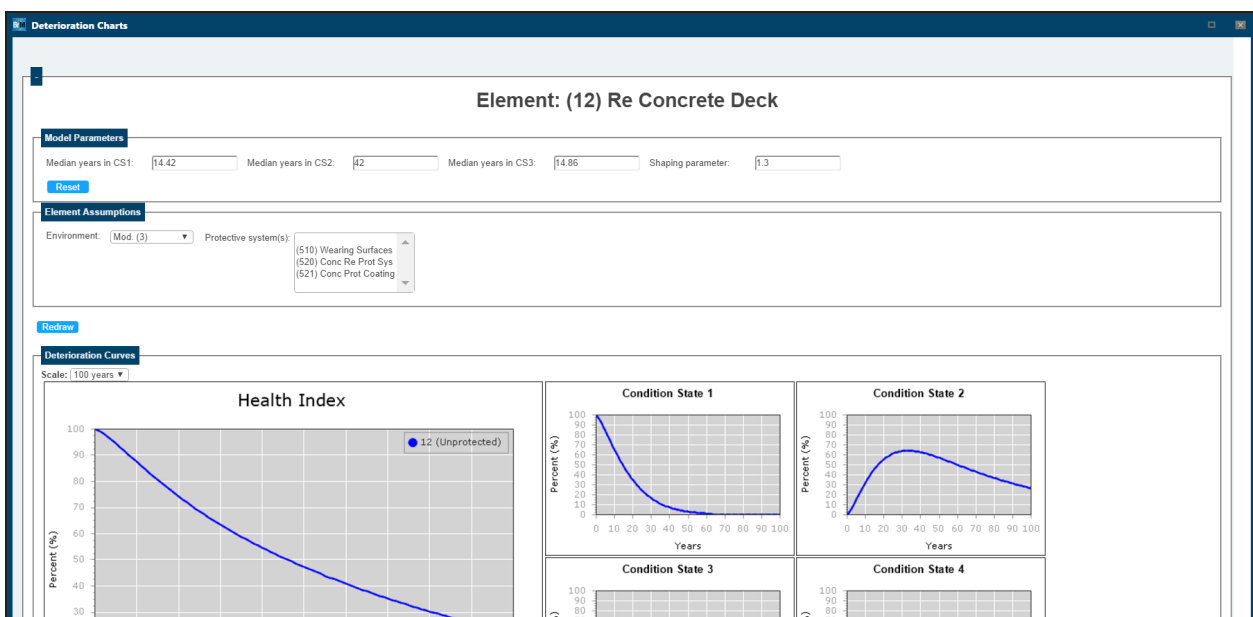
2. **Median Years in CS1, CS2, CS3** - The median number of years in which a unit of element stays respectively in state 1, state 2, and state 3.
3. **Shaping Parameter** - Specifies how quickly an element begins to deteriorate.
4. If desired, adjust the *Environment* dropdown and *Protective Systems* listbox.
5. Click *Redraw*. The Deterioration Curves and Deterioration Forecasts will update. The Deterioration Curves will reveal a dotted line based on the changes made in steps 2-4:

The Health Index graph displays the element's forecast health index over time.

The four Condition State graphs display the percentage of the element in that particular condition state over time.

*Note: While using the *Environment* and *Protective System* controls can be helpful, it is important to note that the model parameters only have one setting. It is not possible to have a different model parameter setting for different environments or protective systems. For example, the model parameters for the "Low" environment setting will be the same as the model parameters for the "Severe" environment setting.

Copy Existing Element's Deterioration Model Parameters

To copy the existing deterioration model parameters of an element, begin by selecting the element that will have its parameters updated, then:

Uncheck the *Model* checkbox. The *Deterioration Modeling* grouping will update.

Select an element from the *Copy From* dropdown. The deterioration model parameters of this element will be copied to the element currently selected on the *Admin > Modeling Config > Element Spec* task. To copy the element, click *Copy Model*.

Deterioration modeling is discussed further in the *Analysis* tab section of the manual.

Elements

The *Admin > Modeling Config > Elements* task is used to manage the environments, materials, categories, and types for elements.

Environments

The environments in the *Environments* grouping are used primarily for deterioration modeling because the environment can play a large role in a bridge's deterioration. New environment levels cannot be added, but the *Name* and *Factor* text-boxes can be changed.

The *Factor* textboxes indicate the impact that the environment will have on the deterioration of the elements of a bridge. The transition times of an element are multiplied by the environment factor, therefore a beneficial environment should have a value greater than 1 and the factors should regress in order all the way to a severe environment which should have a value less than 1.

Materials

The materials in the *Element Materials* grouping are used to classify the elements. No new materials can be added, but the names of the materials can be changed in the *Name* textboxes and the order in which they appear can be changed in the *Sort* textboxes.

Categories

The categories in the *Element Categories* grouping are used to classify the elements. New categories can be added by clicking the *Add New* button. The names of the categories can be changed in the *Name* textboxes and the order in which they appear can be changed in the *Sort* textboxes.

Categories can be deleted using the ✕ symbol as long as they are not being used by an element definition or element type. If at least one element definition or type is using the category, a message will appear when the mouse is hovered over the ✕ symbol:

However, admins who do not wish to remove the element definitions and element types associated with the element category can instead reassign those definitions and types to a different category. The category can then be deleted without having to delete the definitions and types.

Types

The types in the *Element Types* grouping are used to classify the elements. The *Category* dropdown determines the category to which the type belongs. The names of the types can be changed in the *Name* textboxes and the order in which they appear can be changed in the *Sort* textboxes. New types can be added by clicking the *Add New* button.

Types can be deleted using the ✕ symbol as long as no element is currently classified as that type. If at least one element is classified as that type, a message will appear when the mouse is hovered over the ✕ symbol:

Element Page Controls

Click the *Save* button to save the changes made on the *Element* subtask.

Assessment

The *Admin > Modeling Config > Assessment* subtask is used to define risk assessment types and their impact on a bridge.

To begin, select an assessment from the *Assessment* listbox or click the *Add New Assessment Definition* button.

Assessment Details

Candidate ID and Label

The *Candidate ID* and *Label* textboxes are used as name and description fields, respectively.

Auto Generation and Manual Generation

The *Auto Generation* and *Manual Generation* dropdowns determine how an assessment is recorded for an inspection.

The *Auto Generation* dropdown allows the admin to have an assessment created automatically upon inspection creation, set based upon the calendar, or turned off with the "Not automatic" setting.

The *Manual Generation* dropdown allows users to create their own assessments on the *Inspection > Assessments* task or can be turned off with the "Not allowed" setting.

Checking

The *Checking* dropdown determines whether or not a review of the assessment is required.

Interval

The *Interval* textbox works directly with the *Auto Generation* dropdown when it is set to "Calendar" to determine the interval (in months) that new assessments will be generated.

Edit Formula

The *Edit Formula* button allows the admin to edit the formula used to determine the final risk value for the assessment.

Notes Page

TableName : PON_DEFS_ASSESSMENT   ColumnName : ASMT_FORMULA

Default RA Calc : final value = $likelihood * $consequence

Characters remaining: 2000

Check Spelling   Cancel   OK
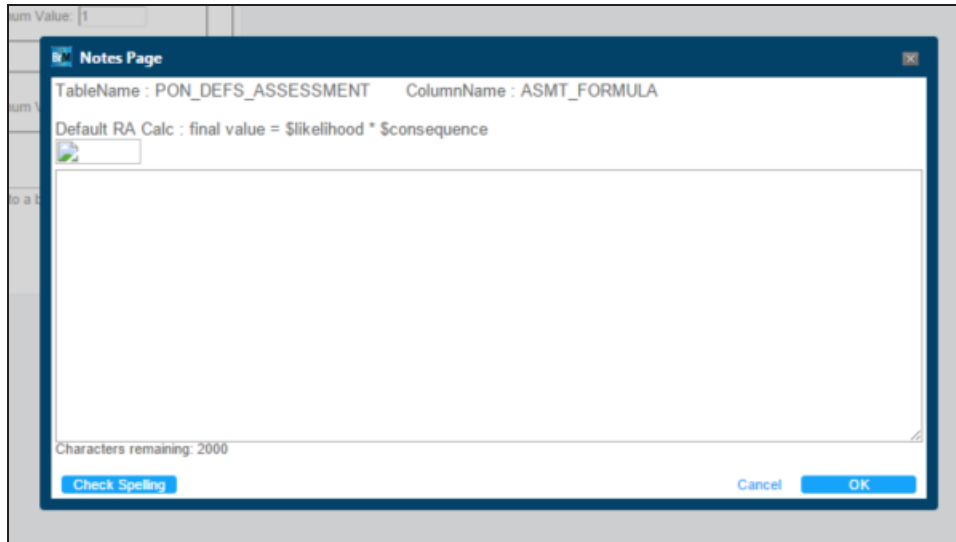
Likelihood, Consequence, and Final Risk Groupings

The default assessment formula multiplies the *Likelihood* and *Consequence to Structure* entries to determine the *Final Risk Value* on the *Inspection > Assessments* task.

The admin can set the maximum and minimum values for each based on agency standards. The set values will be reflected in the Risk Assessment Value grid on the *Inspection > Assessments* task:
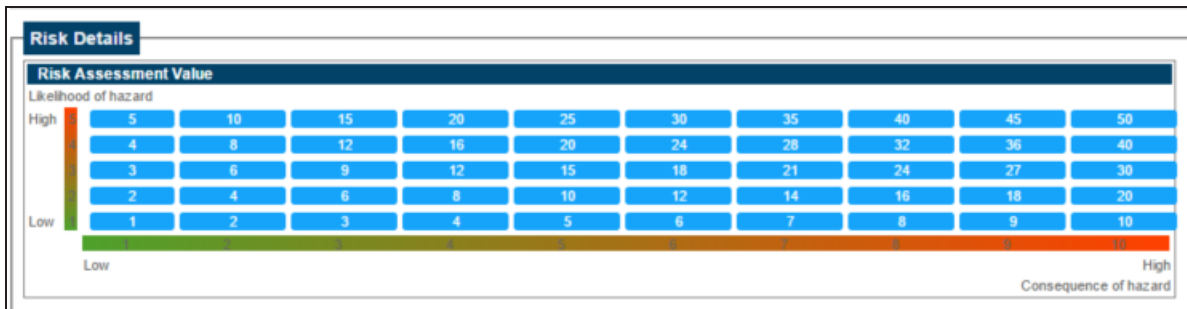
Once on the *Inspection > Assessment* task, each of the numbered boxes on the Risk Assessment Value grid can be selected to indicate the values for the *Likelihood*, *Consequence to Structure*, and *Final Risk Value* fields.

Assessment Page Controls

Click the *Save* button to save the changes for the selected assessment.

Click the *Delete* button underneath the *Assessment* listbox to delete the selected assessment.

Benefit Groups

The *Admin > Modeling Config > Benefit Groups* task is used to determine the impact of a specific action or actions on a structure. This is shown through an action's effects on elements, specific fields, and risk assessments.

Benefit Groups
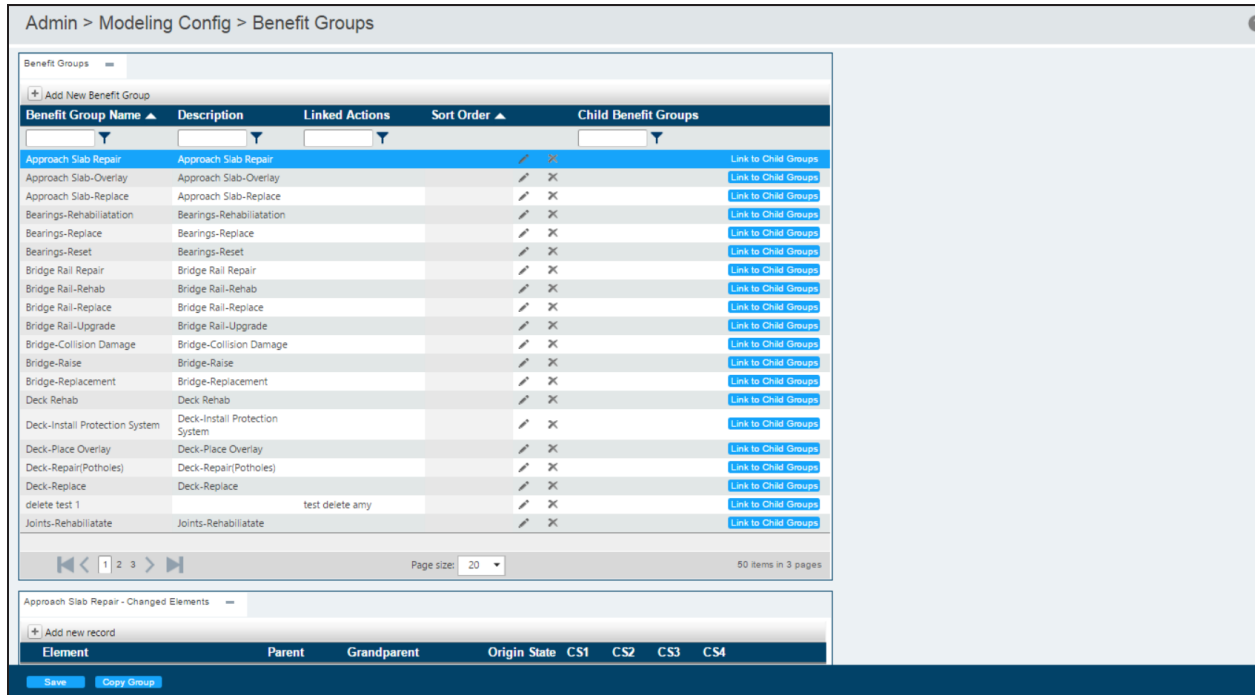
The *Benefit Groups* grouping displays the groups for specific actions. Clicking on a benefit group will select it. A new benefit group can be created by clicking the ⊞ icon at the top of the Benefit Groups grid.

The Linked Actions column of the Benefit Groups grid is determined by the linking of the benefit groups to actions on the *Admin > Modeling Config > Action Defs* subtask.

The ✎ icon allows the user to change the name and description of the selected benefit group.
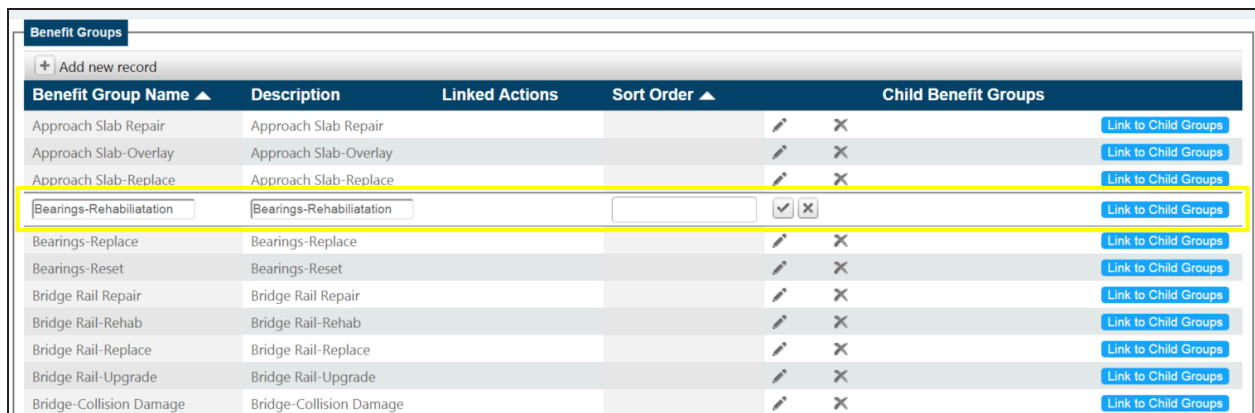
Click the ✓ icon to accept the changes or the ✗ icon to cancel the changes.

The ✕ icon deletes the selected benefit group.

The selected benefit group will determine what appears in the *Benefit Group* task's other groupings.

Child Groups

Administrators can now establish child groups for benefit groups to tie in work that is commonly performed together. Once a benefit group has child benefit groups, adding it to an action will include all of the child benefit groups as well.

Example: An admin may create a Rehab Bridge benefit group with Rehab Deck, Rehab Super, and Rehab Sub as child benefit groups. Then, each of those child benefit groups can have child groups of their own.

To add or remove child groups, click the *Link to Child Groups* button for the desired benefit group to open a popup with all of the benefit groups in the system:
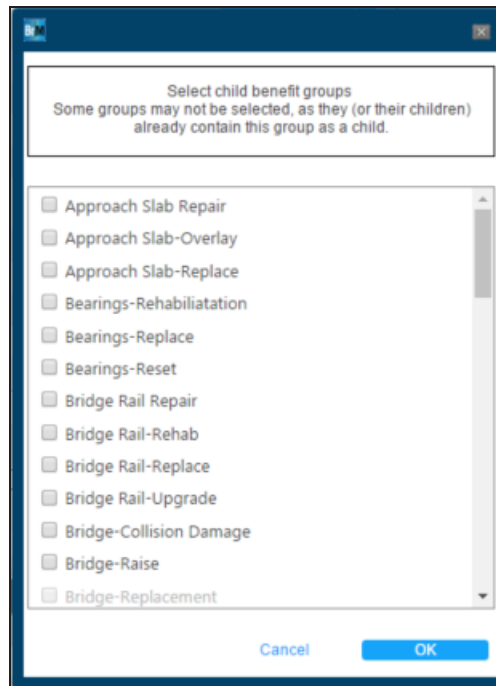
Checking the boxes of the benefit groups will make them child benefit groups of the currently selected benefit group. To remove child groups, simply uncheck the desired boxes.

Click *OK* to accept the changes or *Cancel* to cancel the changes.

Child benefit groups will then be listed in the Child Benefit Groups column of the Benefit Groups grid.

Changed Elements

The *Changed Elements* grouping displays the elements that have their condition states impacted by the selected benefit group's actions.

A new record can be added by clicking the ⊞ icon at the top of the Changed Elements grid.

The purpose of the *Changed Elements* grouping is to determine what effect the benefit group's actions will have on the selected element. Clicking the ✎ icon allows the admin to indicate how the actions will improve the element's condition state.

Parent and grandparent combinations can be added using the *Parent* and *Grandparent* column dropdowns. These allow the admin to be specific about exactly how a benefit is applied.

Example: There is an element with a protective system applied. That protective system has a defect. Therefore, the grandparent > parent > child relationship would be element > protective system > defect. A benefit group can impact a specific part of that relationship without impacting the rest. So, perhaps a benefit group removes or improves the defect on the protective system without affecting any other part of the bridge.

To declare the impact the benefit group's actions have on the element, first use the *Origin State* dropdown to set the original condition state, then change the percentages in the *CS1*, *CS2*, *CS3*, and *CS4* column textboxes to add up to 100%.

Example: An element with an origin state of CS3 might change to 100% CS1 after being repaired by the benefit group's actions.

Click the ✔ icon to accept the changes or the ✖ icon to cancel the changes.

The ✖ icon deletes the selected element from the selected benefit group.

Removed Elements

The *Removed Elements* grouping displays the elements that are fully removed by the selected benefit group's actions.

*Note:** Benefit groups that perform replacement actions automatically remove defects, therefore those benefit groups do not need to include defects in the *Removed Elements* grouping.

A new removed element can be added by clicking the ✚ icon at the top of the Removed Elements grid. The *Element*, *Parent*, and *Grandparent* dropdowns allow the admin to select specifically which element is being removed.

Clicking the ✏ icon allows the admin to edit the *Element*, *Parent*, and *Grandparent* dropdowns of existing entries.

Click the ✔ icon to accept the changes or the ✖ icon to cancel the changes.

The ✖ icon deletes the selected removed element from the selected benefit group.

Replaced Elements

The *Replaced Elements* grouping displays the existing elements and protective systems that are replaced by new elements and protective systems as a result of the selected benefit group's actions.

A new replaced element can be added by clicking the ✚ icon at the top of the Replaced Element grid. The *Orig. Element* and *Orig. Parent* dropdowns are used to determine which element or protective system will be replaced. The *New Element* dropdown determines which new element or protective system will take the place of the old one.

Clicking the ✏ icon allows the admin to edit the *Orig. Element*, *Orig. Parent*, and *New Element* dropdowns of existing entries.

Click the ✔ icon to accept the changes or the ✖ icon to cancel the changes.

The ✖ icon deletes the selected replaced element from the selected benefit group.

*Note: Element replacement is only applicable to elements and protective systems.

Created Protective Systems

The *Created Protective Systems* grouping displays the protective systems that are added as a result of the selected benefit group's actions.

A new created protective system can be added by clicking the ⊞ icon at the top of the Created Protective Systems grid. The *Element* and *Parent* dropdowns are used to determine which protective system will be added to which element. The *Percent Coverage* textbox determines how much of the element the new protective system covers.

Clicking the ✎ icon allows the admin to edit the *Element* and *Parent* dropdowns and *Percent Coverage* textbox of existing entries.

Click the ☑ icon to accept the changes or the ☒ icon to cancel the changes.

The ✕ icon deletes the selected created protective system from the selected benefit group.

Fields

The *Fields* grouping displays the fields that are impacted by the selected benefit group's actions. A new field can be added by clicking the ⊞ at the top of the Fields grid.

The *Fields* grouping contains specific columns of specific tables within the system that are changing due to the action.

Clicking the ✎ icon allows the admin to indicate how the action will change the field's value or increment. The *Value* textbox is used if the admin wants to specify the exact number the field will change to because of the action. The *Increment* textbox is used if the admin wants to specify how much of an increase or decrease will occur to the number in the field. Only one option - Value or Increment - can be used for one field.

*Note: To locate a specific table or column name, use the tooltips feature and hover the mouse over the desired location in the system to discover the table and column name.

Click the ☑ icon to accept the changes or the ☒ icon to cancel the changes.

The ✕ icon deletes the selected field from the selected benefit group.

Risks

The *Risks* grouping displays the risk assessments that are impacted by the selected benefit group's actions. A new assessment benefit can be added by clicking the [+] at the top of the Risks grid.

Clicking the ✎ icon allows the admin to indicate how the action will change the assessment's risk level. The *Value* textbox is used if the admin wants to specify the exact risk level the assessment will change to because of the actions. The *Increment* textbox is used if the admin wants to specify how much of an increase or decrease will occur to the risk level of the assessment. Only one option - Value or Increment - can be used for one assessment.

*Note: As shown in the grouping title, use negative values to reduce risks.

Click the ☑ icon to accept the changes or the ☒ icon to cancel the changes.

The ✖ icon deletes the selected assessment from the selected benefit group.

Benefit Groups Page Controls

Click the *Save* button to save the changes for the selected benefit group.

Click the *Copy Group* button to make a copy of the selected benefit group. The copy will include all of the elements, risks, and fields for the benefit group, but it will not include the child group links.

Actions Defs

The *Admin > Modeling Config > Action Defs* task is used to create and define actions, link actions with benefit groups, and determine the cost per unit of the elements associated.

Action Defs

The *Action Defs* grouping contains the Action grid with all of the actions in the system. To search for a specific action, type the action into the textbox next to the *Search* button and then click the button. The search operates under a partial match, therefore anything containing the words typed into the textbox (in that exact order) will be displayed in the search results. To select an action, click the ▶ icon for that action.

The *Sort Order* column textboxes are used to designate a particular order for the actions in the Action grid. By default, the actions are in alphabetical order. However, numerical values (starting with 1) can be entered into the *Sort Order* column textboxes to place the selected action to the top of the Action grid.

Add New Action Def

To add a new action def, use the empty entries at the top of the Action grid. Complete the *Name*, *Description*, and *Notes* textboxes for the action.

The *Order* textbox is used to designate a particular order for the actions in the Action grid. The actions that do not have an order number are sorted alphabetically. Actions with a number order, starting with "1," will appear ahead of the unnumbered actions in the Action grid.

The *Network Level* checkbox indicates whether or not the action is a network-level action. If this box is checked, the action can then be added to a network policy on the *Admin > Modeling Config > Network Policies* subtask to then be used in the *Program* tab to automatically generate projects for the program.

The *Bridge Replace* checkbox indicates that the selected action is part of a bridge replacement. It is a marker used in LCCA policies and does not have an actual function associated with it.

The *Required Minimum Cost* field indicates the minimum cost an action must meet (cost per unit * total units) in order to appear as an option within a program's generated work items. This threshold ensures that BrM does not recommend actions that have improbably low costs for which agencies would not perform work.

*Note:** The required minimum cost can be set for both an entire program (in the *Programs* tab) as well as for individual actions. Undesirable results can occur if an inexperienced user incorrectly sets these values. It is highly recommended that the required minimum cost only be set at the overall program level until users become more familiar with how the values can change the program generation process.

The *Action Type* dropdown is used to group together specific actions by type so that they can be filtered on the *Inspection > Work > Work Candidates* subtask. New action types can be created on the *Admin > General Config > Parameters* task using the pon_flexactions_sets - flex_type parameter.

When the desired selections have been made for the new action, click the *Add* button.

To delete an action, click the ✕ icon for the desired action.

Associated Benefit Groups for Action

The *Associated Benefit Groups for Action* grouping ties the selected action in the Action grid with one or more benefit groups and then allows the admin to estimate the cost of the action.

*Note:** Benefit groups can be shared between actions.

To add a benefit group to the selected action, use the *Add a Benefit Group* dropdown to make a selection and then click the *Add* button. Once a benefit group is linked to the action, the benefit group's associated elements will appear in the Unit Cost feature.

To remove a benefit group from the action, click the ✕ icon for the desired benefit group.

*Note: If changes have been made to a benefit group on the *Admin > Modeling Config > Benefit Groups* subtask after the benefit group has been added to the action, those changes will be reflected. The benefit group does NOT need to be removed and re-added to the action in order for those changes to be present.

Before making changes to the various cost sections, use the radio buttons in the top right corner of the *Associated Benefit Groups for Action* grouping to determine whether units will be in "Metric" or "English."

Overriding Direct Cost

The Overriding Direct Cost feature allows the admin to override unit costs by basing the overall direct cost of the action off of deck area square footage.

Overriding Direct Cost (overrides unit-costs) —			
Enabled	**Field Name**	**Cost Per Unit**	**Unit**
☐	Deck Area	$ 5	sq.ft

To use the Overriding Direct Cost feature, check the *Enable* checkbox. This will make the Overriding Direct Cost's *Cost Per Unit* textbox available for a cost per unit to be entered. This feature will then override the information entered into the Unit Costs feature.

Unit Costs

The Unit Costs feature is used to estimate an action's direct cost based on the cost per unit of the associated benefit group's elements.

ID	Element Name	Cost Per Unit	Unit	?	
300	Strip Seal Exp Joint (Replacing Strip Seal Exp Joint)	$ 18	ft	🟩	✕
301	Pourable Joint Seal (Replacing Pourable Joint Seal)	$ 5	ft	🟩	✕
302	Compressn Joint Seal (Replacing Compressn Joint Seal)	$ 65	ft	🟩	✕
512	Thin Bonded Polymer (Created on Re Concrete Deck)	$ 5	sq.ft	🟩	✕

All of the elements tied to the benefit groups that have been linked to the action will appear in the Unit Costs feature. Use the *Cost Per Unit* textbox to add an element's cost. The unit cost is calculated based on the portion of an element that changes due to the action, not the entire size of the element.

Example: 200 square feet of a 500 square foot deck is in CS3 and will be repaired. The other 300 square feet are in CS1. If the cost per unit of the deck is $100, the direct cost would calculate to be $20,000, not $50,000, because only the repaired portion factors into the calculation.

The ? column will contain a green box - 🟩 - for elements tied to one of the action's benefit groups. However, when a benefit group is deleted from the action, the elements from that benefit group remain in the Cost Per Unit grid and the ? column box turns red - 🟥 - for those elements. The red box indicates that the element is still tied to the action but is no longer tied to a benefit group.

To remove an element from the action, click the ✕ icon for the desired element.

*Note: An element can be removed from the action even if that element's benefit group is still associated with the action. Deleting the element from the action does not remove the element's tie to the benefit group on the *Admin > Modeling Config > Benefit Groups* subtask.

Indirect Cost

The Indirect Cost feature allows the admin to estimate an indirect cost in addition to the direct cost. The indirect cost is based on a percentage of the direct cost or a custom agency formula.

Indirect Cost ▬		
Enabled	**Component**	**Estimation Method**
☐	Total Indirect Cost	Percentage ▼

To use the Indirect Cost feature, check the *Enable* checkbox. This will make the dropdown available to select "Percentage," "Flat Indirect Cost," or a custom agency formula. The custom agency formulas are created on the *Admin > Modeling Config > Advanced Formulas* task using the "IndirectCostFormula" context.

If "Percent" is selected from the dropdown, use the textbox to enter a value. This value will be a percentage of the direct cost.

If "Flat Indirect Cost" is selected from the dropdown, use the textbox to enter a flat cost for the action. This ensures that benefit groups that change a field instead of an element, such as changing the deck NBI rating, will still have a cost reflected in the analysis.

Example: If the direct cost is $10,000 and the admin enters "25" as the indirect cost percentage value, the indirect cost will be 25% of $10,000 = $2,500.

If a custom agency formula is chosen from the dropdown, the textbox will become read only and display the formula being used.

Deferment Rules

The Deferment Rules feature allows the admin to establish rules that defer specific actions for a period of time based on the application of the current action.

Deferment Rules ▬		
Action Name	**Deferment Interval (Years)**	
Please Select ▼		Add
Preserve Deck - Network	5	✗

Use the *Action Name* dropdown to select an action to defer. Once an action is selected, use the *Deferment Interval* textbox to enter a value (in years) of how long the action will be deferred after the application of the current action. When the desired selections have been made, click the *Add* button to add the deferment rule.

To remove a deferment rule from the action, click the ✗ icon for the desired deferment rule.

Action Defs Page Controls

Click the *Save* button to save the changes made to the selected action. Multiple actions can have their details changed prior to saving.

Cost Index

The *Admin > Modeling Config > Cost Index* task allows the admin to normalize all future costs to a base year to adjust for inflation, material costs, etc. Each cost index created is tied to a specific year and its value represents how costs are expected to change in that year. The cost index value is typically a projection of the cost of specific materials an agency needs for bridge construction.

The cost indexes established can then be used on the *Analysis > LCCA* task to ensure inflation is taken into account throughout the life-cycle cost analysis.

However, agencies do not need to use the cost index. The analysis includes an option for a flat 4% inflation that can be used in place of the cost index.

Select a year from the *Effective Year* dropdown and then use the *Value* textbox to enter the desired value for that year.

Once the information is entered, select the *Add* button to add the cost index.

To delete a cost index, click the ✕ icon next to the cost index.

Select the *Save* button at the bottom of the screen to save the new cost indexes.

Network Policies

The *Admin > Modeling Config > Network Policies* task is used to establish and manage an agency's network policies. Network policies consist of a main network-level action and a series of follow-up network-level actions. Network-level actions are set on the *Admin > Modeling Config > Action Defs* subtask. Network policies are used within the *Programs* tab to automatically generate projects for the program.
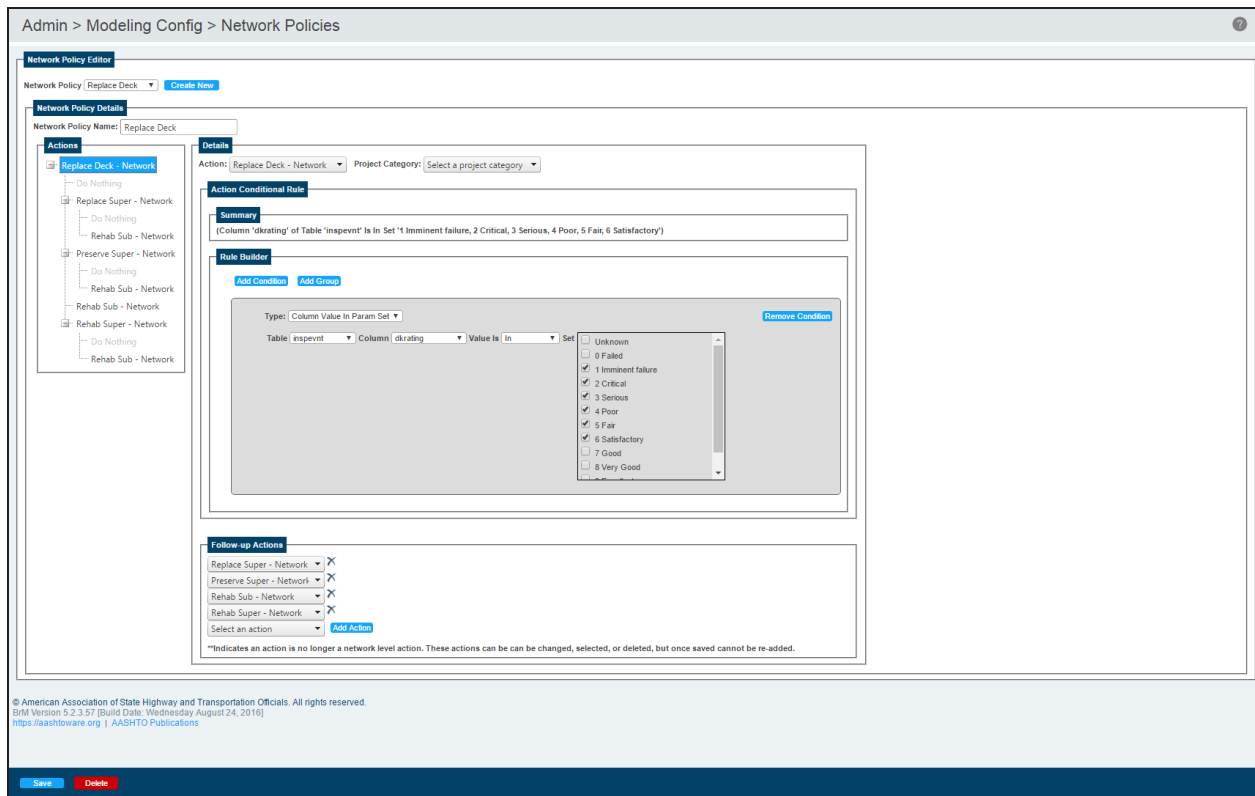
The *Network Policy* dropdown is used to select which existing network policy to view and edit.

The *Create New* button creates a new network policy.

Create a New Network Policy

If no network policies have been created, the *Network Policies* subtask will default to the creation screen. If there are existing network policies, select the *Create New* button from the footer.
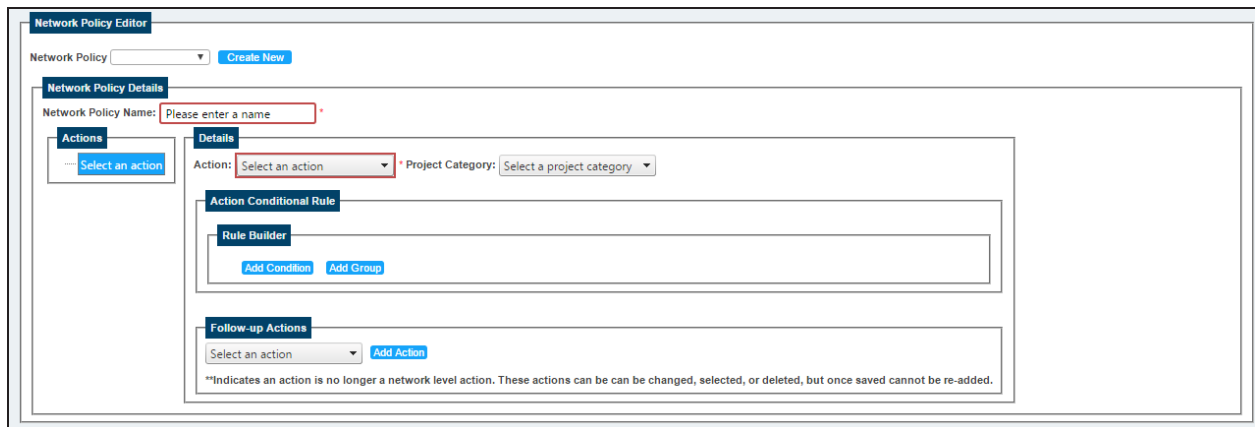
Use the ***Policy Name*** textbox to name the network policy. This will be used in the *Network Policies* grouping of the *Programs > Create/Edit Programs* task.

Actions
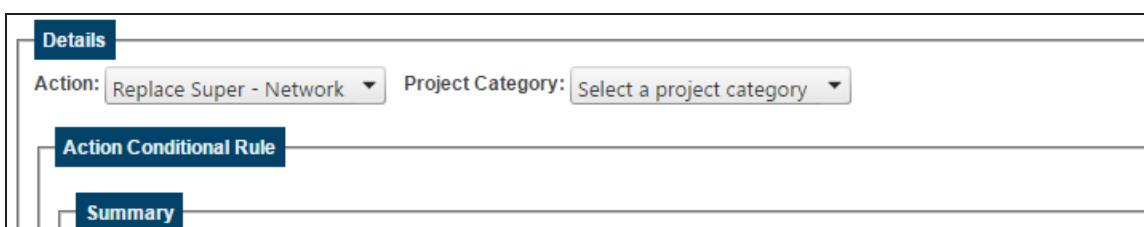
The *Actions* grouping contains a tree that displays the network policy's main action and the follow-up actions nested within. When it reads "Select an action," no main network-level action has been chosen yet. This must be done in the *Details* grouping.

Actions can be nested up to three levels deep, meaning the main action can have follow-up actions nested within, and those follow-up actions can have their own follow-up actions nested within.

Use the ***+/-*** icons in the tree to expand/minimize the various actions in the tree. To view and edit the selections for a specific action within the tree, select the action. That action's nesting information will appear in the *Details* grouping and can be edited.

Details

The *Details* grouping is used to assign the main network-level action and follow-up network-level actions to the network policy.

The ***Action*** dropdown is for the action currently selected in the *Actions* grouping. When creating a new network policy, this control will be for the main action because no actions will yet be present to select in the *Actions* grouping. Only actions that have been designated as network-level actions on the *Admin > Modeling Config > Action Defs* subtask will appear in the dropdown list. Once an action is selected and the network policy is saved, the action will appear in the *Actions* grouping.

The ***Project Category*** dropdown allows the admin to link the specific action to a project category. This ensures that when a program is optimized, each project included in the program can have a project category.

Action Conditional Rule

The *Action Conditional Rule* grouping is used to build the rule that determines whether or not the selected action will be activated.

The *Add Condition* button adds a condition to the rule. The *Add Group* button groups together multiple conditions. The following screenshots displays a lone condition and conditions within a group:

Use the *Type* dropdown to establish the type of condition:

- **Column Value in Param Set** - The table column's value is compared to a set of possible values.
- **Column Value** - The table column's value is compared to one value.

When multiple conditions are added to the rule, whether inside a group or not, the conditions operate under an "And/Or" system. This means that conditions can work in tandem with each other or as alternatives to each other, but it cannot be a mixture. Once a selection is made from the *And/Or* dropdown, all other conditions added will operate under the same selection. The only exception is that individual groups of conditions can have a different selection than the overall policy rule. The following screenshots display these concepts:
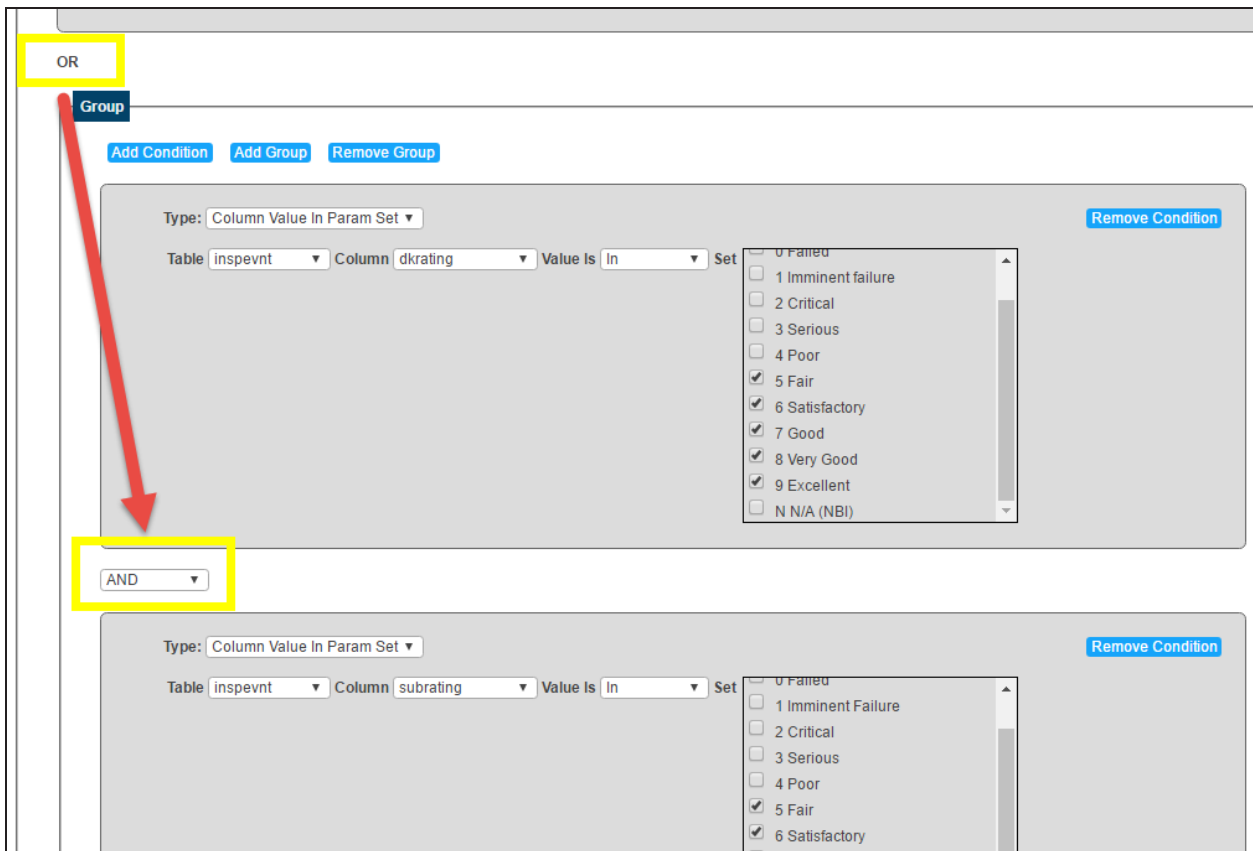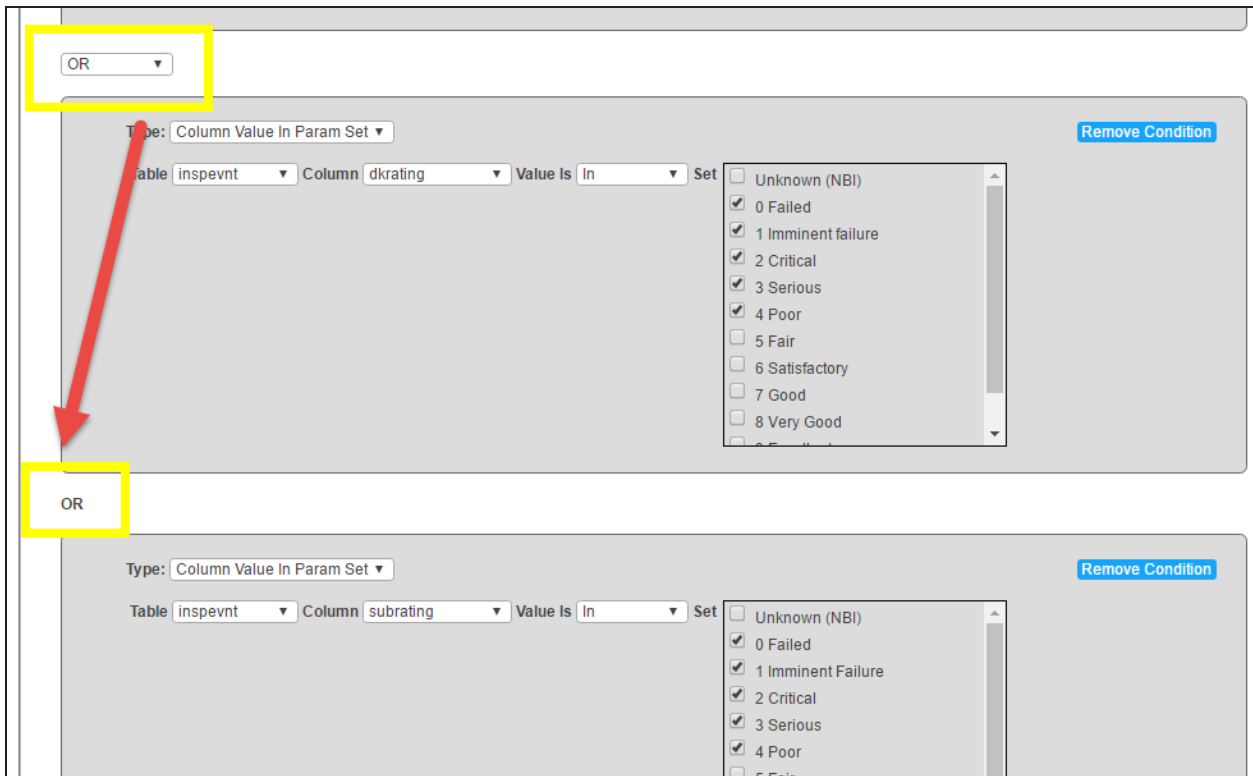
The *Remove Condition* button removes the condition from the rule.

The *Remove Group* button removes the group, and all conditions within, from the rule.

Follow-Up Actions

The *Follow-up Actions* dropdown allows the admin to add follow-up actions to the action currently selected in the *Actions* grouping.

Again, when creating a new network policy, this control will be for the main action's follow-up actions because no actions will yet be present to select in the *Actions* grouping. Only actions that have been designated as network-level actions on the *Admin > Modeling Config > Action Defs* subtask will appear in the dropdown list. Once an action is selected, click the *Add Action* button next to the dropdown to nest the selected follow-up action into the main action in the *Actions* grouping. To delete a follow-up action, click the ✖ next to the action.

*Note: The note at the bottom of the *Follow-up Actions* grouping states that network-level actions that have since lost their network-level permission (this would be removed on the *Admin > Modeling Config > Action Defs* subtask) will be marked with a "******." Therefore, if the action is removed and the network policy is saved, that cannot be re-added to the policy unless the network-level permissions are granted again.

Network Policies Page Controls

The *Save* button saves any changes made to the selected network policy.

The *Delete* button deletes the selected network policy.

Advanced Formulas

The *Admin > Modeling Config > Advanced Formulas* task allows the admin to create and/or modify formulas used for various calculations, including: utility, deterioration modeling, protective systems, and more.

Select Formula/Context

The *Select Formula/Context* grouping is used to determine which existing formula will be modified or where the new formula will be utilized.

The *Context* dropdown distinguishes where the formula will be used:

- **Deterioration** - The formula will be used for the deterioration modeling calculations. These formulas are selectable on the *Admin > Modeling Config > Element Spec* task. These formulas are for additional effects and do not override the default deterioration model formulas.
- **ProtSystem** - The formula will be used for the protective systems calculations. These formulas are automatic and therefore not selectable. These formulas estimate the overall protective factor of an element's protective systems.
- **Custom** - The formula will be used for the utility scaling calculations on the *Admin > Modeling Config > Utility* task.
- **IndirectCostFormula** - The formula will be used for the indirect cost calculation on the *Admin > Modeling Config > Action Defs* subtask.
- **LCCA** - The formula will be used for the LCCA user cost calculation on the *Admin > Modeling Config > Preservation and Replacement Policy* subtask.
- **UtilBaseValue** - The formula will be used for estimating the base values of utility criteria on the *Admin > Modeling Config > Utility* task.
- **StructureWeights** - The formula will be used for determining structure weights for programs on the *Programs > Create/Edit Programs* task.

The *Formula* dropdown is dependent upon the selection made in the *Context* dropdown. The selected context's formulas will appear in the *Formula* dropdown, as well as a "<New Formula>" option for the Deterioration and Custom contexts. New formulas cannot be created for the ProtSystem context.

The *New* button is an additional way to create a new formula in the Deterioration and Custom contexts. The *New* button will be read only if the ProtSystem context is selected.

Formula Detail

The *Formula Detail* grouping is used to specify the details of the selected context/formula.

The *Formula Name* textbox contains the formula's unique name that is used in other areas of the software.

The *Formula* textbox houses the actual formula. The formula can be typed manually or the *Expressions* grouping can be used to insert specific expressions. If the formula is not valid, an error will appear upon attempting to save.

The *Formula's Description* textbox allows the admin to include any relevant notes about the formula.

Expressions

The *Expressions* grouping houses the expressions necessary to create a formula. Using the *Expressions* grouping is not mandatory. Expressions can be entered into the formula manually, but using the *Expressions* grouping ensures that all expressions are accurate. Below are the available types of expressions:

- **Advanced Functions** - The Advanced Functions branch contains advanced mathematical functions.
- **Basic Arithmetic** - The Basic Arithmetic branch contains basic mathematical functions.
- **Database Fields** - The Database Fields branch contains all of the calculable fields throughout the system.
- **Prot_sys** - The Prot_sys branch contains the 4 protective system slots available for elements.

Once the expression is selected, click the *Insert* button to insert it into the *Formula* textbox.

The *Replace* button replaces a portion of the formula with the selected expression by highlighting the desired portion of the formula and clicking *Replace*.

Advanced Formula Page Controls

Click the *Save* button to save the currently selected formula.

Click the *Delete* button to delete the currently selected formula. The ProtSystem context formulas cannot be deleted.

Utility

The *Admin > Modeling Config > Utility* task allows the admin to establish the scaling and weight of the criteria used to evaluate the performance of a bridge. The utility values are used in the *Analysis* and *Projects* tabs.
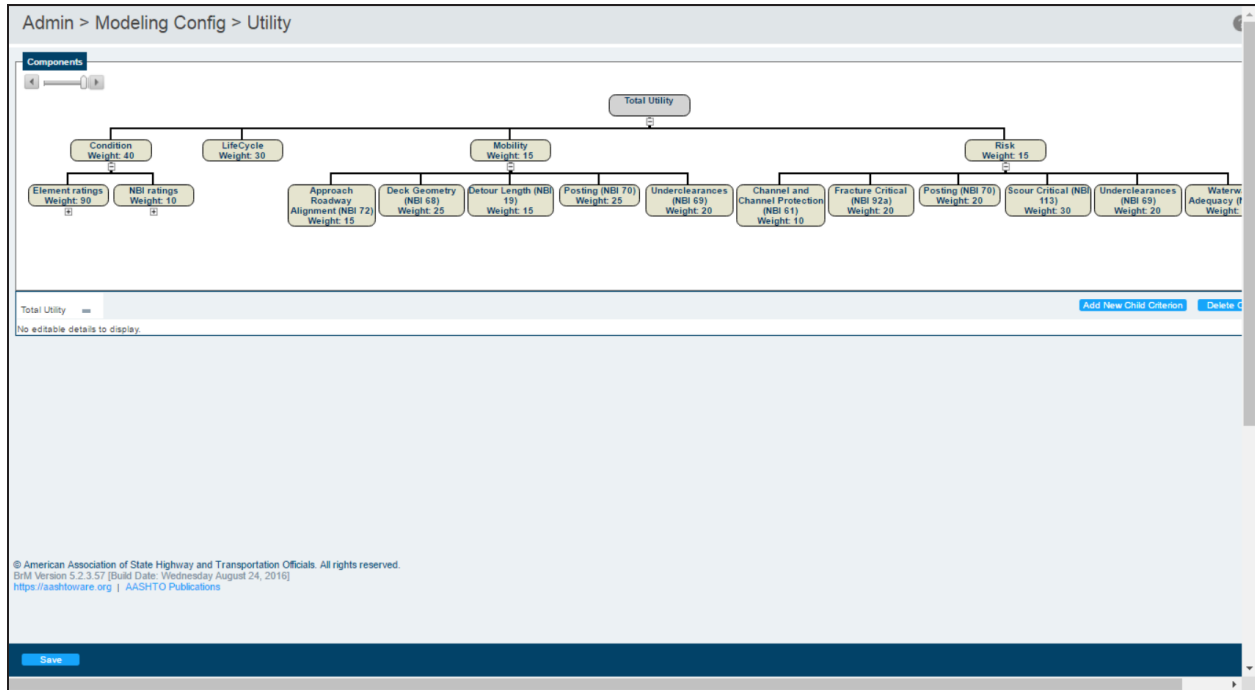
Create/Edit Criterion

To create a new criterion, select the desired parent criterion in the utility tree and click the *Add New Child Criterion* button. To edit an existing criterion, select the desired criterion. Whether creating a new criterion or editing an existing criterion, the following settings will appear:

Criterion Properties

The *Criterion Properties* grouping is used to determine from where in the software the value will be pulled and the weight of the criterion as compared to the other criteria that make up the parent criterion.

Name

The *Name* textbox determines the name of the criterion as it will be displayed in the utility tree and throughout the software.

Weight

The *Weight* textbox determines the importance or significance of the criterion to the parent criterion. The value of the parent criterion is the weighted average of all of the child criteria, therefore if child A has a weight of 10 and child B

has a weight of 1, child A will have a much greater impact on the parent criterion's value.

Type

The *Type* dropdown determines from where the base value of the criterion will come. The type can be a field, assessment, element, or element group. Additional controls will appear on the page based on which type is selected.

Scaling

The *Scaling* grouping is used to determine how the criterion will be scaled. The different types of criteria that can be added to the utility tree have various rating systems. For instance, NBI condition ratings are 0-9, whereas element ratings are 0-100.

The *Scaling* grouping uses either the scaling graph or a selected formula to map all of the criteria within a node to a single scale. Therefore, when all of the nodes meet to make-up the Total Utility node, they will be on the same scale.

Scaling Graph

To use the Scaling Graph, select it from the *Formula* dropdown.
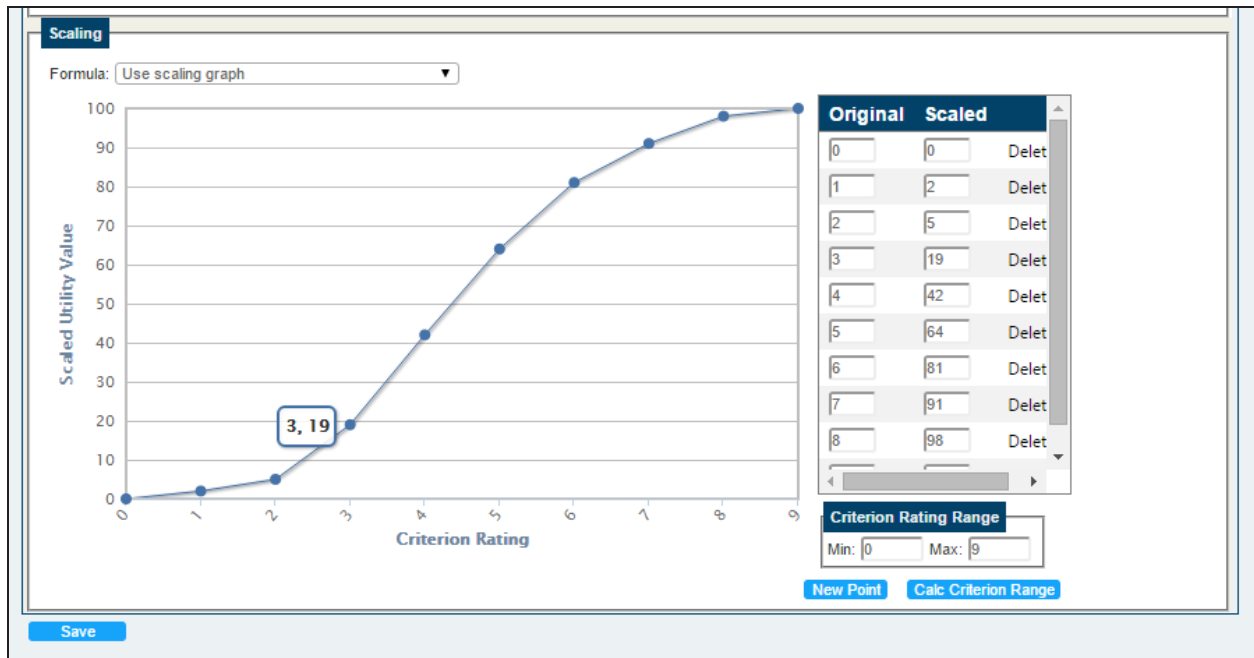
The *Criterion Rating Range* grouping determines the original minimum and maximum ratings for the criterion. New points can be added by either clicking on the desired location of the graph or clicking the *New Point* button and entering the desired values into the table.

If the selected type is "Field," there will also be an additional button - *Calc Criterion Range* - that provides a recommended scale breakdown based on the minimum and maximum rating range.

Formula

To use a formula, select the desired formula from the *Formula* dropdown. Administrators can create custom formulas on the *Admin > Modeling Config > Advanced Formulas* task.
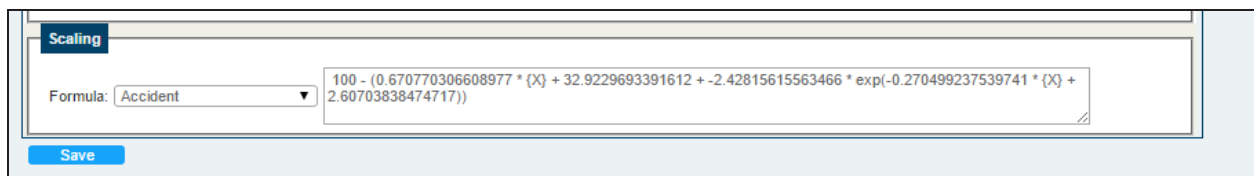
Utility Page Controls

Zoom In/Out

Depending on the size of the utility tree and the parent criteria that are expanded, it may be necessary to zoom out or zoom in on the utility tree.
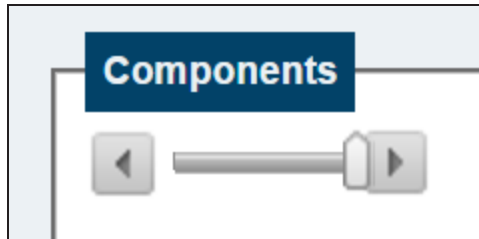
Use the left and right arrow buttons or click, hold, and drag the bar to get the desired view.

Save and Delete Controls

To save the new or modified criterion, click the *Save* button.

To delete a criterion, select the desired criterion and click the *Delete Criterion* button.

Weights Profile

The *Admin > Modeling Config > Weights Profile* task is used to create new utility profiles. The profiles allow the admin to override the default utility weights determined on the *Admin > Modeling Config > Utility* task.
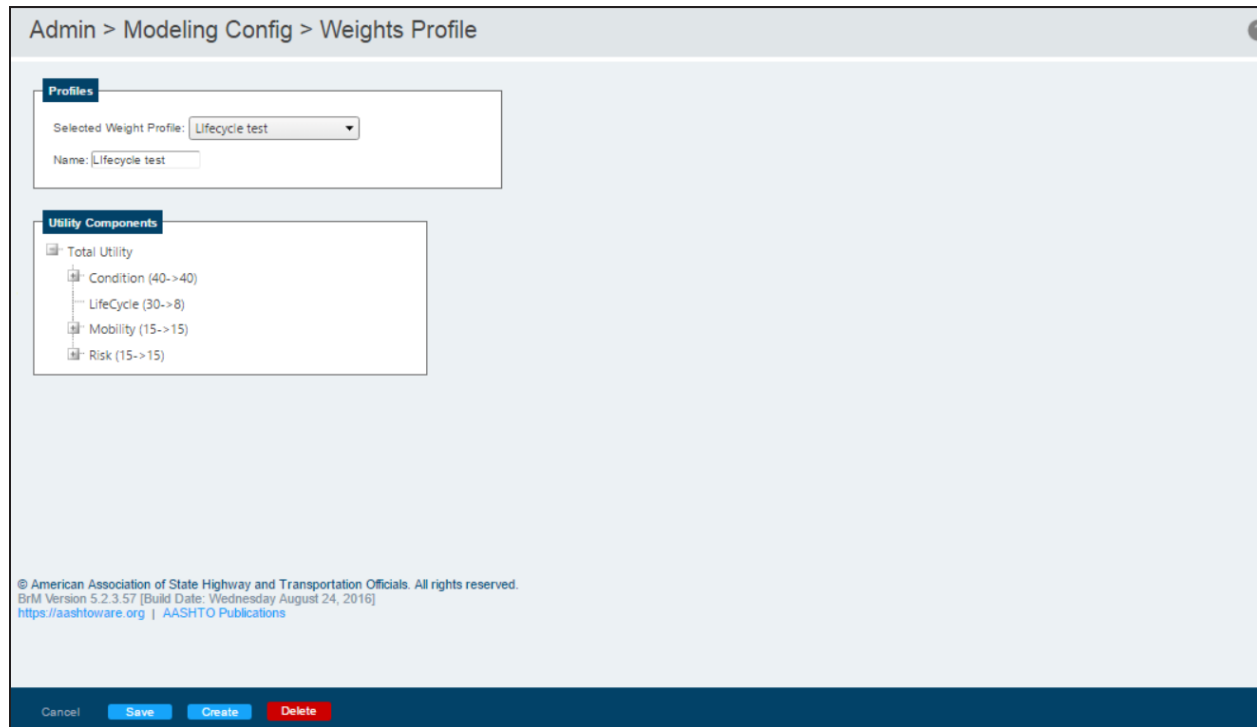
Profiles

To create a new weights profile, select the *Create New* button.

If desired, use the *Name* textbox to establish a unique name for the weights profile.

Utility Components

The *Utility Components* grouping contains a tree view with contents identical to the *Admin > Modeling Config > Utility* task's graphic display. When an item in the tree is selected, the *Criterion's Details* grouping will appear:

Criterion's Details

The *Override Weight* textbox allows the admin to change the weight of the selected criterion. Once changed, the displayed "Override Sibling Total Weight" value and the override weight's percentage will change to display the updated information.

The change in a criterion's utility weight will be used on the *Programs > Create/Edit Program* task. When a program is assigned a utility weights profile, that profile aids the optimization process in determining which projects to assign to the program.

The *Reset to Default* button resets the changed value back to the default value from the *Admin > Modeling Config > Utility* task. The value can be reset at any time, even after the new value has been saved.

Weights Profile Page Controls
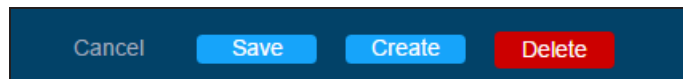
Click *Create* to create a new weights profile.

Click *Save* to save the changes made to the currently selected weights profile.

Click *Cancel* to cancel any changes made to the selected weights profile and refresh the page.

Click *Delete* to delete the selected weights profile.

NBI Deterioration Models

The *Admin > Modeling Config > NBI Deterioration Models* task is used to establish the deterioration modeling parameters for the default components in the system. New components cannot be added.
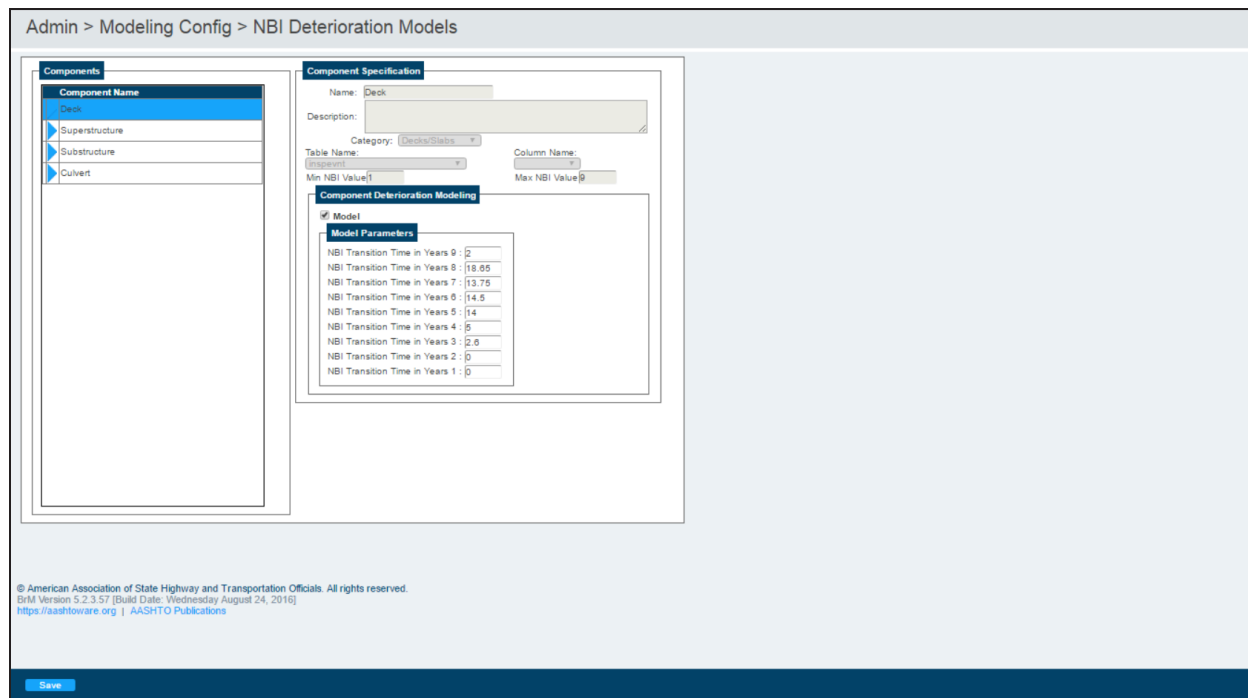
Components

The *Components* grouping lists all of the NBI components. Click the ▶ icon to view the component's details in the *Component Specification* grouping.

Component Specification

The *Component Specification* grouping displays basic, read-only information about the selected component. The only information that can be edited is within the *Component Deterioration Modeling* grouping.

Component Deterioration Modeling

The *Model* checkbox indicates whether deterioration modeling is enabled for the selected component. If checked, the deterioration modeling will reflect the transition times shown in the *Model Parameters* grouping. If unchecked, the transition times will not be applied to the component and therefore its deterioration will not be modeled.

The *Model Parameters* grouping is used to determine the NBI transition time (in years) from one NBI rating to the next.

Example: If NBI transition time 9 is set to 2, the selected component is expected to deteriorate from NBI rating 9 to NBI rating 8 in 2 years.

The *Save* button at the bottom of the page saves the changes made to the entire subtask. Saving is not required in between switching NBI components.

NBI Conversion Profiles

The *Admin > Modeling Config > NBI Conversion Profiles* task is used to create and modify the NBI profiles that can then be used on the *Inspection > Condition* task. By default, BrM comes with the FHWA Profile that uses the FHWA's recommended condition state upper limits.
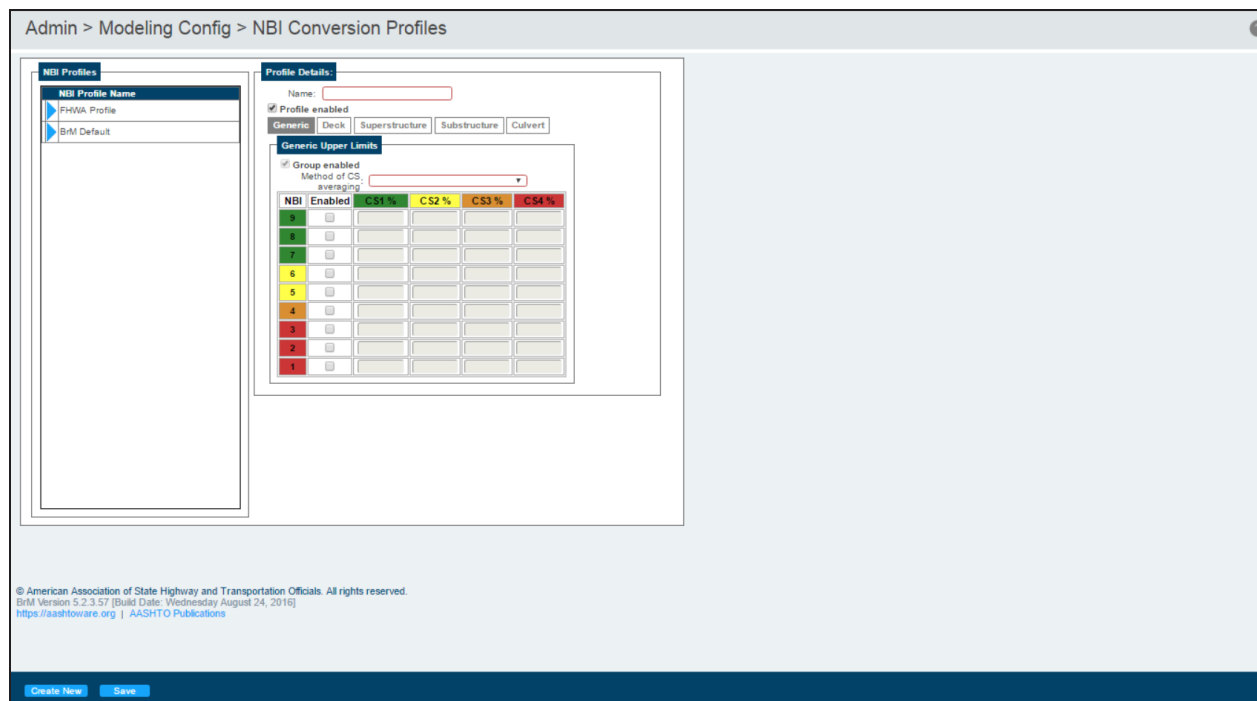
NBI Profiles

The *NBI Profiles* grouping lists all of the NBI profiles. Click the ▶ icon to view the profile's details in the *Profile Details* grouping.

To create a new profile, click the *Create New* button at the bottom of the page.

Profile Details

The *Profile Details* grouping allows the admin to determine the upper condition state limits of each NBI rating for the overall profile (generic) or individual components.

The *Name* textbox names the profile and will be the name visible in the *NBI Converter Profile* dropdown on the *Inspection > Condition* task.

The *Profile Enabled* checkbox determines whether the NBI profile selected is enabled and available to select in the *NBI Converter Profile* on the *Inspection > Condition* task.

[Component] Upper Limits

The *Upper Limits* grouping is used to established the maximum condition state percentages allowed for each NBI value. The tabs above the grouping indicate which component's upper limits are being modified.

*Note: Only the default components have tabs. No user-added components will have a tab.

*Note: The FHWA Profile cannot be edited and does not contain upper limits for the specific components.

The *Generic* tab applies the upper limits to all of the components in the profile. However, each individual component can override the generic upper limits if the component's tab is selected and its *Group Enabled* checkbox is checked.

The *Method of CS Averaging* dropdown determines how the component's elements will be condensed into a single NBI value. The options are:

- **Group by Measurement Unit Type** - Groups together all of the component's elements and averages their quantities in each condition state, then averages those unit averages into a single component average to be converted to an NBI value.

  *Note: This selection ensures that an element with a very large quantity does not overshadow and have more influence than an element with a low quantity.

- **Element Weighting** - Averages all of the elements in a component and weights them by element weight, then uses that value for the NBI value conversion.

- 194 -

To establish upper limits, use the *Enabled* checkbox within the grid to determine which NBI values (1-9) will be available. If the *Enabled* checkbox is not checked, the component(s) will not be able to achieve that value when the NBI converter is run on the *Inspection > Condition* task.

The values entered into the CS1% through CS4% columns for each NBI value indicate the maximum percentage that can exist for that NBI value in that condition state before the grade drops down to the next NBI value.

Example: Assume the following generic upper limits are being used for all components:

Generic Upper Limits

☑ Group enabled
Method of CS averaging: Group by Measurement Unit type ▾

NBI	Enabled	CS1 %	CS2 %	CS3 %	CS4 %
9	☐				
8	☑	100	0	0	0
7	☑		20	0	0
6	☑			5	0
5	☑			20	0
4	☑				20
3	☑				100
2	☐				
1	☐				

In order for a bridge's component to receive an NBI rating of 8, it must be 100% in CS1. Similarly, in order for a bridge's component to receive an NBI rating of 3, it must be 100% in CS4.

If a bridge contains Element 12 - Re Concrete Deck with 85% in CS1 and 15% in CS2, the deck component will receive an NBI rating of 7. This is because CS1 is not 100%, so the bridge cannot receive a rating of 8. CS2 is within the 20% maximum, so the bridge cannot receive a rating of 6. Therefore, the bridge receives a rating of 7.

As the bridge deteriorates, Element 12's condition becomes 70% CS1, 25% CS2, and 5% CS3. CS2 is now over the 20% maximum, so the bridge cannot receive a rating of 7. CS3 is at the 5% maximum but not over it, so the bridge cannot receive a rating of 5. Therefore, the new rating for the bridge's deck component is 6.

Conversion Profiles Page Controls

Create New   Save   Delete   Copy

The *Create New* button creates a new NBI profile.

The *Save* button saves the changes made to the entire subtask. Saving is not required in between switching NBI profiles.

The *Delete* button deletes the selected NBI profile. The *Delete* button is not present when default NBI profiles are selected because they cannot be deleted.

The *Copy* button makes a copy of the currently selected NBI profile and all of its details.

Preservation and Replacement Policy

The *Admin > Modeling Config > Preservation and Replacement Policy* task is used to create the life-cycle cost analysis (LCCA) policies and add rules to them. These policies are used by the LCCA to determine preservation actions.

The *Create New* button creates a new policy.

The *Policy* dropdown is used to select an existing policy to edit.

The *Copy>>* button copies the selected policy. This will reveal the *Copy Name* textbox. Enter a name and click the *Copy* button to complete the copy, or click the *<<* button to cancel the copy.

Create New Policy

Click the *Create New* button to create a new policy:

Policy Details
The *Policy Details* grouping allows the admin to establish the basic information for the policy.

The *Name* textbox determines the name for the policy that will be used when attaching the policy to a bridge.

The *User-Cost Calculation* dropdown is used to indicate how user costs are estimated per year of the LCCA. Custom formulas, created on the *Admin > Modeling Config > Advanced Formulas* task, can be selected. The *User-Cost Formula String* textbox will then display the selected formula.
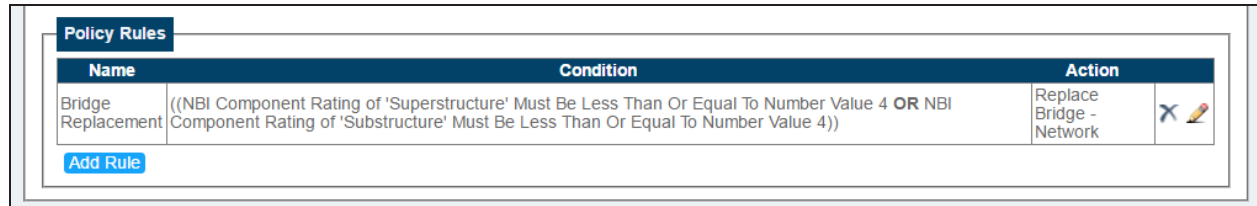
Once the basic information has been added, click the *Save* button at the bottom of the page. Saving the new policy will reveal the *Policy Rules* grouping.

Once saved, the *Policy Rules* grouping will appear at the bottom of the page.

*Note: When a policy is deleted, all records of the policy and its association with bridges are removed from the database.

Policy Rules

The *Policy Rules* grouping allows the admin to add rules to the policy.

To add a new rule to the policy, select the *Add Rule* button. This will open the *LCCA Policy Rules* task.

To edit an existing rule, select the ✎ button for the desired rule. This will open the *LCCA Policy Rules* task.

To delete an existing rule, select the ✕ button for the desired rule.

LCCA Policy Rules

The *Admin > Modeling Config > LCCA Policy Rules* task is very similar to the *Equation Editor* task. The specific conditions for the LCCA policy rule are established here.
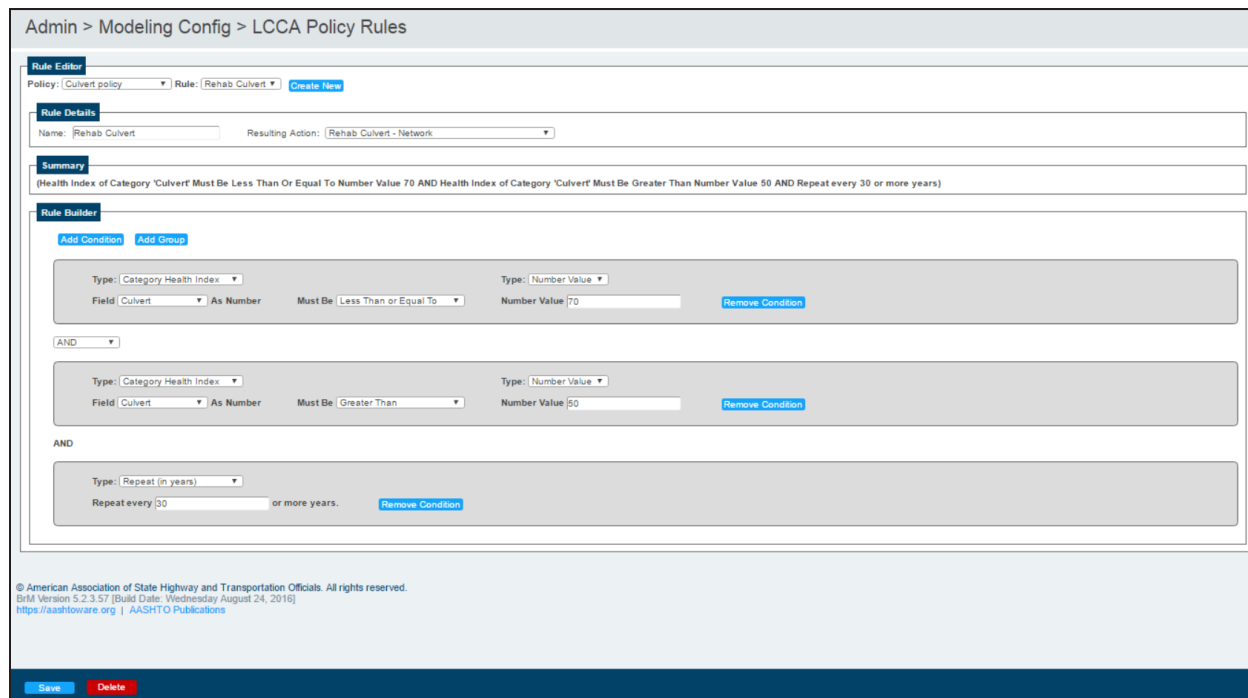
The *Policy* and *Rule* dropdowns are used to select which policy rule to edit.

The *Create New* button creates a new policy.

Rule Details

In the *Rule Details* grouping, use the *Name* textbox to name the new rule.

The *Resulting Action* dropdown determines what action will take effect if the conditions established in the *Rule Builder* grouping are met during the LCCA process.

Example: The admin may select "**Replace**" as the resulting action and establish an element health index condition: **12 - Re Concrete Deck** must be **Equal To** value "**1**" in the rule builder.

So, when the policy is linked to a bridge and that bridge has an LCCA performed, the LCCA will replace the deck any time the deck's health index reaches "1."

Rule Summary

The *Summary* grouping displays an English representation of the rule. This can be useful in helping the admin understand exactly what criteria are established in the rule.

Establish New Policy Rule

Conditions are the individual rules that make up the overall policy rule.

Groups are containers for multiple related conditions. Groups can exist within other groups.

Click the *Add Condition* button to begin creating the policy rule. Click the *Add Group* button if more than one condition will be grouped together. The following screenshots display a lone condition and conditions within a group.

Use the *Type* dropdown to establish the equation to use for the rule:

Type	Description
Is Null	Equations indicating whether or not the condition has a value.
Bridge Health Index	Equations indicating the value of the bridge health index.
Element Health Index	Equations indicating the value of the element health index.
Category Health Index	Equations indicating the value of the category health index.
Material Health Index	Equations indicating the value of the material health index.
Type Health Index	Equations indicating the value of the type health index.
NBI Component Rating	Equations indicating the value of the NBI component rating.
Repeat (in years)	Equations indicating the repeat frequency.
Element Condition State	Equations indicating the value of a percentage of an element condition state.

The available controls will be dependent on the selection made from the *Type* dropdown. The following screenshots indicate the control possibilities based on the selection made in the *Type* dropdown:

*Note: Screenshots for *Type* dropdown selections - "Category Health Index," "Material Health Index," "Type Health Index," and "NBI Component Rating" - have been excluded because the controls (not the selections within the controls) are identical to "Element Health Index."

Type: Bridge Health Index

Bridge Health Index   **Must Be** Equal To   **Type:** Number Value   **Number Value** 1   Remove Condition

Type: Element Health Index

Field 12 - Re Concrete Deck   As Number   **Must Be** Equal To   **Type:** Number Value   **Number Value** 1   . Remove Condition

Type: Element Condition State

Condition State 1 of Element 12 - Re Concrete Deck   **Must Be** Equal To   **Type:** Number Value   **Number Value** 1   Remove Condition

Type: Repeat (in years)

Repeat every 1 or more years.   Remove Condition

When multiple conditions are added to the policy rule, whether inside a group or not, the conditions operate under an "And/Or" system. This means that conditions can work in tandem with each other or as alternatives to each other, but it cannot be a mixture. Once a selection is made from the *And/Or* dropdown, all other conditions added will operate under the same selection. The only exception is that individual groups of conditions can have a different selection than the overall policy rule. The following screenshots display these concepts:

Summary

(Bridge Health Index Must Equal Number Value 1 AND Repeat every 1 or more years)

Rule Builder

Add Condition   Add Group

Type: Bridge Health Index

Bridge Health Index   **Must Be** Equal To   **Type:** Number Value   **Number Value** 1   Remove Condition

AND
AND
OR

Type: Repeat (in years)

Repeat every 1 or more years.   Remove Condition

Summary

(Bridge Health Index Must Equal Number Value 1 AND Repeat every 1 or more years AND Health Index of Material 'Decks ' Must Equal Number Value 1)

Rule Builder

Add Condition   Add Group

Type: Bridge Health Index ▼   Type: Number Value ▼
Bridge Health Index   Must Be Equal To ▼   Number Value 1   Remove Condition

AND ▼

Type: Repeat (in years) ▼
Repeat every 1 or more years.   Remove Condition

AND

Type: Material Health Index ▼   Type: Number Value ▼
Field Decks ▼ As Number   Must Be Equal To ▼   Number Value 1   Remove Condition

Rule Builder

Add Condition   Add Group

Type: Bridge Health Index ▼   Type: Number Value ▼
Bridge Health Index   Must Be Equal To ▼   Number Value 1   Remove Condition

AND ▼

Type: Repeat (in years) ▼
Repeat every 1 or more years.   Remove Condition

AND

Type: Material Health Index ▼   Type: Number Value ▼
Field Decks ▼ As Number   Must Be Equal To ▼   Number Value 1   Remove Condition

AND

Group

Add Condition   Add Group   Remove Group

Type: Element Health Index ▼   Type: Number Value ▼
12 - Re Concrete Deck ▼ As Number   Must Be Equal To ▼   Number Value 1   Remove Condition

OR ▼

Type: Category Health Index ▼   Type: Number Value ▼
Field Bearings ▼ As Number   Must Be Equal To ▼   Number Value 1   Remove Condition

OR

Type: Element Condition State ▼   Type: Number Value ▼
Condition State 1 ▼ of Element 12 - Re Concrete Deck ▼   Must Be Equal To ▼   Number Value 1   Remove Condition

To remove a condition, click the *Remove Condition* button for the desired condition.

To remove a group, click the *Remove Group* button for the desired group. All conditions within the group will also be removed.

Policy Rule Page Controls

Once the desired selections have been made, click the *Save* button at the bottom of the screen to save the policy rule.

Click the *Delete* button to delete the selected policy rule.

LCCA Assign Policies

The *Admin > Modeling Config > LCCA Assign Policies* task allows the admin to attach the LCCA policies to bridges and/or components within the system. This link can then be analyzed on the *Analysis > LCCA* task.
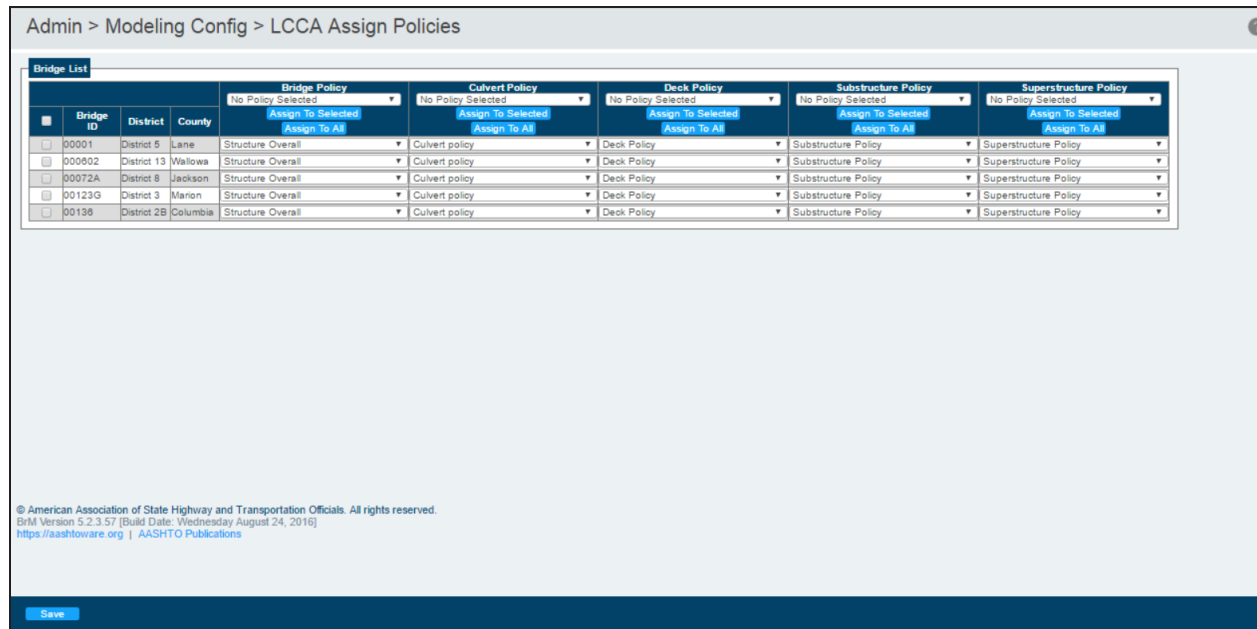
Only bridges that are currently selected on the Bridge List will appear in the grid. If no bridges are present in the grid, no bridges are selected on the Bridge List.

There are multiple ways of assigning policies to the bridges and components:

1. Each bridge row in the grid has a *Policy* dropdown for each of the policy columns in the grid. Each of the bridge's *Policy* dropdowns can be used to determine what policy will be used for the overall bridge or specific component.

    *Note: Any policy can be selected for any component. For example, the Deck Policy does not have to be assigned to the Deck Component column.

2. Check the boxes of all of the bridges in the grid that will have the same policy for a specific column, then select that policy from the *Column Header Policy* dropdown for the desired column. Click the *Assign to Selected* button to link all of the selected bridges to the selected policy for that column.
3. If all of the bridges in the grid will have the same policy for a specific column, select that policy from the *Column Header Policy* dropdown for the desired column and click the *Assign to All* button to link all of the bridges in the grid to the selected policy for that column.

Use the *Save* button at the bottom of the page to save any changes to the assignments.

Subdivision Profiles

The *Admin > Modeling Config > Subdivision Profiles* task is used to create and define subdivision profiles that can be used on the *Programs > Create/Edit Programs* task. A subdivision profile is a list of database fields that are used to subdivide a program into segments. Throughout the *Program* tab, program segments can have their own performance constraints and optimization run separate from the rest of the program.
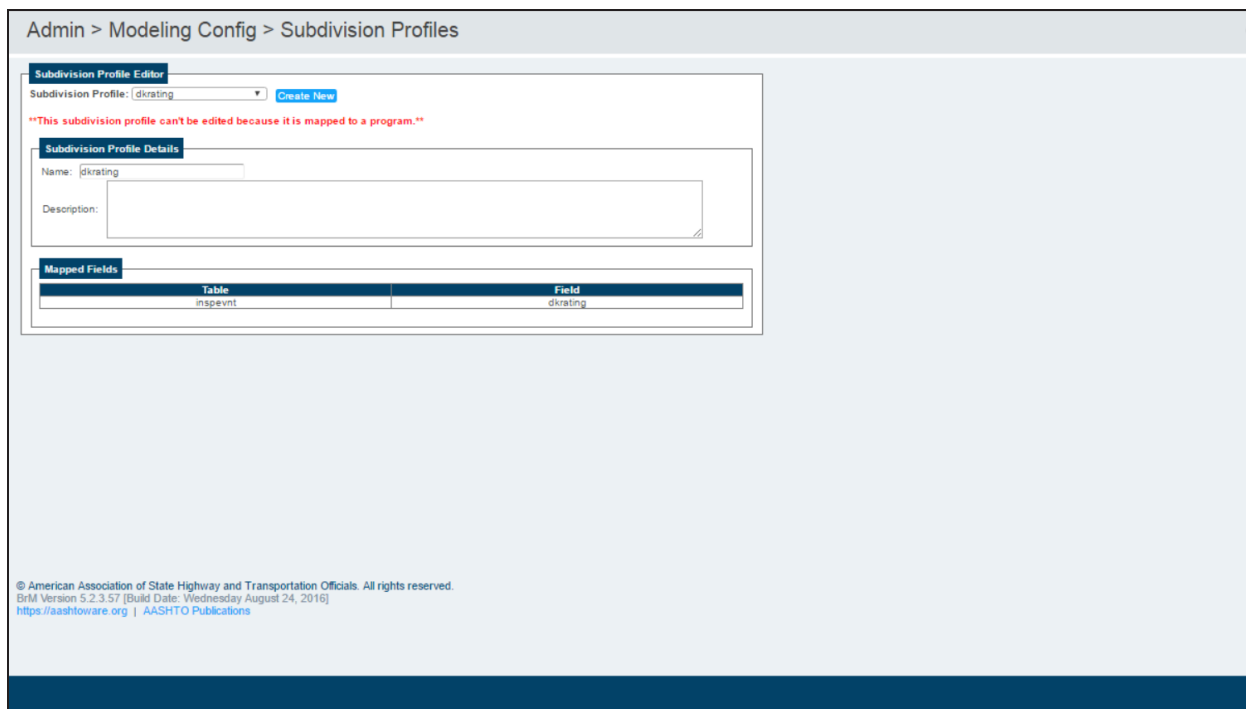
Use the *Subdivision Profile* dropdown to switch between the existing subdivision profiles.

Select the *Create New* button to create a new subdivision profile:
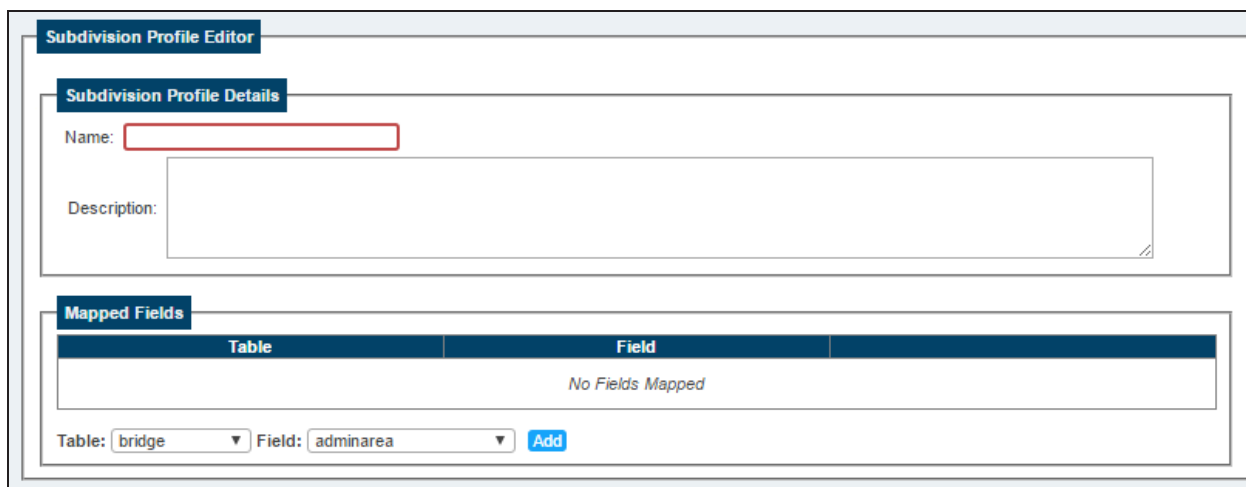
Subdivision Profile Details

Use the *Name* textbox to provide a unique name for the subdivision profile. This is the name that will appear in the *Subdivision Profile* dropdown on the *Programs > Create/Edit Programs* task.

*Note: When a subdivision profile is linked to a program on the *Programs > Create/Edit Programs* task, it will become read-only on the *Admin > Modeling Config > Subdivision Profiles* subtask. Only subdivision profiles not currently linked to a program can be edited.

Mapped Fields

The *Mapped Fields* grouping allows the admin to add up to five fields to the subdivision profile. Locate the desired field using the *Table* and *Field* dropdowns, then click the *Add* button to add the field to the subdivision profile.

The field will then appear in the Mapped Fields grid. It can be removed by clicking the field's ✕ symbol.

*Note: If five fields have been mapped to the subdivision profile, the *Table* and *Field* dropdowns and the *Add* button will disappear and will not return unless one of the five currently mapped fields is deleted from the subdivision profile.

Subdivision Profile Page Controls

Use the *Save* button to save the changes made to the selected subdivision profile.

Use the *Delete* button to delete the selected subdivision profile.

*Note: The *Save* and *Delete* controls become unavailable if the selected subdivision profile is mapped to a program.

Executive Summary

The *Admin > Modeling Config > Executive Summary* task allows the admin to configure new and existing chart templates to be used on the *Programs > Executive Summary* task. These templates allow for the creation of custom graphs that display specific information that may not be displayed in BrM's standard graphs.
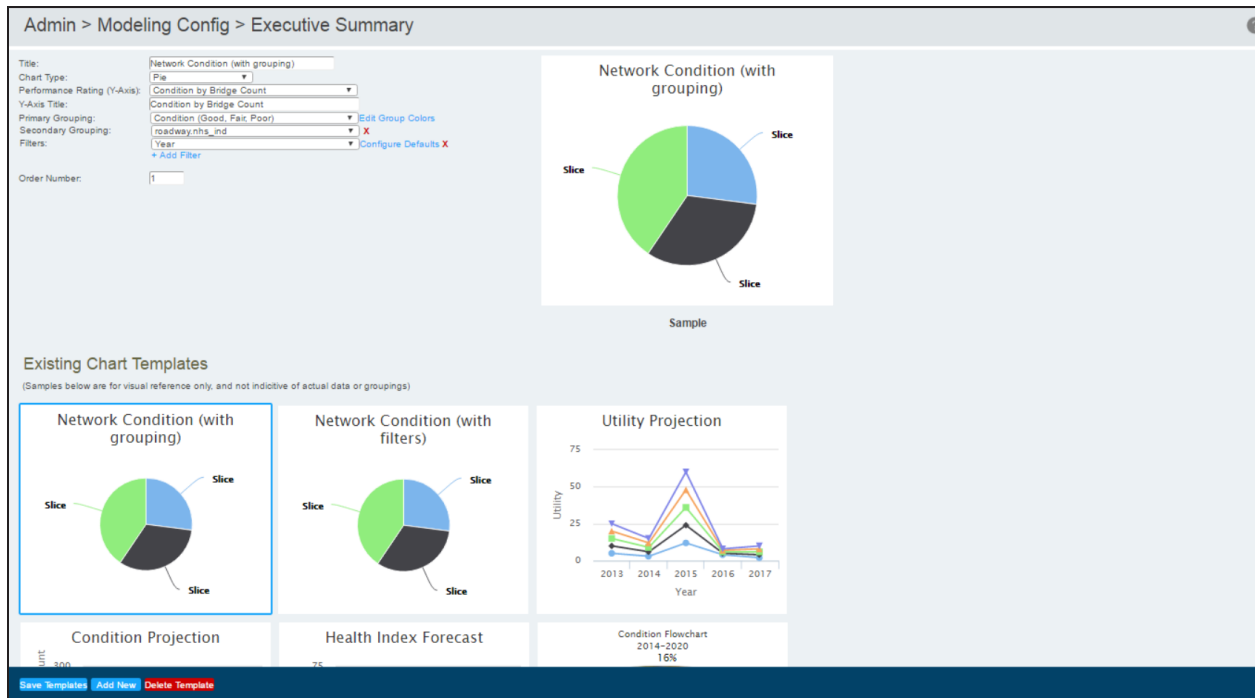
Create New Executive Summary Template

Click the *Add New* button in the footer to create a new executive summary template. The controls for editing an existing executive summary template will be very similar to creating a new one.

*Note: The available controls are dependent on the *Chart Type* dropdown selection.
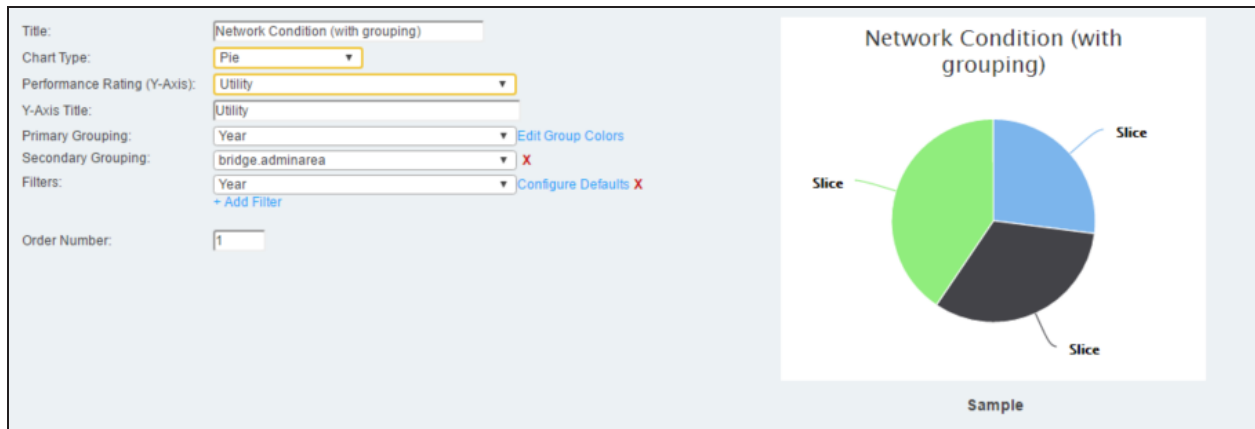
Control	Description
Title	Indicates the title of the template and is displayed at the top of the chart.
Chart Type	Determines what type of chart will be used to display the information, including:

Control	Description
	Bar, Column, Line, Pie, Stacked Column, Condition Flowchart
Performance Rating (Y-Axis)	Determines the performance rating on the Y-axis that will be plotted against the X-axis.
Y-Axis Title	The title displayed on the Y-axis.
X-Axis Field	Determines the field on the X-axis that will be plotted against the Y-axis. The available fields are dependent upon the Y-axis selection.
X-Axis Title	The title displayed on the X-axis.
Groupings	Groupings are applicable to bar, column, line and pie graphs. They separate the data into segments based on a database field. **Example:** On a line graph, the roadway.NHS_IND field grouping would have a line for NHS bridges and a line for non-NHS bridges. The individual items within the grouping can then have their colors set using the *Edit Group Colors* link. ***Note:** Pie charts allow for a secondary grouping to be included.
Filters	Filters are the specific pools of data used for the templates. They are the parameters that can be used to change what information the user sees on the graph. For example, a common filter will be "Year." ***Note:** Multiple filters can be added for each chart type.
Order Number	Determines where the template appears in the list of selectable executive summary templates.

While creating a new template is always an option, BrM has six default Executive Summary templates that can be used, including:

Executive Summary Default Templates						
Title	**Type**	**Y-Axis**	**X-Axis**	**Primary Grouping**	**Secondary Grouping**	**Filter**
Network Condition (with grouping)	Pie	Condition by Bridge Count	N/A	Condition	roadway.nhs_ind	Year
Network Condition (with filters)	Pie	Condition by Bridge Count	N/A	Condition	None	Year, roadway.nhs_ind
Utility Projection	Line	Utility	Year	roadway.nhs	N/A	None
Condition Projection	Stacked Column	Condition by Bridge Count	Year	N/A	N/A	None
Health Index	Column	Health	roadway.nhs_	Year	N/A	None

Executive Summary Default Templates						
Title	**Type**	**Y-Axis**	**X-Axis**	**Primary Grouping**	**Secondary Grouping**	**Filter**
Forecast		Index	ind			
Condition	Flowchart	N/A	N/A	N/A	N/A	None

These templates can be used as is or can be tweaked to meet the admin's needs. They can also be deleted if desired.

Executive Summary Page Controls

Save Templates Add New Delete Template
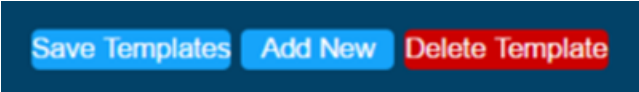
The *Save Templates* button saves the changes to all of the templates. Multiple templates can be changed before saving.

The *Add New* button creates a new Executive Summary template.

The *Delete Template* button deletes the currently selected template.

Asset Element Definitions

The *Admin > Tunnels > Asset Element Definitions* task is used to create tunnel elements and define the specifications for existing tunnel elements.
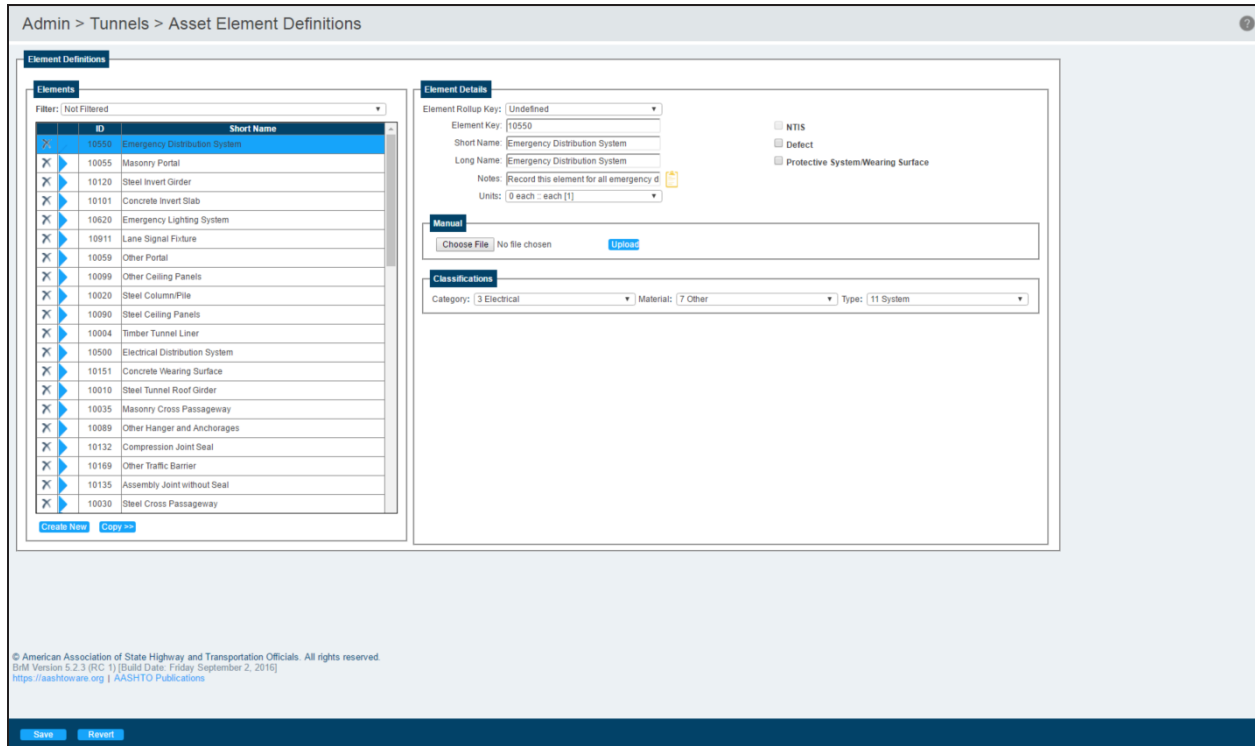
Elements

The *Elements* grouping contains the Element list. In order to view and edit an element's specifications, it must be selected from the Element list. To select an element, click the ▶ symbol. The selected element's information will then appear in the *Element Details* grouping.

The *Filter* dropdown can be used to filter the Element list based on a specific tunnel element category.

Elements that have been marked as National Tunnel Inspection Standards (NTIS) elements in the *Element Details* grouping cannot be edited or deleted unless the NTIS element status is removed.

If the element has an ✖ next to the ▶ in the Element list, the element is not an NTIS element and can be edited and deleted freely.

Create or Copy Element

The *Create New* button creates a new element with blank specifications that must be completed.
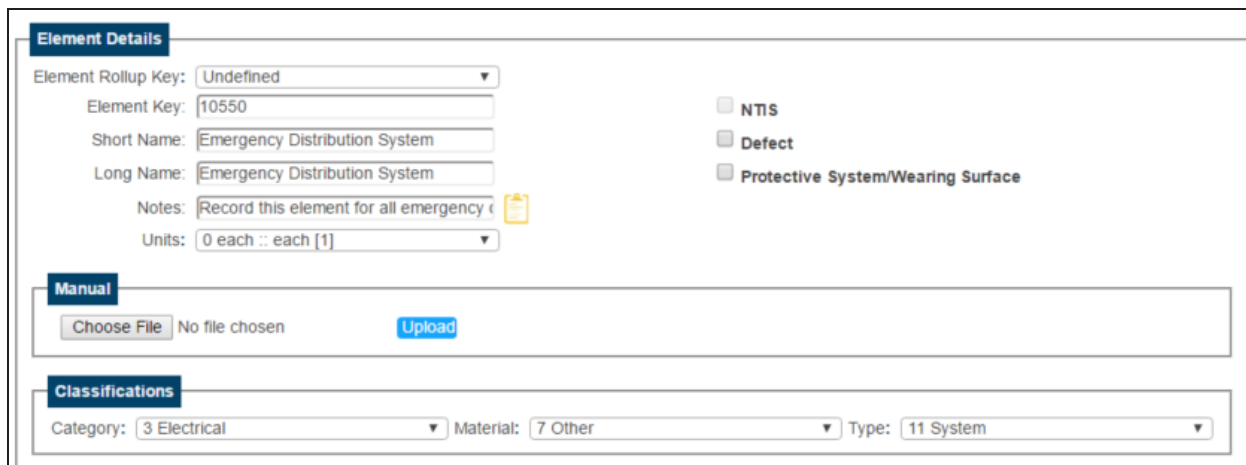
The *Copy>>* button creates a copy of the currently selected element with matching specifications other than the Element Key, Short Name, and Long Name. Clicking the *Copy>>* button reveals the *Copy Name* textbox. Enter a name and click the *Copy* button to complete the copy, or click the *<<* button to cancel the copy.

By default, the ID column (element key) progresses in sequential order. Therefore, if the element list's last element has an element key of 1000, a newly created or copied element will have an element key of 1001. The key can be changed once created, but only one element key is permitted per number.

Element Details

The *Element Details* grouping includes the specifications of the selected element and allows the admin to add reference manuals to the element.

Element Rollup Key

The *Element Rollup Key* dropdown is used for non-NTIS elements. Information for non-NTIS elements can be "rolled up" into the NTIS elements. Therefore, the currently selected element's information will be included in the reports of the NTIS element selected from the dropdown.

When an NTIS element is selected from the Element list, the *Element Rollup Key* dropdown is read only.

Element Key and Name

The *Element Key* textbox is the element's ID. The element can be any number as long as it is unique.

The *Short Name* and *Long Name* textboxes provide a description of the element. NTIS element short and long names cannot be edited and are greyed out and inaccessible.

Notes

The *Notes* textbox can be used to enter a description of the element. This is particularly useful when creating new elements that may not be universally recognized by their short and long names.

Units

The *Units* dropdown determines how the element is measured. NTIS element units are read only.

Manual

A PDF can be added to any element as reference material for the users. To add a PDF, click the *Choose File* button and locate the desired file. Once selected, click the *Upload* button to add the PDF to the element.

*Note: When upgrading to a new version of BrM, previously uploaded custom agency element manuals will be lost during the uninstall of the old version. In order to ensure the manuals are maintained and added into the new version, the ElemGuideManuals subdirectory must be copied prior to uninstalling the old version. Then, after installing the new version, the ElemGuideManuals subdirectory can be returned to its folder location. **When completing this process, only copy over the custom agency element files. The new install of BrM will contain the latest manuals for the standard elements.**

Classifications

The *Classifications* grouping is used to classify the selected element. The classifications of NTIS elements cannot be edited.

Use the *Category*, *Material*, and *Type* dropdowns to classify the element.

Element Spec Page Controls

Click the *Save* button to save the changes made to the selected element.

Click the *Revert* button to cancel the changes made to the selected element.

Asset Element-Child Linking

The *Admin > Tunnels > Asset Element-Child Linking* task is used to link tunnel elements, defects, and protective systems. The elements must be linked together in order to be used together throughout the software.

Assigning Element Relationships

The *Assign* dropdown is the key to the element relationships. When a selection is made using the *Assign* dropdown, the links are for that type of element only.

Elements can have:

- Protective Systems (children)
- Defects (children)

Protective Systems can have:

- Elements (parents)
- Defects (children)

Defects can have:

- Elements (parents)
- Protective Systems (parents)

Asset Element-Child Linking Page Controls

Click the *Save* button to save the changes made to the assigned element.

Inspection

- The Inspection section of the manual addresses each of the tasks in BrM's *Inspection* tab. The *Inspection* tab allows for the creation and management of inspections, work candidates, assessments, and more for a selected structure.

The *Inspection > Condition* task allows the user to manage both the NBI condition ratings and the individual element conditions for a specific inspection report.

The ***Bridge*** dropdown allows the user to select a bridge to be inspected.

The ***Inspection*** dropdown allows the user to select the inspection to be modified.

The ***Metric/English*** radio buttons switch between metric and English units on the page.

Condition Ratings

The *Condition Ratings* grouping is used to determine the NBI condition ratings, perform a validation of the selected bridge, and calculate the bridge's sufficiency rating.

There are two ways of setting the bridge's NBI condition ratings. One is to manually complete each of the NBI submission item (NBI numbers are in red parentheses) dropdowns - ***Deck***, ***Superstructure***, ***Substructure***, etc. The other method is to use the NBI Converter Profile as discussed below.

Validate
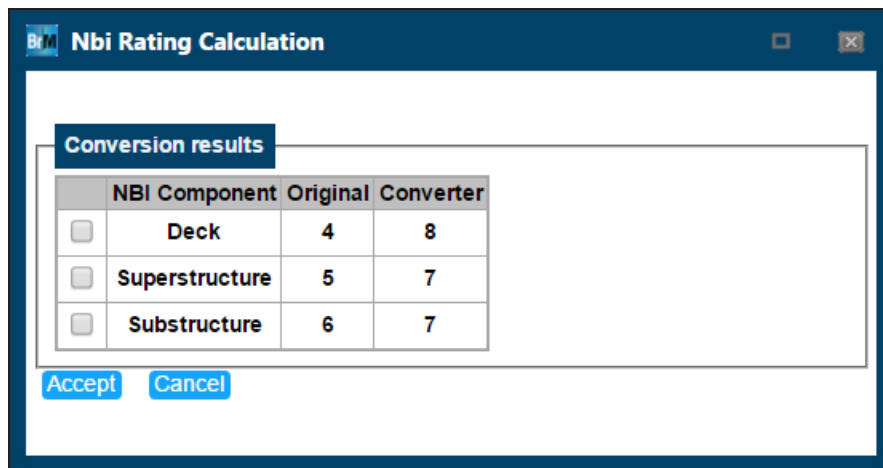
The *Validate* button takes the user to the *Bridges > Validate* task to find FHWA discrepancies with the selected bridge.

Sufficiency Rating

The *Calculate SR* button takes the user to the *Bridges > Suff Rate* task to calculate the selected bridge's sufficiency rating.

NBI Converter Profile

An alternative option to the user manually determining the NBI component ratings is to use the *NBI Converter Profile* dropdown to estimate the NBI component ratings based on the bridge's element ratings. The *NBI Converter Profile* dropdown uses the NBI profiles created on the *Admin > Modeling Config > NBI Conversion Profiles* subtask. Once a selection is made, click the *Calculate NBI* button to view the results of the calculation:

Nbi Rating Calculation

Conversion results

	NBI Component	Original	Converter
☐	**Deck**	4	8
☐	**Superstructure**	5	7
☐	**Substructure**	6	7

Accept   Cancel

The table shows the original NBI component ratings (the current ratings) and the converted NBI component ratings. To accept the conversion of any of the NBI components, select the desired components' checkboxes and then click the *Accept* button. To cancel and not accept any of the conversions, click the *Cancel* button.

*Note: The *NBI Converter Profile* dropdown and *Calculate NBI* button are unavailable when the inspection status is locked, under review, or archived.

Element Conditions

The *Element Conditions* grouping is used to select which elements will be included in the inspection and then determine the condition states of each element.

	Elem	Str. Unit	Env	Description	Quantity	Units	Qty. 1	Qty. 2	Qty. 3	Qty. 4	
>	16	1	Mod. (3)	Re Conc Top Flange	600	sq.ft	588.000	12.000	0.000	0.000	✕
>	39	1	Mod. (3)	Prestressed Slab	896	(SF)	886.000	8.000	2.000	0.000	✕
⌄	110	1	Mod. (3)	Re Conc Opn Girder/Beam	112	ft	109.000	3.000	0.000	0.000	✕
	1080	1	✎	*Delamination/Spall/Patched Area*	3	ft	0.000	3.000	0.000	0.000	✕
>	215	1	Mod. (3)	Re Conc Abutment	108	ft	98.000	6.000	4.000	0.000	✕
	310	1	Mod. (3)	Elastomeric Bearing	16	each	16.000	0.000	0.000	0.000	✕
>	330	1	Mod. (3)	Metal Bridge Railing	100	ft	0.000	100.000	0.000	0.000	✕
	980	1	Mod. (3)	Approach Roadway Embank	1	(EA)	1.000	0.000	0.000	0.000	✕
	990	1	Ben. (1)	Miscellaneous Elements	1	(EA)	1.000	0.000	0.000	0.000	✕
	999	1	Ben. (1)	Roadway Impact	1	(EA)	1.000	0.000	0.000	0.000	✕

Structure Unit

The *Structure Unit* dropdown is used to select which structure unit's elements to view in the Bridge Elements grid. If "All Structures" is selected, the elements from all of the structure units will be visible in the grid. If a specific structure unit is selected, only that structure unit's elements will be visible.

*Note: If an element is expected to be visible in the Bridge Elements grid but is not, the element may have been assigned the wrong structure unit. View the Bridge Elements grid with the other structure units selected to find the element in question, select it, and then click the *Edit Element* button to change its structure unit.

Show Last CoRe Inspection

The *Show Last CoRe Insp* button allows the user to view the last inspection for the selected bridge that used the CoRe inspection that contained a five quantity condition state rating. If an inspection is available, it will appear in a pop-up window and be read-only.

AASHTO Bridge Elements grid

The Bridge Elements grid contains all of the elements included in the inspection of the selected bridge (filtered based on structure type with the *Select Structure Unit* dropdown). For a new structure that has not had a previous inspection there will be no pre-existing elements and all of the desired elements will need to be added. For structures that have pre-existing inspections, the information from the most recent inspection will automatically be loaded into the new inspection.

	Elem	Str. Unit	Env	Description	Quantity	Units	Qty. 1	Qty. 2	Qty. 3	Qty. 4	
⌄	16	1	Mod. (3)	Re Conc Top Flange	600	sq.ft	588.000	12.000	0.000	0.000	✕
	1081	1	⚡	*Soffit Spalls/Delams/Patches*	6	sq.ft	0.000	6.000	0.000	0.000	✕
	1120	1	⚡	*Efflorescence/Rust Staining*	6	sq.ft	0.000	6.000	0.000	0.000	✕
	511	1	⬛	*Asphalt Overlay*	600	sq.ft	0.000	600.000	0.000	0.000	✕
›	39	1	Mod. (3)	Prestressed Slab	896	(SF)	886.000	8.000	2.000	0.000	✕
⌄	110	1	Mod. (3)	Re Conc Opn Girder/Beam	112	ft	109.000	3.000	0.000	0.000	✕
	1080	1	⚡	*Delamination/Spall/Patched Area*	3	ft	0.000	3.000	0.000	0.000	✕
›	215	1	Mod. (3)	Re Conc Abutment	108	ft	98.000	6.000	4.000	0.000	✕
	310	1	Mod. (3)	Elastomeric Bearing	16	each	16.000	0.000	0.000	0.000	✕
›	330	1	Mod. (3)	Metal Bridge Railing	100	ft	0.000	100.000	0.000	0.000	✕

*Note: By default, the Bridge Elements grid is sorted first by structure unit, then element ID, and finally by environment.

Quantity Columns

The Quantity columns can be viewed based on quantity or percent by using the *Quantity/Percent* radio buttons at the top of the *Element Conditions* grouping.

The *Quantity* and condition state *Qty. 2*, *Qty. 3*, and *Qty. 4* columns can all be modified. The condition state Qty. 1 column cannot be modified. It is updated based on the difference between the *Quantity* and combined *Qty. 2*, *Qty. 3*, and *Qty. 4* columns.

If the total quantity is increased, the additional quantity is added to CS1 and the user must manually distribute it amongst the other condition state quantities as needed.

If the total quantity is decreased, none of the condition state quantities will change automatically. The user must manually update the quantities to equal the total quantity.

The user will receive an error when saving if condition state quantities 1-4 do not match the total quantity.

The available options in the Bridge Elements grid, including *Add New Element*, *Edit Element*, *Add Defect*, and *Add Protective Sys*, appear depending on the element currently selected in the grid.

Add New Element

The *Add New Element* button is available regardless of whether or not an element is selected because it is used to add new NBEs or agency elements to the grid. When clicked, the button reveals the following popup window:

Complete the *Element ID*, *Structure Unit*, and *Environment* dropdown selections.

*Note: When adding a new element, the *Structure Unit* dropdown will always default to the agency's default structure unit regardless of what structure unit is selected for the Bridge Elements grid on the *Inspection > Condition* main page. If the user is expecting the new element to appear in the Bridge Elements grid for the selected structure unit, they must ensure that the selection in the *Structure Unit* dropdown matches what is selected for the Bridge Elements grid.

Quantity

The *Quantity* field determines the total quantity of the element. This can be changed in the Bridge Elements grid once the element is added.

Add and Cancel Controls

Click *Add* to add the element to the Bridge Elements grid.

Click *Cancel* to cancel the element addition and return to the Bridge Elements grid.

Edit Element

The *Edit Element* button is available when an element is selected, including defects and protective systems. Click the *Edit Element* button to reveal the same popup as the *Add New Element* button:

The only field that cannot be edited is the *Element ID* dropdown.

If the *Structure Unit* dropdown is changed, the element will no longer appear in the Bridge Elements grid for the selected structure unit (unless "All Structures" is selected).

If the parent element is selected and either the structure unit or the environment is changed, the parent element will remain linked with its relative defect and protective system elements to ensure that the child elements are not orphaned by the change.

If the defect or protective system is selected and the either the structure unit or environment is changed, an error will appear and the change will not be applied. The only way to avoid this error is for the selected structure unit and environment to match an existing applicable parent element, at which point the *Parent Element* dropdown will reappear and the change can be applied. However, this change would not be recommended unless it was preconceived.

Add Defect and Protective System

The *Add Defect* and *Add Protective Sys* buttons become available when an element is selected. The *Add Defect* button is also available when a protective system is selected.

When clicked, the buttons reveal the same popup as the *Add New Element* and *Edit Element* buttons:

Complete the *Element ID*, *Structure Unit*, and *Environment* dropdown selections.

*Note: Only elements that have been linked to the currently selected element in the *Admin > Modeling Config > Element-Child Linking* subtask will appear in the *Element ID* dropdown.

Once a selection is made in the *Element ID* dropdown, the *Parent Element* and *Grandparent Element* (if applicable) dropdowns will appear above it. The currently selected element will be the parent element, but this can be changed.

*Note: Only certain elements will appear in the *Parent Element* dropdown. In order for an element to appear in the *Parent Element* dropdown, it must meet the following criteria (the same rules apply for the grandparent > parent relationship):

1. The parent element must be linked to the defect or protective system (as applicable) selected in the *Element ID* dropdown in the *Admin > Modeling Config > Element-Child Linking* subtask.
2. The parent element must exist under the selected structure unit.
3. The parent element must exist under the selected environment.

If the desired element does not meet all three qualifications, it will not appear in the *Parent Element* dropdown.

The remaining selections operate in the same way as the *Add New Element* button.

Highlighted Orphan

A highlighted orphan is a protective system or defect that is displayed in the Bridge Elements grid but is not connected to a specific element:

Highlighted orphans can occur for various reasons. The most common scenarios that cause highlighted orphans will be listed below. When attempting to resolve a highlighted orphan, users can select the orphan from the grid and click the *Edit Element* button to reveal the message container with an error explaining why the defect/protective system is a highlighted orphan:

1. Lack of element-child link - A highlighted orphan can occur if the defect/protective system is not linked to the element on the *Admin > Modeling Config > Element-Child Linking* task. The admin should be notified of this issue so that they can fix the link.

2. Correct element, incorrect defect/protective system - If after selecting the highlighted orphan and clicking the *Edit Element* button the user sees that the element-child link contains the correct element but the incorrect defect/protective system, the user can use the *Element ID* dropdown to select the correct defect/protective system. All of the selections in the dropdown, aside from the incorrect orphan, are linked to the element and can be selected to remove the highlighted orphan status.

*Note: Using this method moves all of the defect/protective system's quantities to CS1. The values will need to be redistributed.

3. Correct defect/protective system, incorrect element - If after selecting the highlighted orphan and clicking the *Edit Element* button the user sees that the element-child link contains the correct defect/protective system but the incorrect element, the *Parent Element* dropdown can be used to change the element. Only elements linked to the selected defect/protective system will be present in the list of parent elements.

*Note: Be sure that the structure unit and environment are correct.

Using this method moves all of the defect/protective system's quantities to CS1. The values will need to be redistributed.
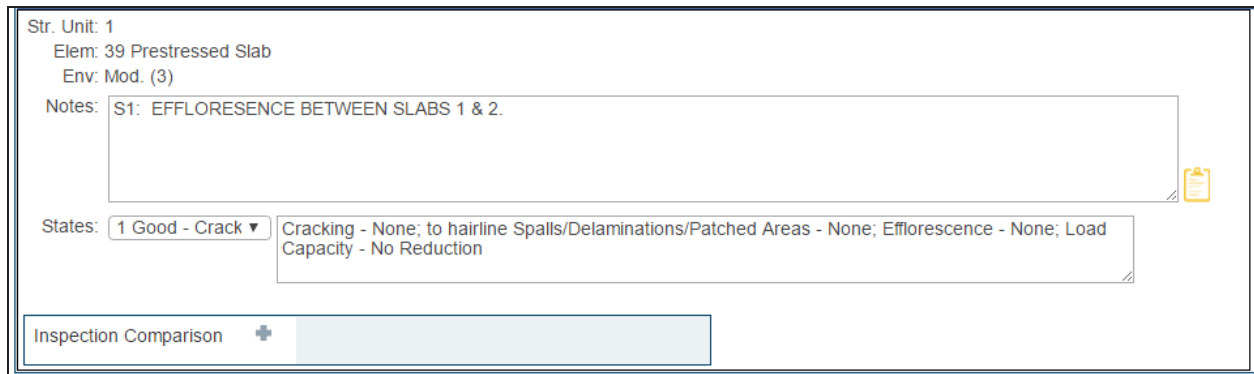
4. User cannot determine orphan's origin - If the user cannot determine how to resolve the highlighted orphan or if it is too complicated, the orphan can simply be deleted.

Delete Element

To delete an element, click the ✕ symbol for the desired element. Deleting an element that has child elements will delete all of the elements.

Element Information

When an element is selected, a new section appears at the bottom of the Bridge Elements grid:

At the top of this section is the basic element information, as well as parent and grandparent element information, if applicable.

Individual element notes can be entered and the *States* dropdown can be used to view or provide notes on each of the condition state levels for the selected element.

Condition Page Controls

Status

The *Status* dropdown allows the user to change the status of the current inspection report. By default, the available statuses are: New, Under Review, Approved, Locked, and Archived.

Admins can edit these statuses and create new ones by using the **inspevnt.inspstat** parameter on the *Admin > General Config > Parameters* task.

Review Needed

The *Review Needed* checkbox allows the user to indicate whether or not the current inspection needs reviewed.

Approved By

The *Approved By* label displays the name of the user who approved the inspection report.

Save/Delete Controls

The *Save* button saves the changes made to the current inspection.

The *Save & Close* button saves the changes made to the current inspection and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the current inspection and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

_____

Inspection > Condition **Control Information**			
Control Name	**Table Name**	**Column Name**	**Notes**
Condition Ratings **Grouping**			
Deck (58)	inspevnt	dkrating	NBI Item 58 - This item describes the overall condition rating of the deck. Concrete decks should be inspected for cracking, scaling, spalling, leaching, chloride contamination, potholing, delamination, and full or partial depth failures. Steel grid decks should be inspected for broken welds, broken grids, section loss, and growth of filled grids from corrosion. Timber decks should be inspected for splitting, crushing, fastener failure, and deterioration from rot.
Superstructure (59)	inspevnt	suprating	NBI Item 59 - This item describes the physical condition of all structural members. The structural members should be inspected for signs of distress which may include cracking, deterioration, section loss, and malfunction and misalignment of bearings.
Substructure (60)	inspevnt	subrating	NBI Item 60 - This item describes the physical condition of piers, abutments, piles, fenders, footings, or other components. All substructure elements should be inspected for visible signs of distress including evidence of cracking, section loss, settlement, misalignment, scour, collision damage, and corrosion.
Future Critical Details	bridge	fc_detail	This is an optional non-NBI field used to characterize the fracture-critical details on the structure. By definition, fracture critical members are steel elements sustaining tensile stresses whose failure will probably cause a portion of or the entire bridge to collapse. This field will not be used to identify fracture critical bridges - NBI Item 92A can be used for that purpose. This field will be used to identify the reason a bridge is fracture critical as well as identifying fatigue prone details which are not necessarily fracture critical.

Control Name	Table Name	Column Name	Notes
Inspection > Condition Control Information			
Channel (61)	inspevnt	chanrating	NBI Item 61 - This item describes the physical conditions associated with the flow of water through the bridge such as stream stability and the condition of the channel, riprap, slope protection, or stream control devices including spur dikes.
Culvert (62)	inspevnt	culvrating	NBI Item 62 - This item evaluates alignment, settlement, joints, structural condition, scour, and other items associated with culverts. The rating code is intended to be overall condition evaluation of the culvert. Integral wingwalls to first construction or expansion joint shall be included in evaluation. NBI Items 58, 59, and 60 shall be coded N for all culverts.
Waterway (71)	inspevnt	wateradeq	NBI Item 71 - This item appraises the waterway opening with respect to passage of flow through the bridge. Site conditions may warrant somewhat higher or lower ratings.
Unrepaired Spalls	inspevnt	deckdistr	The actual distressed deck area in square meters. Non-NBI field.
Bridge Elements Grid			
Quantity	PON_ ELEM_ INSP	ELEM_ QUANTITY	The total quantity of the selected element.
Qty. 1	PON_ ELEM_ INSP	ELEM_ QTYSTATE1	The quantity of the selected element that is in condition state 1.
Qty. 2	PON_ ELEM_ INSP	ELEM_ QTYSTATE2	The quantity of the selected element that is in condition state 2.
Qty. 3	PON_ ELEM_ INSP	ELEM_ QTYSTATE3	The quantity of the selected element that is in condition state 3.
Qty. 4	PON_ ELEM_ INSP	ELEM_ QTYSTATE4	The quantity of the selected element that is in condition state 4.
Pct. 1	PON_ ELEM_ INSP	ELEM_ PCTSTATE1	The percentage of the selected element that is in condition state 1.
Pct. 2	PON_ ELEM_ INSP	ELEM_ PCTSTATE2	The percentage of the selected element that is in condition state 2.
Pct. 3	PON_ ELEM_ INSP	ELEM_ PCTSTATE3	The percentage of the selected element that is in condition state 3.
Pct. 4	PON_ ELEM_	ELEM_ PCTSTATE4	The percentage of the selected element that is in condition state 4.

Control Name	Table Name	Column Name	Notes
	INSP		
Add Element Popup			
Grandparent Element	PON_ELEM_INSP	PARENT_PON_ELEM_INSP_GD	The grandparent element exists when there is an element with a protective system and that protective system has a defect. Therefore, element > protective system > defect. *Note: While the grandparent is shown, there is no longer a database field for it. So, in the element > protective system > defect family, the grandparent only exists in the database as the parent of the protective system and not as the grandparent of the defect.
Parent Element	PON_ELEM_INSP	PARENT_PON_ELEM_INSP_GD	The parent element can be either an element with a protective system or defect, or a protective system in the element > protective system > defect hierarchy.
Element ID	PON_ELEM_INSP	PON_ELEM_DEFS_GD	The element currently selected.
Structure Unit	PON_ELEM_INSP	STRUCTURE_UNIT_GD	Determines to which structure unit within the bridge that the element belongs.
Environment	PON_ELEM_INSP	PON_ENVT_DEFS_GD	The environment in which the element exists.
Quantity/Count	PON_ELEM_INSP	ELEM_QUANTITY	The size/amount of the element.
Element Description	PON_ELEM_INSP	ELEM_NOTES	A description or notes about the element.
Inspection Notes Grouping			
Insp Level Notes	inspevnt	notes	Notes for the current inspection.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			

Inspection > Condition Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Appraisal

The *Inspection > Appraisal* task allows the user to enter a bridge's NBI structure appraisal information, including clearances, NBI load ratings, and more. The user can also view the calculated appraisal ratings for the selected bridge, operating and inventory ratings, and the structure's posting status.

Appraisal Groupings

Structural Appraisal

The *Structural Appraisal* grouping contains several structural NBI fields to be completed.

Calculated Appraisal Ratings

The *Calculated Appraisal Ratings* grouping contains information that is calculated on the database level, including NBI fields such as structural evaluation and sufficiency rating. The *Bridges > Suff Rate* task can be used to override the calculated values in this section.

Calculated Appraisal Ratings

Structural Evaluation **(067)**: 6 Equal Min Criteria
Deck Geometry **(068)**: 7 Above Min Criteria
Underclearances **(069)**: N Not applicable (NBI)
SD/FO Status: Not Deficient
Sufficiency Rating **(SRB)**: 97.7
Sufficiency Rating Calculate Status: **SAVED / 0**
Health Index: 95.29%
Bridge Condition: Fair

The Bridge Condition rating has been added to the *Calculated Appraisal Ratings* grouping in BrM version 5.2.3. This displays a bridge status of Good/Fair/Poor and stores it in the database at inspevnt.bridge_condition. This status is determined by the lowest rating of the NBI condition ratings for deck, superstructure, substructure, and culvert. The status is as follows:

- **Good** - 9, 8, 7
- **Fair** - 6, 5
- **Poor** - 4, 3, 2, 1

Example: An inspection is completed with the following values:

Deck: 7
Superstructure: 6
Substructure: 5
Culvert : Null

Because substructure is the lowest NBI condition rating, it will be used to determine the Good/Fair/Poor status. With "5" as its rating, the bridge status will be set to Fair.

Clearances

The *Clearances* grouping contains vertical and lateral clearances and navigation data NBI fields to be completed.

Clearances

Minimum Vertical Clearances

Over Structure **(053)**: 99.990 ft
Under (Reference) **(054A)**: N Feature not hwy or RR
Under Clearance **(054B)**: 0.000 ft

Minimum Lateral Clearances

Reference Feature **(055A)**: N Feature not hwy or RR
Right Side **(055B)**: 99.900 ft
Left Side **(056)**: 0.000 ft

Navigation Data

Navigation Control Exists **(038)**: Permit Not Required
Navigation Vertical Clearances **(039)**: 0.000 ft
Navigation Horizontal Clearances **(040)**: 0.000 ft
Minimum Vertical Lift Clearances **(116)**: ft

NBI Load Ratings

The *NBI Load Ratings* grouping contains load rating NBI fields and alternate fields to be completed.

*Note: In previous versions of BrM, the *Rating Date* textbox value defaulted to the structure's creation date. This no longer occurs in BrM version 5.2.3. Instead, the field is left blank upon creation of a new structure.

Appraisal Page Controls

The *Save* button saves the changes made to the selected bridge's appraisal page.

The *Save & Close* button saves the changes made to the selected bridge's appraisal page and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the selected bridge's appraisal page and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

Inspection >*Appraisal* Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Structural Appraisal Grouping			
Open/Posted/Closed	inspevnt	oppostcl	NBI Item 41: This item provides information about the actual operational status of a structure. The field review could show that a structure is posted, but Item 70 - Bridge Posting may indicate that posting is not required. This is possible and acceptable coding since Item 70 is based on the operating stress level and the governing agency's posting procedures may specify posting at some stress level less than the operating rating.

Inspection >Appraisal Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Approach Alignment	inspevnt	appralign	NBI Item 72: This item identifies those bridges which do not function properly or adequately due to the alignment of the approaches. It is not intended that the approach roadway alignment be compared to current standards but rather to the existing highway alignment. This concept differs from other appraisal evaluations. The establishment of set criteria to be used at all bridge sites is not appropriate for this item. The basic criteria is how the alignment of the roadway approaches to the bridge relate to the general highway alignment for the section of highway the bridge is on.
Bridge Railings	inspevnt	railrating	NBI Item 36A: Bridge railings should be evaluated using the current AASHTO Standard Specifications for Highway Bridges, which calls for railings to meet specific geometric criteria and to resist specified static loads without exceeding the allowable stresses in their elements.
Transitions	inspevnt	transratin	NBI Item 36B: The transition from approach guardrail to bridge railing requires that the approach guardrail be firmly attached to the bridge railing. It also requires that the approach guardrail be gradually stiffened as it comes closer to the bridge railing. The ends of curbs and safety walks need to be gradually tapered out or shielded. The data collected shall apply only to the route on the bridge. Collision damage or deterioration of the elements are not considered when coding this item.
Approach Guardrail	inspevnt	arailratin	NBI Item 36C: The structural adequacy and compatibility of approach guardrail with transition designs should be determined. Rarely does the need for a barrier stop at the end of a bridge. Acceptable guardrail design suggestions are contained in the AASHTO Roadside Design Guide and subsequent FHWA or AASHTO guidelines. The data collected shall apply only to the route on the bridge. Collision damage or deterioration of the elements are not considered when coding this item.
Approach Guardrail Ends	inspevnt	aendrating	NBI Item 36D: As with guardrail ends in general, the ends of approach guardrails to bridges should be flared, buried, made breakaway, or shielded. Design treatment of guardrail ends is given in the AASHTO Roadside Design Guide. The data collected shall apply only to the route on the bridge. Collision damage or deterioration of the elements are not considered when coding this item.
Pier Protection	inspevnt	pierprot	NBI Item 111: Code the whether pier protection is present and the status of the protection.
Scour Critical	inspevnt	scrourcrit	NBI Item 113: Identify current status of bridge regarding vulnerability to scour. Scour analyses to be made by hydraulic/geotechnical/structural engineers. A scour critical bridge is one with abutment or pier foundations which are rated as unstable due to observed scour at bridge site or scour potential

Inspection >*Appraisal* Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
			as determined from scour evaluation study.
Fracture Critical Details	inspevnt	fc_detail	This is an optional non-NBI field used to characterize the fracture-critical details on the structure. This field will not be used to identify fracture critical bridges; NBI Item 92A can be used for that purpose. This field will be used to identify the reason a bridge is fracture critical as well as identifying fatigue prone details which are not necessarily fracture critical.
Clearances - Minimum Vertical Clearances Grouping			
Over Structure	bridge	vclrover	NBI Item 53: The information to be recorded for this item is the actual minimum vertical clearance over the bridge roadway, including shoulders, to any superstructure restriction, rounded down to the nearest hundredth of a meter. For double decked structures code the minimum, regardless whether it is pertaining to the top or bottom deck. When no superstructure restriction exists above the bridge roadway, or when a restriction is 30 meters or greater, code 9999. Coding of actual clearances between 30 meters and 99. 99 meters to an exact measurement is optional.
Vertical Under Reference	bridge	refvuc	NBI Item 54A: The feature under the structure used to measure the vertical clearance. Coded as H = highway, R = railroad, N = not a highway or railroad.
Vertical Under Clearance	bridge	vclrunder	NBI Item 54B: Code a 4-digit number to represent the minimum vertical clearance from that feature to the structure, truncated to the hundredth of a meter--with an assumed decimal point. When a restriction is 30 meters or greater, code 9999. Coding of actual clearances between 30 meters and 99. 99 meters to an exact measurement is optional. If the feature is not a highway or railroad, code the minimum vertical clearance 0000.
Clearances - Minimum Lateral Clearances Grouping			
Lateral Reference Feature	bridge	refhuc	NBI Item 55A - The feature under the structure used to measure the lateral clearance. Coded as H = highway, R = railroad, N = not a highway or railroad.
Right Side	bridge	hclrurt	NBI Item 55B: Using a 3-digit number, record and code the minimum lateral underclearance on the right to the nearest tenth of a meter--with an assumed decimal point. The lateral clearance should be measured from the right edge of the roadway--excluding shoulders--to the nearest substructure unit, to a rigid barrier, or to the toe of slope steeper than 1 to 3. In the case of a dual highway, the median side clearances of both roadways should be measured and the smaller distance recorded and coded. If there is no obstruction in the median area, a notation of open should be recorded and 999 should be coded. For clearances greater than 30 meters, code 998. Coding of actual clearances greater than 30 meters to an exact measurement is optional. Code 000 to indicate not applicable.

Inspection >Appraisal Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Left Side	bridge	hclrult	NBI Item 56: Using a 3-digit number, record and code the minimum lateral underclearance on the left--median side for divided highways--to the nearest tenth of a meter--with an assumed decimal point. The lateral clearance should be measured from the left edge of the roadway--excluding shoulders--to the nearest substructure unit, to a rigid barrier, or to the toe of slope steeper than 1 to 3. In the case of a dual highway, the median side clearances of both roadways should be measured and the smaller distance recorded and coded. If there is no obstruction in the median area, a notation of open should be recorded and 999 should be coded. For clearances greater than 30 meters, code 998. Coding of actual clearances greater than 30 meters to an exact measurement is optional. Code 000 to indicate not applicable.
Navigation Data Grouping			
Navigation Control Exists	bridge	navcntrol	NBI Item 38: Indicates whether or not a bridge permit is necessary for navigation, if applicable.
Navigation Vertical Clearances	bridge	navvc	NBI Item 39: If navigation of the waterway requires a permit, this is the minimum vertical clearance of the navigation.
Navigation Horizontal Clearances	bridge	navhc	NBI Item 40: If navigation of the waterway requires a permit, this is the minimum horizontal clearance of the navigation.
Navigation Vertical Lift Clearances	bridge	lftbrnavcl	NBI Item 116: The minimum vertical lift clearance for the lift bridge in the dropped/closed position.
Calculated Appraisal Ratings Grouping			
Structural Evaluation	inspevnt	strrating	NBI Item 67: This is the structural evaluation rating of the bridge. This item is calculated by the specifications used in the NBI Coding Guide.
Deck Geometry	inspevnt	deckgeom	NBI Item 68: The overall rating for deck geometry includes two evaluations: the curb-to-curb or face-to-face of rail bridge width and the minimum vertical clearance over the bridge roadway. When an individual table lists several deck geometry rating codes for the same roadway width under a specific ADT, the lower code is used.
Underclearances	inspevnt	underclr	NBI Item 69: This is the underclearance of the bridge. This item is calculated by the specifications used in the NBI Coding Guide.
SD/FO Status	inspevnt	nbi_rating	The NBI rating (structurally deficient/functionally obsolete status).
Sufficiency Rating	inspevnt	suff_rate	The calculated sufficiency rating of the bridge.
SRCS	bridge	srstatus	Indicates whether the sufficiency rating is current or needs updated.
Health Index			The health index is a calculated value that comes from database

			Inspection >Appraisal Control Information
Control Name	Table Name	Column Name	Notes
			view: v_hix.hix.
NBI Load Ratings Grouping			
Load Rating Review Recommended	bridge	req_op_rat	This control indicates whether review of the load ratings is recommended.
Rating Date	bridge	ratingdate	The date the load rating calculation was made. Non-NBI field.
Initials	bridge	rater_ini	The initials of the load rater/engineer responsible for performing the load rating. Non-NBI field.
Design Load	bridge	designload	NBI Item 31: Use the codes below to indicate the live load for which the structure was designed. The numerical value of the railroad loading should be recorded on the form.
Posting	bridge	posting	NBI Item 70: The National Bridge Inspection Standards require the posting of load limits only if the maximum legal load configurations in the state exceeds the load permitted under the operating rating. If the load capacity at the operating rating is such that posting is required, this item shall be coded 4 or less. If no posting is required at the operating rating, this item shall be coded 5.
Operating Type	bridge	ortype	NBI Item 63: Use one of the codes below to indicate which load rating method was used to determine the Operating Rating coded in Item 64 for this structure.
Operating Rating	bridge	orload	NBI Item 64: This capacity rating, referred to as the operating rating, will result in the absolute maximum permissible load level to which the structure may be subjected for the vehicle type used in the rating. Code the operating rating as a 3-digit number to represent the total mass in metric tons of the entire vehicle measured to the nearest tenth of a metric ton--with an assumed decimal point. It should be emphasized that only MS loading shall be used to determine the operating rating.
Inventory Type	bridge	irtype	NBI Item 65: Use one of the codes below to indicate which load rating method was used to determine the Inventory Rating coded in Item 66 for this structure.
Inventory Rating	bridge	irload	NBI Item 66: This capacity rating, referred to as the inventory rating, will result in a load level which can safely utilize an existing structure for an indefinite period of time. Only the MS loading shall be used to determine the inventory rating. Code the Inventory Rating as a 3-digit number to represent the total mass in metric tons of the entire vehicle measured to the nearest tenth of a metric ton--with an assumed decimal point. Code 999 for a structure under sufficient fill such that, according to AASHTO design, the live load is insignificant in the structure load capacity.
Alternate Operating	bridge	altormeth	The alternate operating rating method. Optional non-NBI field

Inspection >Appraisal Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Rating Type			to indicate the method used in developing the alternate operating load rating fields.
Alternate Operating Rating	bridge	altorload	The alternate operating load rating. Optional non-NBI field to hold a load rating by some alternative method aside from the one used in the NBI load rating fields.
Alternate Inventory Rating Type	bridge	altirmeth	The alternate inventory rating method. Optional non-NBI field to indicate the method used in developing the alternate operating load rating fields.
Alternate Inventory Rating	bridge	altirload	The alternate inventory load rating. Optional non-NBI field to hold a load rating by some alternative method aside from the one used in the NBI load rating fields.
Posting Loads - Inventory **Grouping**			
Inventory - Type 1	bridge	truck1or	The operating rating for truck type 1. This is an optional non-NBI field to provide for a load rating specific to a particular type of truck.
Inventory - Type 2	bridge	truck2or	The operating rating for truck type 2. This is an optional non-NBI field to provide for a load rating specific to a particular type of truck.
Inventory - Type 3	bridge	truck3or	The operating rating for truck type 3. This is an optional non-NBI field to provide for a load rating specific to a particular type of truck.
Posting Loads - Operating **Grouping**			
Operating - Type 1	bridge	truck1ir	The inventory rating for truck type 1. Optional non-NBI field to provide for a load rating specific to a particular type of truck.
Operating - Type 2	bridge	truck2ir	The inventory rating for truck type 2. Optional non-NBI field to provide for a load rating specific to a particular type of truck.
Operating - Type 3	bridge	truck3ir	The inventory rating for truck type 3. Optional non-NBI field to provide for a load rating specific to a particular type of truck.
Posting Loads - SHVs **Grouping**			
SU4	bridge	su4	Single unit SHV load model - 4 axle SHV.
SU5	bridge	su5	Single unit SHV load model - 5 axle SHV.
SU6	bridge	su6	Single unit SHV load model - 6 axle SHV.
SU7	bridge	su7	Single unit SHV load model - 7 axle SHV.
NRL	bridge	nrl	Notational rating load model.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.

Inspection >*Appraisal* Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

The *Inspection > Inventory* task allows the user to modify a bridge's information through four subtasks: *Admin*, *Design*, *Roads*, and *Agency Items*.

*Note: User permissions may limit the fields available to be modified.

Admin

The *Inspection > Inventory > Admin* subtask is used to modify a bridge's structure identification, location, age and service, and more.

Admin Page Groupings

Location

The *Location* grouping determines the location details of the selected bridge, including the latitude and longitude values used in BrM's matching features.

Programming

The *Programming* grouping contains the sufficiency rating calculation status for the selected bridge. The *SR Calculate Status* dropdown sets the status.

Age and Service

The *Age and Service* grouping provides information about the age of the bridge and how it is used.

Operation

The *Operation* grouping is used to indicate who owns the bridge and who is responsible for the maintenance of the bridge.

Classification Information

The *Classification Information* grouping contains information about the how the structure is classified.

Admin Page Controls

If changes have been made to the subtask, those changes must be saved before leaving the current page in order for the changes to be maintained.

Cancel	Save	Save & Close	Delete Inspection

The *Save* button saves the changes made on the current subtask.

The *Save & Close* button saves the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

Control Name	Table Name	Column Name	Notes
Inspection > Inventory > Admin Control Information			
Structural Identification Grouping			
Agency Bridge ID	bridge	bridge_id	Agency bridge identification number. Used to identify structures on most screens and reports.
NBI Structure No.	bridge	struct_num	NBI Item 8 - The NBI structure number. Note that regardless of whether Item 8 is mapped only to struct_num or also to additional fields, if a user changes the value stored and exports then imports an NBI file, the result may be the creation of a new brkey.
Brkey	bridge	brkey	The bridge key. One of the structure identifiers in BrM.
Name	bridge	strucname	The agency's structure name. Non-NBI field.
Location Grouping			
FIPS State	bridge	fips_state	NBI Item 1A - The state the structure is located within.
FHWA Region	bridge	fhwa_regn	NBI Item 1B - The region the structure is located within.
District	bridge	district	NBI Item 2 - The highway agency district in which the bridge is located. Existing district numbers shall be used where districts are identified by number. Where districts are identified by name, a code number shall be assigned based on an alphabetical or organizational listing of the districts.
County	bridge	county	NBI Item 3 - The county the structure is located within.
City/Town/Placecode	bridge	placecode	NBI Item 4 - The city, town, township, village, or other census-designated place the structure is located within.
Feature Intersected	bridge	featint	NBI Item 6 - This item contains a description of the features intersected by the structure and a critical facility indicator.

Control Name	Table Name	Column Name	Notes
			When Item 5A indicates an under record, this item describes the inventory route and/or features under the structure.
Facility Carried	bridge	facility	NBI Item 7 - The facility being carried by the structure shall be recorded and coded. In all situations this item describes the use on the structure.
Location	bridge	location	NBI Item 9 - This item contains a narrative description of the bridge location. It is recommended that the location be keyed to a distinguishable feature on an official highway department map such as road junctions and topographical features.
Latitude	bridge	latitude	NBI Item 16 - For bridges on STRAHNET and STRAHNET Connector highways and on the NHS, record and code the latitude of each in degrees, minutes and seconds to the nearest hundredth of a second--with an assumed decimal point. The point of the coordinate may be the beginning of the bridge in the direction of the inventory or any other consistent point of reference on the bridge which is compatible with the LRS.
Longitude	bridge	longitude	NBI Item 17 - For bridges on STRAHNET and STRAHNET Connector highways and on the NHS, record and code the longitude of each in degrees, minutes and seconds to the nearest hundredth of a second--with an assumed decimal point. The point of the coordinate may be the beginning of the bridge in the direction of the inventory or any other consistent point of reference on the bridge which is compatible with the LRS.
Border State	bridge	nstatecode	NBI Item 98AA - The neighboring state of the structure. For the special case of a structure on the border with Canada or Mexico, code the State code "CAN" or "MEX" respectively. If structure is not on a border, leave blank.
Share%	bridge	bb_pct	NBI Item 98B - It is for specifying the percent responsibility for improvements to the existing structure when it is on a border with a neighboring state. Code it with the percentage of total deck area of the existing bridge that the neighboring state is responsible for funding.
Border FHWA Region	bridge	n_fhwa_reg	NBI Item 98AB - Indicate the FHWA region of the neighboring state. For the special case of a structure on the border with Canada or Mexico, leave blank.
Border Struct No.	bridge	bb_brdgeid	NBI Item 99 - Code the neighboring state's 15-digit NBI structure number for any structure noted in Item 98. This number must match exactly the neighboring state's submitted NBI structure number. The entire 15-digit field must be accounted for including zeros and blank spaces whether they are leading, trailing, or embedded in the 15-digit field. If Item 98 is blank, this item is blank.

Inspection > Inventory > Admin Control Information

Inspection > Inventory > Admin Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Programming Grouping			
SR Calculate Status	bridge	srstatus	Tracks whether sufficiency rating (SR) needs to be recalculated. This field is set to 1 when a new roadway or inspection is created (and in response to other circumstances that may trigger a need to recalculate SR), and set to 0 when SR is recalculated.
Age and Service Grouping			
Year Built	bridge	yearbuilt	NBI Item 27 - Record and code the year of construction of the structure. Code all 4 digits of the year in which construction of the structure was completed. If the year built is unknown, provide a best estimate.
Year Reconstruct	bridge	yearrecon	NBI Item 106 - Record and code the year of most recent reconstruction of the structure. Code all 4 digits of the latest year in which reconstruction of the structure was completed. If there has been no reconstruction code 0000.
Type of Service On	bridge	servtypon	NBI Item 42A - Indicates the type of service on the bridge.
Under	bridge	servtypund	NBI Item 42B - Indicates the type of service under the bridge.
Lane Under	bridge	sumlanes	NBI Item 28B - The sum of the number of lanes under the structure.
Operation Grouping			
Maintenance Resp.	bridge	custodian	NBI Item 21 - The name of the agency responsible for the maintenance of the structure.
Owner	bridge	owner	NBI Item 22 - The name of the owner of the structure.
Agency Admin Area	bridge	adminarea	This is used in subsetting and sorting of bridge data as a convenience feature. Non-NBI field.
On/Off Agency System	bridge	on_off_sys	Specifies whether the structure is on or off the agency system. Typically based on the value for either structure ownership (NBI Item 22) or custodian (NBI Item 21). Used for determining applicable policies and costs, and for reporting results.
Bridge Group	bridge	bridgegroup	Agency-defined group for the bridge. Intended for use in grouping together bridges for inspection purposes. Non-NBI field.
Classification Information Grouping			
NBIS Bridge Length	bridge	nbislen	NBI Item 112 - Indicate whether this structure meets or exceeds the minimum length specified to be designated as a bridge by NBI standards.
Parallel Structure	bridge	paralstruc	NBI Item 101 - Code this item to indicate situations where separate structures carry the inventory route in opposite directions of travel over the same feature.

Inspection > Inventory > Admin Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Temporary Structure	bridge	tempstruc	NBI Item 103 - Code this item to indicate situations where temporary structures or conditions exist. Temporary structures or conditions are those which are required to facilitate traffic flow. This may occur either before or during the modification or replacement of a structure found to be deficient.
Historic Significance	bridge	histsign	NBI Item 37 - The historical significance of a bridge involves a variety of characteristics: the bridge may be a particularly unique example of the history of engineering; the crossing itself might be significant; the bridge might be associated with a historical property or area; or historical significance could be derived from the fact the bridge was associated with significant events or circumstances.
***Structure Notes* Grouping**			
Structure Notes	bridge	notes	Notes about the structure.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Design

The *Inspection > Inventory > Design* subtask is used to modify a bridge's deck, span, length, and more. New structure units can also be created on this page.

Structure Units

The *Structure Units* grouping allows the user to create/modify structure units. Structure units are groups of structures typically based on structural design and material. It is not necessary to have multiple structure units, but it can be helpful for inspections.

Click the *Add New* button to create a new structure unit.

- **Type:** The structure unit type options can be defined in the *Admin > General Config > Parameters* task.
- **Default:** Only one structure unit may be the default. When a structure unit is the default, it will be the default structure unit selected when a new element is added to a bridge inspection on the *Inspection > Condition* task.

Design Page Controls

If changes have been made to the subtask, those changes must be saved before leaving the current page in order for the changes to be maintained.

The *Save* button saves the changes made on the current subtask.

The *Save & Close* button saves the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

Control Name	Table Name	Column Name	Notes
Inspection > Inventory > Design Control Information			
Deck Grouping			
Deck Structure Type	bridge	dkstructyp	NBI Item 107: The deck structure type.
Deck Surface Type	bridge	dksurftype	NBI Item 108A: The deck wearing surface type.
Deck Membrane Type	bridge	dkmembtype	NBI Item 108B: The deck membrane type.
Deck Protection	bridge	dkprotect	NBI Item 108C: The protection being used on the deck.
Curb Sidewalk Width/Left	bridge	lftcurbsw	NBI Item 50A: The left curb or sidewalk width. Record and code a 3-digit number to represent the width of the left curb or sidewalk to the nearest tenth of a meter (with assumed decimal points). "Left" and "Right" should be determined on the basis of direction of the inventory.
Curb Sidewalk Width/Right	bridge	rtcurbsw	NBI Item 50B: The right curb or sidewalk width. Record and code a 3-digit number to represent the width of the right curb or sidewalk to the nearest tenth of a meter (with assumed decimal points). "Left" and "Right" should be determined on the basis of direction of the inventory.
Deck Width	bridge	deckwidth	NBI Item 52: The deck width, out-to-out.
Bridge Median	bridge	bridgemed	NBI Item 33: The structure median indicator.
Deck Area	bridge	deck_area	The structure deck area. This is a non-NBI field used as the basis for area-based replacement and improvement cost estim-

Control Name	Table Name	Column Name	Notes
			ates.
Structure Status Grouping			
Bridge Status	bridge	bridge_status	The current status of the bridge, such as active, inactive, or closed.
Bridge Lifecyle Phase	bridge	bridge_lifecycle_phase	Indicates the current lifecycle phase of the bridge, such as design or preconstruction.
Spans Grouping			
Number of Main Spans	bridge	mainspans	NBI Item 45: Record the number and indicate with a 3-digit code the number of spans in the main or major unit. This item will include all spans of most bridges, the major unit only of a sizable structure, or a unit of material or design different from that of the approach spans.
Main Span Material	bridge	materialmain	NBI Item 43A: The kind of material and/or design for the main span.
Main Span Design	bridge	designmain	NBI Item 43B: The type of design and/or construction for the main span.
Number of Approach Spans	bridge	appspans	NBI Item 46: Record the number and indicate with a 4-digit number the number of spans in the approach spans to the major unit. This item will include all spans of most bridges, the major unit only of a sizable structure, or a unit of material or design different from that of the approach spans.
Approach Span Material	bridge	materialappr	NBI Item 44A: The kind of material and/or design for the approach span.
Approach Span Design	bridge	designappr	NBI Item 44B: The type of design and/or construction for the approach span.
Structure Flared	bridge	strflared	NBI Item 35: Code this item to indicate if the structure is flared, meaning the width of the structure varies. Generally, such variance will result from ramps converging with or diverging from the through lanes on the structure, but there may be other causes. Minor flares at ends of structures should be ignored.
Length Grouping			
Maximum Span Length	bridge	maxspan	NBI Item 48: The length of the maximum span shall be recorded. It shall be noted whether the measurement is center to center of bearing points or clear open distance between piers, bents, or abutments. The measurement shall be along the centerline of the bridge. For this item, code a 5-digit number to represent the measurement to the nearest tenth of a meter with an assumed decimal point.
Structure Length	bridge	length	NBI Item 49: Record and code a 6-digit number to represent the

Inspection > Inventory > Design Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
			length of the structure to the nearest tenth of a meter--with an assumed decimal point. This shall be the length of roadway that is supported on the bridge structure. The length should be measured back to back of backwalls of abutments or from paving notch to paving notch. Culvert lengths should be measured along the center line of roadway regardless of their depth below grade. Measurement should be made between inside faces of exterior walls. Tunnel length should be measured along the centerline of the roadway.
Total Length	bridge	tot_length	The total length of the structure, including approach roadways. It is always greater than or equal to the structure length.
***Structure Units* Grouping**			
Key	structure_unit	strunitkey	The structure unit's primary identifier.
Unit	structure_unit	strunitlabel	A secondary identifier for the structure unit.
Type	structure_unit	strunittype	The type of structure unit (main, approach, etc.).
Default Unit	structure_unit	defaultflag	Default flag that indicates whether or not this is the default structure unit for the structure. If it is the default, then new elements are assigned to this unit.
Description	structure_unit	strunitdescription	A description of the structure unit.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Roads

The *Inspection > Inventory > Roads* subtask is used to modify the information for roadways on or under the structure including classification data, traffic, clearance, and more.

Adding Records

To add an "On" or "Under" structure record, select the *Create* button.

*Note: The option to add an "On" structure record will only be available if the roadway information that was automatically generated when the structure was created was deleted at some point on the *Inspection > Inventory > Roads* subtask.

In most cases, the roadways being added will be under records. If "One Route Under" is checked, all other options will become read only. This selection indicates that only one under record exists for the bridge.

Checking the box of multiple selections starting with "1st Route Under" allows the user to add more than one under record for the bridge.

When the desired selections have been made, click the *Create* button to add the under records to the bridge.

Click the *Cancel* button to cancel the addition of the under records.

Editing Records

Once the under records are added, the user can switch between the on record and under records using the *Roadway* drop-down:
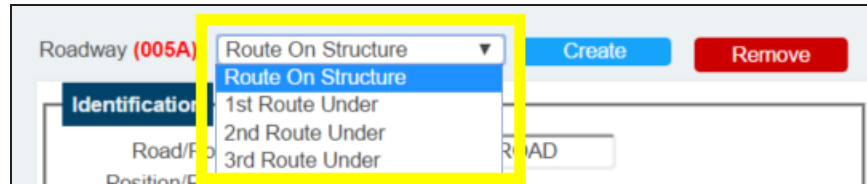
Once a record is selected, the user can fill in the basic information for the record in each of the groupings.

Agency Roadway Fields

The *Agency Roadway Fields* grouping contains blank fields that the agency can define and use as needed. These fields can be defined/changed using the *Admin > Navigation and Field Security* task. Within the database, these fields are listed in the Roadway table as "userrwkey1," "userrwkey2," etc.

Roads Page Controls

If changes have been made to the subtask, those changes must be saved before leaving the current page in order for the changes to be maintained.

The *Save* button saves the changes made on the current subtask.

The *Save & Close* button saves the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

Inspection > Inventory > Roads Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Roadway	roadway	on_under	NBI Item 5A - Used to select the route to view/edit. The route will be either on or under the structure.

Control Name	Table Name	Column Name	Notes
Inspection > Inventory > Roads Control Information			
Identification **Grouping**			
Road/Route Name	roadway	roadway_ name	Non-NBI field indicating the name of the roadway.
Position/Prefix	roadway	on_under	NBI Item 5A - Indicates whether the route is on or under the structure.
Kind Hwy (Rt. Prefix)	roadway	kind_hwy	NBI Item 5B - Identify the route signing prefix for the inventory route.
Desig. Level Service	roadway	levl_srvc	NBI Item 5C - Identify the designated level of service for the inventory route.
Rte#	roadway	routenum	NBI Item 5D - Code the route number of the inventory route in the next 5 positions. If concurrent routes are of the same hierarchy level, denoted by the route signing prefix, the lowest numbered route shall be coded. Code 00000 for bridges on roads without route numbers.
Suffix	roadway	dirsuffix	NBI Item 5E - Code the directional suffix to the route number of the inventory route when it is part of the route number.
Critical Facility	roadway	crit_feat	NBI Item 6B - Critical Facility Indicator will no longer be coded.
Traffic **Grouping**			
Lanes	roadway	lanes	NBI Item 28A - Indicate the number of lanes on the structure.
Medians	roadway	num_median	Indicates the number of medians on the structure.
Speed	roadway	road_speed	Indicates the speed limit of the roadway.
ADT Class	roadway	adtclass	The traffic volume class of the roadway.
Recent ADT	roadway	adttotal	NBI Item 29 - Code a 6-digit number that shows the average daily traffic (ADT) volume for the inventory route identified in Item 5. The ADT coded should be the most recent ADT counts available. Included in this item are the trucks referred to in Item 109. If the bridge is closed, code the actual ADT from before the closure occurred.
Year	roadway	adtyear	NBI Item 30 - Record the year represented by the ADT in Item 29. Code all four digits of the year.
Truck%	roadway	truckpct	NBI Item 109 - Code a 2-digit percentage that shows the percentage of Item 29 that is truck traffic. Do not include vans, pickup trucks, and other light delivery trucks in this percentage. If this information is not available, an estimate which represents the average percentage for the category of road carried by the bridge may be used.
Future ADT	roadway	adtfuture	NBI Item 114 - Code for all bridges the forecasted average daily traffic (ADT) for the inventory route identified in Item 5. This shall be projected at least 17 years but no more than 22 years from the year of inspection. The intent is to provide a basis for a

Inspection > Inventory > Roads Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
			20-year forecast. This item may be updated anytime, but must be updated when the forecast falls below the 17-year limit.
Future Year	roadway	adtfutyear	NBI Item 115 - Record and code the year represented by the future ADT in Item 114. The projected year of future ADT shall be at least 17 years but no more than 22 years from the year of inspection.
***Highway Network & Service Classification* Grouping**			
Kilometer/Mile Point	roadway	kmpost	NBI Item 11 - The linear referencing system (LRS) mile-point/kilometer point is used to establish the location of the bridge on the Base Highway Network--see Item 12. The kilometer point coded in this item directly relates to Item 13. This item must be coded for all structures located on or overpassing the Base Highway Network. Code a 7-digit number to represent the LRS kilometer point distance in kilometers to the nearest thousandth with an assumed decimal point.
National Base Net	roadway	onbasenet	NBI Item 12 - This item is to be coded for all records in the inventory. The Base Highway Network includes the through lane - mainline - portions of the NHS, rural/urban principal arterial system, and rural minor arterial system. Ramps, frontage roads, and other roadways are not included in the Base Network. For the inventory route identified in Item 5, indicate whether the inventory route is on the Base Highway Network or not on that network.
LRS Inventory Rte	roadway	lrsinvrt	NBI Item 13A - If Item 12 has been coded 1, the information to be recorded for this item is inventory route for the State's linear referencing system (LRS). If Item 12 has been coded 0, this entire item should be left blank.
Sub#	roadway	subrtnum	NBI Item 13B - The subroute number is a number that uniquely identifies portions of an inventory route section where duplicate kilometer points occur. These subroute numbers, if they exist, are identified in the State's HPMS-LRS records. If there is no subroute number, code 00 in this segment.
Toll Facility	roadway	tollfac	NBI Item 20 - The toll status of the structure is indicated by this item. Interstate toll segments under Secretarial Agreement shall be identified separately.
Functional Class	roadway	funcclass	NBI Item 26 - Indicates the functional classification of the roadway.
Traffic Direction	roadway	trafficdir	NBI Item 102 - Code the direction of traffic of the inventory route identified in Item 5.
***Alternate Classifications* Grouping**			
Defense Highway	roadway	defhwy	NBI Item 100 - This item shall be coded for all records in the inventory. For the purposes of this item, the STRAHNET Connectors are considered included in the term STRAHNET.

Inspection > Inventory > Roads Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Nat. Hwy System	roadway	nhs_ind	NBI Item 104 - This item is to be coded for all records in the inventory. For the inventory route identified in Item 5, indicate whether the inventory route is on the NHS or not.
Fed. Lands Hwy	roadway	fedlandhwy	NBI Item 105 - Structures owned by State and local jurisdictions on roads which lead to and traverse through federal lands sometimes require special coded unique identification because they are eligible to receive funding from the Federal Lands Highway Program.
Nat. Truck Network	roadway	trucknet	NBI Item 110 - The national network for trucks includes most of the Interstate System and those portions of Federal-Aid highways identified in the Code of Federal Regulations--23 CFR 658. The national network for trucks is available for use by commercial motor vehicles of the dimensions and configurations described in these regulations.
School Bus Rte	roadway	school_bus	School bus route indicator. This flag should be set to 1 if the roadway is on a designated school bus route.
Transit Rte	roadway	transit_rt	Transit bus route indicator. This flag should be set to 1 if the roadway is on a designated transit bus route.
Emergency Rte	roadway	crit_trav	Critical travel route indicator. This flag should be set to 1 if the roadway is on a designated critical travel route (e.g., designated for use during emergency evacuations).
NBI Rte	roadway	nbi_rw_flag	Specifies whether the roadway should be included in NBI file exports.
***Clearances* Grouping**			
Vertical Clearance	roadway	vclrinv	NBI Item 10 - Code the minimum vertical clearance over the inventory route identified in Item 5, whether the route is on the structure or under the structure. For structures having multiple openings, clearance for each opening shall be recorded, but only the greatest of the minimum clearances for the two or more openings shall be coded regardless of the direction of travel. This would be the practical maximum clearance. When no restriction exists or when the restriction is 30 meters or greater, code 9999.
Horizontal Clearance	roadway	hclrinv	NBI Item 47 - The total horizontal clearance for the inventory route identified in Item 5 should be measured and recorded. The clearance should be the available clearance measured between the restrictive features and shoulders. When the restriction is 100 meters or greater, code 999. The purpose of this item is to give the largest available clearance for the movement of wide loads. Flush and mountable medians are not considered to be restrictions.
***Widths* Grouping**			
Approach Road	roadway	aroadwidth	NBI Item 32 - Code a 4-digit number to represent the normal width of usable roadway approaching the structure measured to

Control Name	Table Name	Column Name	Notes
			the nearest tenth of a meter. Usable roadway width will include the width of traffic lanes and the widths of shoulders. For structures with medians of any type and double-decked structures, this item should be coded as the sum of the usable roadway widths for the approach roadways. When there is a variation between the approaches at either end of the structure, record and code the most restrictive of the approach conditions.
Roadway	roadway	roadwidth	NBI Item 51 - Represents the most restrictive minimum distance between curbs or rails on the structure roadway.
Detours Grouping			
Length	roadway	bypasslen	NBI Item 19 - Indicate the actual length to the nearest kilometer of the detour length. The detour length should represent the total additional travel for a vehicle which would result from closing of the bridge.
Speed	roadway	det_speed	The speed limit for detouring vehicles.
Accidents Grouping			
Count	roadway	acc_count	Average annual accident count for the roadway.
Rate	roadway	acc_rate	Accident rate in number of accidents per 100m VMT. Currently not used, but future safety management system interfaces could provide this information and lead to improved user cost models.
Roadway Notes Grouping			
Roadway Notes	roadway	notes	Roadway notes.
Agency Roadway Fields Grouping			
Agency Roadway Field 1	roadway	userrwkey1	Agency-defined field 1.
Agency Roadway Field 2	roadway	userrwkey2	Agency-defined field 2.
Agency Roadway Field 3	roadway	userrwkey3	Agency-defined field 3.
Agency Roadway Field 4	roadway	userrwkey4	Agency-defined field 4.
Agency Roadway Field 5	roadway	userrwkey5	Agency-defined field 5.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.

Table header: *Inspection > Inventory > Roads* **Control Information**

Inspection > Inventory > Roads Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Agency Bridge Items

The *Inspection > Inventory > Agency Bridge Items* subtask is an entire page of blank fields that the agency can define and use for any purpose.

Agency Bridge Items Page Controls

If changes have been made to the subtask, those changes must be saved before leaving the current page in order for the changes to be maintained.
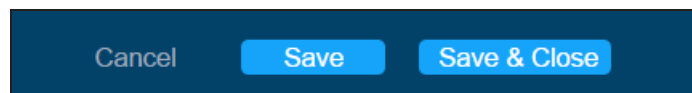
The *Save* button saves the changes made on the current subtask.

The *Save & Close* button saves the changes made on the current subtask and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made on the current subtask and returns the user to the *Bridges > View List* task.

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Inspection > Inventory > Agency Items Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Agency Bridge Item (1 through 15)	bridge	userkey1 (replace "1" with 2-15)	This field is available for agencies to define and use for any purpose.

Inspection > Inventory > Agency Items Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Created On	bridge	createdatetime	The date and time the original record was made on the form.
Created By	bridge	createuserkey	The user who made the original record.
Last Updated	bridge	modtime	The date and time of the last update to the record on the form.
Updated By	bridge	userkey	The user who made the last update to the record.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

The *Inspection > Schedule* task allows the user to schedule the upcoming inspections for the selected bridge.

Note: The *Inspection > Schedule* task has changed from previous versions of BrM. In the past, the *Current Date* text-boxes displayed the previous inspection date, not the date of the inspection that was just performed/is being performed. In BrM 5.2.3, the *Current Date* textboxes display the inspection that was just performed/is being performed, therefore making it easier to utilize the *Current Date* and *Frequency* textboxes to calculate the *Next Date* inspection.

Summary

The *Summary* grouping contains the information that was entered when the new inspection was created. All of the information in the *Summary* grouping can be modified except for the read-only checkboxes in the *Types of Inspection Performed* grouping.

Schedule

The *Schedule* grouping is used to determine the selected bridge's upcoming inspection schedules based on inspection type.

Required

Check the *Required* checkboxes of the inspections that are required for the selected bridge. Routine and element inspections are required NBI inspections and therefore do not have checkboxes.

Current Date

The *Current Date* textbox displays the date of the most recent inspection for the selected bridge based on type of inspection. The date can be entered manually or the [icon] icon can be used to select a date. Inspection types that have not been performed on the selected bridge will default to "01/01/1901."

*Note: As stated earlier, BrM 5.2.3's *Current Date* textboxes display the inspection that was just performed/is being performed.

If the inspection that was just performed/is being performed does not include all of the inspection types, those inspection types' *Current Date* textboxes will populate with their most recent inspection, if applicable.

Frequency
The *Frequency* textbox is used to determine the number of months between inspections based on type of inspection.

Next Date
The *Next Date* textbox displays the calculated next inspection date based on the *Current Date* and *Frequency* information. If the calculated date is not the desired date, the date can be entered manually or the [icon] icon can be used to select a date.

Inspection Resources

The *Inspection Resources* grouping is used to indicate the next inspector for the bridge, the bridge group, and the crew hours necessary to complete the inspection.

Schedule Page Controls
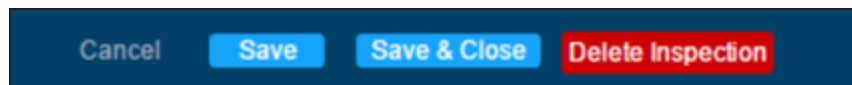
The *Save* button saves the changes made to the schedule.

The *Save & Close* button saves the changes made to the schedule and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the schedule and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

		Inspection > Schedule Control Information	
Control Name	**Table Name**	**Column Name**	**Notes**
Summary Grouping			
Date Entered	inspevnt	date_entered	The date the record was entered.
Inspection Date	inspevnt	inspdate	The date of the inspection.
Inspector	inspevnt	inspusrguid	The user that performed the inspection.
Primary Type	inspevnt	insptype	Indicates the primary type of inspection that was performed.
Inspection Group	inspevnt	inspectcontrolid	An agency-defined group for the bridge inspection. Intended for use in grouping together inspections. Non-NBI field.

Inspection > Schedule Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Entered By	inspevnt	entered_by_gd	The user that entered the inspection into the system.
Engineer of Record	inspevnt	engineer_of_record	The engineer of record for the inspection.
Types of Inspection Performed **Grouping**			
Routine	inspevnt	nbinspdone	Checked if a routine inspection was performed.
Element	inspevnt	elinspdone	Checked if an element inspection was performed.
Fracture Critical	inspevnt	fcinspdone	Checked if a fracture critical inspection was performed.
Underwater	inspevnt	uwinspdone	Checked if an underwater inspection was performed.
Other Special	inspevnt	osinspdone	Checked if an other special inspection was performed.
Schedule **Grouping**			
Routine Current Date	inspevnt	lastinsp	NBI Item 90: Record the month and year that the last routine inspection of the structure was performed. This inspection date may be different from those recorded in Item 93.
Routine Frequency	inspevnt	brinspfreq	NBI Item 91: The routine inspection frequency (in months).
Routine Next Date	inspevnt	nextinsp	The date of the next scheduled routine inspection. This will automatically populate based on the current date and frequency.
Element Current Date	inspevnt	elinspdate	Record the month and year that the last element inspection of the structure was performed.
Element Frequency	inspevnt	elinspfreq	The element inspection frequency (in months).
Element Next Date	inspevnt	elnextdate	The date of the next scheduled element inspection. This will automatically populate based on the current date and frequency.
FC Required	inspevnt	fcinspreq	Specifies whether fracture critical inspections are required for the structure.
FC Current Date	inspevnt	fclastinsp	NBI Item 93A: Record the month and year that the last fracture critical inspection of the structure was performed. This inspection date may be different from that recorded in Item 90.
FC Frequency	inspevnt	fcinspfreq	NBI Item 92AB: The fracture critical inspection frequency (in months).
FC Next Date	inspevnt	fcnextdate	The date of the next scheduled fracture critical inspection. This will automatically populate based on the current date and frequency.
UW Required	inspevnt	uwinspreq	Specifies whether underwater inspections are required for the structure.
UW Current Date	inspevnt	uwlastinsp	NBI Item 93B: Record the month and year that the last underwater inspection of the structure was performed. This inspection date may

Control Name	Table Name	Column Name	Notes
			be different from that recorded in Item 90.
UW Frequency	inspevnt	uwinspfreq	NBI Item 92AB: The underwater inspection frequency (in months).
UW Next Date	inspevnt	uwnextdate	The date of the next scheduled underwater inspection. This will automatically populate based on the current date and frequency.
OS Required	inspevnt	osinspreq	Specifies whether other special inspections are required for the structure.
OS Current Date	inspevnt	oslastinsp	NBI Item 93C: Record the month and year that the last other special inspection of the structure was performed. This inspection date may be different from that recorded in Item 90.
OS Frequency	inspevnt	osinspfreq	NBI Item 92AB: The other special inspection frequency (in months).
OS Next Date	inspevnt	osnextdate	The date of the next scheduled other special inspection. This will automatically populate based on the current date and frequency.
Inspection Resources Grouping			
Next Inspector	bridge	nextinspid	Non-NBI field maintained by the system by default. BrM automatically fills in this field by copying the user key of the person doing the current inspection. An inspector may change this assignment if desired.
Bridge Group	bridge	bridgegroup	An agency-defined group for the bridge. Intended for use in grouping together bridges for inspection purposes. Non-NBI field.
Crew Hours	bridge	crewhrs	The number of crew hours required for a regular inspection for the structure.
Flagger Hours	bridge	flaggerhrs	The number of flagger hours required for a regular inspection for the structure.
Helper Hours	bridge	helperhrs	The number of helper hours required for a regular inspection for the structure.
Snooper Hours	bridge	snooperhrs	The number of snooper hours required for a regular inspection for the structure.
Special Crew Hours	bridge	spcrewhrs	The number of special crew hours required for a regular inspection for the structure.
Special Equipment Hours	bridge	spequiphrs	The number of special equipment hours required for a regular inspection for the structure.
Schedule Notes Grouping			
Inspection Schedule Notes	inspevnt	schedule_notes	Notes relating to the current inspection's scheduling.

Control Name	Table Name	Column Name	Notes
Inspection > Schedule Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

The *Inspection > Work* task allows the user to set up and track work candidates for the selected bridge. The work candidates can then be viewed and utilized in the *Analysis* and *Projects* tabs.

Work Candidates

The *Inspection > Work > Work Candidates* subtask is used to create work candidates for the selected bridge.

The Work Candidates grid displays all of the work candidates that have been entered for the selected bridge. The **Show All** and **Show Open** radio buttons toggle between showing all of the bridge's work candidates and only the work candidates that have not been completed. The **Source** dropdown allows the user to filter the Work Candidaes grid based on the source of the work candidate.

*Note: The Work Candidates grid was not sortable in previous versions of BrM, but version 5.2.3 allows the user to sort the grid by clicking on any of the grid columns.

Selecting a work candidate from the grid by clicking the ▶ icon will reveal the *Type of Work* grouping where the specifications for the work candidate can be changed.

Click the ✕ icon to delete the work candidate.

To add a new work candidate for the selected bridge, click the *Add New* button.

Type of Work

The *Type of Work* grouping is used to determine the details for the selected or new work candidate.

Candidate ID

The *Candidate ID* textbox indicates the name or ID of the work candidate. When a new work candidate is created, this textbox will automatically populate. It can be helpful to change the automated name to something more recognizable because the work candidate will be viewable on other pages, such as the *Analysis > Work Candidates > Bridge Analysis* subtask.

Structure Unit

The *Structure Unit* dropdown allows the user to determine whether the current work candidate is for a specific structure unit within the bridge or if it is for all structure units.

Action Type

The *Action Type* dropdown is an optional field used to filter the available selections in the *Action* dropdown to only include actions within the selected action type. By default, the *Action Type* dropdown will display "None" upon opening the *Work Candidates* subtask.

New action types can be created on the *Admin > General Config > Parameters* task using the pon_flexactions_sets - flex_type parameter, and then those action types can be linked to actions on the *Admin > Modeling Config > Action Defs* task.

*Note: Default action types are included in the pon_flexactions_sets - flex_type parameter, but they will not show up in the *Action Type* dropdown on the *Work Candidates* subtask unless they are linked to at least one action.

Action

The *Action* dropdown is used to determine what action will be performed when completing the work candidate.

Date Recommended

The *Date Recommended* textbox indicates the date that the user recommended the work to be performed on the bridge. This will, in most cases, be the same date as the inspection. Because of this, the textbox will default to the currently selected inspection's date.

Priority

The *Priority* dropdown allows the user to determine the priority level of the work candidate so that the higher priority candidates can be recognized.

The priority levels can be edited using the **pon_insp_workcand.iwc_agency_priority** parameter on the *Admin > General Config > Parameters* task.

Date Completed

The *Date Completed* textbox indicates the date that the work candidate was completed.

*Note: If a work candidate has been completed, the *Date Completed* textbox must be filled out in order for the work candidate not to show up in the Work Candidates grid when the *Show Open* radio button is selected.

Target Year

The *Target Year* textbox is used to indicate the year in which the work candidate is planned to be completed.

Assigned

The *Assigned* dropdown is used to indicate the status of the work candidate by selecting whether or not the work has been assigned.

Work Assignment

The *Work Assignment* dropdown allows the user to select whether the work will be completed by the agency or by a contractor.

Status

The *Status* dropdown is used to determine the current status of the work candidate.

The statuses can be edited using the **pon_insp_workcand.iwc_status** parameter on the *Admin > General Config > Parameters* task.

Source

The *Source* dropdown is used to indicate the source of the work candidate or who requested it.

The sources can be edited using the **pon_insp_workcand.source** parameter on the *Admin > General Config > Parameters* task. The default entry for the field will be the default parameter value.

Work Estimates

The *Work Estimates* grouping is used to estimate the cost of the work. The estimate can be calculated by completing the *Estimated Quantity* and *Cost Per Unit* textboxes, then clicking the *Calculate* button. This calculated total will then appear in the *Estimated Cost* textbox.

*Note: In previous versions of BrM, the *Cost Per Unit* textbox did not allow for decimals to be entered. This had the potential to create significant miscalculations for very large estimated quantities. The ability to add decimals has been included in version 5.2.3 to help ensure more accurate calculations.

While the calculation can be used, the *Estimated Cost* textbox can also be modified without a calculation.

Work Candidate Page Controls
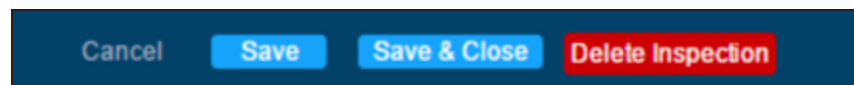
The *Save* button saves the changes made to the work candidates.

The *Save & Close* button saves the changes made to the work candidates and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the work candidates and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

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Control Name	**Table Name**	**Column Name**	**Notes**
Inspection > Work > Work Candidates **Control Information**			
Type of Work **Grouping**			
Candidate ID	pon_insp_ workcand	iwc_work-cand_name	The name/ID of the work candidate.
Structure Unit	pon_insp_ workcand	structure_ unit_gd	The structure unit of the selected structure relevant to the work candidate. "AllStrUnits" can be selected if the work candidate applies to the entire structure.
Action	pon_insp_ workcand	pon_flex-actions_sets_ gd	Indicates the action associated with the work candidate.
Date Recommended	pon_insp_ workcand	iwc_work_ rec_date	By default, the date that the user creates the work candidate.
Priority	pon_insp_ workcand	iwc_agency_ priority	Used to determine the priority level of the work candidate.
Date Completed	pon_insp_ workcand	iwc_work-comp_date	The date that the work candidate was completed.
Target Year	pon_insp_ workcand	iwc_target_ year	The year in which the work candidate is planned to be completed.
Assigned	pon_insp_ workcand	iwc_assigned	Determines whether or not the work candidate has been assigned.
Work Assignment	pon_insp_ workcand	iwc_work_ assigned	Determines to whom the work candidate will be assigned.
Status	pon_insp_ workcand	iwc_status	Determines the current status of the work candidate.
Source	pon_insp_ workcand	source	Indicates the source of the work candidate.
Notes	pon_insp_ workcand	iwc_notes	Notes for the work candidate.
Work Estimates **Grouping**			
Estimated Quantity	pon_insp_ workcand	iwc_est_qty	The estimated quantity of units needed to perform the work.
Cost Per Unit	pon_insp_ workcand	iwc_cost_per_ unit	The estimated cost per unit of performing the work.
Estimated Cost	pon_insp_ workcand	iwc_est_cost	The entered or calculated estimated cost to complete the work candidate.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date	inspevnt	inspkey	The inspection key. A unique identifier for the inspections

Inspection > Work > Work Candidates Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Selection			on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Project Information

The *Inspection > Work > Project Information* subtask is used to enter NBI project data for the selected bridge. The NBI items include 75A, 75B, 76 and 94-97.

Project Information Page Controls

The *Save & Close* button saves the changes made to the project information and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the project information and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

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Inspection > Work > Project Information Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Proposed Work	bridge	propwork	NBI Item 75A - The information to be recorded for this item will be the type of work proposed to be accomplished on the structure to improve it to the point that it will provide the type of service needed.
Work to be Done By	bridge	workby	NBI Item 75B - Determines who will be responsible for performing the project work.
Improvement Length	bridge	implen	NBI Item 76 - Code a 6-digit number that represents the length of the proposed bridge improvement to the nearest tenth of a meter-- with an assumed decimal point. For replacement or rehabilitation

			Inspection > Work > Project Information Control Information
Control Name	**Table Name**	**Column Name**	**Notes**
			of the entire bridge, the length should be back to back of back-walls of abutments or from pavement notch to pavement notch. For replacement or rehabilitation of only part of the structure, use the length of the portion to be improved.
Improvement Cost	bridge	nbiimpcost	NBI Item 94 - The estimated cost of the proposed bridge or major structure improvements in dollars. This cost shall include only bridge construction costs, excluding roadway, right of way, detour, demolition, preliminary engineering, etc.
Roadway Improvement Cost	bridge	nbirwcost	NBI Item 95 - The cost of the proposed roadway improvement in dollars. This shall include only roadway construction costs, excluding bridge, right-of-way, detour, extensive roadway realign-ment costs, preliminary engineering, etc.
Total Cost	bridge	nbitotcost	NBI Item 96 - The total project cost in dollars, including incid-ental costs not included in Items 94 and 95. This item should include all costs normally associated with the proposed bridge improvement project. The Total Project Cost will therefore usu-ally be greater than the sum of Items 94 and 95. Do not use this item for coding maintenance costs.
Year of Estimate	bridge	nbiyrcost	NBI Item 97 - Record and code the year that the costs of work estimated in Items 94, 95, and 96 were based upon.
			Inspection Header
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
			Inspection Footer
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

The *Inspection > Multimedia* task allows the user to upload any file type to the selected bridge or bridge inspection. There are no restrictions on the type of file that can be uploaded.

Multimedia Grid

The Multimedia grid contains all of the files that have been uploaded for the selected bridge or inspection report - determined by the *Context* dropdown.

Context

The *Context* dropdown has two purposes:

1. It toggles the Multimedia grid between displaying the overarching files for the selected bridge and files that are specifically for the bridge's currently selected inspection report.
2. It determines the purpose of newly uploaded files. If "BRIDGE" is selected in the dropdown, uploading a new file will be for the bridge overall. If "INSPECTION" is selected in the dropdown, uploading a new file will be for the bridge's currently selected inspection report only.

Root Directory

The root directory is the server location for the multimedia files and is displayed next to the *Context* dropdown.

Grid Description

Agency Type

The *Agency Type* dropdown is used to indicate the type of file. The available options can be modified on the *Admin > General Config > Parameters* task.

Report Flag

The *Report Flag* checkbox is currently used only for agency customizations to the database.

Sort Order

The *Sort Order* textbox determines the order in which the files are listed. If there are images, the first image in the grid will appear as the first image when the bridge is highlighted on the Bridge List.

Location

The *Location* textbox determines the file's location on the server and can be modified.

Agency Items

The *Agency Item* textboxes are agency specific fields to be used as desired.

Unlink

The ✕ icon unlinks the file from the bridge or inspection report. However, it does not delete the file from the server.

Notes

The *Notes* grouping can be used to enter notes for the selected file.

Document Information

The *Document Information* grouping is hidden until a file is selected from the Multimedia grid. It displays details about the file including the file name, location, size, and more.

For image files, an image preview will be displayed. If the file name cannot be found at the file location, an "Image not found" notice will appear in place of the image preview.
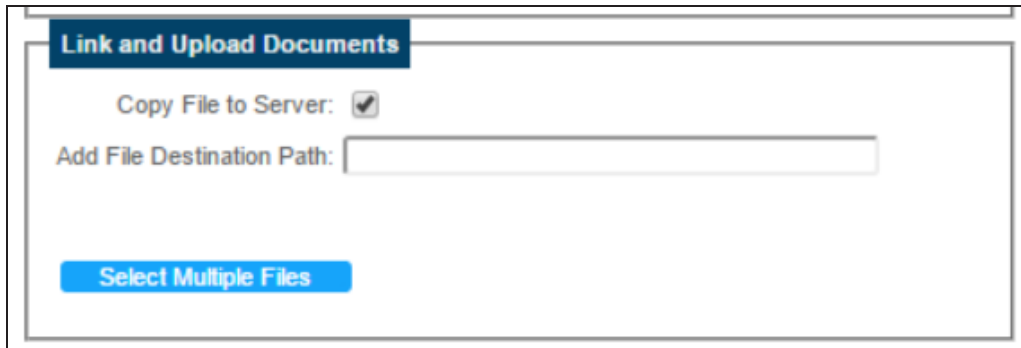
Text files, such as PDF or doc, will not display previews.

Unlink

The *Unlink* button acts in the same was as the ✕ icon in the Multimedia grid. It unlinks the selected file from the bridge or inspection report but does not delete the file from the server.

Link and Upload Documents

The *Link and Upload Documents* grouping is used to select the files to upload for the bridge or inspection report.

Copy File to Server

The *Copy File to Server* checkbox determines whether or not the file(s) being uploaded will be copied to the server. It is highly recommended that all files be copied to the server.

Add File Destination Path

The *Add File Destination Path* textbox is used to enter the server location for the files being uploaded.
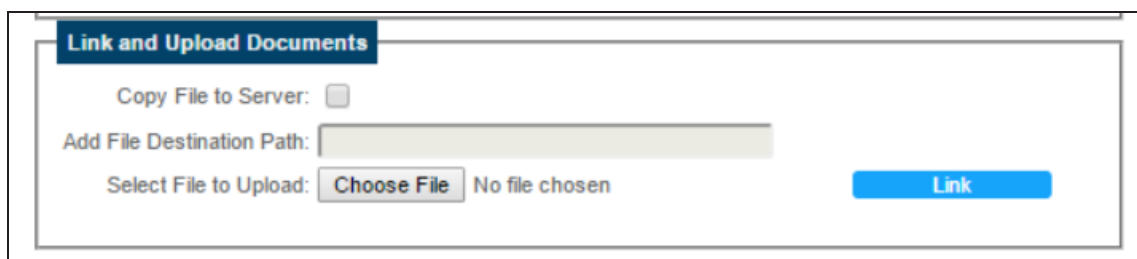
Select Multiple Files

The *Select Multiple Files* button is used to select the files to be uploaded. Clicking the button allows the user to search through the files on their computer. Multiple files can be selected at once.

Local Files

Uploading local files has been disabled in BrM for security purposes. If the functionality is restored, the process is as follows:

Uncheck the *Copy File to Server* checkbox.

The *Add File Destination Path* textbox will then be greyed out, the *Select Multiple Files* button will be replaced with a *Choose File* button, and the *Link* button will appear.

To select a file, click the *Choose File* button and navigate the computer's files to locate the desired file. Once a file is selected, that file can be linked to the selected bridge or inspection report by clicking the *Link* button.

Multimedia Page Controls
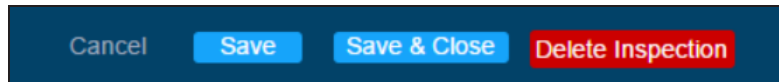
The *Save* button saves the changes made to the files.

The *Save & Close* button saves the changes made to the files and returns the user to the *Bridges > View List* task.

The *Cancel* button cancels the changes made to the files and returns the user to the *Bridges > View List* task.

The *Delete Inspection* button deletes the current inspection for the selected bridge.

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Control Name	Table Name	Column Name	Notes
Inspection > Multimedia Control Information			
Multimedia Grid			
Agency Type	MULTIMEDIA	AGENCYTYPE	Indicates the type of file uploaded.
Sort Order	MULTIMEDIA	USERKEY5	Determines the order in which the files are listed in the grid.
Agency Item 1	MULTIMEDIA	USERKEY1	This field is available for agencies to define and use for any purpose.
Agency Item 2	MULTIMEDIA	USERKEY2	This field is available for agencies to define and use for any purpose.
Agency Item 3	MULTIMEDIA	USERKEY3	This field is available for agencies to define and use for any purpose.
Agency Item 4	MULTIMEDIA	USERKEY4	This field is available for agencies to define and use for any purpose.
Notes **Grouping**			
Notes	MULTIMEDIA	NOTES	Notes for the selected image.
Document Information **Grouping**			
File	MULTIMEDIA	FILEREF	The file name of the selected file.
Location	MULTIMEDIA	FILELOC	Indicates where the file is being stored.
Created	MULTIMEDIA	CREATEDATETIME	The date and time the file was uploaded.
Size	MULTIMEDIA	SIZE	The size of the uploaded file.
Status	MULTIMEDIA	STATUS	The availability status of the file.
Modified	MULTIMEDIA	MODTIME	The date and time the file was modified.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.

Inspection > Multimedia Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Facility Carried	bridge	facility	NBI Item 7: The facility being carried by the structure shall be recorded and coded. In all situations this item describes the use on the structure.
Inspection Date Selection	inspevnt	inspkey	The inspection key. A unique identifier for the inspections on a particular structure that includes the date of the inspection.
Type	inspevnt	insptype	The primary type of inspection performed.
Inspection Footer			
Status	inspevnt	inspstat	The current status of the selected inspection.
Review Needed	inspevnt	rev_req	Indicates whether or not a review of the inspection is required.
Approved By	inspevnt	inspname	The name of the user that approved the inspection report.

Assessments

The *Inspection > Assessments* task allows the user to create risk assessments for the selected bridge.

Identified Risks

The *Identified Risks* grouping contains a grid with all of the risks that have been identified for the selected bridge.

Add New Assessment

To add a new assessment, click the *Add New Assessment* button. The following popup will appear:

Assessment Type

Select the desired risk assessment from the *Assessment Type* dropdown.

Assessment Date

The *Assessment Date* textbox indicates the date the assessment was performed. By default, the field will populate with the current date.

Inspection Key
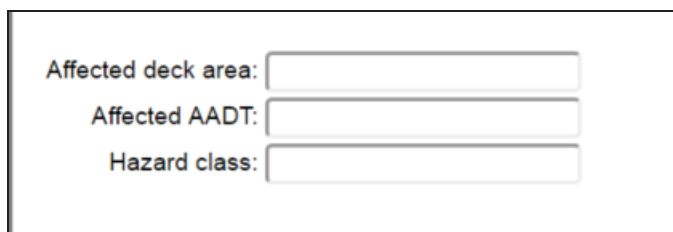
The *Inspection Key* dropdown indicates the inspection report to which the assessment is tied. By default, the dropdown will populate with the currently selected inspection report.

Workflow Status

The *Workflow Status* dropdown indicates how the assessment is entered/the status of the assessment:

- **Manual** - The assessment was entered manually.
- **Calculated** - The assessment was calculated by a formula.
- **Verification Pending** - The assessment was entered manually and needs verified.
- **Obsolete** - The assessment is obsolete.

Affected Deck Area - Affected AADT - Hazard Class

```
Affected deck area: [              ]
   Affected AADT: [              ]
     Hazard class: [              ]
```

*Note: These fields are for informational purposes. They add additional data to the assessment but do not currently serve a function or impact any other areas of the software.

Likelihood of Extreme Event

The *Likelihood of Extreme Event* textbox allows the user to enter a value indicating the likelihood that an extreme event will occur.

The *Admin > Modeling Config > Assessment* subtask determines the maximum and minimum values for the scale. However, the textbox does not restrict the user to the maximum and minimum values established by the admin.

*Note: While the textbox can be used, the best practice is to leave it blank until the assessment is saved. This will allow the user to use the Risk Assessment Value grid to determine the Likelihood of Extreme Event value.

Consequences to Structure

The *Consequences to Structure* textbox allows the user to enter a value indicating the level of consequence to the structure if the event occurs.

The *Admin > Modeling Config > Assessment* subtask determines the maximum and minimum values for the scale. However, the textbox does not restrict the user to the maximum and minimum values established by the admin.

*Note: While the textbox can be used, the best practice is to leave it blank until the assessment is saved. This will allow the user to use the Risk Assessment Value grid to determine the Consequences to Structure value.

Assessment Final Value

The Assessment Final Value is the result of multiplying the Likelihood of Extreme Event by the Consequences to Structure. The *Assessment Final Value* textbox will not, however, automatically populate if a value is entered into both the *Likelihood of Extreme Event* and *Consequences to Structure* textboxes.

The *Admin > Modeling Config > Assessment* subtask determines the maximum and minimum values for the scale. However, the textbox does not restrict the user to the maximum and minimum values established by the admin.

Next Assessment Date

The *Next Assessment Date* textbox indicates the date the next assessment is scheduled to be performed.

Save/Cancel

Click the *Save* button to add the new assessment. This will take the user to the main page where they can use the Risk Assessment Value grid.

Click the *Cancel* button to cancel the addition of the new assessment.

Delete Assessment

To delete an assessment, select it from the grid in the *Identified Risks* grouping and click the *Delete* button.

Risk Details

The *Risk Details* grouping reveals all of the assessment's details once it is created. It contains all of the same fields as the Add New Assessment popup, but allows the user to utilize the Risk Assessment Value grid to complete the calculation.

Risk Assessment Value

The *Risk Assessment Value* grid can be used to calculate the assessment's final value by determining the Likelihood of Hazard and Consequences of Hazard then locating and selecting where they meet on the grid.

This selection will automatically populate the *Likelihood of Hazard*, *Consequences to Structure*, and *Assessment Final Value* textboxes below the grid.

Risk Details

All of the risk details are the same as those entered in the popup window when adding a new assessment. These details can all be changed.

For the *Affected Deck Area* textbox, using the *Metric* and *English* radio buttons at the top of the page will convert the entered value to square meters or square feet.

The only additional control is the *Description* textbox to be used for entering notes for the assessment.

Save

To save any changes made to the assessment, click the *Save* button.

_____

Inspection > Assessments Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Risk Details Grouping			
Vulnerability Type	pon_defs_ assessment	asmtdefkey	The type of risk assessment being performed.
Assessment Date	pon_ assessment	asmtdate	The date of the assessment. The database can store the entire history of assessments on the bridge, but only the most recent is used in the analysis.
Assessment Key/Date	inspevnt	inspdate	The key and date for the inspection the assessment is attached to.
Workflow Status	pon_ assessment	workflow_ status	The workflow status of the assessment. Currently an information-only field. <u>Verified</u> - Entered or checked manually. <u>Calculated</u> - Record was calculated by a formula. <u>Verification Pending</u> - A manual check is pending (required but not completed). <u>Obsolete</u> - The assessment is obsolete.
Affected Deck Area	pon_ assessment	affected_ deck_area	The percent of deck area affected. This allows for hazards to affect only a portion of the structure. Currently an information-only field.
Affected AADT	pon_ assessment	affected_aadt	The percent of AADT exposed to the hazard. Allows for hazards to affect only a portion of traffic flow. Currently an information-only field.
Hazard class	pon_ assessment	hazard_class	The classification of the structure into hazard zones or classes for the type of risk assessment represented.
Likelihood of Hazard	pon_ assessment	likelihood	A quantitative estimate or score for the likelihood of an extreme event. Display and editing are governed by pon_defs_assessment.flag_likelihood.
Consequences to Structure	pon_ assessment	consequences	A quantitative estimate or score for the consequences to the structure of an extreme event. Display and editing are governed by pon_defs_assessment.flag_consq.
Assessment Final Value	pon_ assessment	asmt_value	A quantitative estimate or score for the overall assessment. Display and editing are governed by pon_defs_assessment.flag_value.

Inspection > Assessments Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Next Assessment Date	pon_assessment	next_asmt_date	The date when the next assessment is to be undertaken. Currently an information-only field.
Description	pon_assessment	description	A description of the assessment.
Inspection Header			
Bridge	bridge	bridge_id	The agency bridge identification number that is used to identify structures on most screens and reports.
Facility Carried	bridge	facility	NBI Item 7: The facility carried by the structure.

Element Condition Ratings

The *Inspection > Element Condition Ratings* task displays a read-only history of both the NBI ratings and element conditions for the selected bridge. Users can utilize this page to view how a bridge's NBI ratings or element conditions have changed over time.

Inspection > Element Condition Ratings

Bridge 00001 — Facility Carried (007): SOUTH 2ND STREET — Inspection: 2014-08-13 (XPHZ) — Type: Regular NBI — Metric / English

NBI RATING HISTORY

Inspection Date	Inspection Type	Inspections Performed	Deck (58)	Super (59)	Sub (60)	Channel (61)	Culvert Rating (62)
8/13/2014	Regular NBI	NBI ELEM	4	5	6	6	N
8/30/2012	Regular NBI	NBI ELEM	6	6	6	6	N
11/5/2010	Regular NBI	NBI ELEM	6	6	6	6	N
12/8/2008	Regular NBI	NBI ELEM	6	6	6	6	N
8/4/2006	Regular NBI	NBI ELEM	7	6	6	6	N
9/27/2004	Regular NBI	NBI ELEM	7	6	6	6	N
8/17/2002	Regular NBI	NBI ELEM	7	7	7	7	N
6/22/2000	Regular NBI	NBI ELEM	7	7	7	8	N
2/1/1999	Regular NBI	NBI ELEM	7	7	7	8	N
2/1/1992	Regular NBI	NBI	–	–	–	–	–

ELEMENT CONDITION HISTORY

Elem	Str. Unit	Env	Description	Inspection	Quantity	Units	Qty. 1	Qty. 2	Qty. 3	Qty. 4
	1	Ben.		2/1/1999	1	each	1	0	0	0
7361	1	Mod.	Scour Carr. 361-6000	11/5/2010	1	each	0	1	0	0
	1	Mod.		12/8/2008	1	each	0	1	0	0
	1	Mod.		8/4/2006	1	each	0	1	0	0
	1	Mod.		9/27/2004	1	each	0	1	0	0
	1	Mod.		8/17/2002	1	each	0	1	0	0
	1	Mod.		6/22/2000	1	each	0	1	0	0
	1	Mod.		2/1/1999	1	each	0	1	0	0

|◄ ◄ 1 2 3 4 5 6 7 **8** ► ►| Page size: 10 ▼   78 items in 8 pages

Gateway

- The Gateway section of the manual addresses each of the tasks in BrM's *Gateway* tab. The *Gateway* tab provides the tools to import and export data between BrM and other systems.

Export

The *Gateway > Export* task allows the user to export the data determined on the *Admin > General Config > Export Options* task to various export files.

Export Controls

Selected Bridges
The Selected Bridges grid displays all of the bridges currently selected on the Bridge List. It is only visible when at least one bridge is selected.

Export What?
The *Export What?* dropdown is used to pick the type of export file that will be created. The options include: XML, non-compressed XML, PDI, custom PDI, a metric NBI file, and an NBE file.

The inputs for the NBI and NBE files are set, therefore the *Include:* dropdown is read only for those exports because no selection needs to be made from it.

If the NBE file is selected, a new option will appear in the *Export Which Bridges?* grouping.

Include:

The *Include:* dropdown is used to select one of the export options determined on the *Admin > General Config > Export Options* task. This is the information that will be exported from the selected bridges.

Validate Data

When "NBE XML" is selected from the *Export What?* dropdown, the *Validate Data* button will appear so the user can validate the selected bridges.

*Note: The *Validate Data* button will not appear for any selections other than "NBE XML."

Export Which Bridges?

The *Export Which Bridges?* radio buttons determine whether the exported file will include only the selected bridges or all of the bridges in the database.

If no bridges are currently selected on the Bridge List, the *Selected Bridges* radio button will be read only.

*Note: An additional radio button - "Only Bridges on the NHS" - appears when "NBE XML" is selected from the *Export What?* dropdown.

Export

Once the desired selections have been made, click the *Export* button to create the exported file.

Import

The *Gateway > Import* task allows the user to import various file types to the database.

Import Controls

Import What?
The *Import what?* dropdown allows the user to choose the type of file that will be imported. The options include PDI, NBI, and XML files.

Input File:
The *Input File:* field displays the file that has been selected. To select a file, click the *Select* button and locate the desired file.

Options
The *Options* grouping contains the options available for the import of an NBI File. It will be read only for PDI and XML files.

The *Update Only* checkbox will update the database based on the imported NBI file.

The *Create New Inspections* checkbox will create new inspections based on the imported NBI file.

The *Import UOM* radio buttons allow the user to choose which units to use for the import.

Import
Once the desired selections have been made, click the *Import* button to import the selected file.

The *Gateway > Check Out* task allows the user to check out bridges from the system. Checking out a bridge can be thought of as locking the bridge. It does not mean that updates cannot be made to the bridge once it's checked out, but rather that any updates made will have to be accepted once the bridge is checked back in.

Check Out Controls

Selected Bridges

The *Selected Bridges* grouping displays all of the bridges currently selected on the Bridge List. It is only visible when at least one bridge is selected.

Check Out What?

The *Check Out What?* dropdown is used to determine the file type that will be created with the check out.

Include:

The *Include:* dropdown is used to determine what information about the selected bridges will be checked out for the PDI file. This option is read only for custom PDI files.

Check Out Which Bridges?

The *Check Out Which Bridges?* radio buttons determine which bridges will be checked out. If no bridges are currently selected on the Bridge List, the *Selected Bridges* radio button will be read only.

Check Out

Once the desired selections have been made, click the *Check Out* button to check out the selected bridges.

***Note:** The following will occur if WARNONEDITFORCHECKEDOUTBRIDGE is set to "Y" on the *Admin > General Config > Options* task:*

When entering the Inspection module with a checked out bridge selected, a popup message will notify the user of the bridge's status and a ✅ *symbol will appear next to the bridge's ID in the Inspection module header.*

The *Gateway > Check In* task allows the user to check bridges back into the system. If a bridge has been modified while checked out, checking the bridge back in will take the user to the *Gateway > Override* task to determine if the changes to the bridge should be accepted.

Check-In Controls

Check-In Data

The *Check In What?* dropdown determines the type of file that will be checked in.

The Input File: *Choose File* button is used to select the check in file. This is the same file that was obtained when the bridge was checked out. If the file has been lost, there will be no way to override the changes that have occurred to the bridge since it was checked out.

Check In and Re-Check In

The *Check In* button is used to perform the initial check in of a checked out bridge.

The *Re-Check In* button is used to check in a bridge after the changes have been accepted on the *Gateway > Override* task, as indicated by the note under the button that reads: "Only check-in accepted conflicts."

Override

The *Gateway > Override* task allows the user to decide whether or not to accept the changes that have been made to a bridge since it's been checked out.

Override Controls

PDI Selection

Use the *PDI* dropdown to select the PDI to view. The name of the PDI will match that of the PDI that was checked in.

Display

Use the *Display* radio buttons to show either all of the rows or only the rows with changes that have been unaccepted. The table will indicate if there is nothing to display for the selected radio button.

Delete All Rows

The *Delete All Rows for this PDI File* button will delete all of the displayed rows in the list for the selected radio button.

- If the *Delete* button is clicked when the *All Rows* radio button is selected, all of the rows within the All Rows list will be transferred to the Unaccepted Rows list.

- If the *Delete* button is clicked when the *Unaccepted Rows* radio button is selected, all of the rows within the Unaccepted Rows list will be deleted.

If there are no more rows listed in both the All Rows list and the Unaccepted Rows list, the PDI will automatically be removed from the *Gateway > Override* task.

Accept, Accept All, and Close

The *Accept* button accepts all of the checked rows for the selected PDI. The changes that occurred to the bridge while checked out will be made permanent when the bridge is re-checked in to the system on the *Gateway > Check In* task.

The *Accept All* button accepts all of the displayed rows, regardless of check status, for the selected PDI. The changes that occurred to the bridge while checked out will be made permanent when the bridge is re-checked in to the system on the *Gateway > Check In* task.

Selecting the *Cancel* button cancels the currently selected PDI's changes (prior to being accepted) and returns the user to the All Rows list of the first PDI listed in the *PDI* dropdown.

Import/Export

The *Gateway > Tunnels > Import/Export* task allows the user to import and export tunnel data as well as to create new asset types.
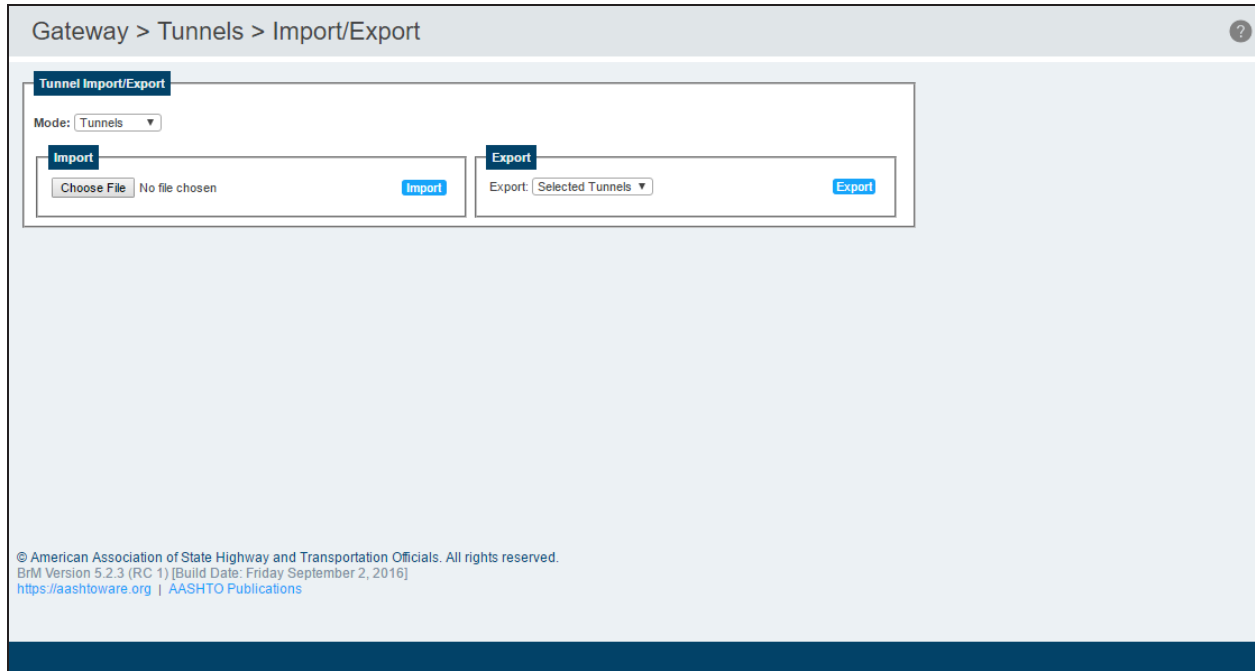
Tunnel Import/Export

The *Mode* dropdown determines whether the user will be importing/exporting tunnel data or whether they intend to work with new asset types.

For tunnel data using "NTIS XML":

Import

The *Import* grouping is used to import a file from the user's computer to the system. The import will accept XLS and XML files.

The XLS import option is meant mainly to simplify an agency's initial tunnel inventory import by allowing them to use the tunnel inventory data XLS file that was distributed to agencies in 2015.

The XML import option is for importing the generated XML file after it has been exported and needs imported to the system again.

To import a file, click the *Choose File* button to locate the desired file from the computer and then click the *Import* button.

Export

The *Export* grouping is used to export National Tunnel Inventory (NTI) data from the system into an XML file.

To export a file, begin by choosing which files to export using the *Export* dropdown. If "Selected Tunnels" is selected, only the tunnels selected on the *Tunnels > Tunnel List* task will be included in the data export.

Click the *Export* button to create the XML file.

Mode: Multi-Asset XML

The "Multi-Asset XML" selection in the *Mode* dropdown exists for users to create new asset types in the system.

However, creating a new asset type requires more than performing an import. Outside of this task, the user must create new database tables and web forms to support the new asset type.

There are two types of multi-asset import/export to select:

- **Definition -** This is the blueprint for the asset type that determines what data will be collected.
- **Data -** This is the actual data for the asset type.

*Note: Additional information will be provided on this topic as the scope of its abilities expand.

Analysis

- The Analysis section of the manual addresses each of the tasks in BrM's *Analysis* tab. The *Analysis* tab allows for an in-depth view of a structure's current condition and how it will be changed through deterioration and work candidates.

Work Candidates

The *Analysis > Work Candidates* task allows the user to analyze a bridge's deterioration and utility values before and after work candidates are performed.

Bridge Analysis

The *Analysis > Work Candidates > Bridge Analysis* subtask analyzes the effect of work candidates on the selected bridge. Only work candidates that have been added to the selected bridge on the *Inspection > Work > Work Candidates* subtask can be used on the *Bridge Analysis* subtask.

Bridge Summary

The top portion of the *Bridge Analysis* subtask contains a summary of the selected bridge including descriptive information, the scaled performance, sufficiency, conditions, and recently completed work.

Utility

The *Utility* grouping allows the user to change the utility weights profile used in the bridge analysis. Utility weights are created and edited on the *Admin > Modeling Config > Weights Profile*. The utility weights profiles can change both the performance of the overall bridge and the performance of the work candidates.

Use the *Utility Profile* dropdown to select the desired utility weights profile for the bridge analysis.

NBI Modeling

The *Bridge Analysis* task can estimate the bridge's future NBI component ratings. The *NBI Modeling* grouping allows the user to select how that estimate will be determined, either using an NBI converter profile or component level deterioration.
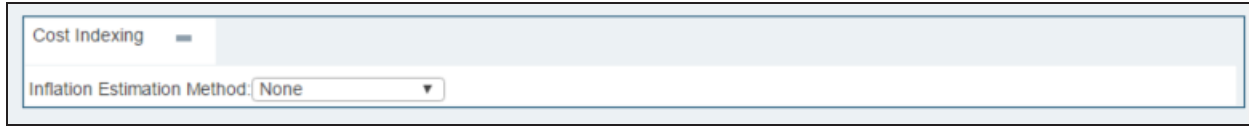

The *NBI Deterioration Method* dropdown allows the user to model the NBI component deterioration in two different ways:

- **NBI Converter** - This option allows the user to select an NBI converter profile (created on the *Admin > Modeling Config > NBI Conversion Profiles* task) to forecast the element ratings.
- **Component-Level Deterioration** - This option uses the component-level deterioration models established on the *Admin > Modeling Config > NBI Deterioration Models* subtask.

The difference between the two NBI deterioration method types can be viewed in the *Deterioration Charts* and *Effects on Each Utility Criterion* groupings.

Work Candidates Grid

The Work Candidates grid contains all of the work candidates that have been added to the selected bridge. In order for work candidates to appear on the *Bridge Analysis* subtask, the following steps must be taken on other pages throughout the software:

1. Add a benefit group via *Admin > Modeling Config > Benefit Group*.
2. Link the benefit group to specific actions via *Admin > Modeling Config > Action Defs*.
3. Add work candidates and assign them to actions for a specific bridge via *Inspection > Work > Work Candidates*.

The Work Candidates grid shows the bridge's base utility and current values for utility, condition, mobility, and risk with the difference between the current and predicted values shown in parenthesis. It also reveals the estimated cost to complete the work candidate, the estimated benefit of the action for the cost, the year targeted to complete the work candidate, and the interval (in years) to repeat the work candidate.

The only editable fields in the Work Candidates grid are the *Cost*, *Target Year*, and *Repeat Interval* textboxes:

- **Cost** - The estimated cost of completing the work candidate.
- **Target Year** - The year in which the work candidate is planned to be completed.
- **Repeat Interval** - The recommended interval of time for repeating the work candidate in the future.

Checking the *Select* checkbox for one or more candidates in the grid updates the *Effects on Each Element, Deterioration Charts, Effects on Each Utility Criterion*, and *Deterioration Results* groupings. The groupings will update each time a work candidate is selected/unselected.

Add to New Project

The *Add to New Project* button can be used to create a new project by checking the desired work candidates from the grid and then clicking the button. This will take the user to the *Projects > Create/Edit Project* task. Projects are a way for agencies to organize and plan related work on specific bridges.

Add New Group

The *Add New Group* button can be used to create a new work candidate comparison group or add work candidates to an existing work candidate comparison group by checking the desired work candidates from the grid and then clicking the button. Work candidate groups are used to group together work candidates that represent a work plan and then compare the different work plans for the selected bridge. With one or more work candidates selected, clicking the *Add New Group* button will reveal the following popup:
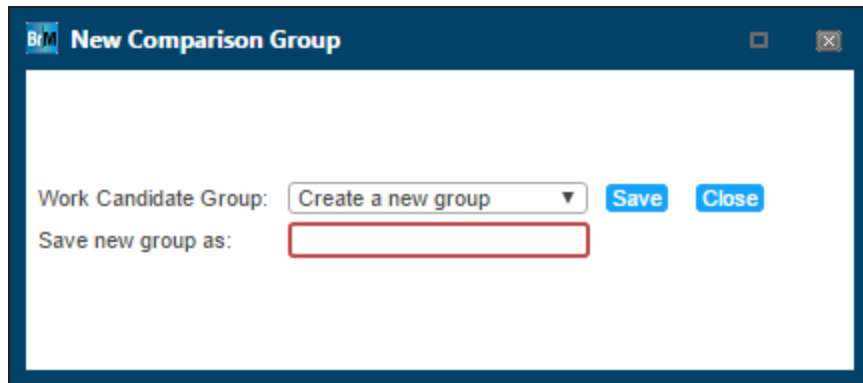
To add the selected work candidates to an existing comparison group, select the comparison group from the *Work Candidate Group* dropdown, then click the *Save* button.

To create a new comparison group, leave "Create a new group" selected and use the *Save New Group As* textbox to name the new comparison group, then click the *Save* button.

The work candidate comparison groups can then be compared on the *Analysis > Work Candidates > Comparison Groups* subtask.

Deterioration Charts

The *Deterioration Charts* grouping contains bridge and element graphs that display the deterioration modeling with and without the selected work candidates.
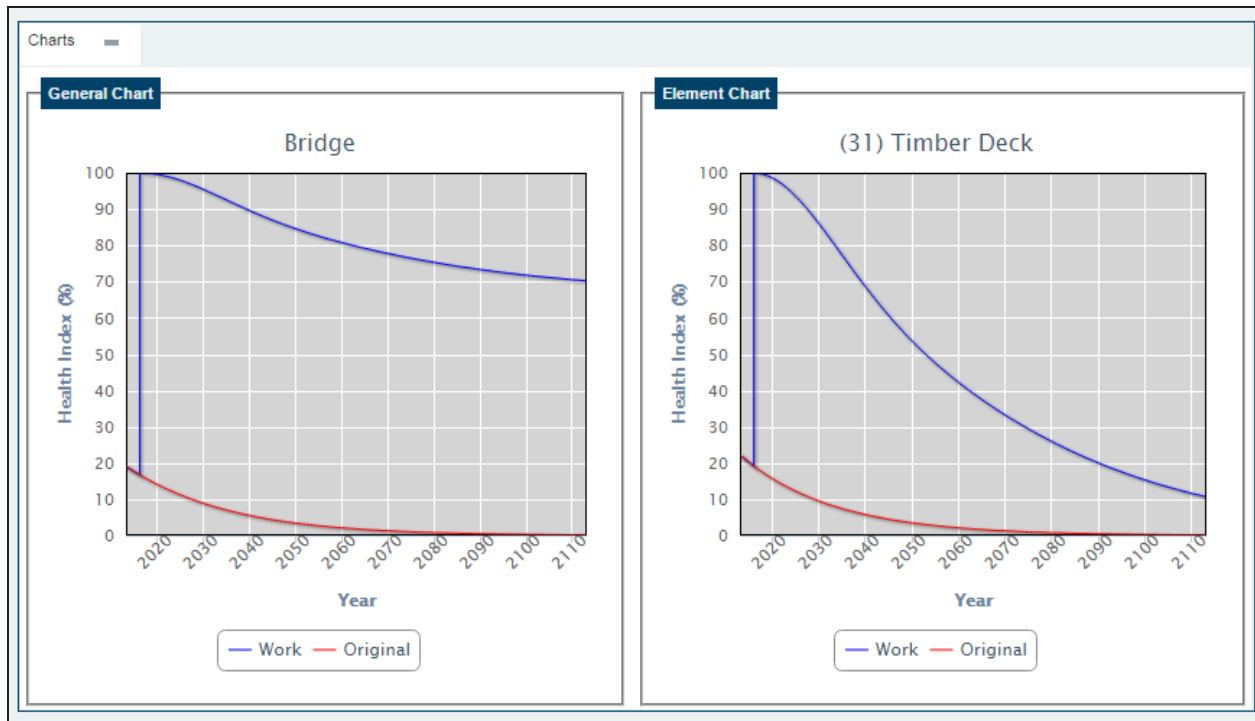
Each graph will have two curves:

- **Red** - The original deterioration
- **Blue** - The deterioration with the selected work candidates being performed at the designated intervals

Depending on the effect of the work candidate and the interval at which it is being performed, the blue curve should deteriorate at a slower rate than the red curve and should have periodic spikes of improvement. Clicking on the name of the curve within the key - Work or Original - will remove that curve from the graph until the name is clicked again.

Effects on Each Element

The *Effects on Each Element* grouping contains a grid that displays the effects of the selected work candidates on individual elements. The grid uses a color-coded system to display the elements' current conditions and then the effect of the selected work candidates on them.

- **Green** - Condition State 1
- **Yellow** - Condition State 2
- **Orange** - Condition State 3
- **Red** - Condition State 4

Checking the *Show Changed* checkbox updates the grid to show only the elements that have changed due to the work candidates.

Elements with a ">" next to them can be expanded to reveal the protective systems and defects associated with them. Selecting an element or protective system will display the expected deterioration of the element in the Element graph in the *Deterioration Charts* grouping. Defects are not currently incorporated into deterioration calculations.

Effects on Each Utility Criterion

The *Effects on Each Utility Criterion* grouping contains a grid that displays the effect the selected work candidates have on the bridge's utility criteria. The Before WC and After WC columns allow the user to compare the before and after effects of the work candidate. The hierarchy displayed under Total Utility is determined by the criteria entered in the *Admin > Modeling Config > Utility* task.

Effects on Each Utility Criterion ▬

Year: 2016 (3 years after inspection)
Show Changed: ☐

Category name	Before WC	After WC
Total Utility	**66.96**	**72.71**
Condition	73.01	80.33
Deck	91	91
Element ratings	19.04	48.3
(12) Reinforced Concrete Deck	9.51	9.51
(31) Timber Deck - Wood Deck	12.23	100
(520) Deck/Slab Protection Systems	35.39	35.39
Substructure	91	91
Superstructure	91	91
Mobility	60.72	60.72
ADT	23.2	23.2
Bridge Posting	100	100
Percent of truck detoured.	34.2	34.2

Checking the *Show Changed* checkbox updates the grid to show only the criteria that have changed due to the work candidates.

Deterioration Results

The *Deterioration Results* grouping contains a grid to compliment the *Deterioration Charts* grouping by providing the deterioration values for every point on the deterioration chart.

Deterioration Results				
Year	**Bridge Age**	**Original H.I.**	**Work H.I.**	**H.I. Diff.**
2013	7	19.05	19.05	0.00
2014	8	18.23	18.23	0.00
2015	9	17.45	17.45	0.00
2016	10	16.69	100.00	83.31
2017	11	15.97	99.97	84.00
2018	12	15.27	99.87	84.60
2019	13	14.60	99.72	85.12
2020	14	13.96	99.52	85.56
2021	15	13.34	99.27	85.93
2022	16	12.75	98.97	86.23
2023	17	12.18	98.63	86.45

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The calculated values are shown through the following columns:

- **Original H.I** - The original health index
- **Work H.I.** - The health index after the performance of the selected work candidates
- **H.I. Diff.** - The difference between the work and original health index

Bridge Analysis Page Controls

Even though the *Bridge Analysis* subtask is primarily for viewing purposes, the *Save*, *Save & Close*, and *Cancel* buttons exist because the *Cost*, *Target Year*, and *Repeat Interval* textboxes can be edited in the Work Candidates grid.

Clicking the *Save* button saves the changes made to the above-mentioned fields.

Clicking the *Save & Close* button saves the changes made to the above-mentioned fields and takes the user to the *Projects > Project List* task.

Clicking the *Cancel* button cancels the changes made to the above-mentioned fields and takes the user to the *Projects > Project List* task.

Reverse Calculation

The *Analysis > Work Candidates > Reverse Calculation* subtask provides nearly the same functionality as the *Bridge Analysis* subtask but operates differently. The *Bridge Analysis* subtask analyzes only the work candidates that have been added to the selected bridge, while the *Reverse Calculation* subtask analyzes all of the possible actions that will positively affect the performance of the selected bridge based on its components and elements.

Bridge Summary

The top portion of the *Reverse Calculation* subtask contains a summary of the selected bridge including descriptive information, the scaled performance, sufficiency, conditions, and recently completed work.

NBI Modeling

The *Reverse Calculation* task can estimate the bridge's future NBI component ratings. The *NBI Modeling* grouping allows the user to select how that estimate will be determined, either using an NBI converter profile or component level deterioration.

NBI Modeling

NBI Deterioration Method: NBI Converter ▼   NBI Converter Profile: BrM Default ▼

The *NBI Deterioration Method* dropdown allows the user to model the NBI component deterioration in two different ways:

- **NBI Converter** - This option allows the user to select an NBI converter profile (created on the *Admin > Modeling Config > NBI Conversion Profiles* task) to forecast the element ratings.
- **Component-Level Deterioration** - This option uses the component-level deterioration models established on the *Admin > Modeling Config > NBI Deterioration Models* subtask.

The difference between the two NBI deterioration method types can be viewed in the *Deterioration Charts* and *Effects on Each Utility Criterion* groupings.

Actions Existing for Selected Bridge

The Actions Existing for Selected Bridge grid displays all of the actions that will positively affect the performance of the selected bridge based on its components and elements.

Actions Existing For Selected Bridge

Show all defined actions:

Sel.	Action	Base Utility	Utility (Change)	Condition (Change)	LifeCycle (Change)	Mobility (Change)	Risk (Change)	Cost	Benefit / Cost ($k)	Cost ($k) / Benefit	Target Year	Repeat Interval
	Last inspection	65.62	65.62 (0.00)	53.79 (0.00)	86.45 (0.00)	71.88 (0.00)	49.22 (0.00)	$0			2013	
☐	Preserve Super - Network	63.76	63.76 (0.00)	49.15 (0.00)	86.45 (0.00)	71.88 (0.00)	49.22 (0.00)	$3			2016	
☐	Rehab Deck - Network	63.76	66.07 (2.31)	60.91 (11.76)	78.46 (-7.99)	71.88 (0.00)	49.22 (0.00)	$1,822,092	.0013	$789	2016	
☐	Rehab Super - Network	63.76	60.85 (-2.91)	51.40 (2.25)	73.74 (-12.71)	71.88 (0.00)	49.22 (0.00)	$8,240,264	-.0004	-$2,832	2016	
☐	Rehab Sub - Network	63.76	64.62 (0.86)	50.77 (1.62)	87.17 (0.72)	71.88 (0.00)	49.22 (0.00)	$383,586	.0022	$446	2016	
☐	Replace Deck - Network	63.76	66.98 (3.22)	73.19 (24.04)	65.13 (-21.32)	71.88 (0.00)	49.22 (0.00)	$869,000	.0037	$270	2016	
☐	Rehab Culvert - Network	63.76	63.76 (0.00)	49.15 (0.00)	86.45 (0.00)	71.88 (0.00)	49.22 (0.00)	$3,022			2016	
☐	Replace Super - Network	63.76	69.45 (5.69)	62.26 (13.11)	87.93 (1.48)	71.88 (0.00)	49.22 (0.00)	$11,988,090	.0005	$2,107	2016	
☐	Replace Structure - Network	63.76	84.37 (20.61)	95.14 (45.99)	93.82 (7.37)	71.88 (0.00)	49.22 (0.00)	$52,140,002	.0004	$2,530	2016	
☐	Preserve Deck - Network	63.76	64.72 (0.96)	51.55 (2.40)	86.45 (0.00)	71.88 (0.00)	49.22 (0.00)	$10,044	.0956	$10	2016	
☐	205 Patch Concrete	63.76	64.53 (0.77)	50.54 (1.39)	87.17 (0.72)	71.88 (0.00)	49.22 (0.00)	$1,350	.5703	$2	2016	

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Add to New Project

Checking the *Show All Defined Actions* checkbox will reveal all actions relevant to the bridge regardless of whether or not the action will have a positive impact.

The Actions Existing for Selected Bridge grid shows the bridge's base utility and current values for utility, condition, mobility, and risk with the difference between the current and predicted values shown in parenthesis. It also reveals the estimated cost to complete the action, the estimated benefit of the action for the cost, the year targeted to complete the action, and the interval (in years) to repeat the action.

The only editable fields in the Actions Existing for Selected Bridge grid are the *Cost*, *Target Year*, and *Repeat Interval* textboxes:

- **Cost -** The estimated cost of completing the action.
- **Target Year -** The year in which the action is planned to be completed.
- **Repeat Interval -** The recommended interval of time for repeating the action in the future.

Checking the *Select* checkbox for one or more action in the grid updates the *Effects on Each Element, Deterioration Charts, Effects on Each Utility Criterion*, and *Deterioration Results* groupings. The groupings will update each time an action is selected/unselected.

Add to New Project

The *Add to New Project* button can be used to create a new project by checking the desired actions from the grid and then clicking the button. This will take the user to the *Projects > Create/Edit Project* task. Projects are a way for agencies to organize and plan related work on specific bridges.

Deterioration Charts

The *Deterioration Charts* grouping contains bridge and element graphs that display the deterioration modeling with and without the selected actions.
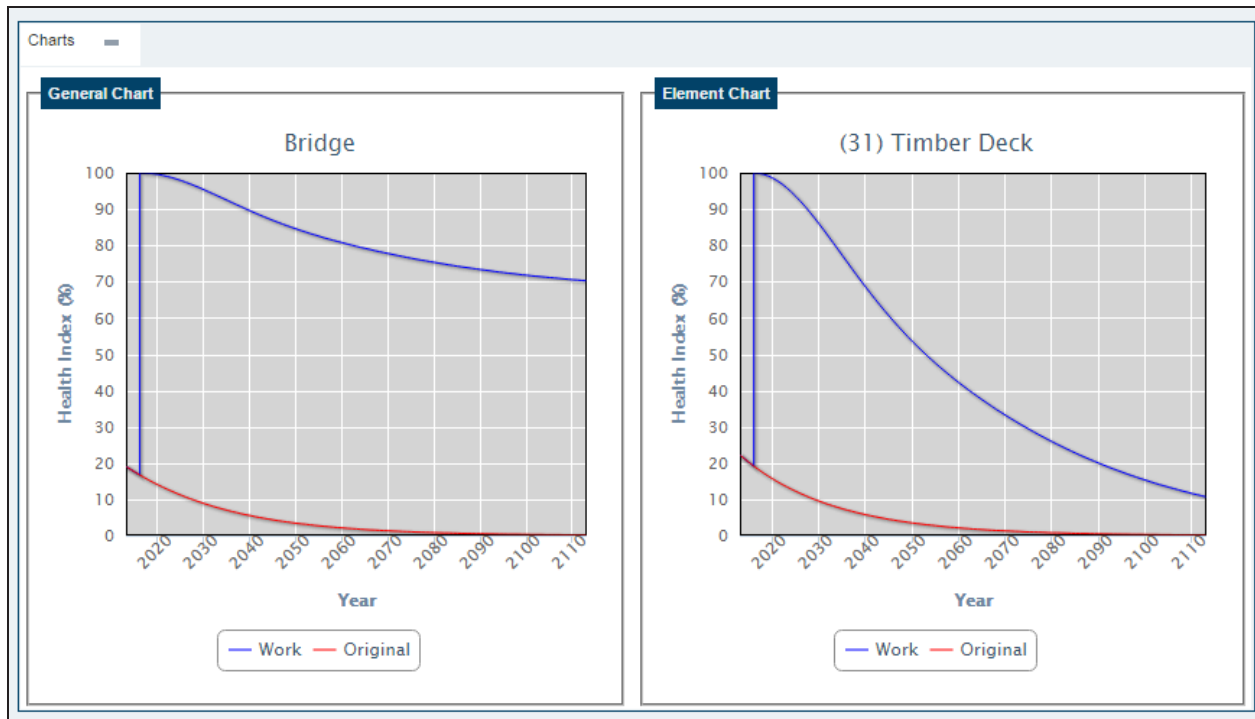
Each graph will have two curves:

- **Red** - The original deterioration
- **Blue** - The deterioration with the actions being performed at the designated intervals

Depending on the effect of the action and the interval at which it is being performed, the blue curve should deteriorate at a slower rate than the red curve and should have periodic spikes of improvement. Clicking on the name of the curve within the key - Work or Original - will remove that curve from the graph until the name is clicked again.

Effects on Each Element

The *Effects on Each Element* grouping contains a grid that displays the effects of the selected actions on individual elements. The grid uses a color-coded system to display the elements' current conditions and then the effect of the selected actions on them.

- **Green** - Condition State 1
- **Yellow** - Condition State 2
- **Orange** - Condition State 3
- **Red** - Condition State 4

Checking the *Show Changed* checkbox updates the grid to show only the elements that have changed due to the actions.

Elements with a ">" next to them can be expanded to reveal the protective systems and defects associated with them. Selecting an element or protective system will display the expected deterioration of the element in the Element graph in the *Deterioration Charts* grouping. Defects are not currently incorporated into deterioration calculations.

Effects on Each Utility Criterion

The *Effects on Each Utility Criterion* grouping contains a grid that displays the effect the selected actions have on the bridge's utility criteria. The Before WC and After WC columns allow the user to compare the before and after effects of the action. The hierarchy displayed under Total Utility is determined by the criteria entered in the *Admin > Modeling Config > Utility* task.

Effects on Each Utility Criterion

Year: 2016 (3 years after inspection)
Show Changed: ☐

Category name	Before WC	After WC
Total Utility	**66.96**	**72.71**
Condition	73.01	80.33
Deck	91	91
Element ratings	19.04	48.3
(12) Reinforced Concrete Deck	9.51	9.51
(31) Timber Deck - Wood Deck	12.23	100
(520) Deck/Slab Protection Systems	35.39	35.39
Substructure	91	91
Superstructure	91	91
Mobility	60.72	60.72
ADT	23.2	23.2
Bridge Posting	100	100
Percent of truck detoured.	34.2	34.2

Checking the *Show Changed* checkbox updates the grid to show only the criteria that have changed due to the actions.

Deterioration Results

The *Deterioration Results* grouping contains a grid to compliment the *Deterioration Charts* grouping by providing the deterioration values for every point on the deterioration chart.

Deterioration Results				
Year	**Bridge Age**	**Original H.I.**	**Work H.I.**	**H.I. Diff.**
2013	7	19.05	19.05	0.00
2014	8	18.23	18.23	0.00
2015	9	17.45	17.45	0.00
2016	10	16.69	100.00	83.31
2017	11	15.97	99.97	84.00
2018	12	15.27	99.87	84.60
2019	13	14.60	99.72	85.12
2020	14	13.96	99.52	85.56
2021	15	13.34	99.27	85.93
2022	16	12.75	98.97	86.23
2023	17	12.18	98.63	86.45

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The calculated values are shown through the following columns:

- **Original H.I** - The original health index
- **Work H.I.** - The health index after the performance of the selected actions
- **H.I. Diff.** - The difference between the work and original health index

Reverse Calculation Page Controls

Even though the *Reverse Calculation* subtask is primarily for viewing purposes, the *Save*, *Save & Close*, and *Cancel* buttons exist because the *Cost*, *Target Year*, and *Repeat Interval* textboxes can be edited in the actions grid.

Clicking the *Save* button saves the changes made to the above-mentioned fields.

Clicking the *Save & Close* button saves the changes made to the above-mentioned fields and takes the user to the *Projects > Project List* task.

Clicking the *Cancel* button cancels the changes made to the above-mentioned fields and takes the user to the *Projects > Project List* task.

Needs List

The *Analysis > Work Candidates > Needs List* subtask is used to view and filter the work candidates in the database.

Filter and Layout

The *Filter* and *Layout* dropdowns determine which work candidates will be displayed and the information that will be included. Filters can be created using the "Needs List" context on the *Manage Filters* task. Layouts can be created using the "Needs List" context on the *Manage Layouts* task. Filters can also be created using the *Work Candidates Quick Filter* below the dropdowns.

When the desired selections have been made, click the *Apply* button to update the grid.

Work Candidates Quick Filter

The *Work Candidates Quick Filter* allows the user to create custom filters for the grid by entering specific information.

The *Filter Results* button allows the user to view the filtered results before saving to ensure the desired selections have been made. Once satisfied, enter a name into the *Save As* textbox and click the *Save* button to save the filter. If the filter should be made available for other users, check the *Share* checkbox before saving.

Work Candidates Information Grid

The Work Candidates Information grid will display the applied filter and layout. Depending on the filter, the grid will contain all of the work candidates in the database.

The *Delete* button for each work candidate listed allows the user to delete the work candidate from the database.

Comparison Groups

Work candidate comparison groups are a collection of work candidates designed to be a work plan for a bridge. The *Analysis > Work Candidates > Comparison Groups* subtask allows the user to compare the performance of these work candidate groups to determine the best course of action for a particular bridge.

*Note: Comparison groups only exist in memory, not in the database. The comparison groups will be lost when the user logs out of BrM.
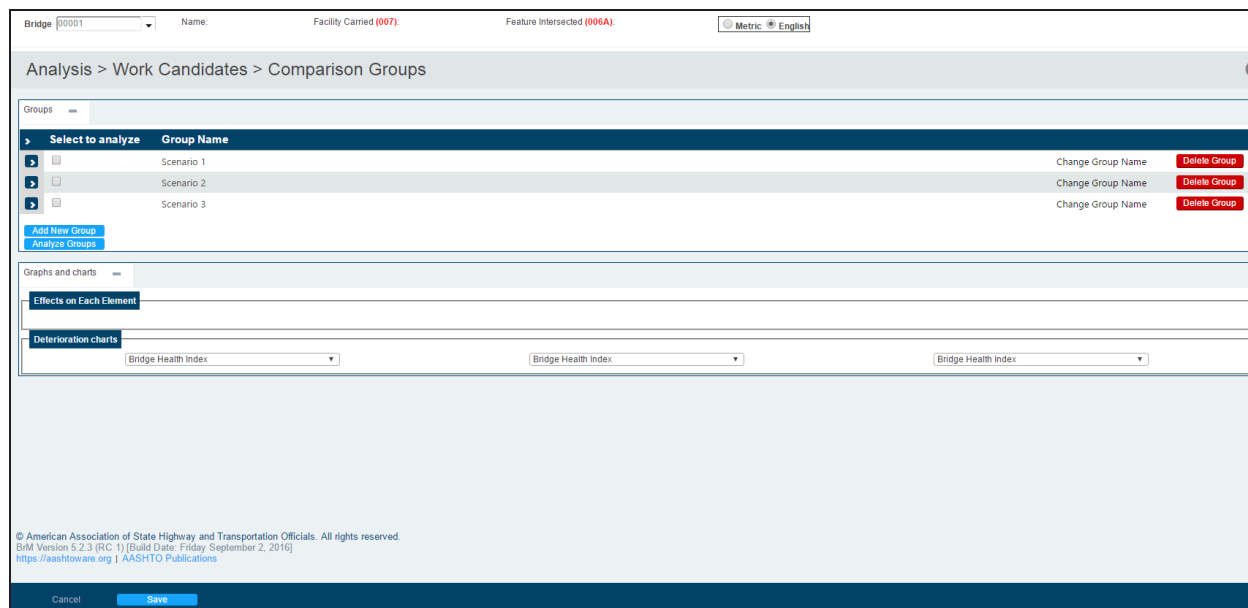
Groups

The *Groups* grouping displays all of the work candidate comparison groups created either on the *Analysis > Work Candidates > Bridge Analysis* subtask or directly from the *Comparison Groups* subtask.
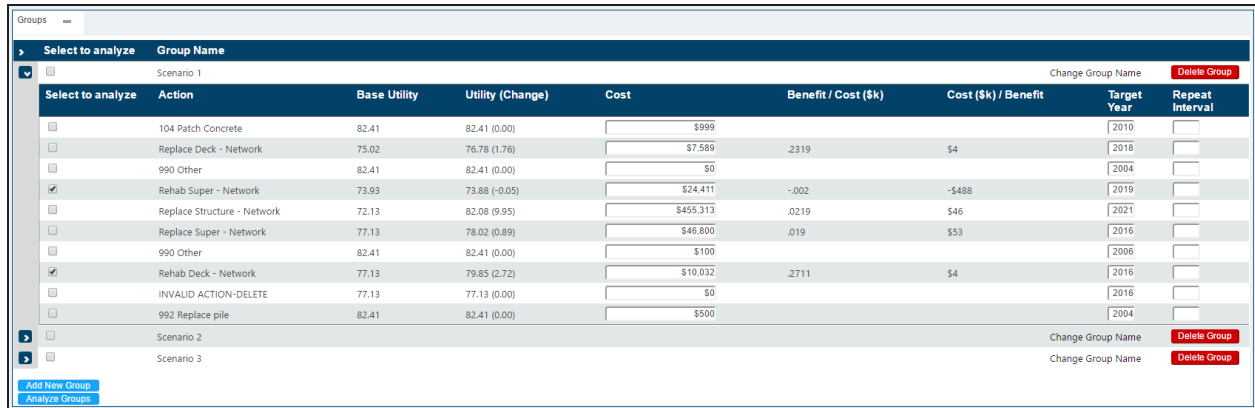
Additional groups can be created using the *Add New Group* button:
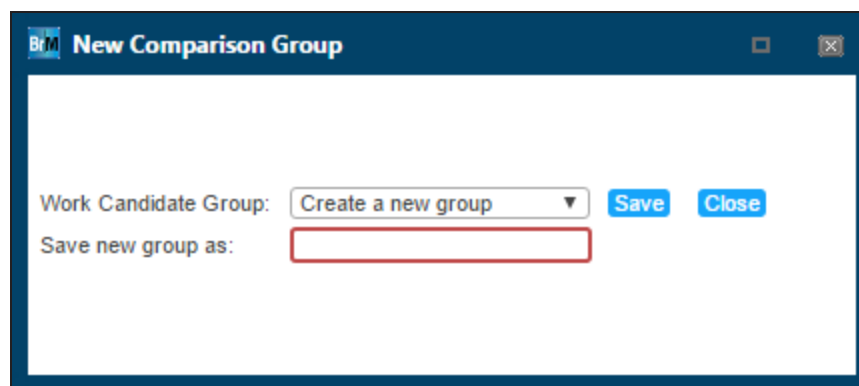
To add the selected work candidates to an existing comparison group, select the comparison group from the *Work Candidate Group* dropdown, then click the *Save* button.

To create a new comparison group, leave "Create a new group" selected and use the *Save New Group As* textbox to name the new comparison group, then click the *Save* button.

To edit an existing comparison group, click the icon to expand the comparison group to display all of the available work candidates for the selected bridge:

Use the work candidates' checkboxes to select/unselect work candidates for the expanded comparison group. The *Cost*, *Target Year*, and *Repeat Interval* textboxes can be edited if desired.

Once ready to analyze, check the boxes of the comparison groups to analyze and click the Analyze Groups button.

*Note: Only three groups can be analyzed at a time.
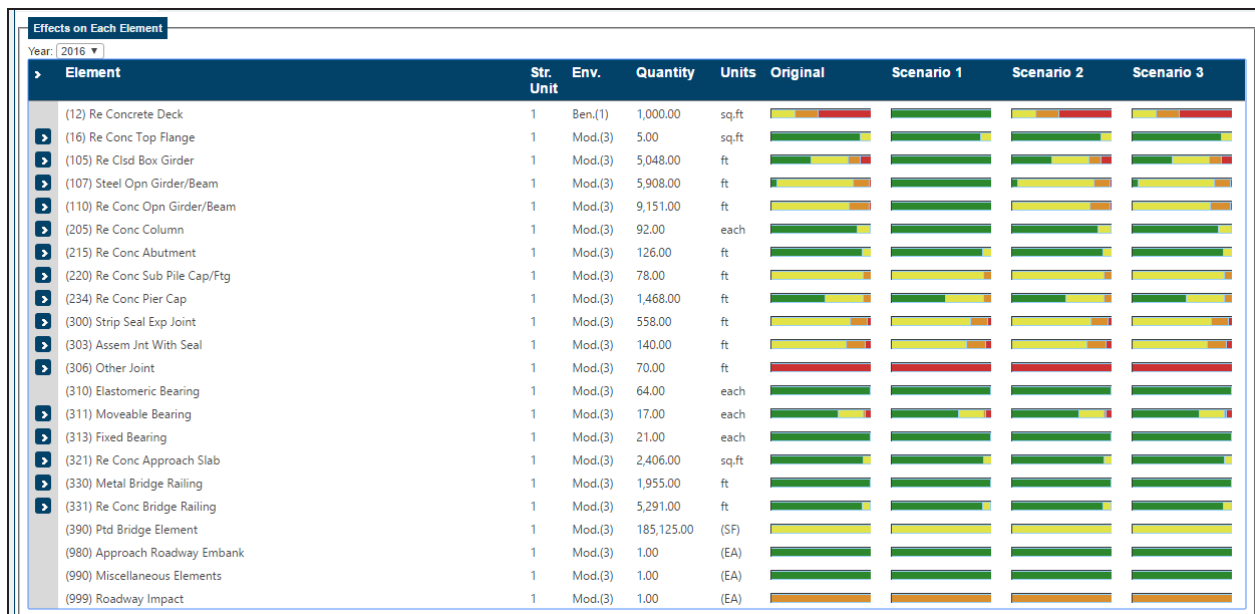
Graphs and Charts

The *Graphs and Charts* grouping contains various tools to compare the selected comparison groups.

Effects on Each Element

The *Effects on Each Element* grouping contains a grid that displays the effects of the comparison groups on individual elements. The grid uses a color-coded system to display the elements' current conditions and then the effect of the work.

- **Green** - Condition State 1
- **Yellow** - Condition State 2
- **Orange** - Condition State 3
- **Red** - Condition State 4

The *Year* dropdown is used to select the specific year of the bridge to compare results. The target year of the work candidates assigned to the comparison groups will determine a bridge's element effects for a given year.

Elements with a ">" next to them can be expanded to reveal the protective systems and defects associated with them.

Deterioration Charts

The *Deterioration Charts* grouping contains various graphs that display the original deterioration modeling and the effects of the selected comparison groups.
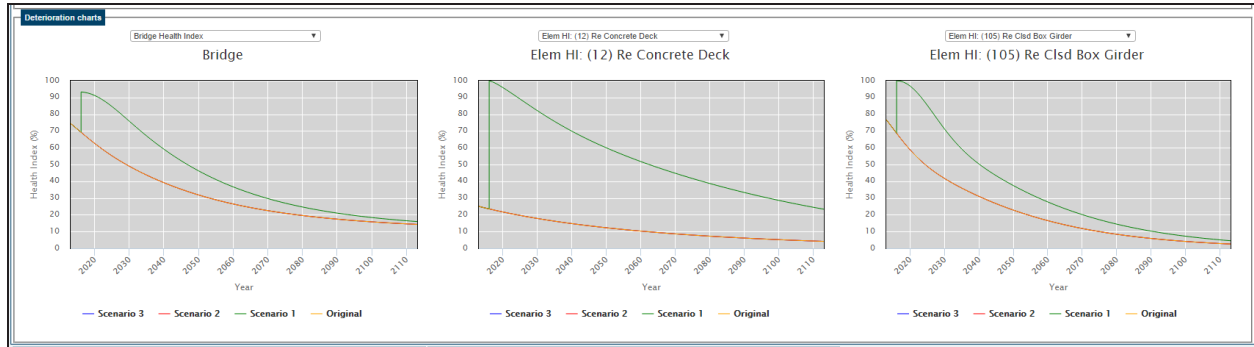
The dropdown above each graph allows the user to select which graph to display. Each of the three graphs can display information independently of the others.

Effects on Each Utility Criterion

The *Effects on Each Utility Criterion* grouping contains a grid that displays the effect the selected comparison groups have on the bridge's utility criteria. The hierarchy displayed under Total Utility is determined by the criteria entered in the *Admin > Modeling Config > Utility* task.

Category name	Original	Scenario 1	Scenario 2	Scenario 3
Total Utility	**56.68**	**73.54**	**56.68**	**56.68**
Condition	42.79	79.22	42.79	42.79
Element ratings	42.29	77.24	42.29	42.29
Bearings Elements	62.21	62.21	62.21	62.21
Deck/Slabs Elements	15.26	99.86	15.26	15.26
Joints Elements	34.34	34.34	34.34	34.34
Substructure Elements	62.36	67.29	62.36	62.36
Superstructure Elements	42.06	99.31	42.06	42.06
NBI ratings	47.33	97	47.33	47.33
Deck	19	100	19	19
Substructure	81	91	81	81
Superstructure	42	100	42	42
LifeCycle	80.69	88.32	80.69	80.69
Mobility	59.9	59.9	59.9	59.9
Approach Roadway Alignment (NBI 72)	75	75	75	75
Deck Geometry (NBI 68)	25	25	25	25

The *Year* dropdown is used to select the specific year of the bridge to compare results. The target year of the work candidates assigned to the comparison groups will determine the effects on each utility criterion.

Deterioration Results

The *Deterioration Results* grouping contains a grid to compliment the health index graph in the *Deterioration Charts* grouping by providing the deterioration values for every point on the deterioration chart.

Year	Bridge Age	Original	Scenario 1	Scenario 2	Scenario 3
2013	29	74.44	74.44	74.44	74.44
2014	30	72.72	72.72	72.72	72.72
2015	31	70.98	70.98	70.98	70.98
2016	32	69.23	93.31	69.23	69.23
2017	33	67.49	93.07	67.49	67.49
2018	34	65.78	92.62	65.78	65.78
2019	35	64.10	91.97	64.10	64.10
2020	36	62.47	91.12	62.47	62.47
2021	37	60.89	90.08	60.89	60.89
2022	38	59.35	88.88	59.35	59.35
2023	39	57.87	87.53	57.87	57.87

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Comparison Group Page Controls

Clicking the *Save* button saves the changes made to the comparison groups.

*Note: Comparison groups are only saved during the user's current session. The comparison groups will be lost when the user logs out of BrM.

Clicking the *Cancel* button cancels the changes made to the comparison groups.

The *Analysis > Utility Value* task allows the user to view the selected bridge's utility value and provides a breakdown of the criteria from the *Admin > Modeling Config > Utility* task.

| Bridge 02102011000B010 | Name: | Facility Carried (007): US-41 | Feature Intersected (006A): W BR WHITEFISH RIVE | |

Analysis > Utility Value

Utility Value: 37.12

Risk Value — Base Risk Value: 95.43 Scaled Value: 95.43 x Weight: 15 = Adjusted Risk Value: 1431.45

Risk Item	Base Value	Scaled Value	Weight	Adjusted Value
Channel and Channel Protection (NBI 61)	7.00	81	10.00	810.00
Fracture Critical (NBI 92a)			20.00	
Posting (NBI 70)	5.00	100	20.00	2,000.00
Scour Critical (NBI 113)	8.00	100	30.00	3,000.00
Scour Risk Assessment			50.00	
Underclearances (NBI 69)			20.00	
Waterway Adequacy (NBI 71)	8.00	87	10.00	870.00

Condition Value — Base Condition Value: 7.79 Scaled Value: 7.79 x Weight: 40 = Adjusted Condition Value: 311.60

Condition Item	Base Value	Scaled Value	Weight	Adjusted Value
Element ratings	0.54	0.54	90.00	48.60
NBI ratings	73.00	73	10.00	730.00

LifeCycle Value — Base LifeCycle Value: N/A Scaled Value: N/A x Weight: 30 = Adjusted LifeCycle Value: N/A

LifeCycle Item	Base Value	Scaled Value	Weight	Adjusted Value
No records to display.				

Mobility Value — Base Mobility Value: 57.03 Scaled Value: 57.03 x Weight: 15 = Adjusted Mobility Value: 855.45

Mobility Item	Base Value	Scaled Value	Weight	Adjusted Value
Approach Roadway Alignment (NBI 72)	8.00	75	15.00	1,125.00
Deck Geometry (NBI 68)	5.00	37.5	25.00	937.50
Detour Length (NBI 19)	39.15	0	15.00	0.00
Posting (NBI 70)	5.00	100	25.00	2,500.00
Underclearances (NBI 69)			20.00	

The *Analysis > LCCA* task allows the user to run a life-cyle cost analysis (LCCA) on the selected bridge. The user can develop work plans and compare the life-cycle cost differences between the various plans.

Detailed information for the selected bridge is displayed in the *Description*, *Conditions*, *Current Scaled Performance*, and *Sufficiency* groupings and Recent Completed Work grid in the top half of the task.

Setting up the LCCA

LCCA Configuration
The *LCCA Configuration* grouping specifies the parameters for the LCCA.

The *Discount Rate* textbox indicates the cost discount percentage for the LCCA. The discount rate suggests that the further in the future an action/event occurs, the less it will cost. The default value is 4 percent.

The *Short-Term Analysis Length* and *Long-Term Analysis Length* textboxes determine the short and long term lengths of time in which the LCCA will be run. By default, the values are 5 years and 50 years.

The *Estimate User Life-Cycle Cost* checkbox allows the user to estimate the user cost of the LCCA. Selecting this option takes the place of the user cost calculation that was selected on the *Admin > Modeling Config > Preservation and Replacement Policy* task.

NBI Modeling
The *NBI Modeling* grouping determines the modeling of the NBI component deterioration.

The NBI Deterioration Method dropdown allows the user to model the NBI component deterioration in two different ways:

- **NBI Converter** - This option allows the user to select an NBI converter profile (created on the *Admin > Modeling Config > NBI Conversion Profiles* task) to forecast the element ratings.
- **Component-Level Deterioration** - This option uses the component-level deterioration models established on the *Admin > Modeling Config > NBI Deterioration Models* task.

Cost Indexing

The *Cost Indexing* grouping allows the user to determine how future inflation rates will be modeled.

The *Inflation Estimation Method* dropdown has three options to choose:

- **None** - Future inflation rates will be ignored so that future costs are not inflated.
- **Cost Indexing** - Future costs will be inflated based on the specifications set on the *Admin > Modeling Config > Cost Index* task.
- **Fixed Inflation Rate** - Future costs will be inflated based on a fixed inflation rate. When selected, the *Inflation Rate* textbox will appear to allow the user to enter the fixed inflation rate percentage.

Short-Term Work Items

Long-term work items will be determined by the LCCA automatically using the preservation and replacement policies assigned to the bridge through the *LCCA* tasks in the *Admin* tab. Short-term work items, on the other hand, can be added by the user by selecting them from the grid.

The *Display System Recommendations* checkbox will show all work recommendations that will positively affect the bridge regardless of whether a work candidate exists for the action.

The *Display Work Candidates* checkbox will show the work candidates that have been created for the selected bridge.

The *Display Zero Cost Recommendations* checkbox will recommend possible actions based on the bridge's elements.

The *Display Zero Cost Work Candidates* checkbox will show the work candidates created for the selected bridge that do not have a cost associated.

*Note: If multiple checkboxes are selected, their effects will be combined.

The *Profile* dropdown and *Add Profile* button are used if the user wants to compare LCCA results with different work candidates selected.

*Note: The *Cost* field within the grid cannot be edited for system generated work items.

If desired, the user can create a new project with the bridge's selected work candidates by clicking the *Add to New Project* button.

*Note: While short-term work items typically span 0-20 years in planning, there is no restriction on how far out the short-term work items can be planned.

Running the LCCA

Once the desired selection have been made to set up the LCCA, click the *Run Analysis* button to run the analysis and view the results.
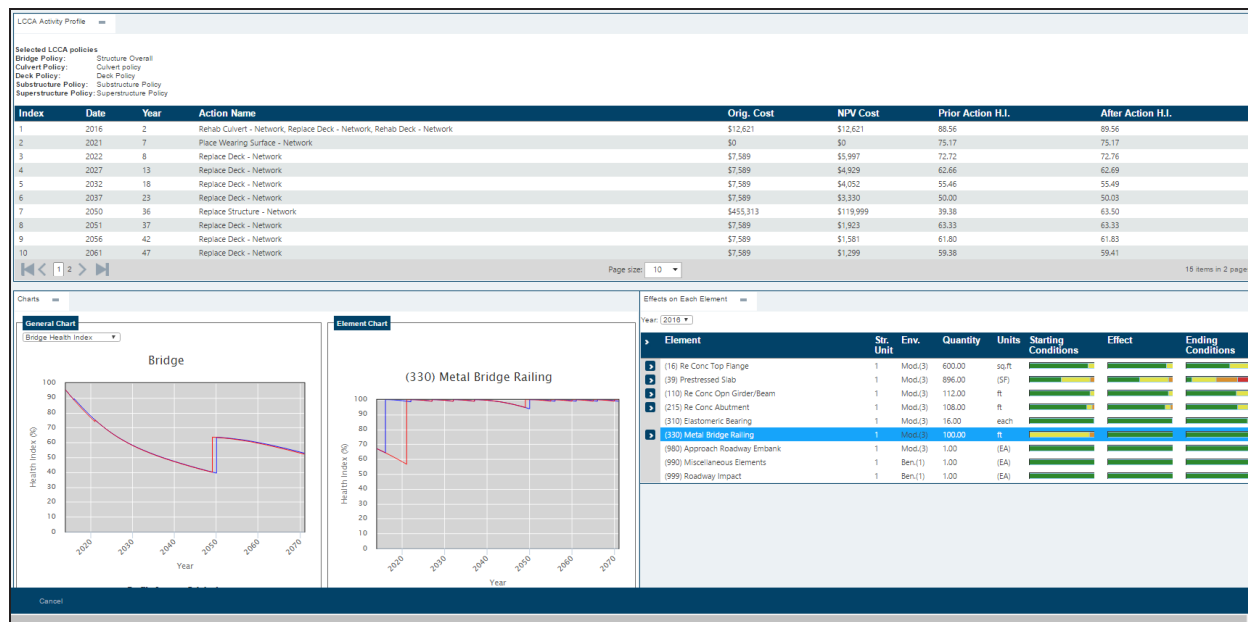
LCCA Activity Profile

The *LCCA Activity Profile* grouping lists all of the actions (both user-selected and automatically generated) applied to the bridge throughout the analysis period and is sorted by the order the actions occur. For each action, the grid displays important information such as the original estimated cost of the action, the net present value (NPV) cost of the action, and the bridge's health index before and after the action.

LCCA Activity Profile

Selected LCCA policies
Bridge Policy: Structure Overall
Culvert Policy: Culvert policy
Deck Policy: Deck Policy
Substructure Policy: Substructure Policy
Superstructure Policy: Superstructure Policy

Index	Date	Year	Action Name	Orig. Cost	NPV Cost	Prior Action H.I.	After Action H.I.
1	2021	7	Preserve Deck - Network	$0	$0	73.98	73.98
2	2022	8	Replace Deck - Network	$7,589	$5,997	71.47	72.72
3	2027	13	Replace Deck - Network	$7,589	$4,929	62.52	62.55
4	2032	18	Replace Deck - Network	$7,589	$4,052	55.27	55.29
5	2037	23	Replace Deck - Network	$7,589	$3,330	49.79	49.82
6	2049	35	Replace Structure - Network	$455,313	$124,799	39.92	63.60
7	2050	36	Replace Deck - Network	$7,589	$2,000	63.43	63.43
8	2055	41	Replace Deck - Network	$7,589	$1,644	61.89	61.92
9	2060	46	Replace Deck - Network	$7,589	$1,351	59.46	59.49
10	2065	51	Replace Deck - Network	$7,589	$1,111	56.35	56.38

Page size: 10   15 items in 2 pages

The rows after the action listings contain summaries of the LCCA:

- **Remaining Life** - The number of years remaining from the end of the analysis to the next replacement of the bridge.
- **Residual Value** - The economic value of the bridge's remaining service life.
- **Agency Life-Cycle Cost** - The sum of the NPVs of the actions applied in the analysis minus the residual net value.
- **User Life-Cycle Cost** - The sum of all user net costs throughout the analysis.
- **Life-Cycle Cost** - The final result of the analysis: the sum of the agency and user life-cycle costs.

Charts

The *Charts* grouping contains bridge and element graphs that provide a visual display of various information related to the analysis. Only two graphs can be displayed at a time, but the dropdown in the top left corner of the grouping contains more graph selections.
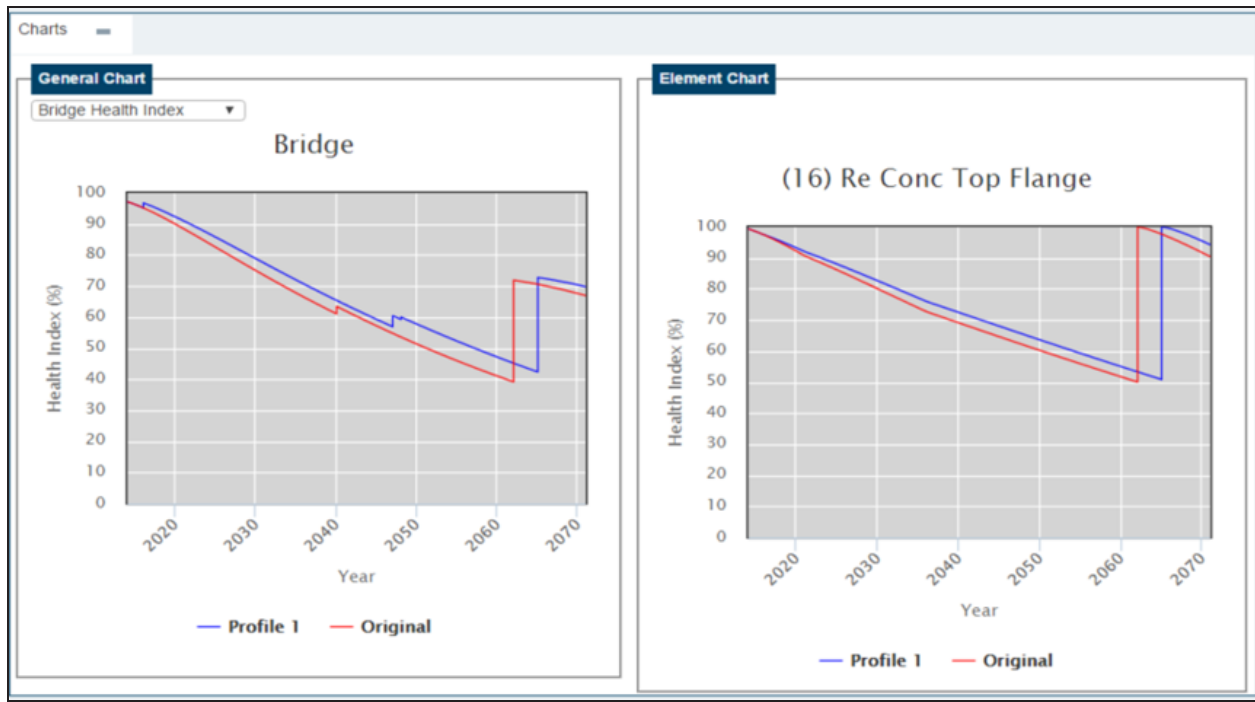
Each graph will have two curves:

- **Red** - The original deterioration
- **Blue** - The deterioration with the work candidates being performed at the designated intervals

Effects on Each Element

The *Effects on Each Element* grouping contains a grid that displays the starting and ending conditions of the elements in the LCCA process. The grid uses a color-coded system to display the elements' conditions:

- **Green** - Condition State 1
- **Yellow** - Condition State 2
- **Orange** - Condition State 3
- **Red** - Condition State 4

The *Year* dropdown is used to select the specific year of the bridge to view results. The target year of the work candidates assigned to the bridge will determine a bridge's element effects for a given year.

Elements with a ">" next to them can be expanded to reveal the protective systems and defects associated with them. Selecting an element or protective system will display the expected deterioration of the element in the Element graph in the *Charts* grouping. Defects are not currently incorporated into deterioration calculations.

Effects on Each Utility Criterion

The *Effects on Each Utility Criterion* grouping contains a grid that displays the starting and ending conditions of the bridge's utility criteria in the LCCA process.

The hierarchy displayed under Total Utility is determined by the criteria entered in the *Admin > Utility* task.

Category name	Starting Utility	Effect	Ending Utility	Total Utility Change
Total Utility	83.51	86.27	80.44	2.76
Condition	79.21	86.12	71.55	2.76
Element ratings	78.27	85.58	69.76	2.63
Bearings Elements	98.64	98.64	87.35	
Deck/Slabs Elements	80.73	80.73	60.33	
Substructure Elements	74.24	79.11	68.48	0.49
Superstructure Elements	67.61	89.08	69.93	2.15
NBI ratings	87.67	91	87.67	0.13
Deck	91	91	81	
Substructure	91	91	91	
Superstructure	81	91	91	0.13
LifeCycle	88.89	88.89	88.89	
Mobility	87.5	87.5	87.5	
Approach Roadway Alignment (NBI 72)	75	75	75	
Deck Geometry (NBI 68)	75	75	75	

The *Year* dropdown is used to select the specific year of the bridge to view results. The target year of the work candidates assigned to the bridge will determine a bridge's utility for a given year.

Deterioration Results

The *Deterioration Results* grouping contains a grid to compliment the health index graph in the *Charts* grouping by providing the deterioration values for every point on the graph.

Year	Bridge Age	Original H.I.	Work H.I.	H.I. Diff.
2014	40	97.13	97.13	0.00
2015	41	96.23	96.23	0.00
2016	42	95.15	96.76	1.61
2017	43	93.95	95.74	1.79
2018	44	92.66	94.64	1.98
2019	45	91.30	93.47	2.17
2020	46	89.89	92.25	2.37
2021	47	88.43	90.99	2.56
2022	48	86.96	89.71	2.75
2023	49	85.47	88.39	2.92
2024	50	83.96	87.05	3.09

1 2 3 4 5 6   Page size: 10   57 items in 6 pages

Projects

- The Projects section of the manual addresses each of the tasks in BrM's *Projects* tab. The *Projects* tab allows for the creation and management of agency projects.

Project List

The *Projects > Project List* task is a complete list of all of the projects in the system that can be filtered and customized in various ways and allows for the selection of projects prior to performing other actions in the system.

Selecting a Project

The *Project List* task's main function is project selection. There are two different ways to select a single project:

1. **Checkbox Select** - Clicking the checkbox of the desired project will select it.
2. **Highlight Select** - When hovering the mouse's cursor over a project in the Project List, the project's row will be highlighted blue. Clicking anywhere on that row will darken and solidify that highlight and select the project. The highlight select differentiates itself from the checkbox select because it reveals additional project details for the highlight selected project including bridge information, a map view of the bridge, and work information.

Filters

Due to the vast size of some users' systems, filters are necessary to sort and locate projects based on specified criteria.

There are two main ways to filter projects:

1. **Filter Dropdown** - The *Filter* dropdown lists all of the relevant filters that have been created/edited on the *Projects > Manage Filters* task (this can also be done on the *Bridges > Manage Filters* task). When a filter is selected from the dropdown, the Project List will automatically update with the filtered projects.
2. **Quick Filters** - Each column in the Project List has a quick filter textbox that enables the user to filter the grid based on a condition, such as "Contains" or "StartsWith." The user types into the *Quick Filter* textbox and then clicks the ▼ symbol to select a condition. Once the condition is selected, the grid will automatically be updated with the filtered projects.

*Note: By default, filling in the *Quick Filter* textbox and then pressing Enter on the keyboard will automatically make use of the "Contains" quick filter condition.

The following table explains the various selectable quick filter conditions:

Quick Filter Conditions	
Condition	**Description**
NoFilter	No filter is applied - filter controls are cleared.
Contains	Returns results that contain the entered value. Same as: dataField LIKE '%value%'
DoesNotContain	Returns results that do not contain the entered value. Same as dataField NOT LIKE '%value%'
StartsWith	Returns results that start with the entered value. Same as: dataField LIKE 'value%'
EndsWith	Returns results that end with the entered value. Same as: dataField LIKE '%value'
EqualTo	Returns results that exactly match the entered value. Same as: dataField = value
NotEqualTo	Returns results that do not exactly match the entered value. Same as: dataField != value
GreaterThan	Returns results with a value greater than the entered value. Same as: dataField > value
LessThan	Returns results with a value less than the entered value. Same as: dataField < value
GreaterThanOrEqualTo	Returns results with a value greater than or exactly matching the entered value. Same as: dataField >= value
LessThanOrEqualTo	Returns results with a value less than or exactly matching the entered value. Same as: dataField <= value
Between	Returns results with a value that falls between the two entered values. Same as: value1 <= dataField <= value2 *Note: Value1 and value2 should be separated by a space when entered into the quick filter.
NotBetween	Returns results with a value that does not fall between the two entered values. Same as: dataField <= value1 && dataField >= value2 *Note: Value1 and value2 should be separated by a space when entered into the quick filter.
IsEmpty	Returns results where the specific field is empty.

Quick Filter Conditions	
Condition	**Description**
	Same as: dataField = "
NotIsEmpty	Returns results where the specific field is not empty. Same as: dataField != "
IsNull	Returns only null values.
NotIsNull	Returns only non-null values.

Layout

The *Layout* dropdown determines the Project List's columns. There is a default layout on the *Project List* task, but new layouts can be created on the *Projects > Manage Layouts* task (this can also be done on the *Bridges > Manage Layouts* task).

Jump to Project

The *Jump to Project* textbox/dropdown allows the user to search for and locate a specific project. The user can type the project name into the textbox or use the dropdown to find the project by clicking through the pages. When the project is selected, it will be highlight selected.

Export Options

There are three export options located at the top left corner of the Project List: PDF, XLS, and KML. If one or more projects are selected, only the information from the selected projects will export. If no projects are selected, all of the projects in the current filter will be exported.
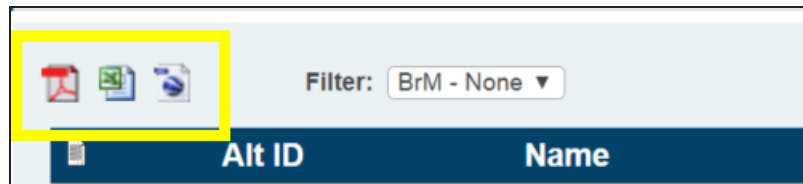
Side Menu Options

The side menu for a certain Tab > Task will typically contain subtasks, but for the *Projects >Project List* task the side menu contains various options that perform actions.

View List Options		
	Option	**Description**
	Select All	Selects all of the projects within the current filter.
	Unselect All	Unselects all of the projects currently selected.
	Select Page	Selects all projects on the current page, regardless of how many projects are in the current filter. **Example:** If there are 25 projects in the current filter but only 10 projects per page, only the 10 projects shown on the current page will be selected.
	Unselect Page	Unselects all projects on the current page, regardless of how many projects are selected in the current filter.

View List Options		
	Option	**Description**
	Toggle Just Selected	Toggles between showing all of the projects in the current filter to showing only the projects that have been selected. **Example:** If a user has 5 projects selected, clicking *Toggle Just Selected* will display only the 5 selected projects, regardless of the total number of projects in the filter.
	Reset Grid Settings	The column headings of the Project List can be arranged in any order. The user can click and hold then drag and drop the column headings into any order desired. If the user wants to revert back to the default column heading order, *Reset Grid Settings* can be selected to reset the layout.

The *Projects > Manage Layouts* task allows the user to create and edit layouts for the Project List as well as several other grids throughout the software. The selections made for the layout will determine the column headings for a given grid. This task is also accessible from the *Bridges* tab with the same functionality.

Context

The *Context* dropdown determines the grid for which the layout is being created. When the *Manage Layouts* task is opened from the *Projects* tab, the default context will be the Project List, however there are several other context selections:

- **Bridge Group Roadways** - The grid on the *Bridges > Manage Bridge Groups > Add/Remove Roadways* subtask.
- **Bridge Groups** - The grid on the *Bridges > Manage Bridge Groups > Bridge Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Project Bridge Needs** - The Bridge Needs grid on the *Projects > Create/Edit Project > Query* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Layout

The *Layout* dropdown lists all of the layouts that have been created or that automatically come with the system. The available options depend on the selection made:

- **BrM System Layout** - If the layout selected is a BrM system layout, it cannot be edited or deleted. A note will appear in red text under the dropdown indicating that the layout is a BrM system layout and may not be edited:

However, the user can copy the BrM system layout's settings by typing a new layout name into the textbox next to the *Save As* button and then clicking *Save As*. Once the copy is made, the newly created layout can be edited.

- **Non-BrM System Layout** - Any layout that, when selected, does not cause the red BrM system layout note to appear can be edited or deleted freely.
- **New** - Clicking the *New* button creates a new layout that can be edited or deleted freely. The new layout can be named by entering a name into the textbox next to the *Save As* button and then clicking *Save*.

Manage Layouts Groupings

Layout Info

The *Layout Info* grouping allows the user to enter a description of the currently selected layout. The user can also check the *Shared* checkbox if the layout should be available to other users.

Layout Columns

The *Layout Columns* grouping is where the user configures the selected layout. A selection must be made from the *Tables* listbox and, based on that selection, the *Fields* listbox will populate with options.

The options in the *Fields* listbox will be the column headings for the layout. An option can be added to the layout by selecting it from the *Fields* listbox and clicking the *Add* button. The multiple select ability of the CTRL and Shift keyboard keys is applicable.

The grid formed from the selection contains the table name, field name, heading text, and:

- **Use Parameters** - The *Use Parameters* checkbox indicates whether or not parameters will be used for the selected field. Parameters for the fields are set up in the *Admin > General Config > Parameters* task and designate text to a specific value.

  Example: A parameter may be established for a certain field so that any row within that column with the value "1" would present the text "District 1," any row within that column with the value "2" would present the text "District 2," etc.

- **Edit** - Clicking the ✎ symbol allows the user to edit the heading text and check/uncheck the *Use Parameters*

checkbox. To save the changes, click the ✔. To cancel changes, click the ✖ symbol.

- **Delete** - Clicking the ✖ symbol deletes the field from the layout.

The buttons to the right of the table - *Top*, *Up*, *Down*, *Bottom* - control the positioning of the fields in the layout. Because tables read left to right, the top field in the layout corresponds to the leftmost column of the table. Once an item is selected, The *Top* and *Bottom* buttons move it to the top and bottom of the layout grid, respectively. The *Up* and *Down* buttons move the selected item up and down by one increment, respectively.

Manage Layouts Page Controls

Save	Save As		Reset	Delete

The *Save* button saves the current layout.

The *Save As* button acts as a copier and copies the current layout's settings into a new layout that uses the name entered into the textbox next to the *Save As* button.

The *Reset* button resets any changes that were made to the current layout back to the last save.

The *Delete* button deletes the current layout.

The *Projects > Manage Filters* task allows the user to create and edit filters for the Project List as well as several other grids throughout the software. The selections made for the filter will determine the projects listed in the Project List upon filter use. This task is also accessible from the *Bridges* tab with the same functionality.

Edit Filter

The *Projects > Manage Filters > Edit Filter* subtask uses the BrM interface to create and edit filters for various grids within the system.

Context

The *Context* dropdown determines the grid for which the filter is being created. When the *Manage Filters* task is opened from the *Projects* tab, the default context will be the Project List, however there are several other context selections:

- **Bridge Analysis Group Roadways** - The grid on the *Bridges > Manage Bridge Analysis Groups > Add/Remove Roadways* subtask.
- **Bridge Analysis Groups** - The grid on the *Bridges > Manage Bridge Analysis Groups > Bridge Analysis Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Filter

The *Filter* dropdown lists all of the filters that have been created or that automatically come with the system. The context must be selected before the filter because the context determines what filters are available. Below are the filter

options:

- **BrM System Filter** - If the filter selected is a BrM system filter, it cannot be edited or deleted. A note will appear in red text under the dropdown indicating that the filter is a BrM system filter and may not be edited:

However, the user can copy the BrM system filter's settings by typing a new filter name into the textbox next to the *Save As* button and then clicking *Save As*. Once the copy is made, the newly created filter can be edited.

- **Customized Filter** - Any filter created by the user can be edited or deleted freely.
- **New** - Clicking the *New* button creates a new filter that can be edited or deleted freely. The new filter can be named by entering a name into the textbox next to the *Save As* button and then clicking *Save*.

Filter Info

The *Filter Info* grouping allows the user to enter a description of the currently selected filter. The user can also check the *Shared* checkbox if the filter should be available to other users.

If the *Access Filter* checkbox is checked, the admin can use the current filter as an access filter for specified roles, displaying that filter as the users' default filter for the applicable context.

Criteria

The *Criteria* grouping is where the user configures the selected filter. A selection must be made from the *Tables* listbox and, based on that selection, the *Fields* listbox will populate with options.

Options can be added to the filter by selecting it from the *Fields* listbox and clicking the *Add Criteria* button. Multiple options can be added at once by holding down the CTRL key while selecting all of the desired options, then clicking the *Add Criteria* button.

Each field added to the filter will have additional options that must be determined.

Clicking the *Clear* button will clear the filter of all fields that have been added. Clicking the *Delete Selected* button will clear the filter of only the fields that have the *Delete* checkbox checked.

Edit Filter Page Controls

The *Save* button saves the current filter.

The *Save As* button copies the current filter's settings into a new filter that uses the name entered into the textbox next to the *Save As* button.

The *Reset* button resets any changes that were made to the current filter back to the last save.

The *Delete* button deletes the current filter.

Edit SQL

The *Projects > Manage Filters > Edit SQL* subtask does not use the BrM interface to create and edit filters. It requires the user to write the SQL manually to create a custom filter.

There are several aspects that differentiate the filters in the *Edit SQL* subtask from the filters in the *Edit Filter* subtask:

1. The SQL filters must be written manually.
2. The SQL filters can only be edited within the *Edit SQL* subtask. They will not show up in the *Filter* dropdown of the *Edit Filter* subtask.
3. When an SQL filter is used on a page that has alternate layouts via a *Layout* dropdown, such as the Bridge List, the *Layout* dropdown will not be visible.

Select Context

The *Context* dropdown determines the grid for which the filter is being created. When the *Manage Filters* task is opened from the *Bridges* tab, the default context will be the Bridge List, however there are several other context selections:

- **Bridge Group Roadways** - The grid on the *Bridges > Manage Bridge Groups > Add/Remove Roadways* subtask.
- **Bridge Groups** - The grid on the *Bridges > Manage Bridge Groups > Bridge Groups* subtask.
- **Bridge List** - The grid on the *Bridges > View List* task.
- **Funding** - The grid on the *Projects > Manage Funding > Funding List* subtask.
- **Needs List** - The grid on the *Analysis > Work Candidates > Needs List* subtask.
- **Programs** - The grid on the *Projects > Manage Programs > Program List* subtask.
- **Projects** - The grid on the *Projects > Project List* task.
- **Tunnels** - The grid on the *Tunnels > Tunnel List* task.

Select Filter

The *Filter* dropdown lists all of the filters that have been created or that automatically come with the system. The context must be selected before the filter because the context determines what filters are available.

SQL Info

The *SQL Info* grouping allows the user to enter a description of the currently selected filter. The user can also check the *Shared* checkbox if the filter should be available to other users.

SQL Statement

The user can use the large textbox to enter the SQL for the custom filter.

The *SQL Order By* textbox allows the user to determine how the filter will be ordered, such as "ORDER BY 'Bridge ID.'"

Once the SQL is entered, click the *Evaluate* button to view the filter results. If the SQL is invalid, an error will appear in place of the results:

Edit SQL Page Controls

The *Save* button saves the current filter.

The *Save As* button copies the current filter's settings into a new filter that uses the name entered into the textbox next to the *Save As* button.

*Note: If changes have been made to a new or existing SQL Filter, the *Save* and *Save As* buttons will not be available until the SQL statement passes an evaluation using the *Evaluate* button.

The *Reset* button resets any changes that were made to the current filter back to the last save.

The *Delete* button deletes the current filter.

The *Projects > Create/Edit Project* task allows the user to create a new project or edit an existing project. There are four subtasks: *Query, Summary, Analysis*, and *Management*.

Query

The *Projects > Create/Edit Project > Query* subtask is used to determine which bridges will be added to the project and what work will be performed on those bridges.

Selected Project

If a project is currently selected, the *Selected Project* dropdown will show that project's name. A different project can be selected from the dropdown if desired. To create a new project, click the *Create New* button.

*Note: This dropdown is available on all four subtasks.

If no project is currently selected, the *Selected Project* dropdown will default to "*** New Project ***" and the *Create New* button will not be present. An existing project can be selected from the dropdown if desired.

Bridges

The *Bridges* grouping contains a *Bridge View* and *Bridge Map View* of all of the bridges in the database.

The *Project Category*, *Filter*, and *Bridge Analysis Group* dropdowns all work to filter the grid/map of bridges based on the selections. Additional filters can be created for the *Filter* dropdown on the *Projects > Manage Filters* task (or the *Bridges > Manage Filters* task). The quick filters can also be used to filter the grid. To cancel the current quick filters, click the icon next to the *Bridge Map View* tab.

Filter 1 to 100 Bridges

If the grid/map contains more than 100 bridges, a message will appear in the top right corner of the *Bridges* grouping:

When a bridge is selected from the grid/map, a new grouping called *Bridge Needs* appears below the *Bridges* grouping. This grouping allows the user to select which work will be performed for the selected bridge. Normally, only one bridge's needs can be selected at a time. However, if 100 bridges or less are filtered in the grid/map, the message in the top right corner is replaced by the *Display Needs for All Bridges in Filter* checkbox. If checked, the *Bridge Needs* grouping will display work that can be added for all of the selected bridges.

Bridge Needs

When a bridge is selected or all bridges in the filter are selected with the *Display Needs for All Bridges in Filter* checkbox, the *Bridge Needs* grouping will appear beneath the *Bridges* grouping and allow the user to select work for the bridge(s).

Layout

Additional layouts can be created for the *Layout* dropdown on the *Projects > Manage Layouts* task (or the *Bridges > Manage Layouts* task).

Checkboxes

The *Display Category Actions Only* checkbox will show the work candidates that have been created for the selected bridge that are associated with the category selected in the *Project Category* dropdown, as well as recommendations of possible actions based on the category selected in the *Project Category* dropdown.

The *Display Work Candidates Only* checkbox will show only the work candidates that have been created for the selected bridge.

The *Display Zero Cost Recommendations* checkbox will recommend possible actions based on the bridge's elements.

The *Display Zero Cost Work Candidates* checkbox will show only the work candidates created for the selected bridge that do not have a cost associated.

*Note: If multiple checkboxes are selected, their effects will be combined.

Select the desired actions/work candidates from the grid and click the *Add to Project* button to add the bridge's selections to the current project.

Selected Bridges and Work

The *Selected Bridges and Work* grouping displays all of the bridges that have been added to the project and reveals a breakdown of exactly what actions will be performed on the bridges for the project.

Query Page Controls

The *Save* button saves the changes made to the selected project.

The *Save and Close* button saves the changes made to the selected project and returns the user to the *Projects > Project List* task.

The *Cancel* button cancels the changes made to the selected project and refreshes the page.

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\multicolumn{4}{c}{*Projects > Create/Edit Project > Query* Control Information}

Control Name	Table Name	Column Name	Notes
Project Name	PON_ PROJECT	PON_PROJECT_LB	The name of the project being created.
Project Category	PON_ PROJECT	PON_PROJECT_ CATEGORY_DEFS_GD	The project category of the project that then filters the list of bridges available to add.

Summary

The *Projects > Create/Edit Project > Summary* subtask provides a summary of the project and allows the user to add additional costs and calculate the benefits of the project.

Project Details

The *Project Details* grouping contains the basic details for the project and has options for setting the project type, project status, and start and end dates.

Project Notes

The *Project Notes* grouping can be used to enter notes for the project.

Project Costs and Benefits

The *Project Costs and Benefits* grouping allows the user to add additional costs to the project and calculate the benefits of the project.

When changing the *Project Status* dropdown, there are limitations based on various details within the project. The statuses are Planned, Proposed, and Programmed. The current status cannot be changed to the next status if:

1. A closed funding source is attached to the project.
2. A closed program is attached to the project.
3. Added work candidates/recommendations are already mapped to an approved project.

Costs

The *Indirect Cost* textbox is an additional project cost determined as a percentage of the direct cost.

Example: If the direct cost is $10000 and the percentage entered into the *Indirect Cost* textbox is 25, the indirect cost will be $2500.

The *Other Costs* textbox is for additional costs to be entered.

Clicking the *Recalculate* button will recalculate and display the total cost.

Benefit

The Benefit grid displays the project's benefits for various criteria. If changes have been made to the project since the last calculation, click the *Calculate Benefit* button to view the up-to-date benefit information.

Bridge and Work Summary

The *Bridge and Work Summary* grouping is the same as the *Selected Bridges and Work* grouping from the *Query* sub-task. It displays all of the bridges that have been added to the project and reveals a breakdown of exactly what actions will be performed on the bridges for the project.

Summary Page Controls

The *Save* button saves the changes made to the selected project.

The *Save and Close* button saves the changes made to the selected project and returns the user to the *Projects > Project List* task.

The *Cancel* button cancels the changes made to the selected project and refreshes the page.

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colspan Projects > Create/Edit Project > Summary Control Information				
Control Name	**Table Name**	**Column Name**	**Notes**
Project Details Grouping			
Project ID	PON_ PROJECT	PON_PROJECT_GD	The main identifier for the project.
Alternate ID	PON_ PROJECT	ALT_ID	An additional identifier for the project.
Project Status	PON_ PROJECT	PROJECT_STATUS	The current status of the project.
Project URL	PON_ PROJECT	URL	The agency's project website, if applicable.
Project Name	PON_ PROJECT	PON_PROJECT_LB	The name of the selected project.
Project Type	PON_ PROJECT	PON_PROJECT_ CATEGORY_DEFS_ GD	The project category of the project that then filters the list of bridges available to add on the *Query* subtask.
Start Date	PON_	START_DATE	The start date of the project.

Control Name	Table Name	Column Name	Notes
	PROJECT		
End Date	PON_PROJECT	END_DATE	The end date of the project.
Created By	PON_PROJECT	CREATEUSERKEY	The user who created the project.
Create Date	PON_PROJECT	CREATEDATETIME	The date the project was created.
Project Description	PON_PROJECT	DESCRIPTION	A description of the project.
Project Notes	PON_PROJECT	NOTES	Additional notes about the project.
Project Costs **Grouping**			
Entered	PON_PROJECT	IND_COST	Determines the indirect cost by entering a percentage of the direct cost.
Other Costs	PON_PROJECT	ADD_COST	Additional costs that should be included in the total cost calculation.

Table title: Projects > Create/Edit Project > Summary Control Information

Analysis

The *Projects > Create/Edit Project > Analysis* subtask is used to help an agency determine what work to perform on a bridge within the project by viewing how a specific work candidate affects the bridge. This page provides the same information as the *Analysis > Work Candidates > Bridge Analysis* subtask but allows the user to switch between bridges within the selected project and analyze the project within the context of the program/scenario it belongs to, if applicable.

If the project is within a program, the *Program* and *Scenario* dropdowns can be used to analyze the project's bridges using the parameters of the selected program and scenario.

The *Selected Bridge* dropdown is used to select a bridge to analyze. Only bridges within the project will be selectable.

For more information on the *Analysis* subtask, read the *Analysis > Work Candidates > Bridge Analysis* section of the user manual.

Projects > Create/Edit Project > Analysis Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Selected Bridge	PON_PROJECT_BRIDGE	BRIDGE_GD	The currently selected bridge within the project.
Bridge Work Description	PON_PROJECT_BRIDGE	WORK_DESCRIPTION	Used to enter a description of the work being performed on the bridge.

Projects > Create/Edit Project > Analysis Control Information			
Control Name	Table Name	Column Name	Notes
Work Item Cost	PON_ PROJECT_ WORKITEM	EST_COST	Determines the cost of the work item for the selected bridge within the project. This control is found in the *Work Items Existing for Selected Bridge* grouping on the page.
Work Item Target Year	PON_ PROJECT_ WORKITEM	TARGET_ YEAR	The target year for the selected bridge's work item to be completed. This control is found in the *Work Items Existing for Selected Bridge* grouping on the page.
Work Item Repeat Interval	PON_ PROJECT_ WORKITEM	REPEAT_ INTERVAL	The interval of time in which to repeat the work item for the selected bridge. This control is found in the *Work Items Existing for Selected Bridge* grouping on the page.

Management

The *Projects > Create/Edit Project > Management* subtask contains some of the same information as the *Summary* subtask but also allows the user to add programs, funding sources, and milestones.

Project Details

The *Project Details* grouping is the same as on the *Summary* subtask. It contains the basic details for the project and has options for setting the project type, project status, and start and end dates.

Project Cost

The *Project Cost* grouping contains the same cost information and controls as the *Project Cost and Benefits* grouping on the *Summary* subtask. For more information on this grouping, review the *Projects > Create/Edit Project > Summary* section of the user manual.

Programs

The *Programs* grouping is used to add the selected project to one or more programs.

*Note: The *Programs* grouping is not available for projects in the "Planned" status.

	Program Name	Program ID	Program's Start Date	Program's End Date	Description	Scenario Name	Target Year	Program Frozen	Year Frozen
✕	p1	6E5AFBFA6B314F0CBEDBDCA3E65AC308	07/20/2016	12/31/2017		Default	2016	☐	☐
✕	p2	A43BAE3465E746E3AF321A64016E41BF	01/01/2018	12/31/2036		Default	2017	☐	☐

Click the *Add New* button to reveal the following popup:

The *Program* dropdown determines to which program the project will be added.

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The *Scenario* dropdown determines to which scenario the project will be added.

The *Target Year* dropdown indicates which year within the select program's time range the selected project is expected to be completed.
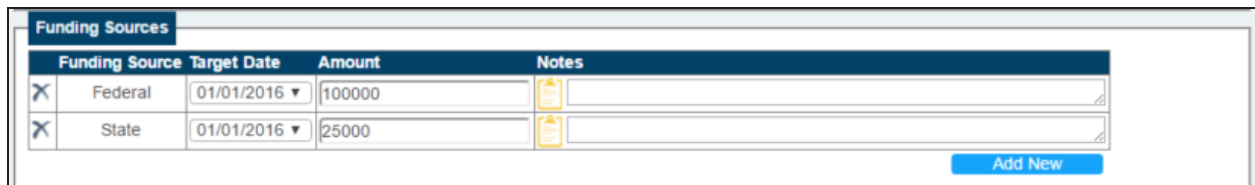
The *Frozen* checkboxes determine whether the project will be frozen to the program and/or year, respectively. If the project is frozen to a program, the optimizer will never remove it from that program even if the optimizer determines it to be ineffective for the program. If the project is frozen to the selected target year, it will never be changed to a different year in the program optimizer meaning it cannot be selected to be completed in a different year.

Click the *Add New* button to add the project to the selected program.

Click the *Cancel* button to cancel the project-program link.

Funding Sources

The *Funding Sources* grouping is used to add one or more funding sources to the selected project. Funding sources are created on the *Projects > Manage Funding* task.

Click the *Add New* button to reveal a popup with the available funding sources:
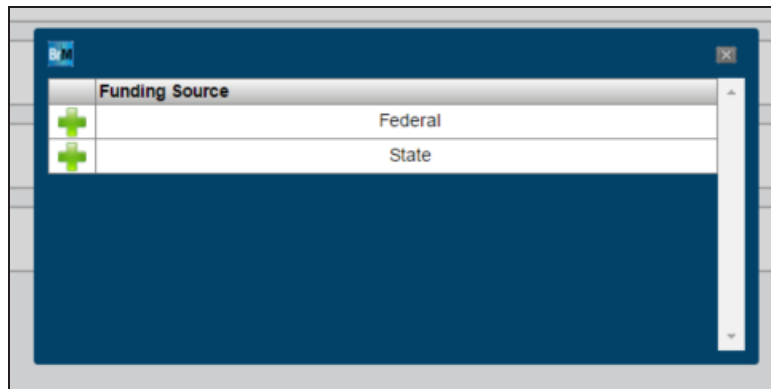
To add a funding source to the project, click the ✚ icon.

Once the funding source is added to the project, its specific information can be entered.

The *Target Date* dropdown indicates when the funding is expected to be available.

The *Amount* textbox indicates the expected amount of funding.

To remove a funding source from the project, click the ✗ icon for the desired funding source.

Milestones

The *Milestones* grouping is used to set milestones for the project.

Click the *Add New* button to add a milestone to the project.

The milestones are only used on the *Management* subtask and the controls are agency defined.

Management Page Controls

The *Save* button saves the changes made to the selected project.

The *Save and Close* button saves the changes made to the selected project and returns the user to the *Projects > Project List* task.

The *Cancel* button cancels the changes made to the selected project and refreshes the page.

Projects > Create/Edit Project > Management Control Information			
Control Name	Table Name	Column Name	Notes
Project Details Grouping			
Project ID	PON_ PROJECT	PON_PROJECT_GD	The main identifier for the project.
Alternate ID	PON_ PROJECT	ALT_ID	An additional identifier for the project.
Create Time	PON_ PROJECT	CREATEDATETIME	The date the project was created.
Project URL	PON_ PROJECT	URL	The agency's URL for the project.
Project Name	PON_ PROJECT	PON_PROJECT_LB	The name of the selected project.
Project Type	PON_ PROJECT	PON_PROJECT_ CATEGORY_DEFS_ GD	The project category of the project that then filters the list of bridges available to add on the *Query* subtask.
Start Date	PON_ PROJECT	START_DATE	The start date of the project.
End Date	PON_ PROJECT	END_DATE	The end date of the project.
Created By	PON_ PROJECT	CREATEUSERKEY	The user who created the project.
Project Description	PON_ PROJECT	DESCRIPTION	A description of the project.

Control Name	Table Name	Column Name	Notes
Projects > Create/Edit Project > Management Control Information			
Project Costs Grouping			
Entered	PON_ PROJECT	IND_COST	Determines the indirect cost by entering a percentage of the direct cost.
Other Costs	PON_ PROJECT	ADD_COST	Additional costs that should be included in the total cost calculation.
Programs Grouping			
Freeze to Program	PON_ PROJECT	FROZEN_ PROGRAM_GD	Freezes the project to the selected program.
Freeze to Year	PON_ PROJECT	FROZEN_YEAR	Freezes the project to the target year.
Funding Sources Grouping			
Target Date	PON_ PROJECT_ FUNDING	TARGET_DATE	The date the funds from the selected funding source are expected to be available.
Amount	PON_ PROJECT_ FUNDING	AMOUNT	The amount of funding from the selected funding source.
Notes	PON_ PROJECT_ FUNDING	NOTES	Notes about the selected funding source.
Milestones Grouping			
Name	PON_ PROJECT_ MILESTONE	PON_PROJECT_ MILESTONE_LB	The name of the milestone. Indicates the standing of the project.
Status	PON_ PROJECT_ MILESTONE	MILESTONE_ STATUS	The status of the selected milestone.
Original Date	PON_ PROJECT_ MILESTONE	ORIGINAL_DATE	The original date the milestone was to be reached.
Revised Date	PON_ PROJECT_ MILESTONE	REVISED_DATE	The revised date for the milestone.
Notes	PON_ PROJECT_ MILESTONE	NOTES	Notes about the selected milestone.

The *Projects > Upload Project* task allows the user to use the XML project template to upload a project.
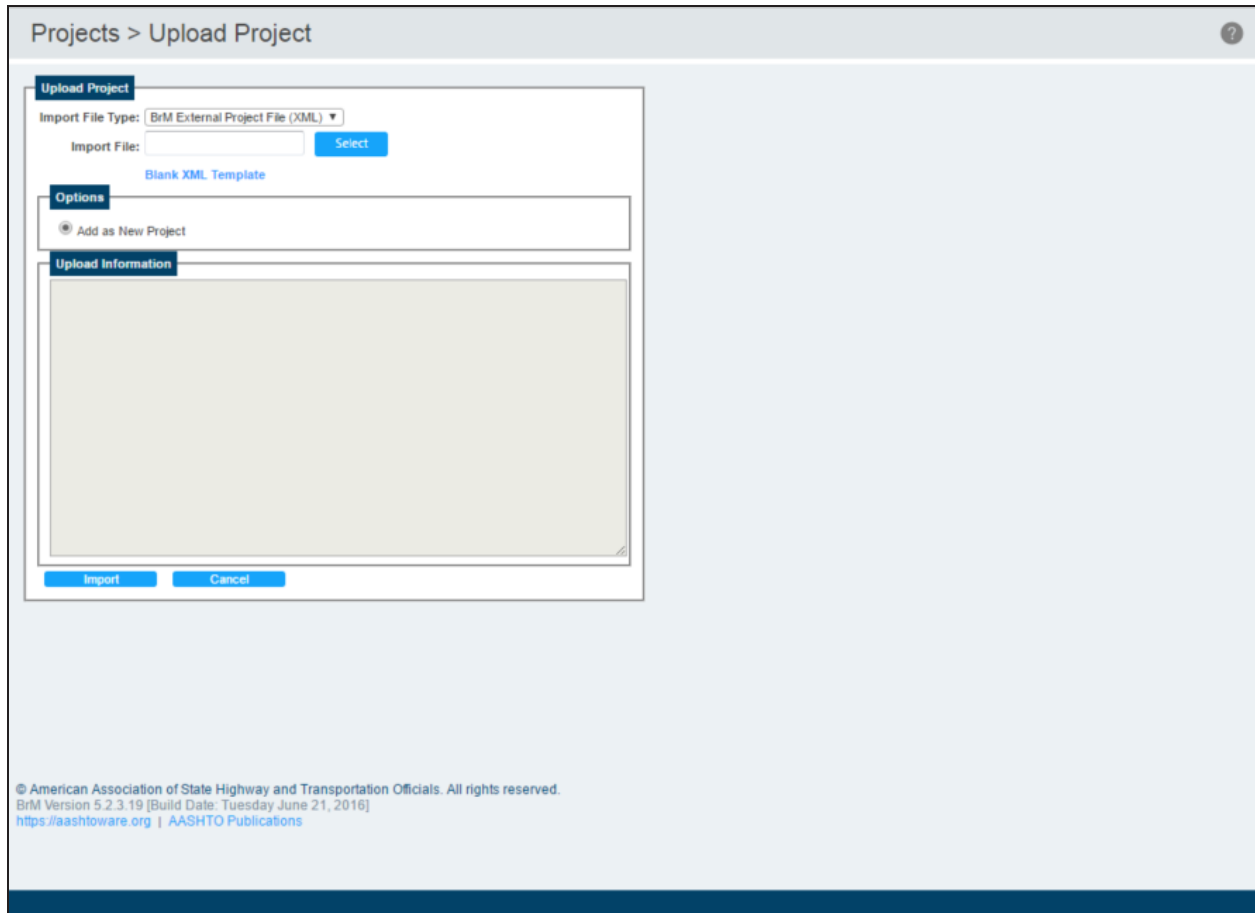
Using the XML Template

To use the XML project template, right click on the *Blank XML Template* link and save the file. Once saved, open the file and edit the fields:

```xml
<?xml version="1.0" encoding="UTF-8"?>
- <Project xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <Name/>
      <AlternateID/>
      <Category/>
      <Description/>
      <Notes/>
      <URL/>
      <StartDate/>
      <EndDate/>
      <IndirectCost/>
      <AdditionalCost/>
  </Project>
```

*Note: Template entries must match database information exactly in order for the template to function correctly.

When the template is complete, ensure the *Import File Type* dropdown is set to "BrM External Project File (XML)" and click the *Select* button to locate the newly created template file.

Options

Determine how the import file will be used by selecting either the *Update Existing Project* or *Add as New Project* radio button. If the *Update Existing Project* radio button is selected, use the *Update Existing Project* dropdown to determine which project will be updated.

Uploading

When the file has been selected and the desired options made, click the *Import* button to import the file. To clear all of the selections made on the *Upload Project* task and refresh the page, click *Cancel*.

Upload Information

The *Upload Information* grouping informs the user of the import file's upload status. Messages will notify the user of the success or failure of the upload:
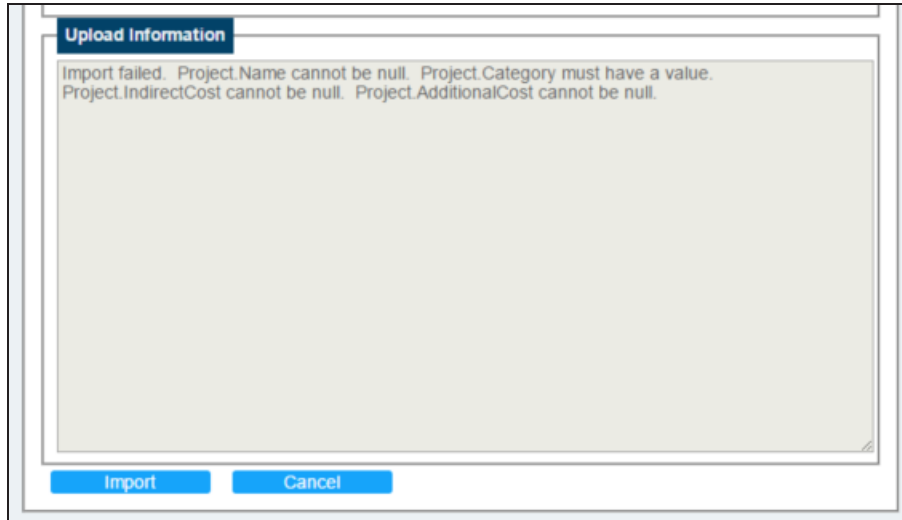
The *Projects > Combine Projects* task allows the user to combine two or more projects into one.

Stipulations:

1. At least two projects must be selected from the Project List. If less than two projects are selected, the following message will appear when the *Combine Projects* task is selected.
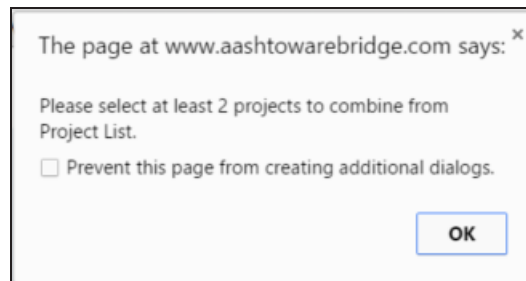
2. In order to combine projects, the selected projects must have the same status. Also, only projects with a "Planned" or "Proposed" status can be combined.

Combining the Projects

All of the projects that will be combined are listed in the Selected Projects grid. To combine the projects, enter a name for the new combined project in the *Combined Project Name* textbox and click the *Combine* button.

When the projects are combined, the user will be taken to the Project List. The new combined project will be present on the grid and the old singular projects will be deleted.

The *Cancel* button cancels the combining of the projects and returns the user to the *Projects > Project List* task.

Split Project

The *Projects > Split Project* task is used to split the selected project into two projects by creating a new split project that takes one or more of the work items from the selected project. Only projects with a "Planned" or "Proposed" status can be split.
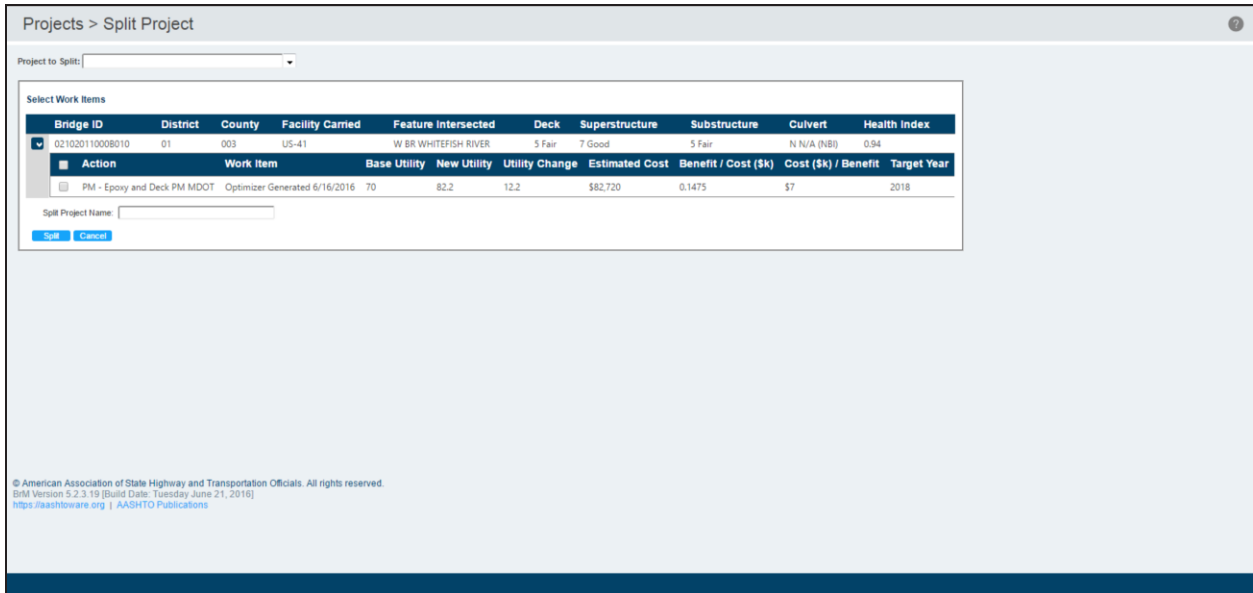
*Note: In order to split a project, the selected project must have at least one work item associated with a bridge.

*Note: It is not possible to select bridges (which would include all of the work items for that bridge within the project). If all of the work items related to a specific bridge are to be moved by splitting the project, each work item must be selected individually.

Select a Project

If a project is highlight selected in the Project List, that project will be displayed as the project to be split. If no project is highlight selected, a project must be selected from the *Project to Split* dropdown.

Bridges and Work Items

The grid will populate with the bridges that have been added to the project and can be expanded to reveal the work items for the bridges.

Select Work Items

Bridge ID	District	County	Facility Carried	Feature Intersected	Deck	Superstructure	Substructure	Culvert	Health Index
04 07598	02	013	JESSE OWENS PKWY	WESTERN CANAL	Unknown (NBI)	Unknown (NBI)	Unknown (NBI)	Unknown (NBI)	100

☐	Action	Work Item	Base Utility	New Utility	Utility Change	Estimated Cost	Benefit / Cost ($k)	Cost ($k) / Benefit
☐	Converted Work Candidates	A	74.1	74.1	0	$100	0	
☐	Converted Work Candidates	A	74.1	74.1	0	$500	0	
☐	Converted Work Candidates	B	74.1	74.1	0	$200	0	

Bridge ID	District	County	Facility Carried	Feature Intersected	Deck	Superstructure	Substructure	Culvert	Health Index
04 07878	02	013	DESERT FOOTHILLS	WASH	N N/A (NBI)	N N/A (NBI)	N N/A (NBI)	7 Minor Deterioration	
04 08511	02	013	CENTER FLYOVER	SKY HARBOR BLVD E & W	5 Fair	6 Satisfactory	7 Good	N N/A (NBI)	

☐	Action	Work Item	Base Utility	New Utility	Utility Change	Estimated Cost	Benefit / Cost ($k)	Cost ($k) / Benefit
☐	Converted Work Candidates	C	60.21	60.21	0	$1,000	0	
☐	Converted Work Candidates	C	60.21	60.21	0	$2,000	0	
☐	Converted Work Candidates	D	60.21	60.21	0	$500	0	

Bridge ID	District	County	Facility Carried	Feature Intersected	Deck	Superstructure	Substructure	Culvert	Health Index
04 08530	02	013	PARKING ENT&EXIT	Sky Harbor Blvd West	6 Satisfactory	7 Good	7 Good	N N/A (NBI)	

Split Project Name: [   ]

[Split] [Cancel]

Check the *Work Item* checkboxes of all of the work items that should be moved to the split project.

Splitting the Project

When all of the desired work items have been selected, enter a name for the new split project in the *Split Project Name* textbox and click the *Split* button.

Click the *Cancel* button to cancel the selections and return to the Project List.

The *Projects > Manage Funding* task allows the user to view and create/edit funding sources. Funding sources can then be added to projects and programs.

Funding List

The *Projects > Manage Funding > Funding List* subtask is a grid containing all of the funding sources. It operates in the same way as the Project List and Bridge List.

Filters and layouts can be created on the *Manage Filters* and *Manage Layouts* tasks, and funding sources can be deleted by clicking the ✗ icon for the desired funding source in the Funding List.

The major difference for the *Funding List* subtask compared to the Bridge List and Project List is that selecting a funding source from the grid takes the user directly to the *Create/Edit Funding Sources* subtask.

Create/Edit Funding Sources

The *Projects > Manage Funding > Create/Edit Funding Sources* subtask controls all of the settings for new or selected funding sources.

Use the *Selected Funding* dropdown to change the currently selected funding source or click the *Add New* button to add a new funding source.

Funding Source Details

The *Funding Source Details* grouping is used to determine all of the basic information for the funding source.

The most important control in the grouping is the *Funding Source Status* dropdown. There are three funding source status stages: Planned, Active, and Closed. The funding source must be in at least the "Active" status in order for other users to view the funding source.

Funding Source Notes

The *Funding Source Notes* grouping can be used to enter notes for the funding source.

Funding Source Targets

The *Funding Source Targets* grouping allows for the creation of funding source targets. Funding source targets are used when funding is added to a project or program. This allows projects and programs to add the same funding source more than once because the target dates are different.

Click the *Add New* button within the grouping to add a new funding source target.

If a funding source target is currently being used, the amount will show up in the Current Plan column of the grid. The Remaining column of the grid will then display how much money is remaining for the funding source target.

Below the grid of funding source targets is listed the total funding source amount for all of the funding source targets combined.

Associated Programs and Projects

The *Associated Programs and Projects* grouping displays all of the programs and projects that are associated with the funding source target date selected in the dropdown at the top of the grouping.

Target Year

There is a grouping for the programs - *Target Year Programs* - and a grouping for the projects - *Target Year Projects*. To remove a program or project from the selected funding source target date, click the ✕ icon for that program/project.

Create/Edit Funding Sources Page Controls

The *Save* button saves the changes made to the selected program.

The *Cancel* button cancels the changes made to the selected program and refreshes the page.

Projects > Manage Funding > Create/Edit Funding Sources Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Funding Source Details Grouping			
Funding Source ID	PON_FUNDING	PON_ FUNDING_ GD	Database ID for the funding source.

Projects > Manage Funding > Create/Edit Funding Sources Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Funding Source Status	PON_FUNDING	FUNDING_ STATUS	The current status of the funding source.
Funding Source URL	PON_FUNDING	URL	The agency's URL for the funding source.
Funding Source Name	PON_FUNDING	PON_ FUNDING_LB	The name of the funding source.
Funding Source Type	PON_FUNDING	FUNDING_ TYPE	The type of funding or from where the funding comes.
Funding Source Description	PON_FUNDING	DESCRIPTION	A description of the funding source.
Funding Sources Notes	PON_FUNDING	NOTES	Additional notes about the funding source.
***Funding Source Targets* Grouping**			
Target Date	PON_FUNDING_ TARGETS	TARGET_ DATE	The date the funds from selected funding source are expected to be available.
Target Amount	PON_FUNDING_ TARGETS	AMOUNT	The amount of funding from the selected funding source.
Notes	PON_FUNDING_ TARGETS	NOTES	Notes about the selected funding source.

Programs

- The Programs section of the manual addresses each of the tasks in BrM's *Programs* tab. The *Programs* tab allows for the creation and management of agency programs.

Program List

The *Programs > Program List* task is a complete list of all of the programs in the system that can be filtered and customized in various ways and allows for the selection of programs prior to performing other actions in the system.
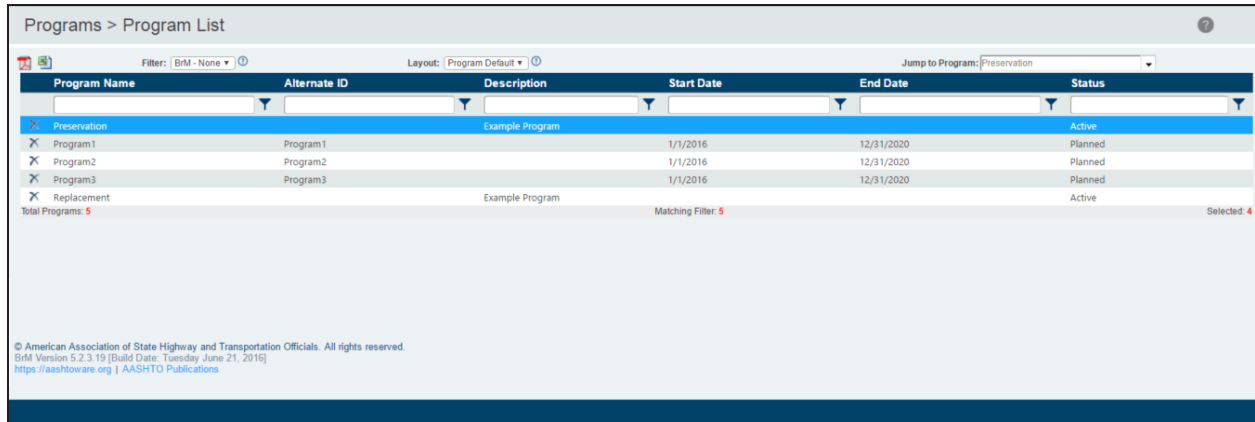
Selecting a Program

The *Program List* task's main function is program selection. To select a program, simply click on that program's row within the list. The major difference for the Program List compared to the Bridge List and Project List is that selecting a program from the grid takes the user directly to the *Create/Edit Program* task.

Filters

Due to the vast size of some users' systems, filters are necessary to sort and locate programs based on specified criteria.

There are two main ways to filter programs:

1. **Filter Dropdown** - The *Filter* dropdown lists all of the relevant filters that have been created/edited on the *Manage Filters* task (found in both the *Bridges* and *Projects* tabs). When a filter is selected from the dropdown, the Program List will automatically update with the filtered programs.

2. **Quick Filters** - Each column in the Program List has a quick filter textbox that enables the user to filter the grid based on a condition, such as "Contains" or "StartsWith." The user types into the *Quick Filter* textbox and then clicks the ▼ symbol to select a condition. Once the condition is selected, the grid will automatically be updated with the filtered programs.

   *Note: By default, filling in the *Quick Filter* textbox and then pressing Enter on the keyboard will automatically make use of the "Contains" quick filter condition.

The following table explains the various selectable quick filter conditions:

Quick Filter Conditions	
Condition	**Description**
NoFilter	No filter is applied - filter controls are cleared.
Contains	Returns results that contain the entered value. Same as: dataField LIKE '%value%'
DoesNotContain	Returns results that do not contain the entered value. Same as dataField NOT LIKE '%value%'
StartsWith	Returns results that start with the entered value. Same as: dataField LIKE 'value%'

Quick Filter Conditions	
Condition	**Description**
EndsWith	Returns results that end with the entered value. Same as: dataField LIKE '%value'
EqualTo	Returns results that exactly match the entered value. Same as: dataField = value
NotEqualTo	Returns results that do not exactly match the entered value. Same as: dataField != value
GreaterThan	Returns results with a value greater than the entered value. Same as: dataField > value
LessThan	Returns results with a value less than the entered value. Same as: dataField < value
GreaterThanOrEqualTo	Returns results with a value greater than or exactly matching the entered value. Same as: dataField >= value
LessThanOrEqualTo	Returns results with a value less than or exactly matching the entered value. Same as: dataField <= value
Between	Returns results with a value that falls between the two entered values. Same as: value1 <= dataField <= value2 ***Note:** Value1 and value2 should be separated by a space when entered into the quick filter.
NotBetween	Returns results with a value that does not fall between the two entered values. Same as: dataField <= value1 && dataField >= value2 ***Note:** Value1 and value2 should be separated by a space when entered into the quick filter.
IsEmpty	Returns results where the specific field is empty. Same as: dataField = ''
NotIsEmpty	Returns results where the specific field is not empty. Same as: dataField != ''
IsNull	Returns only null values.
NotIsNull	Returns only non-null values.

Layout

The *Layout* dropdown determines the Program List's columns. There is a default layout on the *Program List* task, but new layouts can be created on the *Manage Layouts* task (found in both the *Bridges* and *Projects* tabs).

Jump to Program

The *Jump to Program* textbox/dropdown allows the user to search for and locate a specific program. The user can type the program name into the textbox or use the dropdown to find the program by clicking through the pages. When the program is selected from the *Jump to Program* textbox/dropdown, the user will automatically be taken to the *Create/Edit Programs* task.

Export Options

There are two export options located at the top left corner of the Program List: PDF and XLS. The export options will export all of the programs currently shown in the list.

Create-Edit Programs

The *Programs > Create/Edit Program* task is used to create or edit a program. A program is a collection of specific projects with specific constraints (budget, performance, etc.) that operates for a predetermined period of time.

Program Details

The *Program Details* grouping contains the basic information that defines the program.

Field	Description
Program Details Fields	
Field	**Description**
Program Alternate ID	An alternative ID to make the program easily identifiable.
Program Status	Determines the status of the program: Planned, Active, or Closed.
Program Start Year	The year that the program will begin.
Program Name	The main identifier for the program.
Program URL	The agency website for the program, if applicable.
Program End Year	The year that the program will end.
Program Objectives	Indicates the specific objective of the program. This is an agency defined field that can be set using the pon_program - program_objective setting on the *Admin > General Config > Parameters* task.
Structure	Determines the priority and importance of bridges in the same network using a formula established

Program Details Fields	
Field	**Description**
Weights Formula	on the *Admin > Modeling Config > Advanced Formulas* task.
Required Minimum Cost	The minimum cost of a program's work. This threshold ensures that BrM does not recommend programs that have improbably low costs for which agencies would not perform work. ***Note:** The minimum cost applies to each individual project generated for the program, not the sum of all of the projects.
Bridge Filter	Determines which bridges are available to be added to the program. Bridge filters can be created on the *Manage Filters* tasks. Only filters with an "Inspection" context will appear in the dropdown. ***Note:** The "Share" feature of filters is ignored for this dropdown. All filters with the "Inspection" context, regardless of share status, will appear in the dropdown.
Program Description	An overall description of the program and what it entails.
Program Notes	Notes related to the program.

Configuration Data

The *Configuration Data* grouping allows the user to establish the program's configuration data for the LCCA.

The *NBI Deterioration Method* dropdown determines whether the program's deterioration method will use a specific NBI converter profile or component level deterioration. If "NBIConverter" is chosen, the *NBI Converter Profile* dropdown will be available to select a specific NBI converter profile that was created on the *Admin > Modeling Config > NBI Conversion Profiles* task.

The *Long-Term Analysis Period* textbox determines the length of time in years for the LCCA. The default value is 50 years.

The *Discount Rate* textbox indicates the cost discount percentage for the LCCA. The discount rate suggests that the further in the future an action/event occurs, the less it will cost. The default value is 4 percent.

The *Inflation Estimation Method* dropdown allows the user to determine if inflation will be considered for the program and, if so, which method will be used:

- **None** - No inflation used.
- **Undefined** - Currently undefined rate.
- **CostIndexing** - Uses the inflation rates established on the *Admin > Modeling Config > Cost Index* task.
- **FixedInflationRate** - Causes the *Inflation Rate* textbox to appear to allow the user to enter a fixed inflation percentage rate.

*Note: When viewing results it must be remembered that discount rate and inflation rate directly oppose each other. For instance, a discount rate of 4 percent and a fixed inflation rate of 4 percent will end up causing the rate to stay the same.

At the end of the LCCA, the system estimates the remaining value of the bridge. The *Residual HiX Approximation* checkbox determines whether that estimation will be simple or complex. If checked, the simplified residual estimation is used and the remaining value of the bridge is estimated based on the bridge's health index at the end of the LCCA. If unchecked, the complex residual estimation is used and the simulation continues until bridge replacement.

*Note: The *Residual HiX Approximation* checkbox is checked by default. It is less accurate than the complex method, but it is significantly faster.

Network Policies

The *Network Policies* grouping allows the user to determine which network policies will be included in the program. Network policies determine which projects are automatically generated for the program during optimization based on the actions included in the network policy.
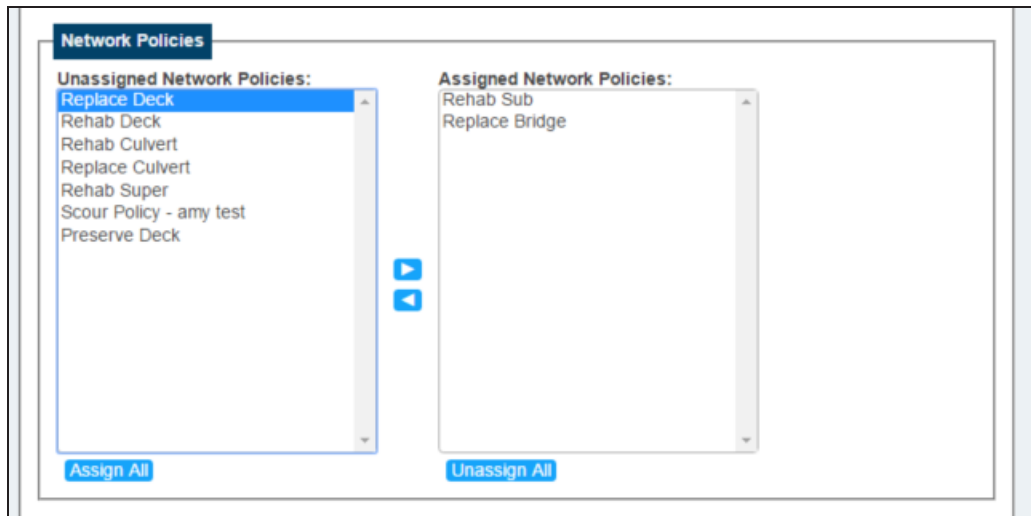
To move one or more network policies from one list to the other, select all of the desired network policies and then click the right or left arrow - - to move the selections to the desired list.

Utility Weights Profile

The *Utility Profile* dropdown is used to select a utility weights profile for the program. Utility weights profiles are created on the *Admin > Modeling Config > Weights Profile* task and are used to override aspects of the default utility weights in the system.

When a utility weight profile is selected, the *Utility Profile's Weights* grouping will appear:
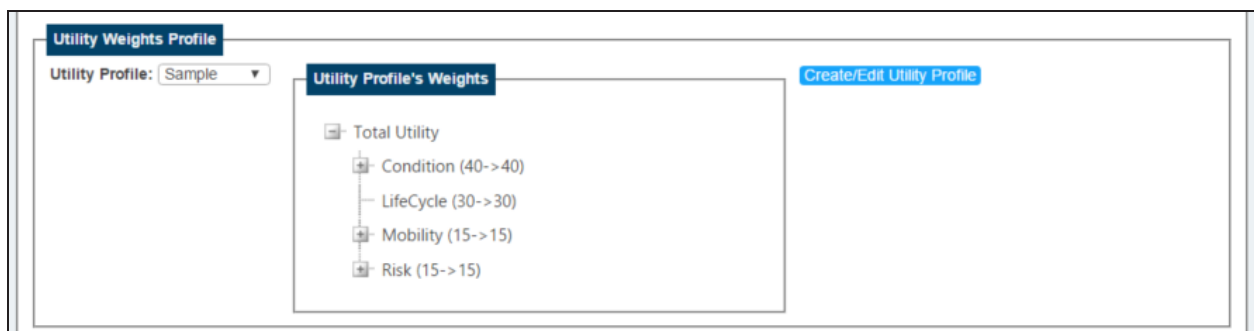
The utility tree displays the default utility weights and to what weight they have changed.

Example: If the Condition utility reads "Condition (31->50), the default weight was 31 and the utility weights profile has changed it to 50.

Clicking the *Create/Edit Utility Profile* button will open the *Admin > Modeling Config > Weights Profile* task so that the utility weights profiles can be created/edited.

Subdivision Profile

The *Subdivision Profile* dropdown is used to select a subdivision profile for the program. The subdivision profiles are created on the *Admin > Modeling Config > Subdivision Profiles* task and determine how the program will be subdivided based on a specific table and field name within the database. For instance, a subdivision profile could subdivide the program by district.

When a subdivision profile is selected, the *Subdivision Profile Segments* and *Filter Segments* groupings will appear:

The *Subdivision Profile Segments* grouping displays the table and field names subdividing the program. Clicking the *Create/Edit Subdivision Profile* button will open the *Admin > Modeling Config > Subdivision Profiles* task so that the subdivision profiles can be created/edited.

The *Filter Segments* grouping allows the user to create filters based on selections from the available subdivision segments. The user can use each segment's dropdown to make a selection, then click the *Add* button. The results will then be displayed in a grid.

Example: If the selected subdivision profile uses inspevnt.dkrating as a segment, the filter segments available to add will be values 0-9 because the deck rating must be a value between 0-9. The program will then only include bridges that meet those filter segments.

Click the ✕ icon to delete a filter segment. If the user deletes a filter segment that has data tied to it, the user will receive a popup notification when trying to save the changes to the program:

Create/Edit Programs Page Controls

Use the *Program* dropdown to select an existing program to edit.

Click the *Create New* button to create a new program.

Click the *Copy>>* button to create a copy of the selected program. This will reveal the *Copy Name* textbox and the *Only Copy Frozen* checkbox.

If the *Only Copy Frozen* checkbox is checked, the new program will only include projects that are frozen to the copied program.

When the desired selections are made and a name is entered into the *Copy Name* textbox, click the *Copy* button to complete the copy or click the << button to cancel the copy.

Click the *Save* button to save changes to the selected program.

Click the *Delete* button to delete the selected program.

_____

Programs > Create/Edit Program Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Program Alternate ID	PON_ PROGRAM	ALT_ID	An alternative ID to make the program easily identifiable.
Program Start Date	PON_ PROGRAM	START_DATE	The year that the program will begin.
Program Name	PON_ PROGRAM	PON_ PROGRAM_ GD	The main identifier for the program.
Program Status	PON_ PROGRAM	PROGRAM_ STATUS	Determines the status of the program: Planned, Active, or Closed.
Program End Date	PON_ PROGRAM	END_DATE	The year that the program will end.
Program Objective	PON_ PROGRAM	PROGRAM_ OBJECTIVE	Indicates the objective of the program. This is an agency defined field that can be set using the pon_program - program_objective setting on the *Admin > General Config > Parameters* task.
Program URL	PON_ PROGRAM	URL	The agency website for the program, if applicable.
Program Description	PON_ PROGRAM	DESCRIPTION	An overall description of the program and what it entails.
Program Notes	PON_ PROGRAM	NOTES	Notes related to the program.

Assign Projects

The *Programs > Assign Projects* task allows the user to assign/unassign projects to programs, delete projects, and freeze/unfreeze projects.

Projects List

The *Projects List* grouping displays all of the projects in the system and can be filtered based on a Project List filter or based on a program's existing projects.

No actions can be performed on the page until at least one project's checkbox is selected in the *Projects List* grouping. Once selected, the *Choose an Action* grouping will appear.

Choose an Action

The *Choose an Action* grouping is used to perform an action on the selected projects. The available actions include:

Assign Selected Projects

To assign the selected projects to a program, select "Assign Selected Projects" from the *Action* dropdown and use the *Programs* listbox to select one or more (hold down the CTRL key to select multiple) programs to which to assign the projects.

Use the *Freeze* dropdown to determine if the selected projects will be frozen or not. If "Freeze" is selected, use the second dropdown to determine whether it will freeze to the program, the year, or both. If "Year" or "Program and Year" is selected, another dropdown will appear so that a year can be chosen.

Freezing a project to a program and/or year means that regardless of the program optimization's recommendations, the link between the project-program and/or project-year cannot be broken.

*Note: The same project can be assigned and frozen to multiple programs.

Unassign Selected Projects

To unassign the selected projects from a program, select "Unassign Selected Projects" from the *Action* dropdown.

The user can then determine whether the project should be removed from "All Programs" or the "Selected Programs." If "Selected Programs" is chosen, the *Programs* listbox will reappear and the user can select one or more (hold down the CTRL key to select multiple) programs from which to remove the projects.

*Note: Users do not need to verify that a project is within the selected program in order to delete it. If the project is not within the selected program, no change will occur.

Delete Selected Projects

To delete the selected projects, select "Delete Selected Projects" from the *Action* dropdown. Choosing to delete the selected projects will remove them from the system completely once the page is saved.

Assign Projects Page Controls

Once the desired action has been chosen, click the *Save* button to perform the action.

Performance Measures

The *Programs > Performance Measures* task is used to include additional performance measures (utility value is automatically included in program optimization) to the selected program. The performance measures are used to evaluate the selected program.

The ***Program*** dropdown is used to select the program for which the performance measures are being established.

The ***Scenario*** dropdown is used to select the scenario of the selected program for which the performance measures are being established.

Select Performance Measures

The *Select Performance Measures* grouping allows the user to determine which performance measures to use on the selected program.

To add a performance measure, click the ***Add New Record*** symbol - ➕ - to make the ***Performance Measures*** dropdown appear.

The available performance measures are:

Performance Measures	
Measure	**Description**
Pct. Good (Count-Based)	The percentage of bridges included in the program analysis with an overall NBI rating greater than or equal to 7. ***Note:** This is count-based, meaning the size of the bridge is NOT considered. With this method, a 1000 ft. bridge is equal to a 100 ft. bridge. It's a 1:1 ratio.
Pct. Good (Surface-Based)	The percentage of deck area of bridges included in the program analysis with an overall NBI rating greater than or equal to 7. ***Note:** This is surface-based, meaning the size of the bridge IS considered. With this method, a 1000 ft. bridge affects the overall per-

Performance Measures	
Measure	**Description**
	centage much more than a 100 ft. bridge.
Pct. Good/Fair (Count-Based)	The percentage of bridges included in the program analysis with an overall NBI rating of 6 or 5. ***Note:** This is count-based, meaning the size of the bridge is NOT considered. With this method, a 1000 ft. bridge is equal to a 100 ft. bridge. It's a 1:1 ratio.
Pct. Good/Fair (Surface-Based)	The percentage of deck area of bridges included in the program analysis with an overall NBI rating of 6 or 5. ***Note:** This is surface-based, meaning the size of the bridge IS considered. With this method, a 1000 ft. bridge affects the overall percentage much more than a 100 ft. bridge.
Pct. Poor (Count-Based)	The percentage of bridges included in the program analysis with an overall NBI rating less than 5. ***Note:** This is count-based, meaning the size of the bridge is NOT considered. With this method, a 1000 ft. bridge is equal to a 100 ft. bridge. It's a 1:1 ratio.
Pct. Poor (Surface-Based)	The percentage of deck area of bridges included in the program analysis with an overall NBI rating less than 5. ***Note:** This is surface-based, meaning the size of the bridge IS considered. With this method, a 1000 ft. bridge affects the overall percentage much more than a 100 ft. bridge.
Deck NBI Rating	The average of all of the deck NBI ratings for the bridges included in the program analysis.
Substructure NBI Rating	The average of all of the substructure NBI ratings for the bridges included in the program analysis.
Superstructure NBI Rating	The average of all of the superstructure NBI ratings for the bridges included in the program analysis.
Culvert NBI Rating	The average of all of the culvert NBI ratings for the bridges included in the program analysis.
Health Index	The average of all of the health indexes for the bridges included in the program analysis.
Database Field Performance	The user can select the table and column of the desired field in the database and determine the best and worst values.

Select the desired performance measure, then click the *Insert* button to add the performance measure. Click the *Cancel* button to cancel the addition of the performance measure.

Each performance measure added will populate default values into the Best Value and Worst Value columns. These values cannot be edited. Clicking the 🖉 icon only allows the user to change the selected performance measure, not the best and worst values.

If "Database Field Performance" is selected, the user can use the *Table* and *Field* dropdowns to select the specific field in the database to use.

Unlike the other performance measures, the database field selections don't have default best and worst values. The **Best Value** and **Worst Value** textboxes allow the user to determine what those values will be. The minimum and maximum values in the database are listed below the textboxes to aid the user in determining the values. These are the only performance measure values that can be edited using the 🖊 icon.

The performance measure can be edited using the *Edit* link or deleted using the ✖ symbol.

Performance Constraints by Segment

The *Performance Constraints by Segment* grouping allows the user to specify constraints (if desired) on the performance measures added in the *Select Performance Measures* grouping. The constraints are separated by the selected program's segments which are set in the *Subdivision Profile* grouping on the *Programs > Create/Edit Programs* task.

*Note: If no program segments exist, the grid will not be displayed and a link to the *Create/Edit Programs* task will be available so that the user can create segments from the *Subdivision Profiles* grouping.

The performance constraints are used to further specify the optimization process. In addition to maximizing utility, the optimization will attempt to adhere to the specified performance (and budget) constraints.

The available constraints, depending on the type of performance measure, are:

Performance Constraints	
Constraint	**Description**
Minimum	The performance measure should be greater than or equal to the value.
Maximum	The performance measure should be less than or equal to the value.
Target	Represents the performance level the program is attempting to achieve.

Example: The Superstructure NBI Rating measure has the following constraints: Min: 6 and Target: >= 7. This means that the optimization process will attempt to create a program in which each bridge's individual superstructure NBI rating is greater than or equal to 6 and the overall average of the bridge's superstructure NBI rating is at least 7.

Performance Measure Page Controls

Click the *Save* button to save the changes made to the performance measures.

Click the *Cancel* button to cancel the changes made to the performance measures.

Programs > Performance Measures Control Information			
Control Name	**Table Name**	**Column Name**	**Notes**
Select Performance Measures Grouping			
Measure	PON_PROG_ PERFORMANCE	PON_PERFORM_ MEASURE_GD	The selected performance measure.
Table	PON_PROG_ PERFORMANCE	TABLE_NAME	The database table used for the "Database Field Performance" performance measure.
Field	PON_PROG_ PERFORMANCE	FIELD_NAME	The database field used for the "Database Field Performance" performance measure.
Best Value	PON_PROG_ PERFORMANCE	BEST_FIELD_ VALUE	The best possible value for the selected "Database Field Performance" performance measure.
Worst Value	PON_PROG_ PERFORMANCE	WORST_FIELD_ VALUE	The worst possible value for the selected "Database Field Performance" performance measure.
Constraints Grid			
Min	PON_PROG_ CONSTRAINT	MINIMUM	The minimum value performance constraint for the segment.
Max	PON_PROG_ CONSTRAINT	MAXIMUM	The maximum value performance constraint for the segment.
Target	PON_PROG_ CONSTRAINT	TARGET	The target value performance constraint for the segment.

The *Funding Allocation* task is used to specify the selected program's funding sources and amounts as well as to distribute the funds between the program's segments.

Use the *Program* and *Scenario* dropdowns to determine for which programs to allocate funding.

Funding Allocation

The *Funding Allocation* grouping displays the program's funding sources and the amounts from each source.

To add a new funding source, click the *Add New* button.

The *Funding Source* dropdown determines from where the funding comes. To create new funding sources, use the *Projects > Manage Funding > Create/Edit Funding Sources* subtask.

The *Amount* textbox is used to indicate the amount of funds allocated to the program from the source.

The *Date* dropdown indicates the date that the selected funding source's funds were allocated. The funding source dates are determined on the *Projects > Manage Funding > Create/Edit Funding Sources* subtask.

To delete a funding source from the program, click that funding source's ✕ symbol.

Budget Distribution

The *Budget Distribution* grouping aids users in distributing the program's funding.

Quick Distribution

If no funding sources have been chosen for the program in the *Funding Allocation* grouping, the *Quick Distribution* grouping will be present.

The *Override Budget* textbox allows the user to enter a budget that will be distributed evenly among the program years.

To distribute the funds, click the *Distribute Evenly* button and the funds will then be split and appear in the *Additional Funds* textbox for each program year in the first funding chart.

Funding Grids

The first grid displays the total annual budget for each year represented in the *Funding Allocation* grouping:

Total budget: $295,000
Total allocated funds: $0

	2016	2017
Identified annual funds:	$150,000	$145,000
Additional funds:	$0	$0
Total annual budget:	$150,000	$145,000
Allocated funds:	$0	$0
Available Funds:	$150,000	$145,000

Each year also has an *Additional Funds* textbox that can be used to enter additional funds not listed in the *Funding Allocation* grouping or where the distributed funds go if the *Quick Distribution* grouping was available and used.

The second grid allows the user to distribute the program's annual budget between the program's segments. The *Input Method* radio buttons beside the grid determine if the entered values will be actual budget values or a percentage of the annual budget.

*Note: The second grid and *Distribute* and *Get Performances* buttons will not appear unless the program has filter segments (determined from the subdivision profile).

One method of distributing the funds is to do so manually by using the textboxes for each year of each segment and entering a dollar amount or percentage in each. In order to make a more informed decision on how to distribute funds, the user can click the *Get Performances* button to reveal the performance levels of each segment at the beginning of the program. The performance measures shown are determined on the *Programs > Performance Measures* task:

The second method of distributing the funds is to do so automatically using the *Distribute* button. Clicking the *Distribute* button takes the budget provided for each year of the program and distributes it amongst the program's segments based on the performance of the segments.

The *Year* checkboxes for each column of the grid allow the user to freeze the funding for that year. This ensures that when the funds are distributed using the *Distribute* button, the checked years are skipped and do not have funds distributed to them.

The ✕ symbol in each textbox of the grid allows the user to delete the "$" and value in the textbox and leave a null value instead of a "$0" value. The difference between "$0" and null becomes important when optimizing the program. If "$0" is in the textbox, the optimizer will not distribute any funds to that specific segment/year combination. If the textbox is null when the program is optimized, that specific segment/year combination will have its funding determined in an effort to find the best cost to benefit ratio. Regardless of the number of null fields, the optimizer will never distribute more funding than has been allocated.

Funding Allocation Page Controls

Click the *Cancel* button to cancel the changes made to the funding allocation and return to the Program List.

Click the *Save* button to save the changes made to the funding allocation and remain on the page.

Click the *Save & Close* button to save the changes made to the funding allocation and return to the Program List.

	Programs > Funding Allocation Control Information		
Control Name	**Table Name**	**Column Name**	**Notes**
Funding Source	PON_FUNDING_TARGETS	PON_FUNDING_GD	The selected funding source in the *Funding Allocation* grouping.
Amount	PON_FUNDING_TARGETS	TARGET_DATE	The expected date the funding will be received.
Year	PON_FUNDING_TARGETS	AMOUNT	The amount of funding that will be received.
Notes	PON_FUNDING_TARGETS	NOTES	Notes about the selected funding source.

The *Programs > Program Planning* task is used to run the optimization process for the selected program and assign and manage the projects within the program.

As its name suggests, the purpose of the program optimizer is to develop optimal programs. The optimizer conducts a benefit cost analysis on a pool of project alternatives and then selects a set of projects that best meet the program's goals under its specified constraints. The pool of project alternatives includes the following projects:

a. Automatic projects generated from network policies.
b. Projects generated from open work candidates.
c. Projects manually assigned to the program.

The current optimization algorithm can consider only manual projects that affect a single bridge. Manual projects affecting multiple bridges will not be considered as alternatives for optimization.

The optimization will run on a separate executable from the web application. Specifically, a Windows Service is responsible for running the program optimization.

While the optimization is running, users can monitor the status of the optimization on this page. Once the optimization is completed, users can view all of the projects assigned to the program by the optimization process.

Only one optimization process can be run for a given database. While the optimization is running for a program, users cannot start the optimization on other programs.

The status of the optimization process is stored in PON_PROG_OPTIMIZATION. A new record is created in this table when users start running the optimization process for a program. The record contains the configuration parameters determined by users. The service continuously polls this table to check if a new optimization process is started. Once detecting a new entry, the executable retrieves the parameters provided by users and then runs the process under the given parameters.

Optimize Program

The *Optimize Program* grouping is used to run the optimization process for the selected program/scenario combination.

The **Program** dropdown is used to select the program for which the optimization will be performed.

The **Scenario** dropdown is used to select the scenario of the selected program for which the optimization will be performed.

The **Optimization Method** dropdown determines what method the optimization process will use:

- **Maximize Utility** - The optimization tries to maximize the overall utility of the program within the specified performance constraints. The program's utility weights are established on the *Programs > Create/Edit Programs* task. Constraints on the program can be established on the *Programs > Funding Allocation* and *Programs > Performance Measures* tasks.
- **Minimize Cost** - The optimization generates a program with the minimum possible cost that meets the specified performance constraints. Utility is not factored into minimizing the cost. This method will consider increasingly expensive project alternatives until the performance constraints are met.

With either selection, the user will be notified if optimization cannot produce a feasible solution that meets the specified program criteria. In that case, users may consider changing some of the program specifics, such as increasing the budget or loosening the performance constraints. If that's not possible or desired, users can still accept the proposed solution even if it doesn't meet the program's goals.

The *Keep Assigned Projects* dropdown determines whether the optimization will include all of the program's currently assigned projects (while potentially adding more) or ignore the projects currently assigned to the program and assign all new projects.

The *Run on All Scenarios* dropdown indicates whether the optimization will run for a specific scenario (the scenario currently selected in the *Scenario* dropdown) or for all of the program's scenarios. If "Yes" is selected, the results of the optimization will still be separated by each scenario and the overall time to perform the optimization will increase.

The *Respect External Frozen Projects* dropdown determines whether the optimization will adhere to the rules established for projects frozen to other programs. If "No" is selected, the program optimizer will ignore the freeze settings of projects. If "Yes" is selected:

- Program frozen projects will not be added.
- Program and year frozen projects' target years will be avoided by the optimizer. The deferment rules for the projects (based on the actions in each project) will also be respected.

Program Information

The *Program Information* grouping indicates the parameters and information specific to the selected program:

Optimization Progress

When the desired selections are made, click the *Run Optimization* button. A status bar will then appear:

Once the optimization process begins, the status bar will display one of the following colors:

- **Green with moving lines:** the optimization is processing
- **Solid green:** the optimization is complete
- **Red:** the optimization failed or was aborted

The optimization processing time will vary depending on various factors including the size of the network, number of projects, number of constraints, and more. As stated earlier, only one program optimization can be run at a time. Users can view other areas of the software while the optimization runs.

Once the optimization begins, the *Run Optimization* button will change to the *Abort Optimization* button and the *Progress Messages* grouping will appear to display the progress of the optimization. If for any reason the optimization needs to be stopped prior to completion, click the *Abort Optimization* button.

Once the optimization is complete, the *Assigned Projects* grouping will update:

Optimization Progress

Complete!

Progress Messages

Initializing Program Optimization...	7/27/2016 10:12:01 AM
Processing Scenario 'Default'.	7/27/2016 10:12:49 AM
Getting Action Sequences	7/27/2016 10:12:49 AM
Getting Utility Tree	7/27/2016 10:13:36 AM
Processing Segments...	7/27/2016 10:13:37 AM
Retrieving Budgets	7/27/2016 10:13:37 AM
Estimating inital conditions of all segments	7/27/2016 10:13:37 AM

Assigned Projects

Segment: All ▼   Year: All ▼

Project Name	Category	Automatic	Cost	Utility	Utility Benefit	Benefit/Cost ($k)	Cost ($k) / Benefit	Year	Frozen	Status
81181073000X010(Rehab Super, Rehab Sub)	No Category	Yes	$14,685,413	62.41	6.12	0.0004	$2,399.58	2035	No	Proposed
81181073000X010(Rehab Sub)	No Category	Yes	$15,553	57.09	0.47	0.0302	$33.09	2033	No	Proposed
80200033000X010(Rehab Super, Rehab Sub)	No Category	Yes	$1,787,408	60.38	10.29	0.0058	$173.70	2031	No	Proposed
80200033000X010(Rehab Super)	No Category	Yes	$319,512	59.99	1.06	0.0033	$301.43	2036	No	Proposed
80200033000X010(Rehab Sub)	No Category	Yes	$29,104	60	0.1	0.0034	$291.04	2033	No	Proposed
73173101000X010(Rehab Super)	No Category	Yes	$7,625,828	50.15	2.46	0.0003	$3,099.93	2035	No	Proposed
52152081000X040(Rehab Super, Rehab Sub)	No Category	Yes	$35,993	64.93	1.07	0.0297	$33.64	2034	No	Proposed
52152081000X040(Rehab Sub)	No Category	Yes	$59,070	65.99	1.35	0.0229	$43.76	2031	No	Proposed
33133041000X010(Rehab Super, Rehab Sub)	No Category	Yes	$6,690,065	60.91	10.01	0.0015	$668.34	2034	No	Proposed
33133041000X010(Rehab Sub)	No Category	Yes	$359,089	51.4	4.22	0.0118	$85.09	2031	No	Proposed
21121022000X020(Rehab Super, Rehab Sub)	No Category	Yes	$763,469	62.31	19.09	0.025	$39.99	2031	No	Proposed
21121022000X020(Rehab Super)	No Category	Yes	$216,157	62.16	2.95	0.0136	$73.27	2036	No	Proposed
21121022000X010(Replace Bridge)	No Category	Yes	$1,314,683	82.79	19.98	0.0152	$65.80	2031	No	Proposed

Items per page: 15 ▼

Assigned Projects

Prior to running the program optimization, the *Assigned Projects* grouping displays the projects that have been manually assigned to the program on the *Programs > Assign Projects* task. Once the optimization is run, the *Assigned Projects* grouping updates with the projects automatically generated by the optimization (the old projects will remain if "Yes" was selected from the *Keep Assigned Projects* dropdown.)

The *Assigned Projects* grouping displays the basic information for each project, including cost, utility, year, and status. The *Segment* and *Year* dropdowns allow the user to filter the assigned projects based on the program segment they relate to or the year they've been assigned, respectively. Clicking the ✎ icon for a specific project will open the *Projects > Create/Edit Project > Management* subtask for that project. From there the project can be removed from the program, if desired.

The *Programs > Program Results* task displays the performance results of the selected program and scenario. The charts evaluate the program based on the performance measures set on the *Programs > Performance Measures* task.
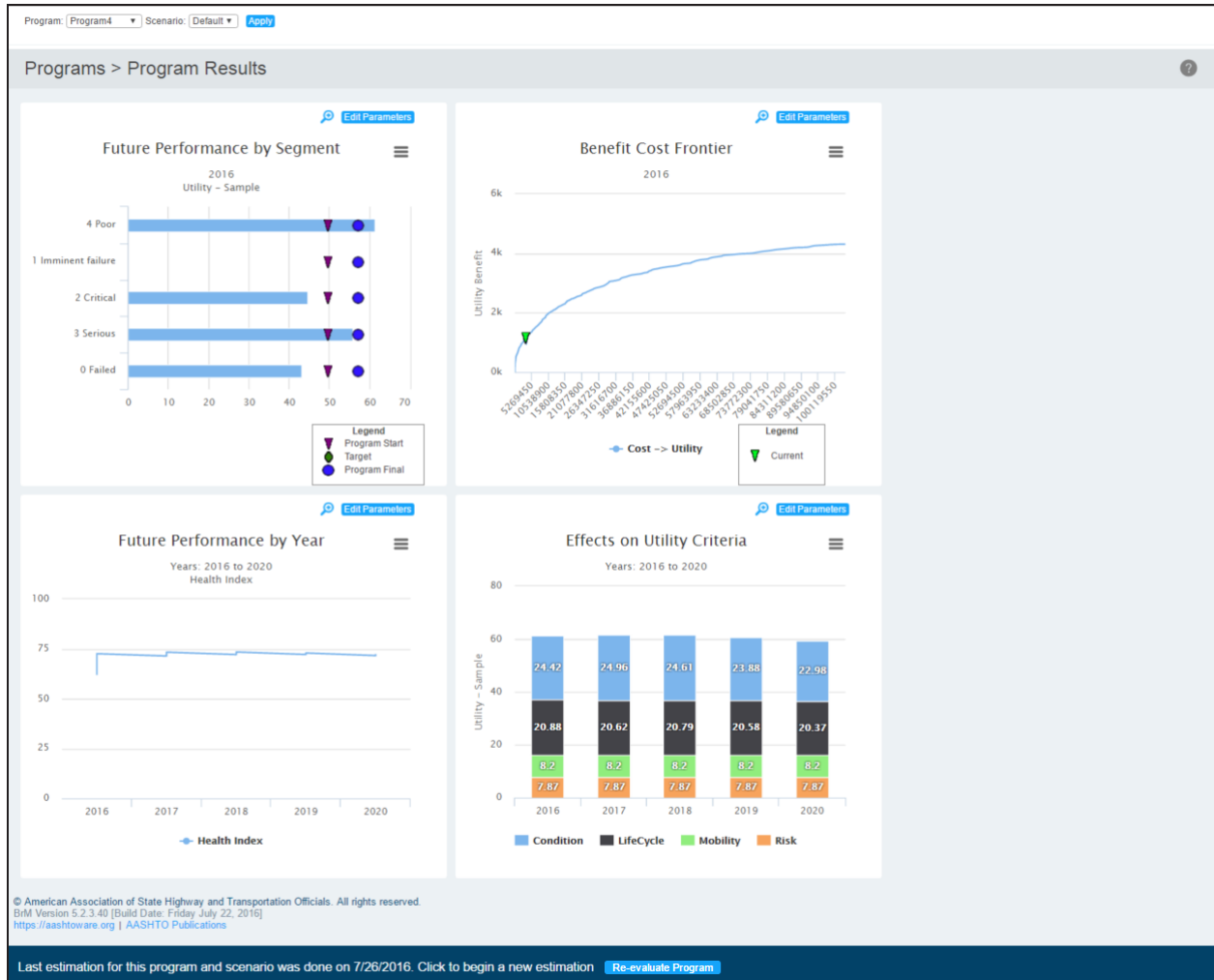
Future Performance by Segment

The Future Performance by Segment chart compares the performance of each program segment in a given year:
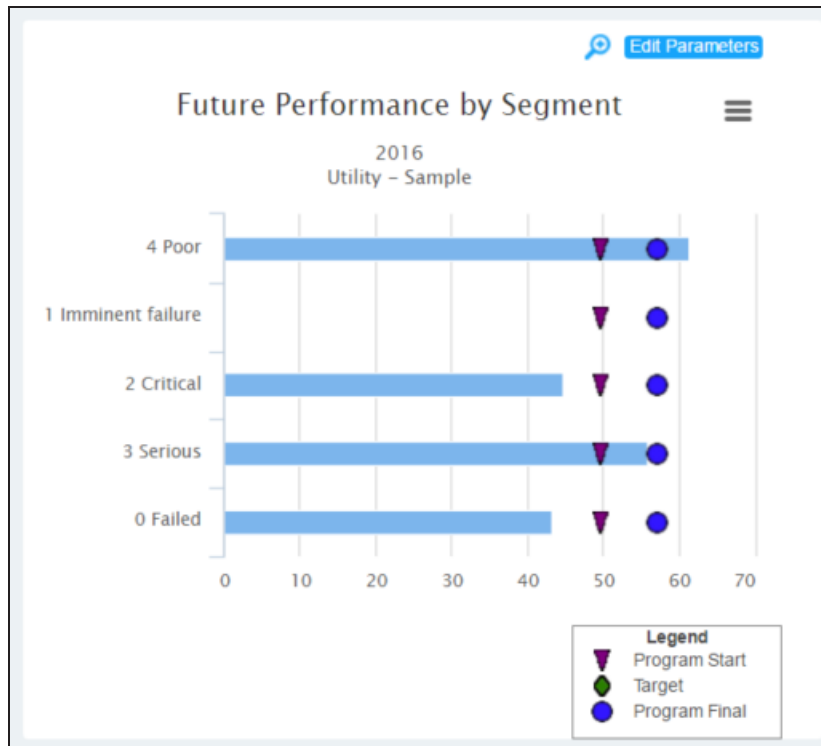
The Legend indicates the various points on the chart: Program Start, Target, and Program Final. The *Edit Parameters* button allows the user to select which performance measure and year to display:

Click the *Apply* button to accept the parameter change.

Click the *Cancel* button to cancel the parameter change.

Benefit Cost Frontier

The Benefit Cost Frontier chart displays the maximum utility level the selected program segment can achieve in the selected year for a certain level of funding.
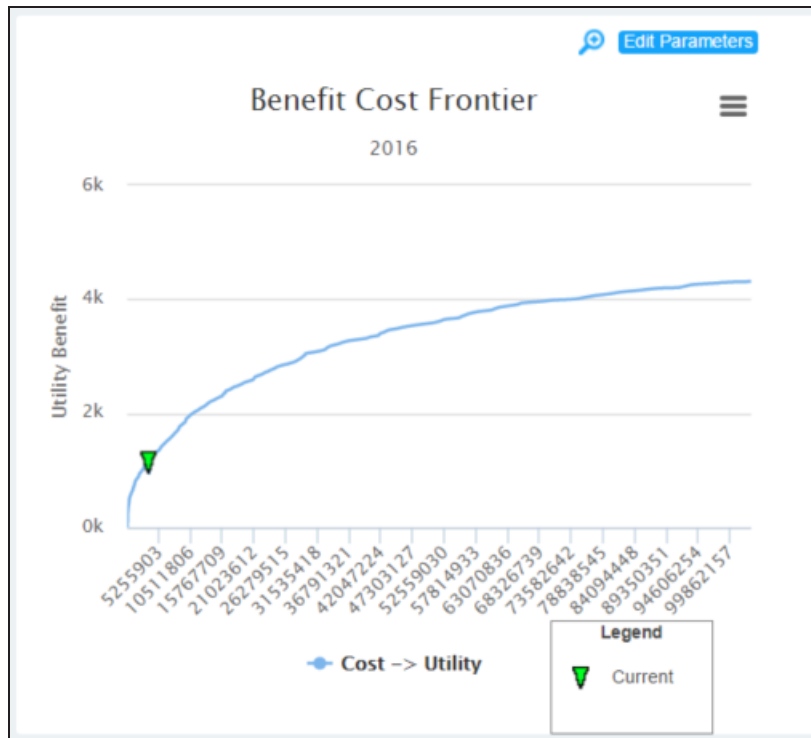
The Legend indicates the single point on the chart: Current. This is the current position of the program in the overall benefit cost frontier.

The *Edit Parameters* button allows the user to select which program segment and year to display:

Click the *Apply* button to accept the parameter change.

Click the *Cancel* button to cancel the parameter change.

Future Performance by Year

The Future Performance by Year chart displays how the program's performance changes throughout the years of the program.
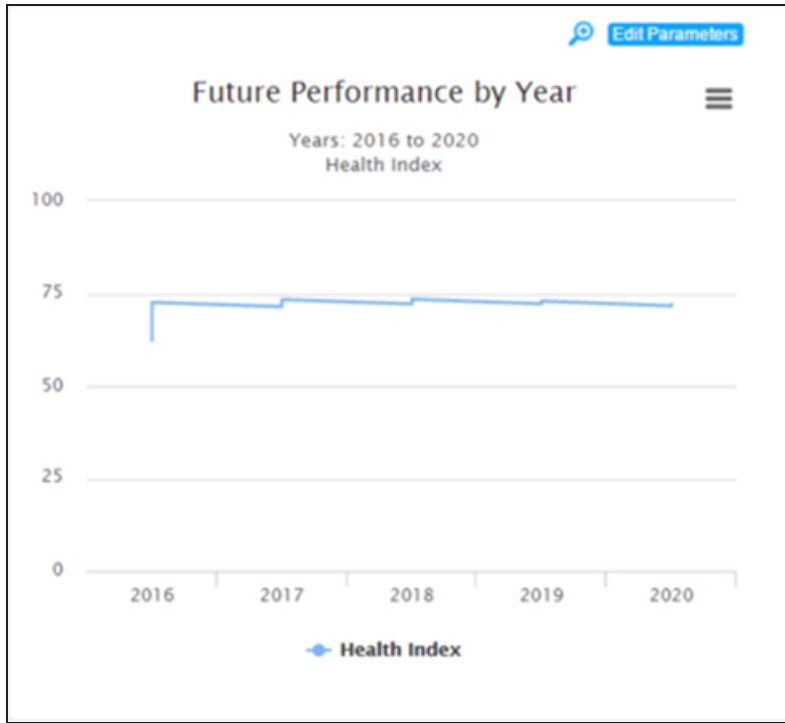
The blue line indicates the selected program segment's performance for the selected performance measure over the span of the program. The red line indicates the target value (if available) for the segment and performance measure selection.

The *Edit Parameters* button allows the user to select which performance measure and program segment to display:

Click the *Apply* button to accept the parameter change.

Click the *Cancel* button to cancel the parameter change.

Effects on Utility Criteria

The Effects on Utility Criteria chart displays the estimated utility of the selected program segment throughout the span of the program.
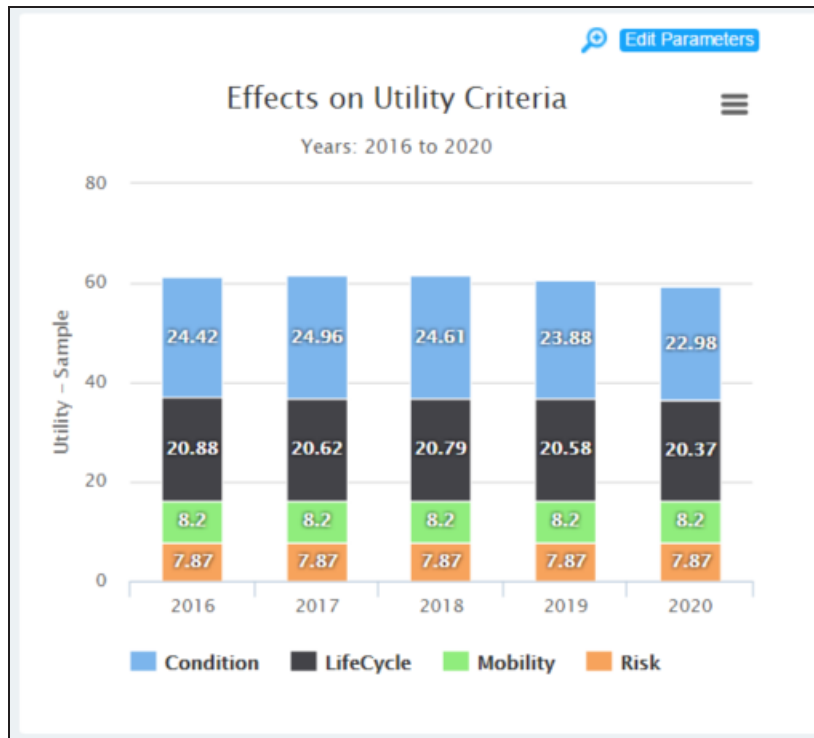
The Condition, LifeCycle, Mobility, and Risk utility values are each displayed and color coded.

The *Edit Parameters* button allows the user to select which program segment to display:

Click the *Apply* button to accept the parameter change.

Click the *Cancel* button to cancel the parameter change.

Program Results Page Controls

The *Re-evaluate Program* button re-evaluates the projects that are within the selected program without re-optimizing the program. This ensures that the program's projects don't change, but any updates made to the individual projects or their work candidates are represented in the graphs.

The ⊕ icon found on each chart displays a popped out, magnified version of the chart for easier viewing.

The ☰ icon found on each chart open a menu of options that allows the user to print the chart, download it in various formats, or open a data table to more easily view the specific data points on the chart.

The *Programs > Executive Summary* task displays high-level visual charts specific to the selected program and scenario. These are performance charts that can be used by executives as overviews to various programs in an effort to choose which programs to implement and how to fund them.

All of the charts will populate upon opening the task. If they do not populate or need updated, click the ***Re-evaluate Program*** button in the footer.

The displayed charts are determined by the administrator using the *Admin > Modeling Config > Executive Summary* task. Contact the administrator to request a new chart.

Some charts may indicate that there is no data to display given the current program and scenario selected combined with the parameters selected for each chart. The program and scenario can be changed in the header. To change the parameters of a given chart, click the chart's ***Edit Parameters*** button, if applicable. A popup will appear to allow the user to change the parameters of the chart:

Once the desired selections have been made, click the ***Apply*** button to accept the parameter change.

Click the *Cancel* button to cancel the parameter change.

*Note: Not all charts will have the same parameters. The type and selectability of the parameters is dependent on the specifics of the chart.

Executive Summary Page Controls

The *Re-evaluate Program* button re-evaluates the projects that are within the selected program without re-optimizing the program. This ensures that the program's projects don't change, but any updates made to the individual projects or their work candidates are represented in the graphs.

The icon found on each chart displays a popped out, magnified version of the chart for easier viewing.

The icon found on each chart open a menu of options that allows the user to print the chart, download it in various formats, or open a data table to more easily view the specific data points on the chart.

The *Create/Edit Scenarios* task allows the user to establish scenarios for specific programs. Scenarios allow the user to compare the performance results of a program under different deterioration circumstances and are utilized on various *Programs* tasks.
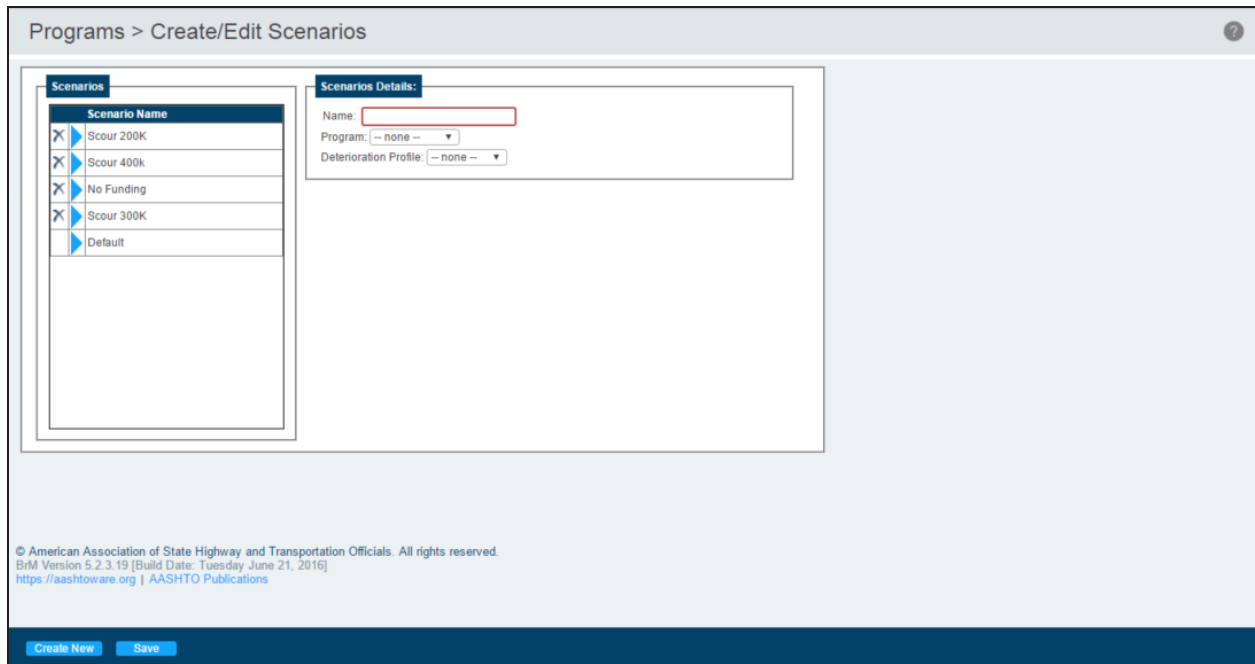
Scenarios

To view and edit the details of a scenario, click its ▶ icon in the *Scenarios* grouping.

To create a new scenario, click the *Create New* button in the page footer.

The "Default" scenario cannot be deleted (though its name and details can be changed), but other created scenarios can be deleted by clicking the ✗ icon for the desired scenario.

*Note: Scenarios can only be deleted when they are not tied to any data in the system.

Scenarios Details

The *Scenarios Details* grouping is used to specify the details of the selected or new scenario.

The *Name* textbox indicates the name of the scenario.

The *Program* dropdown is used to select the program to which the scenario will be applied.

The *Deterioration Profile* dropdown indicates which deterioration profile will be used in the scenario. Deterioration profiles are created on the *Admin > Modeling Config > Deterioration Profiles* task.

Create/Edit Scenarios Page Controls

The *Create New* button creates a new scenario.

The *Save* button saves the changes made to the new or existing scenario.

The *Copy* button creates a copy of the currently selected scenario.

The *Programs > Scenario Explorer* task is used to visually compare the performance of a program's various scenarios. Scenarios within a program can differ based on funding, distribution of funding, performance measures, and deterioration models.
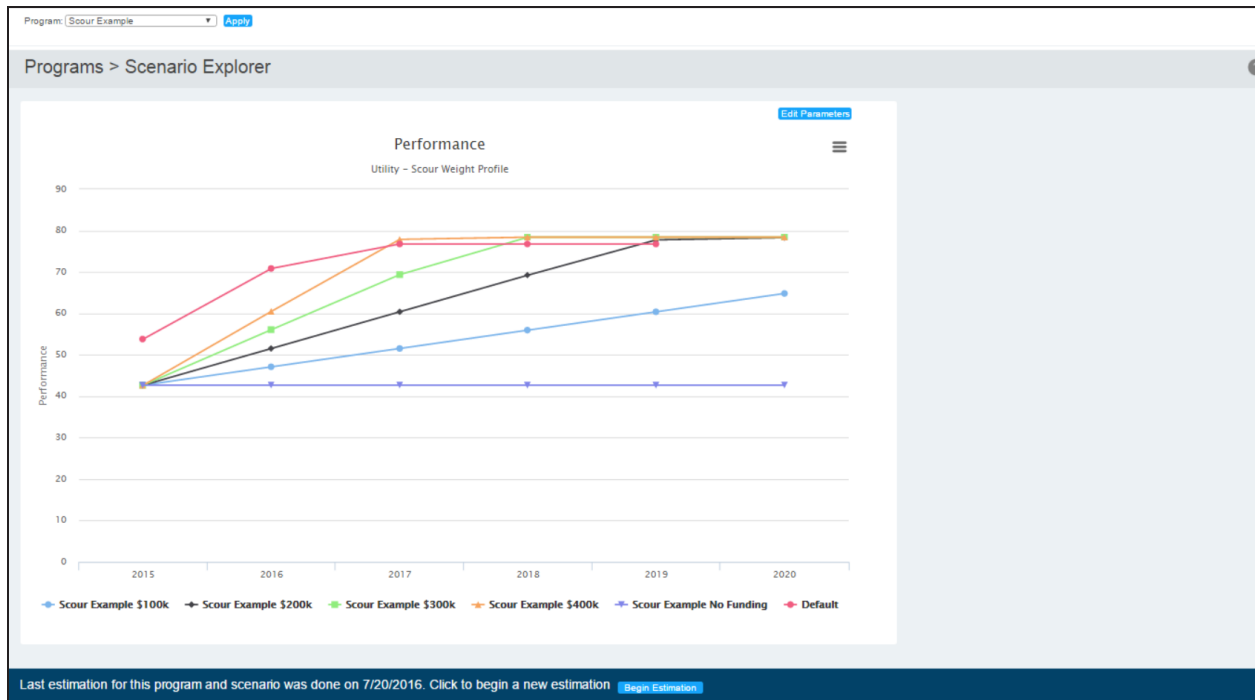
Use the ***Program*** dropdown in the header to select which program's scenarios to compare. Once selected, click the ***Apply*** button to generate the graph.

Parameters

The graph results are dependent upon the parameters selected. The parameters available to examine are dependent upon the selected program's performance measures that have been assigned on the *Programs > Performance Measures* task and the subdivision profile filter segments determined on the *Programs > Create/Edit Programs* task.

To specify the graph's parameters, click the ***Edit Parameters*** button:

The Performance section lists all of the available performance measures. Only one performance measure can be selected.

The Segments section lists all of the available filter segments. Multiple filter segments can be selected.

Click the *Apply* button to accept the selections and apply them to the graph.

Click the *Cancel* button to cancel the selections.

Viewing the Graph

The graph will display results based on the parameter selections. However, it does not automatically update. If, for instance, the specifics of the scenario or performance measure were changed, the graph will need regenerated.

The footer of the page will notify the user of the last time an estimation was done for the selected program:

Last estimation for this program and scenario was done on 9/26/2016. Click to begin a new estimation   Re-evaluate Program

The *Re-evaluate Program* button re-evaluates the projects that are within the selected program without re-optimizing the program. This ensures that the program's projects don't change, but any updates made to the individual projects or their work candidates are represented in the graph.

*Note: The estimation can take a long time to run depending on the specifics of the program.

Click the ☰ button to view the printing and downloading options for the graph.

Appendix A

- A BrM 5.2.3 User Group PowerPoint training that outlines the new features of the software and how they work together.

This walkthrough was orginially a PowerPoint presentation. It has been included here so that users may continue to benefit from it.

Before we start, let's make sure you have my contact info.

Today
3:30 5.2.3 Walk Through
• User Interface
• Visual Forms Editor
• Actions and Benefits
• Network Policies

Tomorrow
8:10 5.2.3 Walk Through (continued)
• Performance Measures
• Funding Allocation
• Program Results
9:30 Break
• Executive Summary
• Scenario Explorer

3

This walkthrough will discuss the 5.2.3 User Interface, the *Visual Forms Editor*, optimization, and the *Scenario Explorer*.

5.2.3 User Interface

The New User Interface

Login

User ID: pontis
Password: ••••••
Database: Utah_Oracle

Login

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Phone: (202) 624-5800 Fax: (202) 624-5806

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We'll begin with the new user interface. Nothing has changed about the login screen.

The New User Interface

First things to notice:

• The nice blue interface.

• Tabs, tasks, and subtasks run down the left side of the application.

The New User Interface

Click on the top left, where your name is, to change your password or to log out.

The New User Interface

Admin > Security > Password Rules

The "Bread Crumb" heading should help you to find your way to any screen from the screenshots.

The Admin menu has been reorganized so planners can have access to modeling configurations, but admins can still secure the central configuration settings.

5.2.3 includes password policy rules, so you can enforce your agency's password policy.

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The new *Admin* menu.

We will get into more of the screens as we continue with the rest of the training.

Visual Forms Editor

BrM 5.2.3 Training

Visual Forms Editor

8

Now let's talk about the *Visual Forms Editor*. If you ever tried to create your own screens in 5.2.1 or 5.2.2, I think you will find the new editor to be a great improvement.

Visual Forms Editor
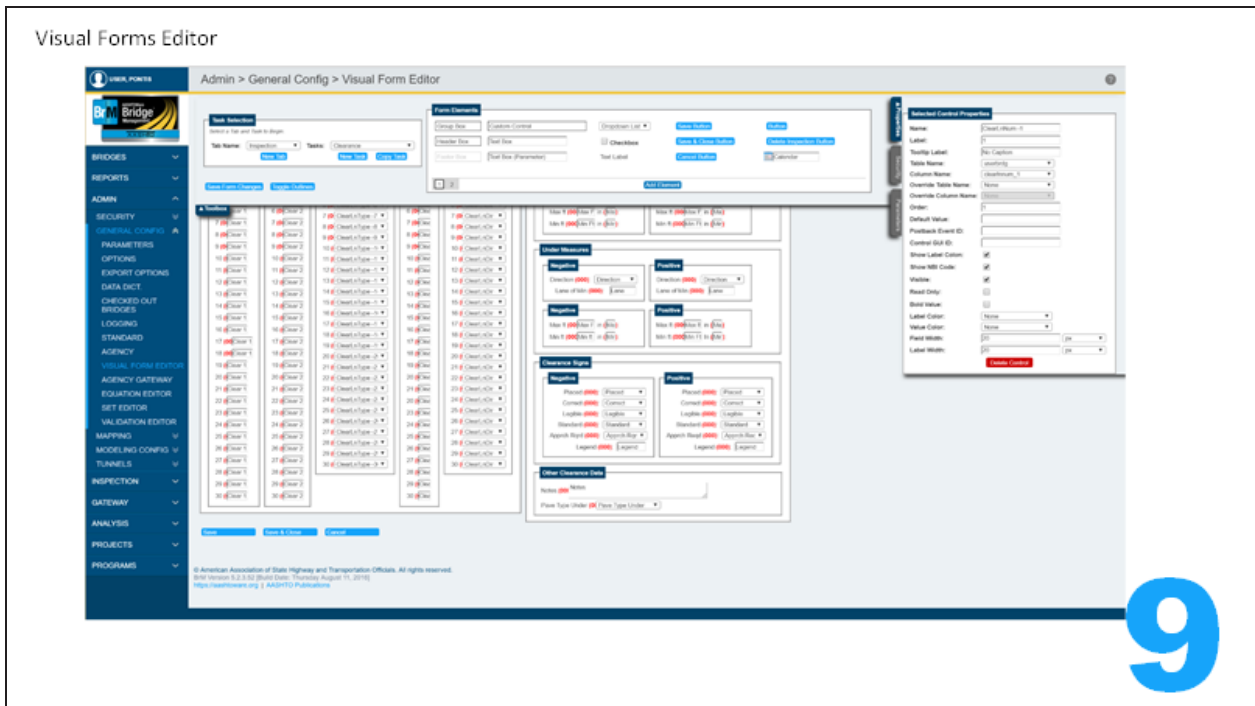
The new visual forms editor is WYSIWYG ("What you see is what you get.")

You can see the effects of your options right away.

Visual Forms Editor

This toolbox is the palate of controls you can create.

In this menu you can set the properties of the controls you add.
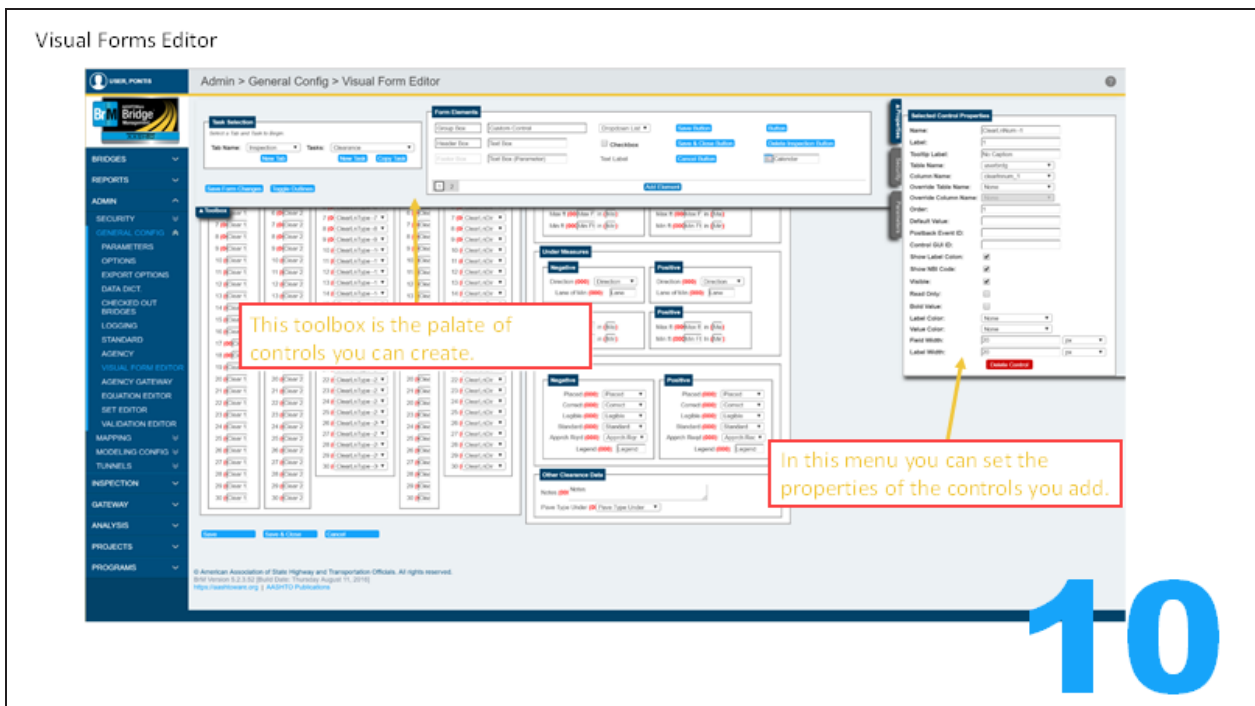
In the menu on the top, you can select the page you wish to edit (or create new pages).

Then from that toolbox you can add groups (the organizational boxes), buttons and fields.

In the menu on the side, you can configure the properties of the control or group you have selected (like attaching the data to a field of your userbrdg table, for example).

Visual Forms Editor

This menu is also a one-stop-shop for security settings.

11
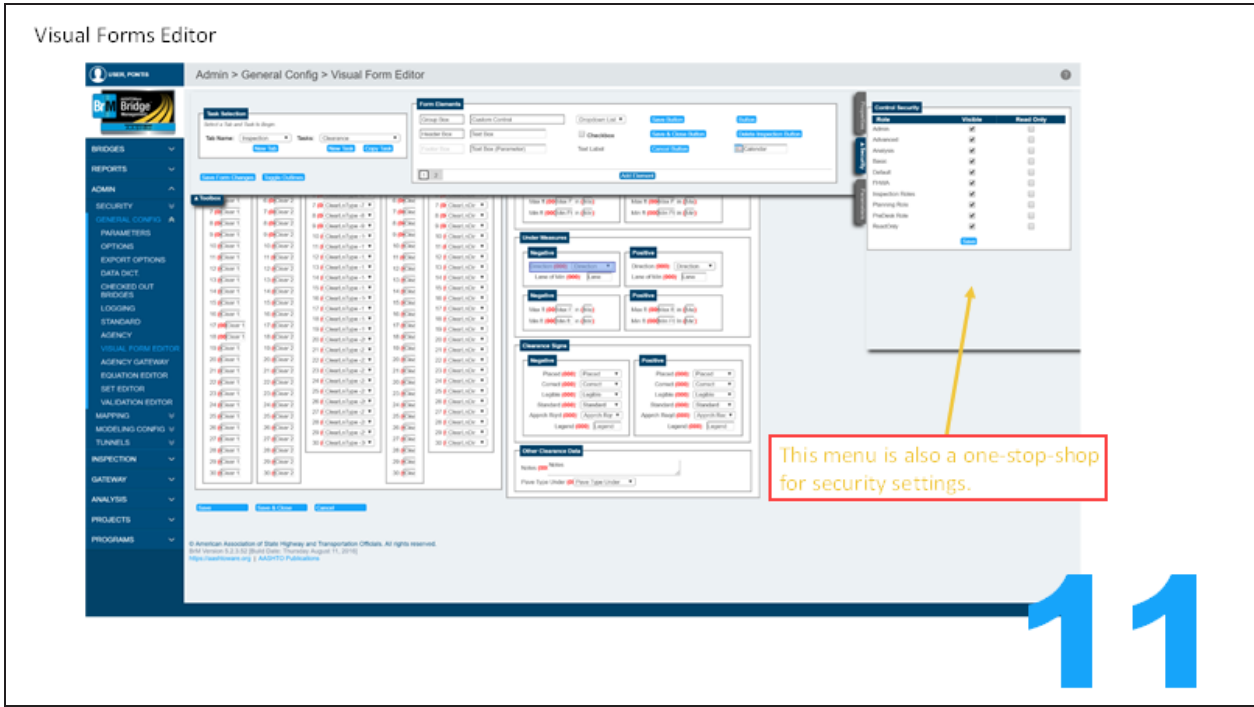
You can also access the security settings from the same menu.

Here you can set this control to read-only for inspectors, or totally hidden.

Visual Forms Editor

And you can quickly link to the parameters of that field.

12
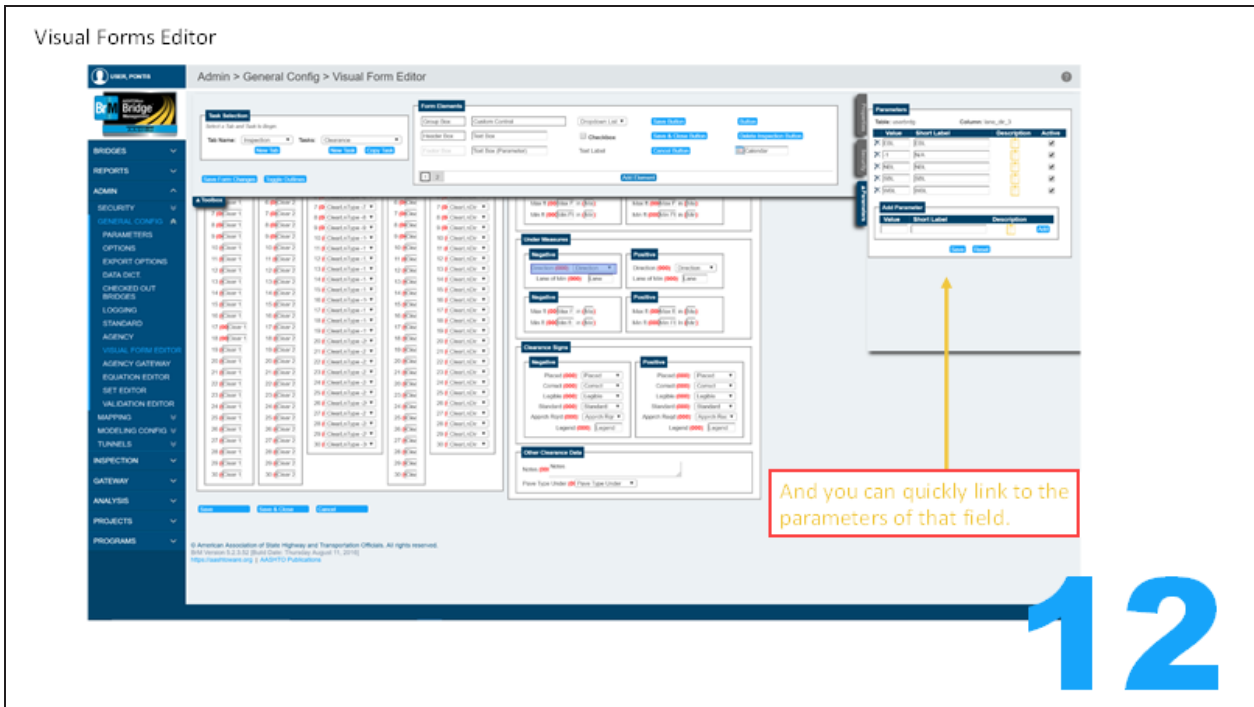
The only thing you can't do from this screen is parameter overrides (where you use the parameter set of one control on another control).
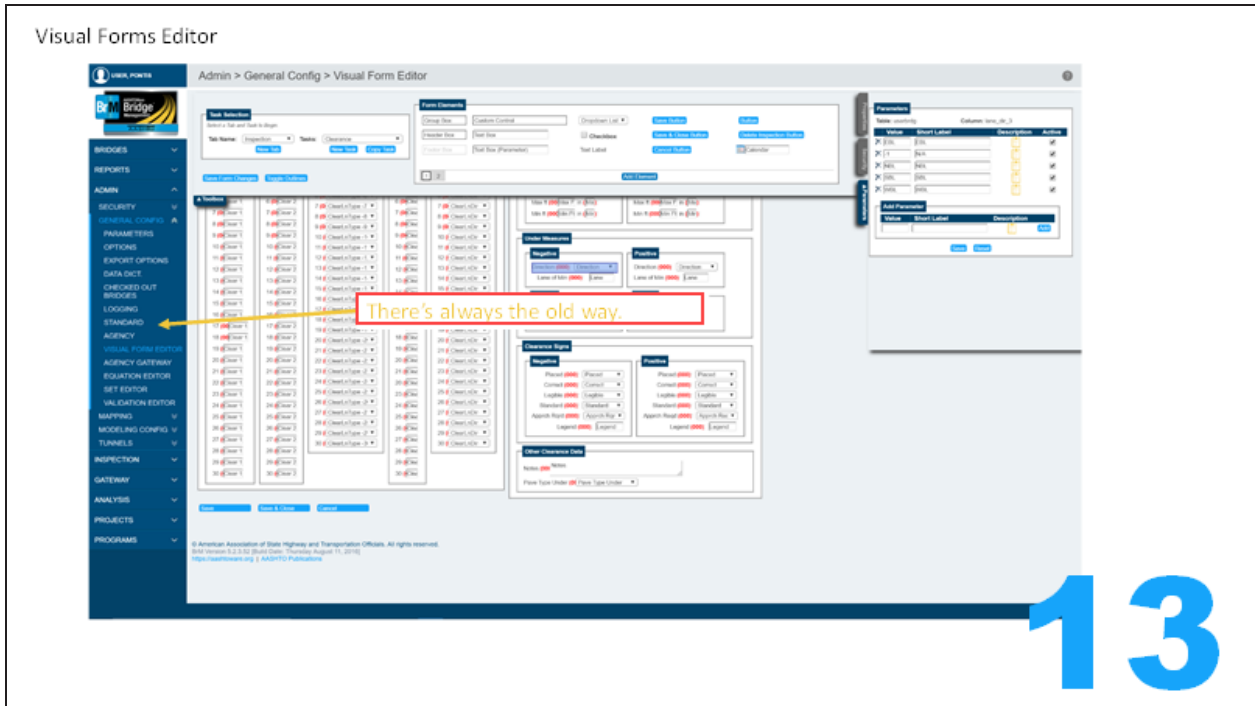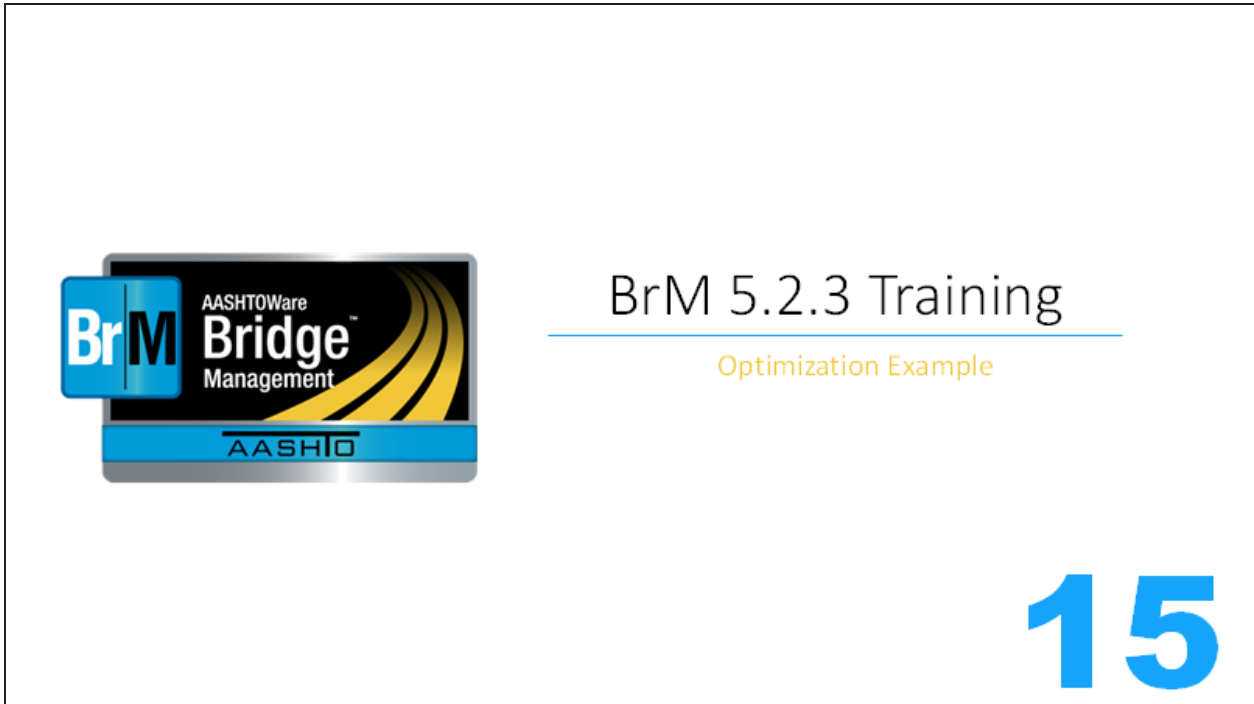
And if you prefer, there's still the old way of doing things.
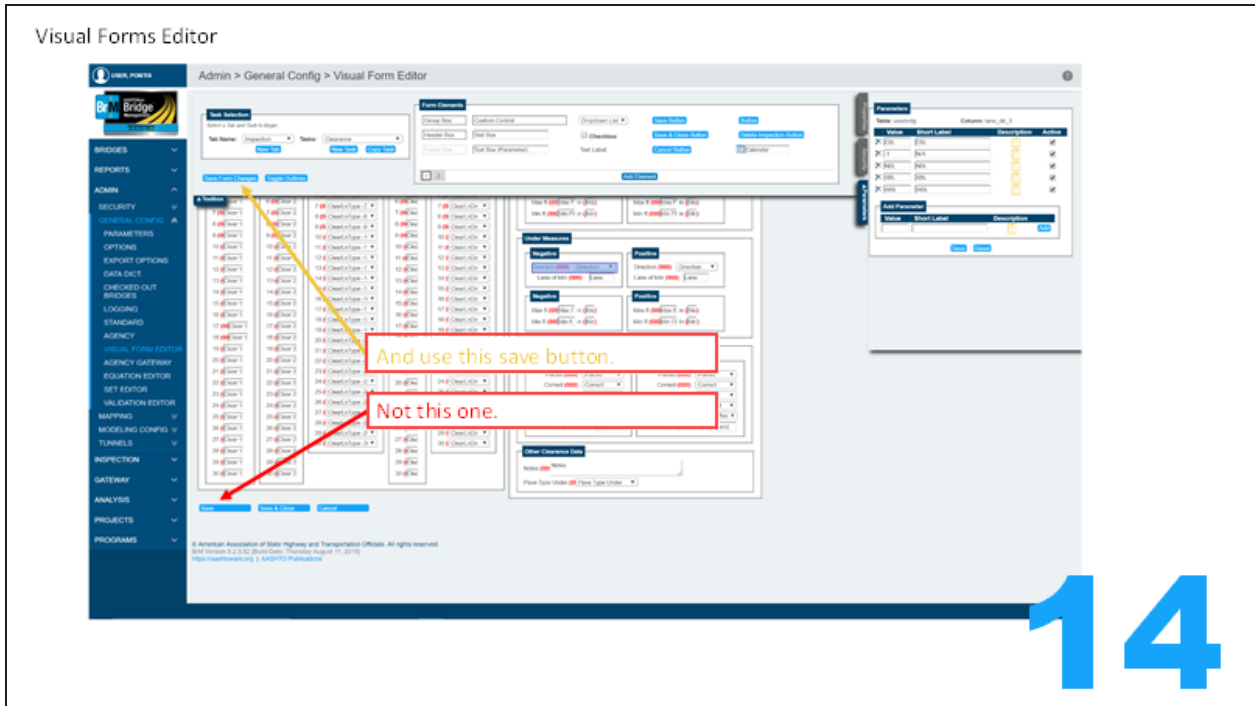
And another hint…

Now let's get started on the optimization example.
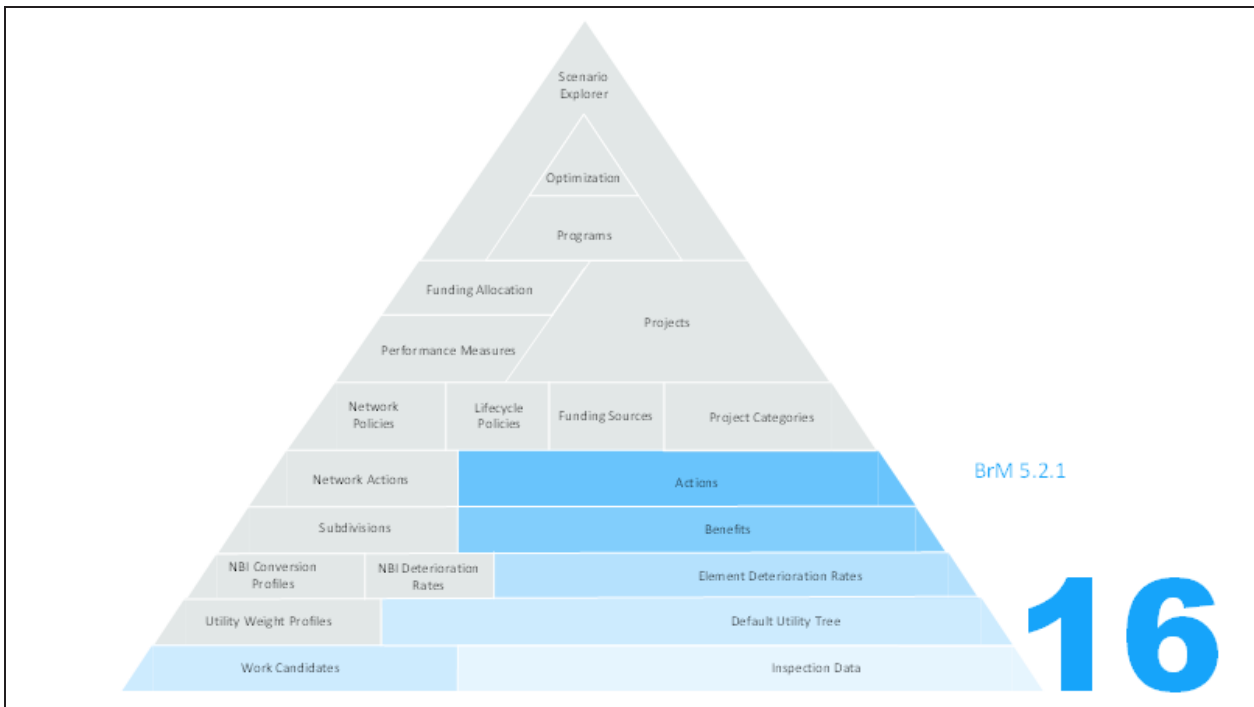
A little perspective.

The first phase of the 5.2.1 overhaul to BrM focused primarily on inspection and work candidates.
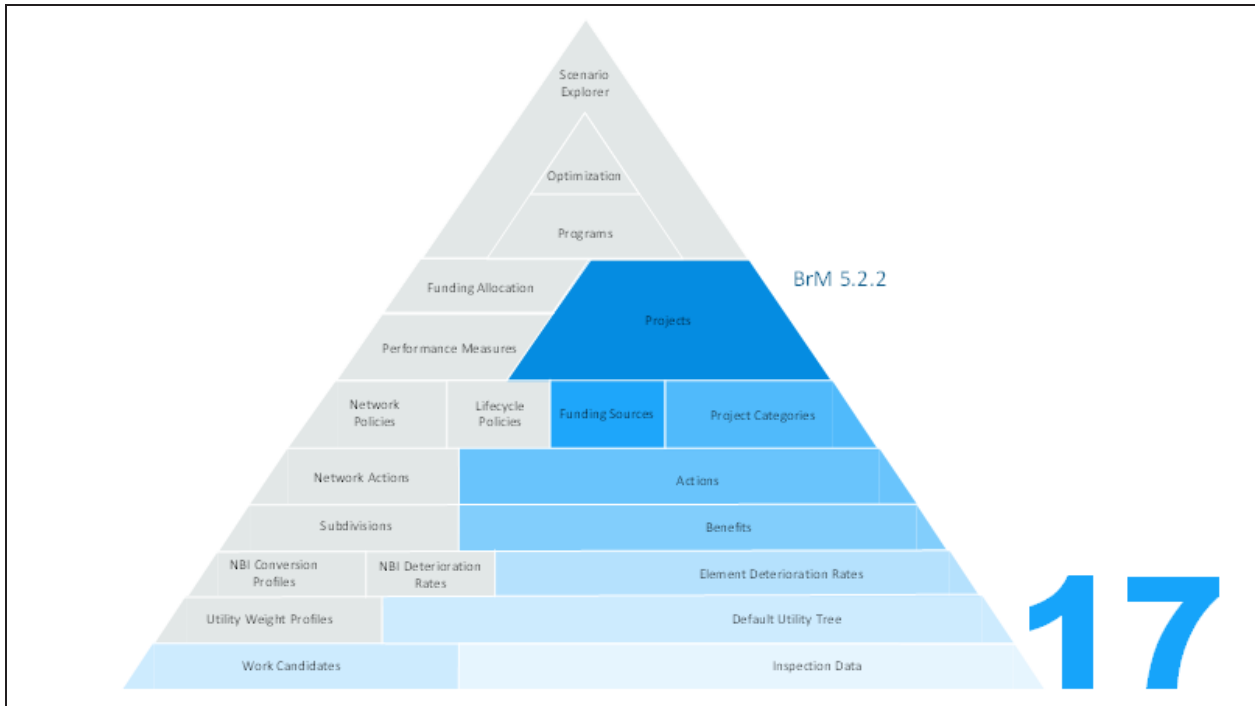
In 5.2.2, we added the ability to create and track projects.
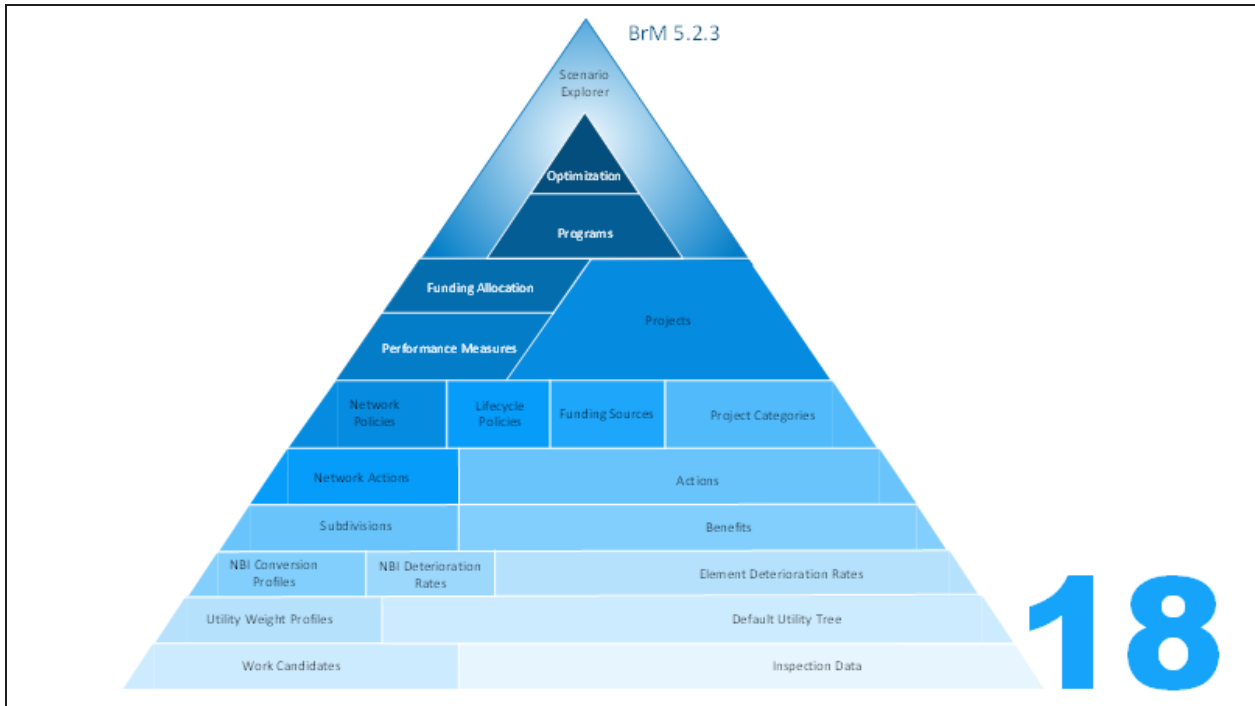
Finally, in 5.2.3, we've added the parts needed to help the software make recommendations for a new program or to complete one you've already started.

These are the pieces we will discuss in the rest of this training.
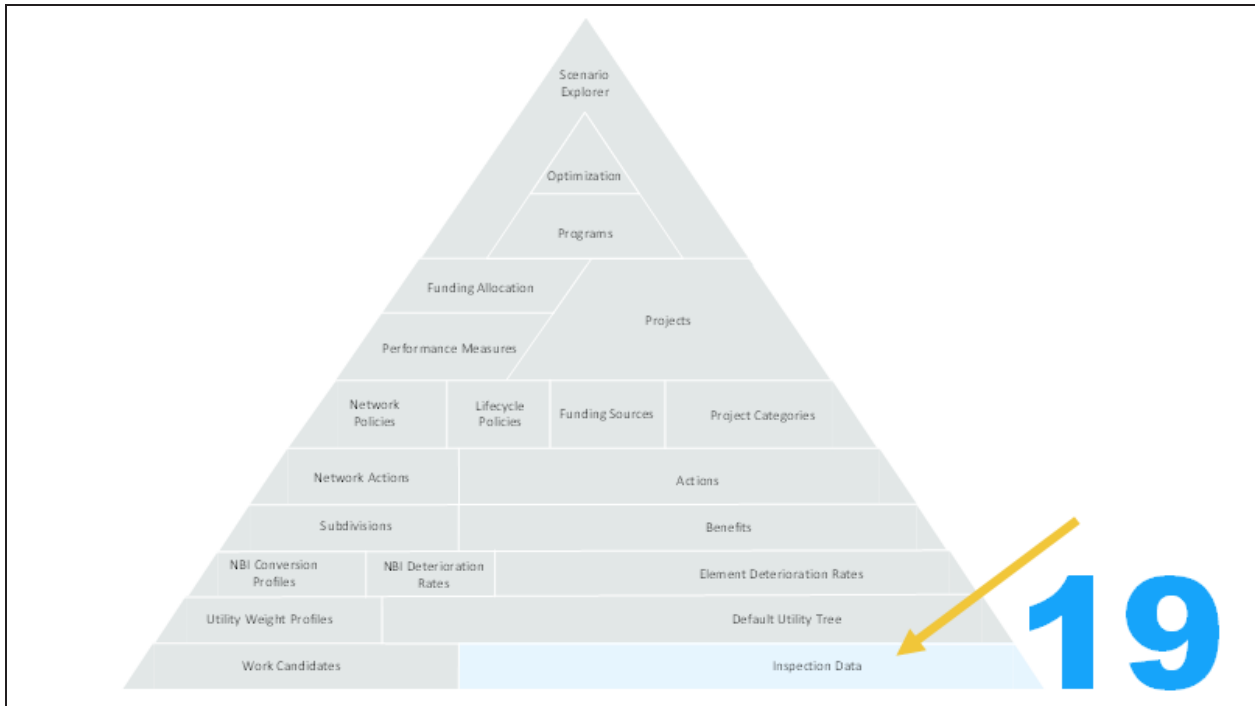
First, we will begin discussing: **Inspection Data**.

The objective of optimization is to create a data-driven program. So Inspection Data really is the foundation.

You will need data for your decisions to be based on.

If you want detailed cost data and element deterioration, then you will need element inspection data.

If you want to perform beam-end repairs when more than 3 beam ends are CS4, you will need Beam-Ends as an Agency Defined Element (ADE).

Inspection Data

Also note the *Validate* button. This has been available since 5.2.2, but you can press this button to run a submittal check on this structure's inspection data.

There is also the *Calculate NBI* button.

Inspection Data

Included in inspection data are the risk assessments. For many of you, this may be your first time seeing the risk assessment screen.

The risk, expressed as a %, is arrived at by multiplying the likelihood of a hazard occurring and the consequence if the hazard does.

Risk categories and properties can be edited on the *Admin > Modeling Config > Assessment* task.
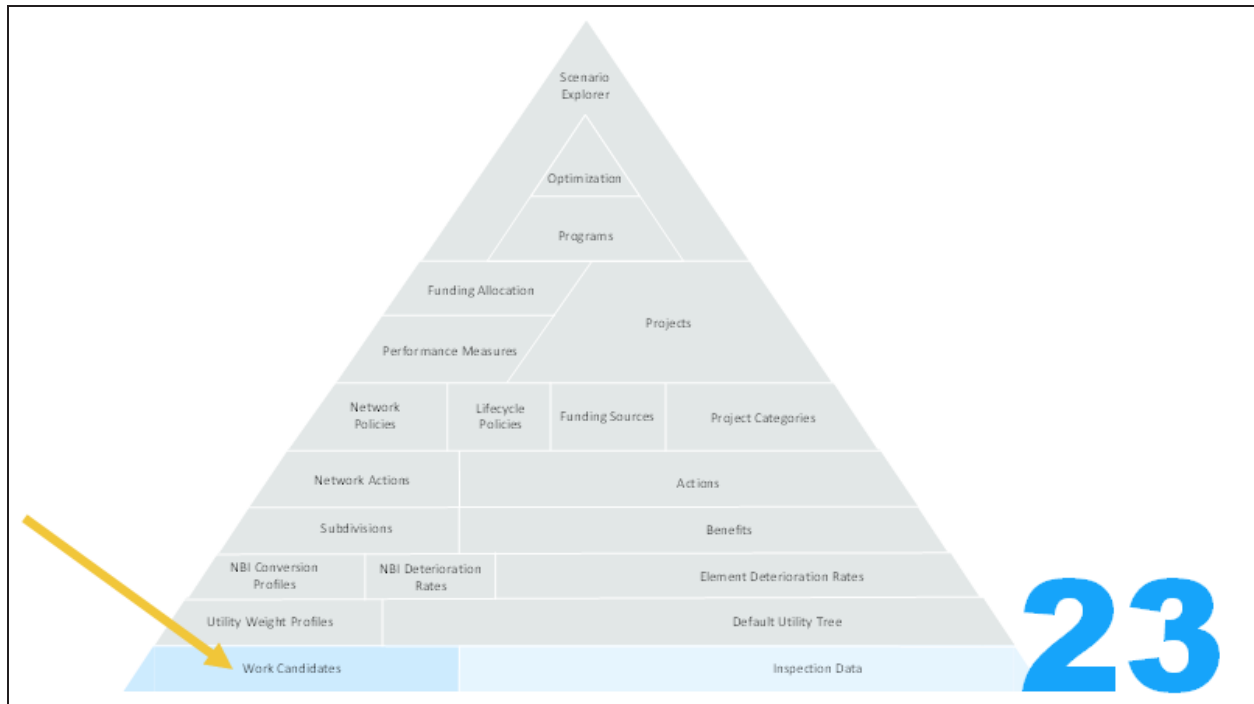
Let's also talk about **Work Candidates**.

Different agencies use work candidates in different ways.

- Some agencies use work candidates as a way for the inspection teams to notify the planners of bridge needs.

- Others use them as a way for the planners to track requests from the district or local owners.

- Some use work candidates so that the planners can show the inspectors what work is anticipated on a structure and the inspectors can make recommendations based on that knowledge.

- Work candidates can also hold historical information, a work history with dates completed and costs.

- One agency syncs work candidates to the maintenance crew task list, and then closes out the work when the task is done.

In the *Analysis* pages, there are tools to help you use work candidates to create projects.

This focuses more on a bridge-level analysis so we will only briefly discuss it here.

The *Bridge Analysis* page lets you compare the future effects of performing those work candidates.

The *Needs List* lets you filter down bridges in the same area or on the same route which need similar work.

For example, if you are putting together a paint program, you can find all the bridges which have an identified paint need.
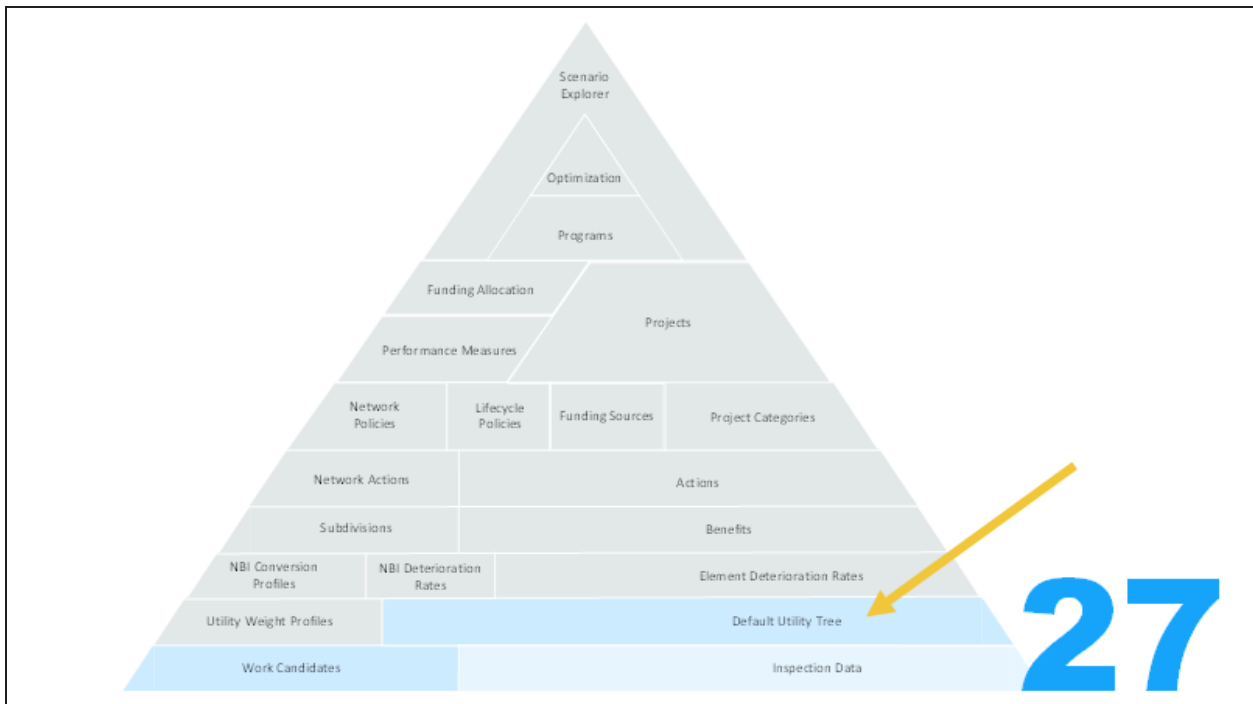
Next stop: **Utility**.

The Utility Tree has been available since 5.2.1, but we will now lean on it much more heavily.

The Utility Value is a score for the value of a bridge. As we model deterioration into the future, the score will deteriorate. And as we model repairs to the bridge, the utility should improve. The benefit part of cost/benefit will be calculated from the benefit to utility.

Each utility node has 2 parts: the base value and the scaler. The base value can be from any field of your database, any element or group of elements, any specific type of risk assessment or even derived from a formula. The scaler will then dictate how intermediate values are weighted: this can be done by the graphs or scaling formulas.

- -

You can see the math going into a bridge's current Utility Value in the *Analysis* tab.
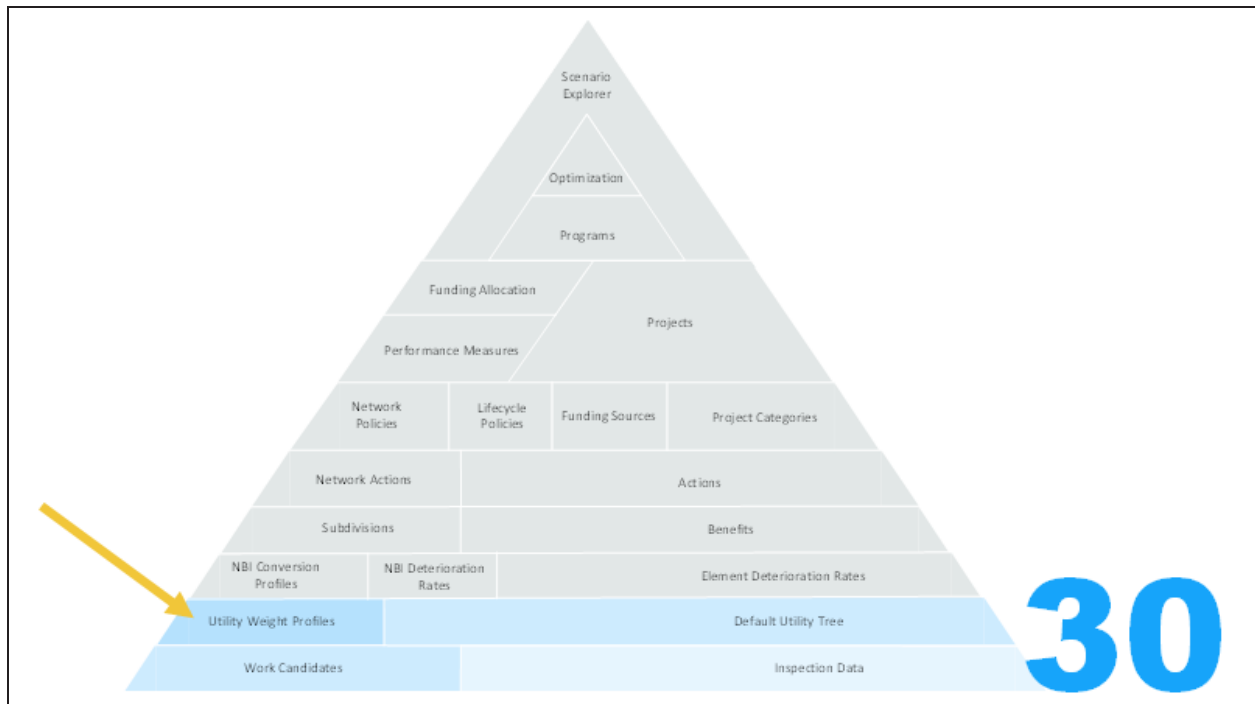
And now we will get to the first purely 5.2.3 feature: **Utility Weight Profiles**.

For different optimization runs, you can temporarily re-weight the Utility Tree to focus in on certain nodes.

For example:

- For rehab & replacement programs, consider leaning more heavily on condition and lifecycle nodes.

- For preservation work, lean almost exclusively on the lifecycle node.

- For scour, you will probably lean mostly on risk.

Element Deterioration Rates

The element deterioration rates can be accessed in two ways:

In this example, I have changed the median years from 12.5 to 25 (see in yellow at the top left).

The solid blue line shows the deterioration of the currently saved values, and the dashed line shows the rate for the values entered above.

Your agency will need to set these deterioration rates for all of your elements: we've done our best to pick defaults, but as an example: steel protective paint last about 15 years in Alabama's marshes vs 45 years in Utah's arid desert. The deterioration rates should match your environment and experience.

(Some states have used service units to have Bentley help determine what their deterioration rates should be.)

Element Deterioration Rates

Element: (12) Re Concrete Deck
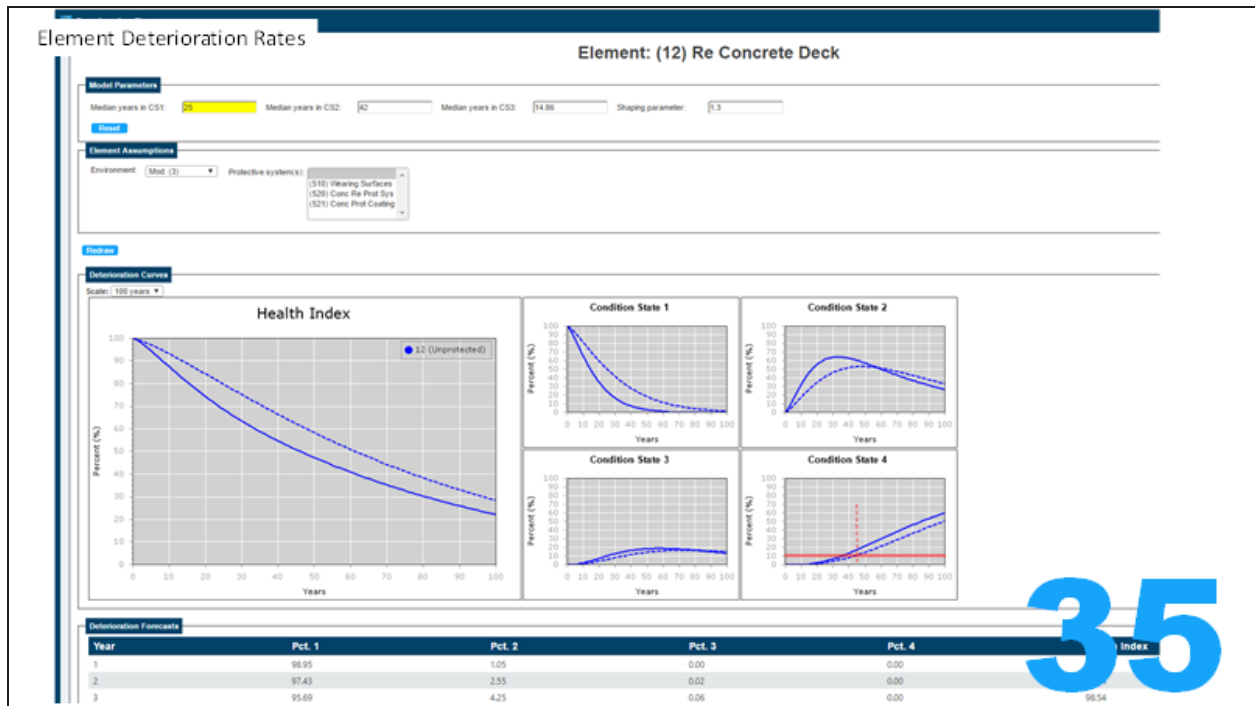
A good intuitive rule of thumb to look at when setting these rates is when the element reaches 10% in CS4.

In your mind, when you say a bare concrete deck 'lasts about 45 years,' this is about the point you're thinking of.

Element Deterioration Rates

Element: (12) Re Concrete Deck
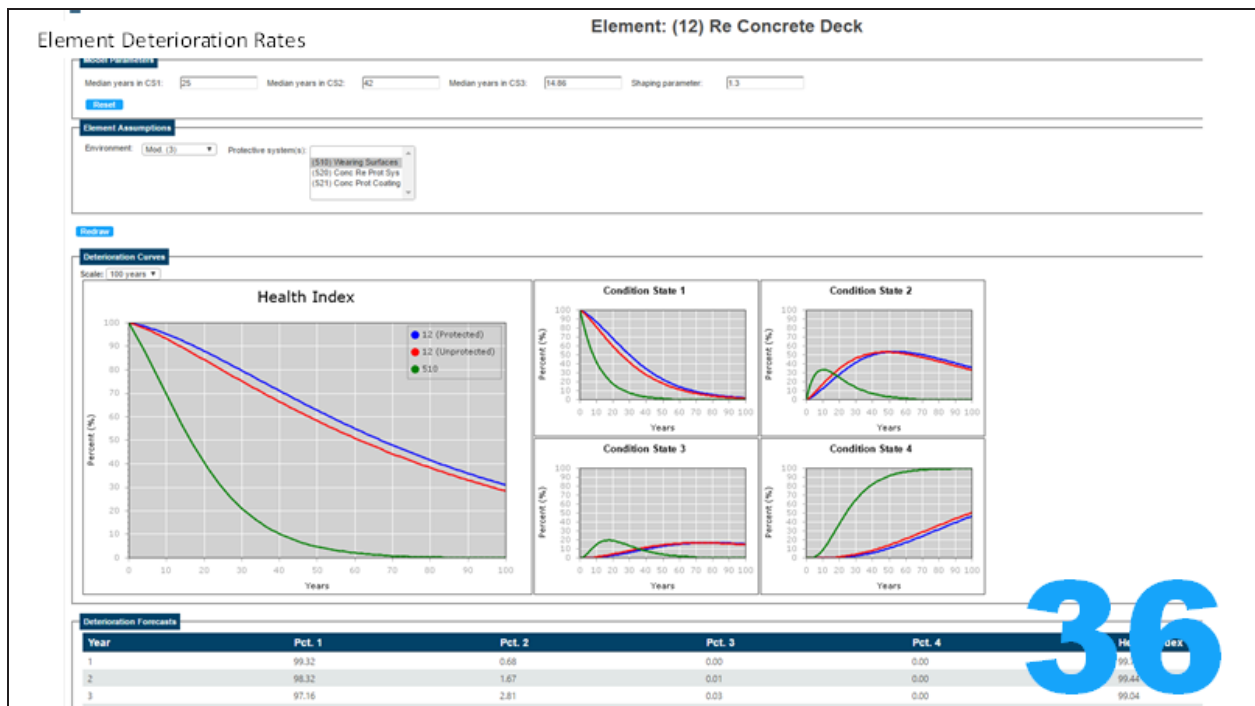
You can also see how protective systems would affect that deterioration. In this case, a 10-year wearing surface (approximately an asphalt treatment) is applied, and you can see that it extends the life of the deck 5 years.
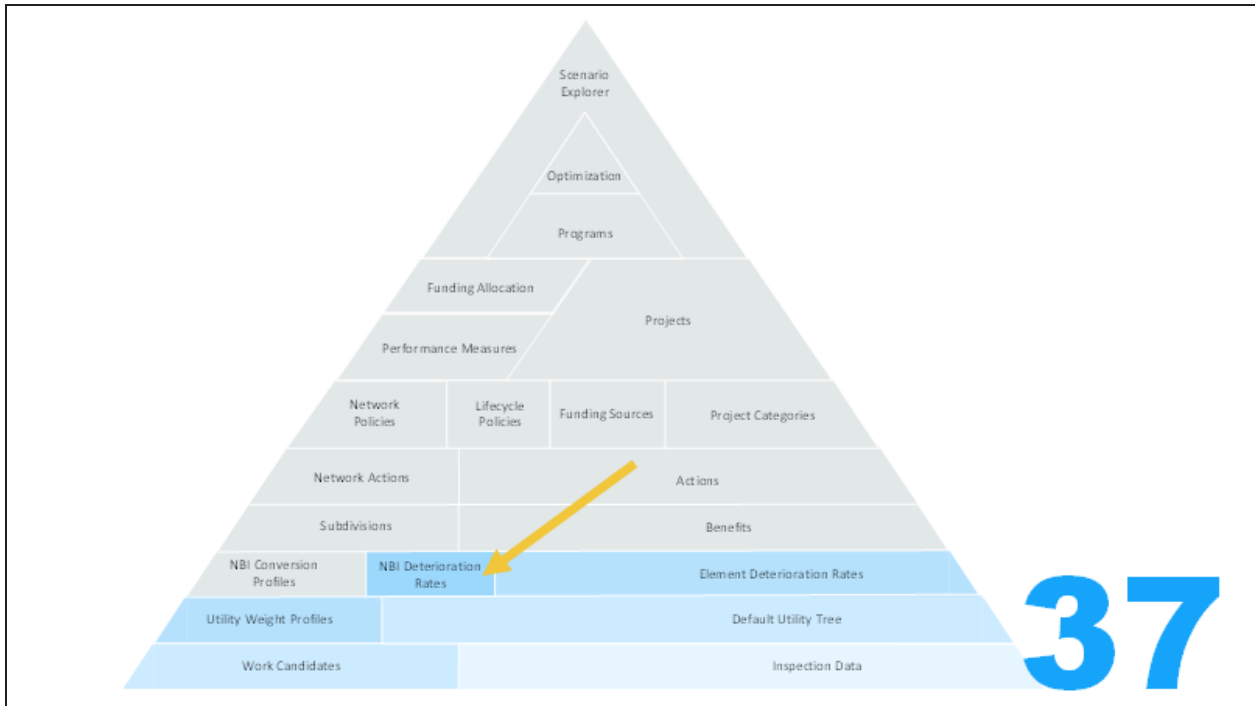
NBI Deterioration Rates

At later points in the configuration process, we will set some triggers for actions based on the NBI value. There are two ways to determine those future NBI values: based on the time in condition state (NBI Deterioration) or converting the deteriorated elements to an approximate NBI value (NBI Conversion).

Here we can set a time in NBI state. The optimizer can use your inspection history to determine how long the bridge deck has been an NBI of 5, and therefore make a guess as to how long it will remain this way.

If you do not use element inspections on local bridges, you will only be able to use NBI deterioration.

Admin > Modeling Config > NBI Deterioration Models

Components

Component Name
Deck
Superstructure
Substructure
Culvert

Component Specification

Name: Deck

Description:

Category: Decks/Slabs

Table Name: Inspevnt

Column Name:

Min NBI Value: 1

Max NBI Value: 9

Component Deterioration Modeling

☑ Model

Model Parameters

NBI Transition Time in Years 9: 2
NBI Transition Time in Years 8: 18.65
NBI Transition Time in Years 7: 13.75
NBI Transition Time in Years 6: 14.5
NBI Transition Time in Years 5: 14
NBI Transition Time in Years 4: 5
NBI Transition Time in Years 3: 2.6
NBI Transition Time in Years 2: 0
NBI Transition Time in Years 1: 0

Network NBI Rating distributions

Bridge Filter: BrM - Active Status   Re-estimate results
Component: Deck

	Latest Inspection Reported	Current	+5 Years	+10 Years
NBI Rating 9	273	69	0	0
NBI Rating 8	1007	1006	900	727
NBI Rating 7	2193	1367	1188	928
NBI Rating 6	2299	2419	2415	2439
NBI Rating 5	1200	1695	1777	1972
NBI Rating 4	98	462	604	265
NBI Rating 3	23	64	119	225
NBI Rating 2	0	11	15	328
NBI Rating 1	1	0	52	102

39

At the bottom of the page, you can pick a filter of bridges and see about how many of those bridges would be "good, fair or poor" based on the values you have set above. This should help you to calibrate these settings.

40

NBI Conversion Profiles

NBI Conversion Profiles
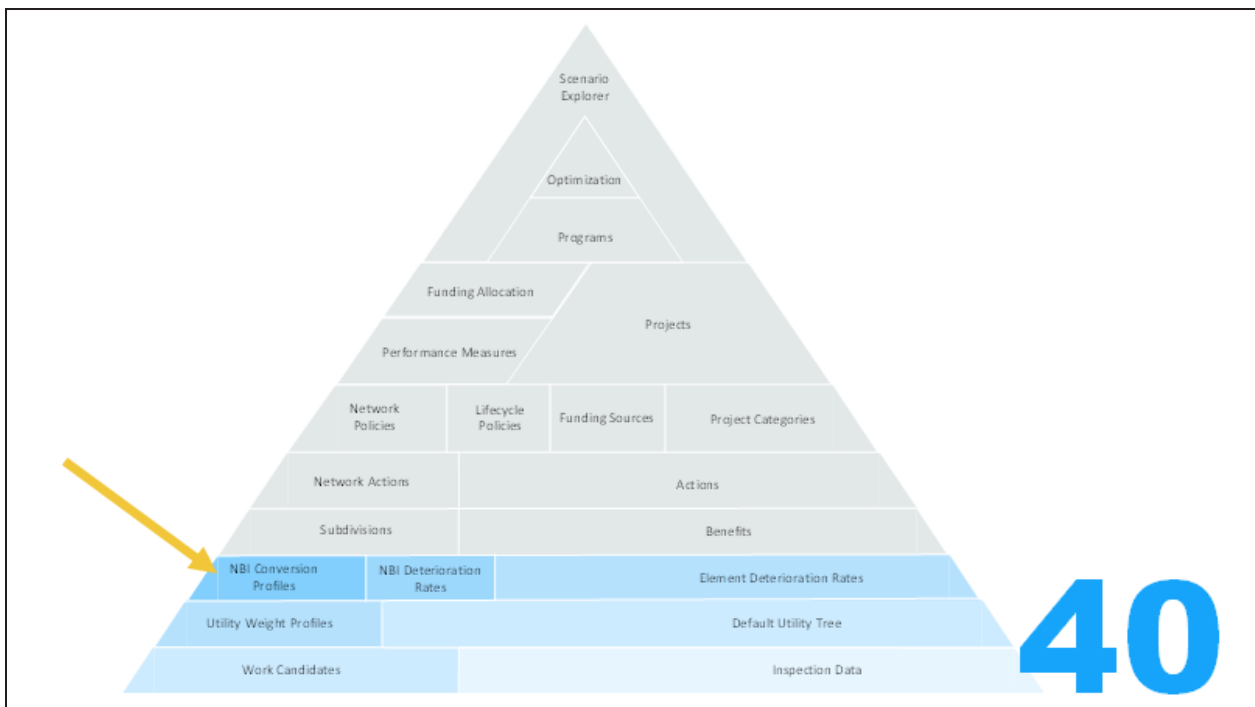
Admin > Modeling Config > NBI Conversion Profiles
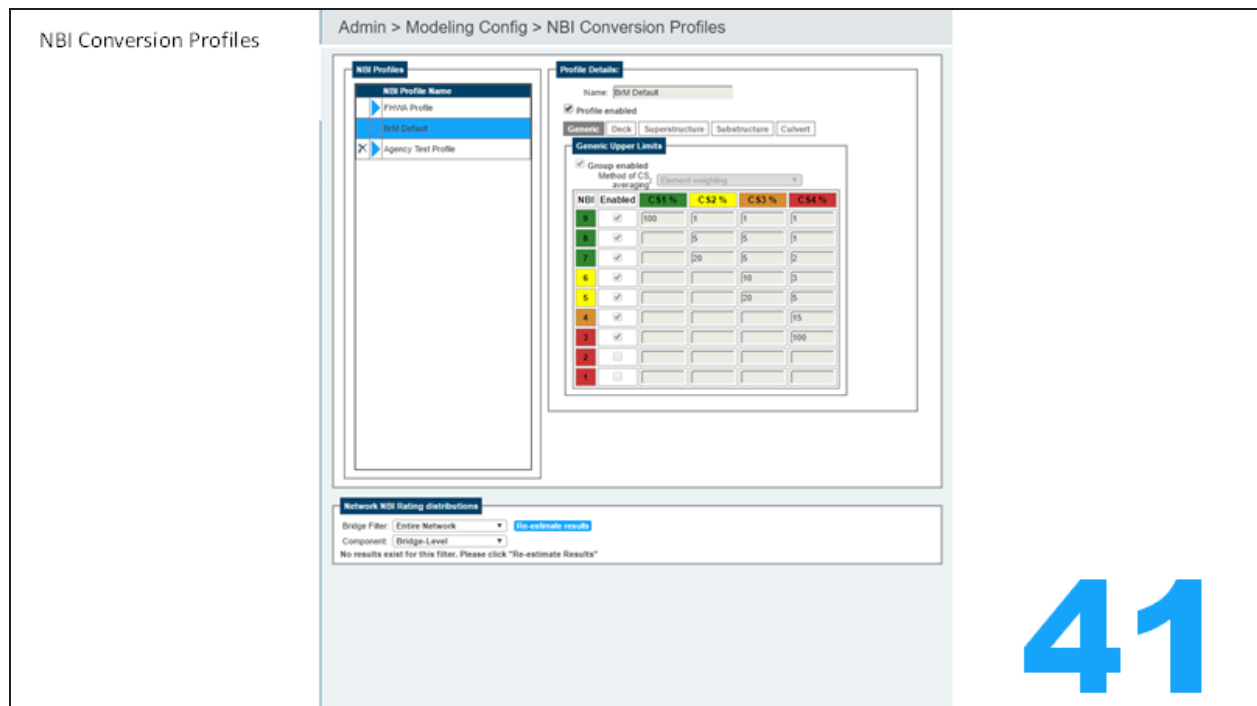
41

The other way to generate future NBI values is to convert them from the elements. This is done with the NBI Conversion Profiles.

These same profiles are used to recommend NBI values from element inspection data on the condition page (see slide 20).

The values in the cells are the upper limit for CS values; so if your deck element has 21% in CS2, the highest possible NBI is an NBI of 6.

If you have 21% in CS3, an NBI of 4 is the highest you will get.

In our experience, the FHWA Profile is very aggressive because it has no tolerance for anything in CS4. But within two or three years of element deterioration, there is 0.001% of the deck in CS4, which forces the NBI value to a 4.

There is also a Good / Fair / Poor guide at the bottom, to help you find the appropriate settings for your state.

In testing we came across some states that allow 100% in CS3 to have an NBI of 5, and some which only tolerated 10% in CS3 before dropping to an NBI of 4. These limits will need to be configured to your agency's practices.
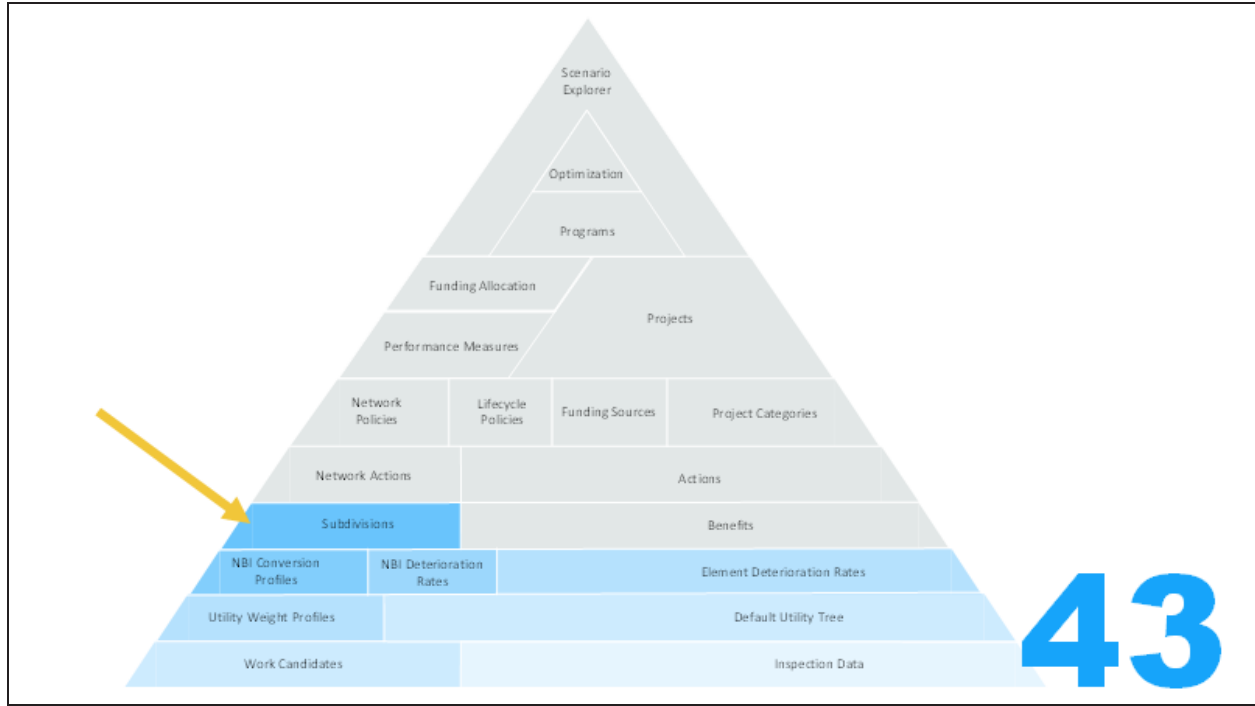
Let's briefly discuss **Subdivisions** before moving on to the main pieces of Actions and Benefits.
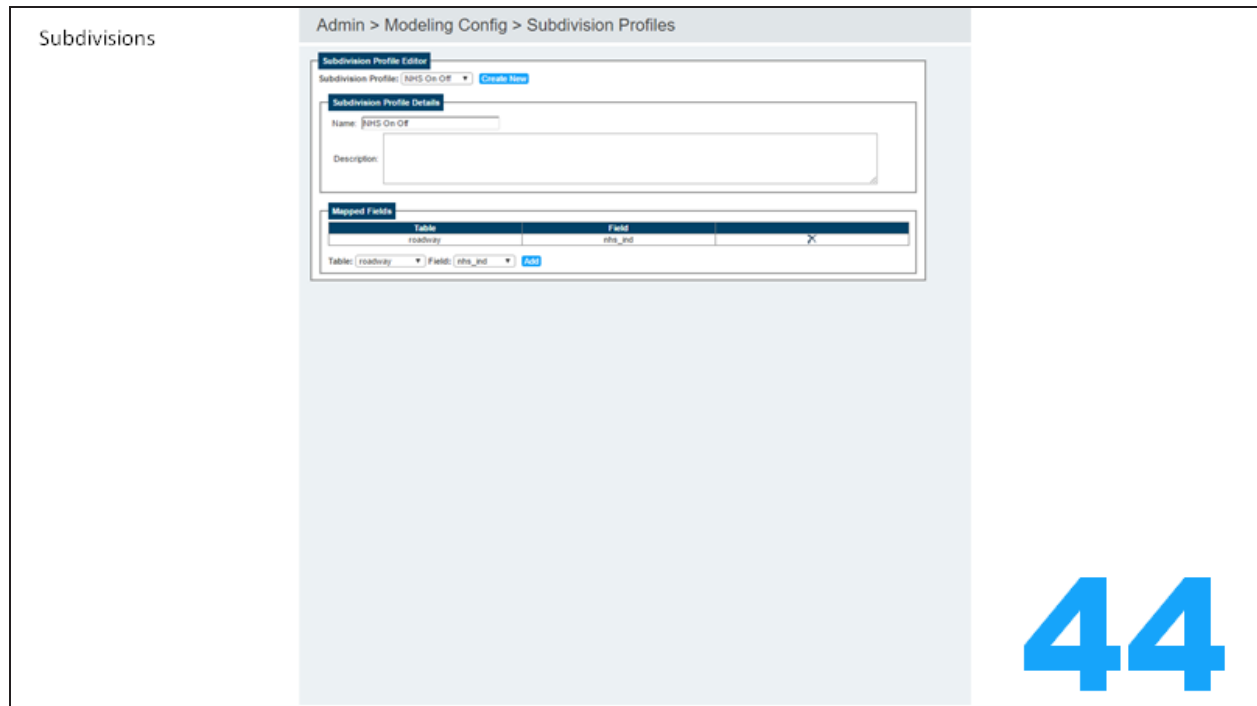
Subdivisions are used to break the analysis group up into different pieces for tracking results. You will see them play a larger role in the end.

You can create subdivisions based on any database field.

Some common examples would be:

- On and Off the NHS (shown here).

- Subdivision by District

- Subdivision by Owner.
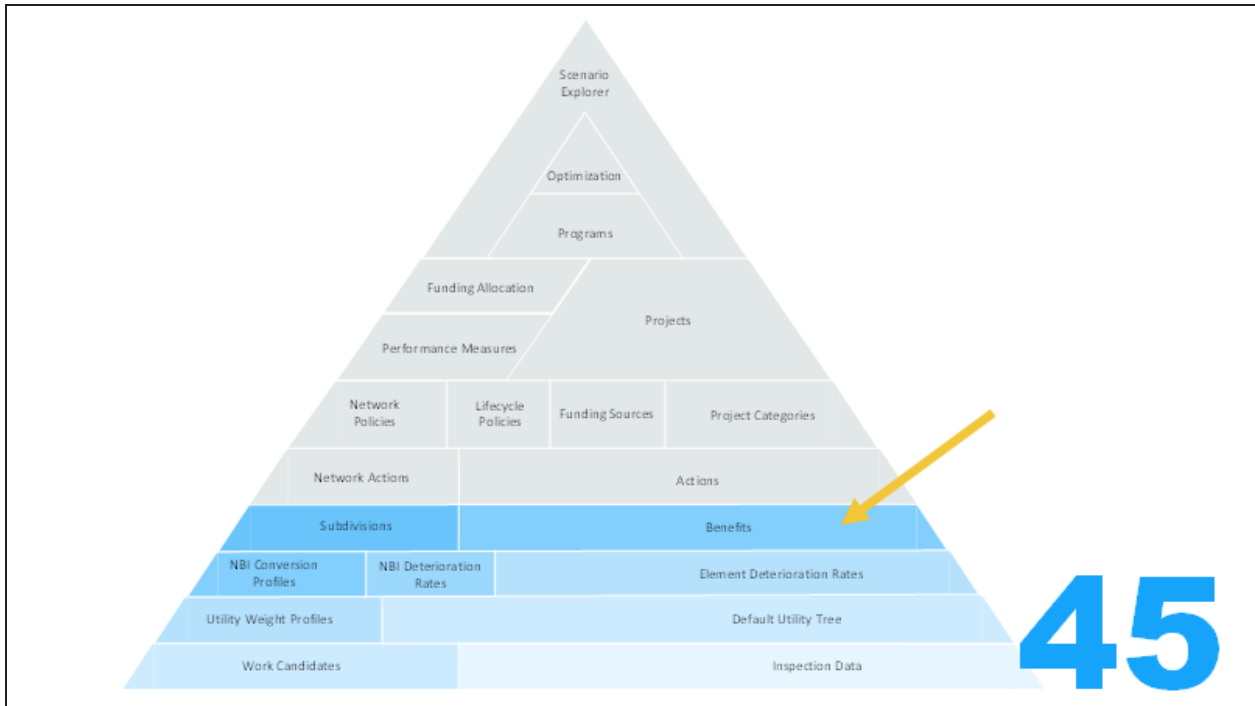
Benefits: in a lot of ways this is the main event.

The Benefits are the changes to a structure as a result of work. There are some defaults out-of-the-box, but you should look at these as an example and then model your agency's typical work.

Benefits

Benefit Group Name ▲	Description	Linked Actions	Sort Order ▲	Child Benefit Groups
Repair Piers & Caps	Repair Pier & Cap Elements		9999	Link to Child Groups
Repair Railings	Repair Concrete, Replace Others	Approach Slab Jacking, Rehab Culvert - Network	9999	Link to Child Groups
Replace Approach Slabs	Replace Approach Elems	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Culvert	Replace Culvert	Replace Structure - Network	9999	Link to Child Groups
Replace Deck	Replace Decks	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Deck Sections	Replace Steel and Timber sections	Approach Slab Jacking	9999	Link to Child Groups
Replace Joint Seals	Replace Joint Seals	Approach Slab Jacking	9999	Link to Child Groups
Replace Railings	Replace Railings	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Sub	Replace Sub Elements	Replace Structure - Network	9999	Link to Child Groups
Replace Super	Replace Super	Replace Super - Network, Replace Structure - Network	9999	Link to Child Groups
Seal Joints	Replace Joint seals	Preserve Deck - Network	9999	Link to Child Groups
Thin Bonded Overlay	Thin Bonded Overlay - Replace / place new	Preserve Deck - Network	9999	Link to Child Groups

A Benefit can be connected to multiple Actions, and an Action can have multiple Benefits. This means you can define something like 'Replace Super' and use the same benefit for a 'Replace Super' Action and as part of a 'Replace Structure' Action.

Benefits

Changed Elements
Removed Elements
Replaced Elements
Created Protective Sys
Fields
Risks

Benefit Group Name ▲	Description	Linked Actions	Sort Order ▲	Child Benefit Groups
Repair Piers & Caps	Repair Pier & Cap Elements		9999	Link to Child Groups
Repair Railings	Repair Concrete, Replace Others	Approach Slab Jacking, Rehab Culvert - Network	9999	Link to Child Groups
Replace Approach Slabs	Replace Approach Elems	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Culvert	Replace Culvert	Replace Structure - Network	9999	Link to Child Groups
Replace Deck	Replace Decks	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Deck Sections	Replace Steel and Timber sections	Approach Slab Jacking	9999	Link to Child Groups
Replace Joint Seals	Replace Joint Seals	Approach Slab Jacking	9999	Link to Child Groups
Replace Railings	Replace Railings	Profile Rotomilling, Replace Structure - Network	9999	Link to Child Groups
Replace Sub	Replace Sub Elements	Replace Structure - Network	9999	Link to Child Groups
Replace Super	Replace Super	Replace Super - Network, Replace Structure - Network	9999	Link to Child Groups
Seal Joints	Replace Joint seals	Preserve Deck - Network	9999	Link to Child Groups
Thin Bonded Overlay	Thin Bonded Overlay - Replace / place new	Preserve Deck - Network	9999	Link to Child Groups

Let's now go through the possible ways to define benefits and talk about the details of each. Some of these have been added in 5.2.2 and some in 5.2.3 to better model the kinds of work an agency does to a structure.

The *Changed Elements* grouping defines a benefit where all or part of an element in a certain condition state is moved to another condition state. The costs will be modeled as $ per unit fixed.

In this example, pothole patching a concrete approach slab moves all of CS3 and CS4 quantities to CS2.

The *Removed Elements* grouping defines a benefit which removes an element. This can be for record-cleanup and remove defects, or this could be for removing elements like temporary shoring or asphalt overlays to exclude them from further deterioration analysis. The costs will be modeled as $ / total quantity of units.

The *Replaced Elements* grouping defines a benefit in which one element is replaced (and not necessarily in kind or completely). Costs will be estimated in terms of $ / unit replaced.

The *Create Protective Systems* grouping lets you add elements to the structure. But due to the complexity of new quantities, in this version we are limiting the new elements to just protective systems. The cost is modeled as $ / Unit Added.

The *Fields* grouping lets you model changes to other fields. NBI fields, scour ratings … all tables and columns of bridge data can be modified. The cost is not modeled by elements, so you will need to use other methods. We will discuss this in Actions.

The *Risk* grouping lets you model changes to the risk assessments. Seismic or scour countermeasures can be modeled. There are no direct costs associated with these benefits, we will discuss ways to model costs soon.
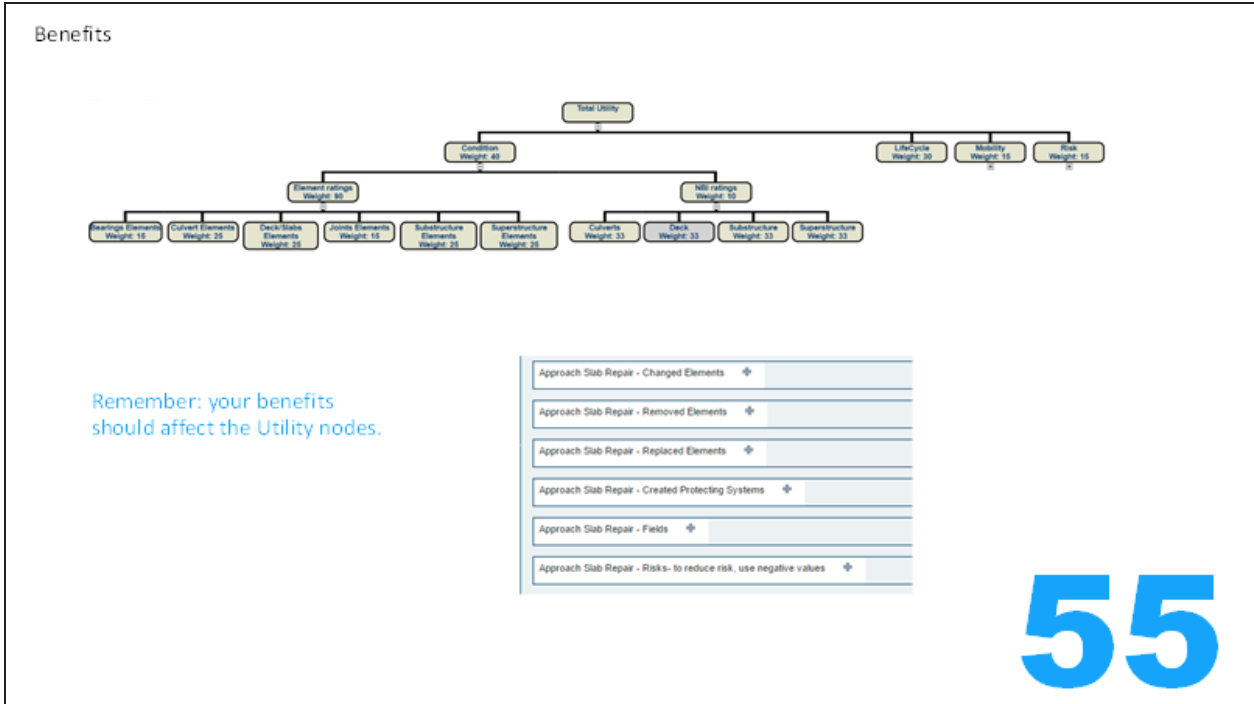
Remember: your benefits should affect the Utility nodes. Actions (with their associated benefits) will be weighed in terms of their cost to benefit – and the benefit is calculated as the Δ Utility. So it is critical that your benefits affect the nodes present in your utility tree.
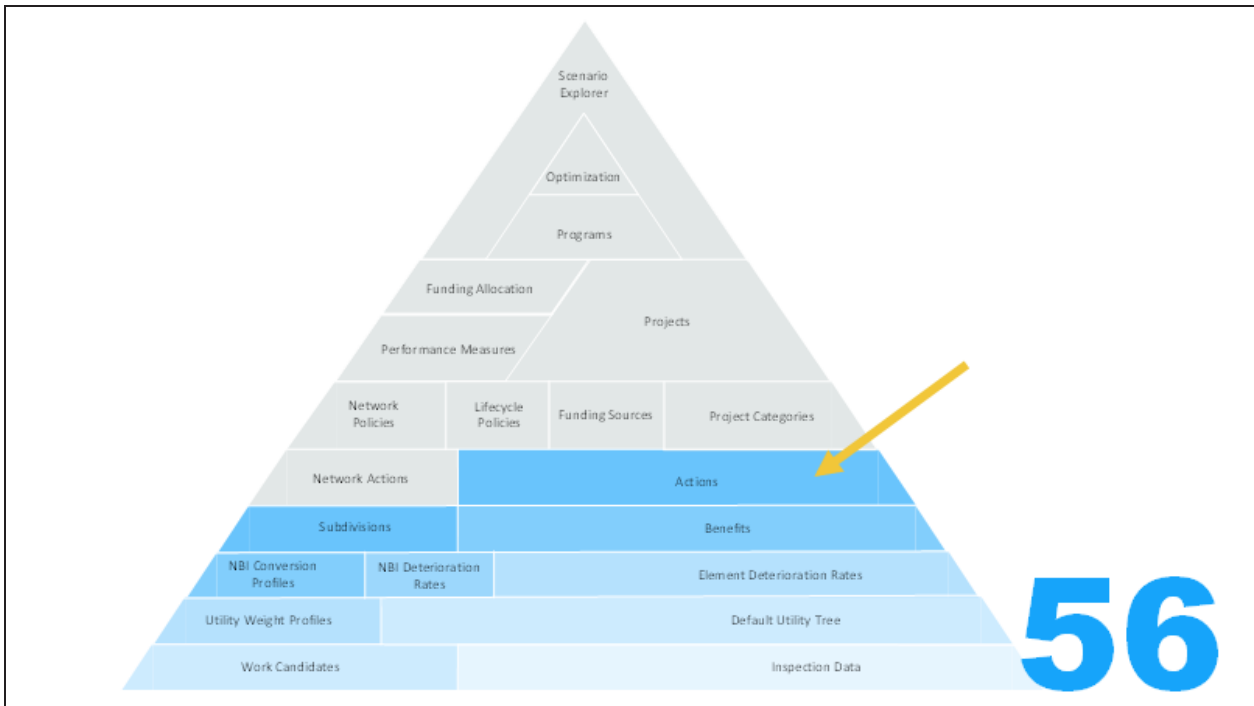
Actions: the other side of the coin from Benefits.

Actions — Admin > Modeling Config > Action Defs

57

There are lots of changes on this screen, and this will impact both the Actions and the Network Actions, with wider impacts to the rest of the software. First we will focus on the parts at the bottom of the screen.

Actions — Admin > Modeling Config > Action Defs

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On the left, this is where you attach the benefits to an action. You can attach multiple benefits to an action (for example, you can re-use a deck replacement benefit as part of a deck replacement action, and a bridge replacement action).

The costs can be modeled in a few ways. First, you have the option to override the costs on a per-element basis with a cost per-sqft of deck. This can be useful if your agency has a sqft cost estimate for structure replacement or standard collections of deck work.

Next we have the Element per-unit costs. As you add benefits to the action, the elements affected will be added to this list. In parenthesis you will see if it's a removal, improvement, replacement, or creation. As you remove benefits from the action, you will see elements be removed. And if for some reason they become unlinked, the green square will turn red.

You also have the option to add indirect costs, either as a fixed amount or a percentage of the total project. For risk or field changes, this is probably the best option to reflect costs.

Deferment rules are used primarily by the LCCA modules, and are helpful for modeling how work would actually be performed. An action can have deferment effects on many actions, for example replacing the bridge can defer any other actions for several years.

You have the option to define a minimum cost – which will keep the optimizer from recommending that work until the cost reaches a minimum threshold. We recommend that you keep these thresholds low or nonexistent until you become familiar with the project-thresholds we will discuss later on.

To help you keep your many actions straight (note this example has more than 10 pages of them), an action type has been added, allowing you to filter down your actions to specific types.

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Network Actions
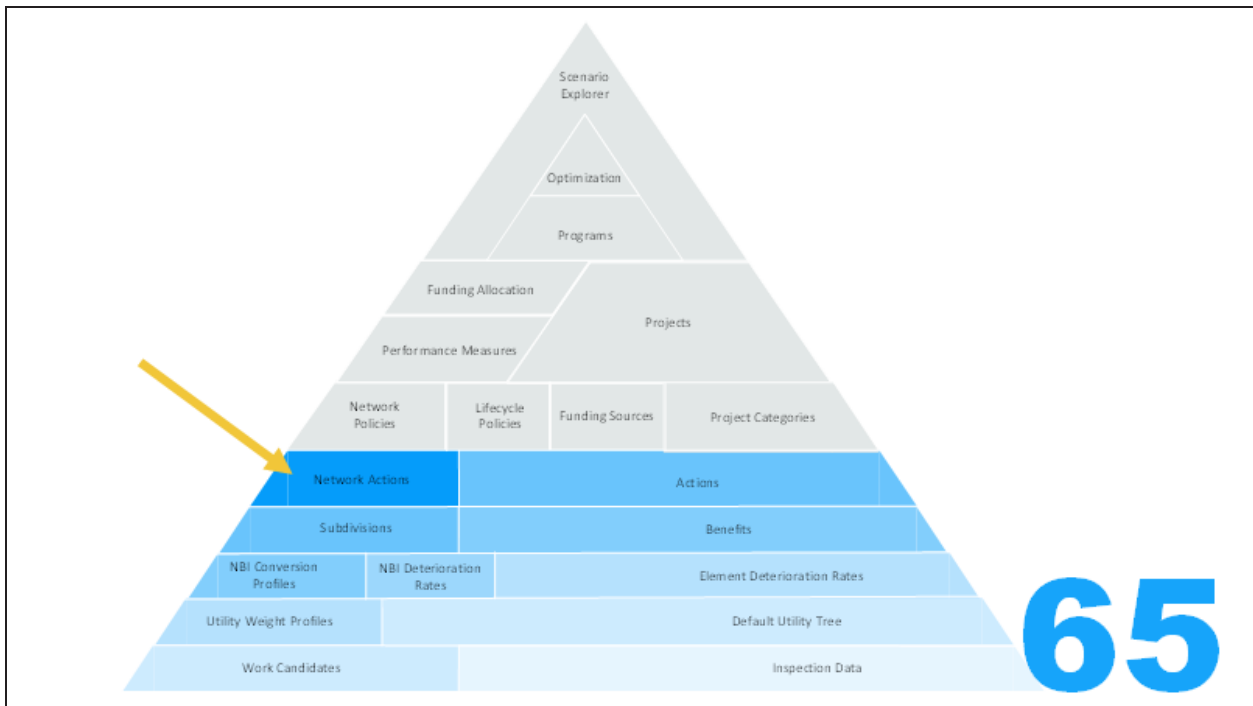
To understand the difference between Actions and Network Actions, let's give you a quick crash course in Modeling. There are two general approaches to network optimization: these are generally referred to as "Top Down" and "Bottom Up".

Bottom Up Approach:
Find the optimal approach for each bridge individually,
then add up to a network program.

Wearing Surface	Deck	Ancillary	Superstructure	Substructure
Do Nothing	Do Nothing	Do Nothing	Do Nothing	Do Nothing
Healer Sealer	Pothole Patching	Parapet Seal	Spot Paint Repair	Backwall repair
Thin Bonded Polymer Overlay	Hydro-Demo	Parapet Repair	Clean & Overcoat	Column repair
Asphalt Overlay w/ Membrane	Deck Replacement	Replace parapets	Repaint Beams	Column Wrap
Polyester Concrete Overlay		Clean joints	Beam Repair	Bent Repair
		Seal Joints	Bearing Replacement	Bent Wrap
		Replace Joint Seal		
		Close Joint		

$$2^{29} = 536,870,912 \; combinations/bridge$$

For a network of 5,000 bridges it was
estimated this would take about 4,256 years
to calculate.

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The fundamental challenge with the bottom up approach is the number of possible combinations of actions. In this case, I listed out the common work items UDOT normally performs, and as you can see, the bridges would be gone long before I could arrive at my best answer – unless I was willing to use a supercomputer or make some assumptions.

Top Down Approach:
Use an average project and apply it to all bridges in the
network.

Preserve Deck
Thin Bonded Polymer
Pothole Patching
Parapet Sealing
Seal Joints

Rehab Deck
Asphalt w/ membrane
Hydro-Demo
Parapet repair
Close Joints

Replace Deck

Deck	Superstructure	Substructure
Do Nothing	Do Nothing	Do Nothing
Preserve Deck	Preserve Super	Preserve Sub
Rehab Deck	Rehab Super	Rehab Sub
Replace Deck	Replace Super	Replace Sub

$$4 \quad \times \quad 4 \quad \times \quad 4$$

$$64 \; combinations/bridge$$

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For the Top-Down approach, using a single average project is probably too simplistic. So instead consider where we chose an action from each of these columns. We define "Preserve Deck" as our generic deck preservation treatment. This calculation can be completed in a more reasonable amount of time.

So Actions which are built to be used for the top-down network analysis can be distinguished from bottom-up (work candidate) Actions by checking the *Network Level* box. This will enable this Action to be used in Network Policies (where we're going next).
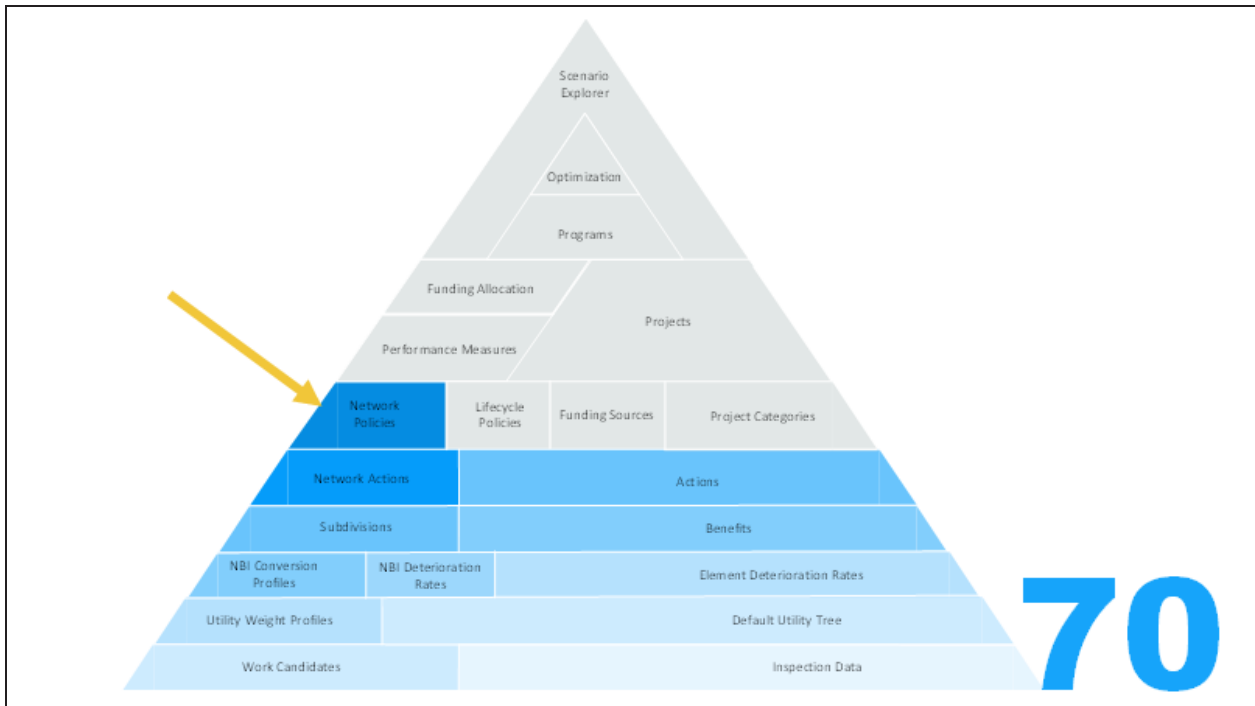
Network Policies
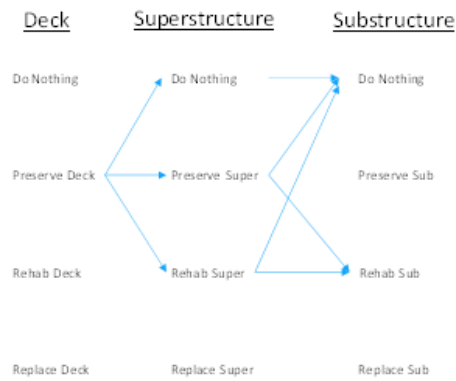
These are the same 4 generic actions in each category that we were discussing on slide 68. Notice that we can reduce the number of combinations (and thus computation time) further by ruling out combinations we would never consider. We would never pair a deck rehab or deck preservation with a superstructure replacement. In this example, in my state there are no substructure preservation treatments we would consider.

The Network Policies allow us to define the combinations of actions to be used in optimization. You can go up to 3 levels deep, and there's no limit to how many treatments you put on each branch of the tree (but remember everything you add will add run-time to the analysis). You add branches through the menu at the bottom.

It's typically good practice to name a tree after the root action, but this is not required.
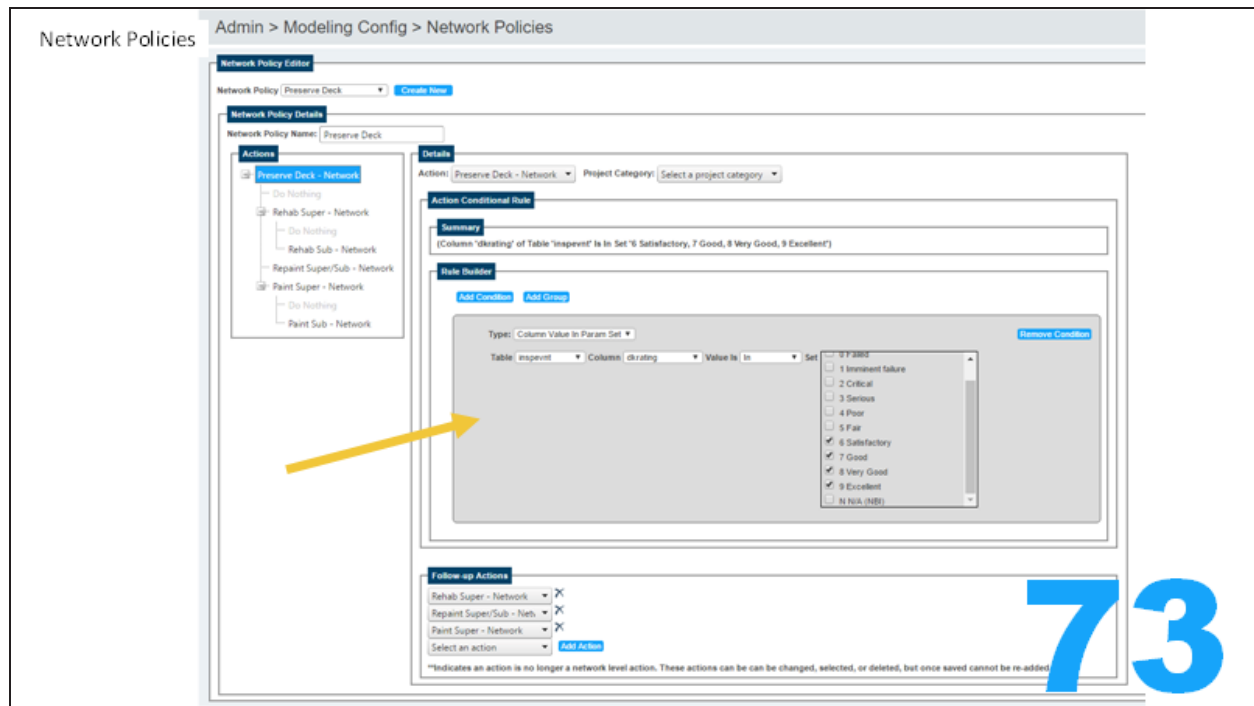
To limit the numbers of conditions even further, you can add conditions based on any database fields of when this work should be considered. This way the optimizer does not recommend preservation work on a bridge with a deck rating of 3.
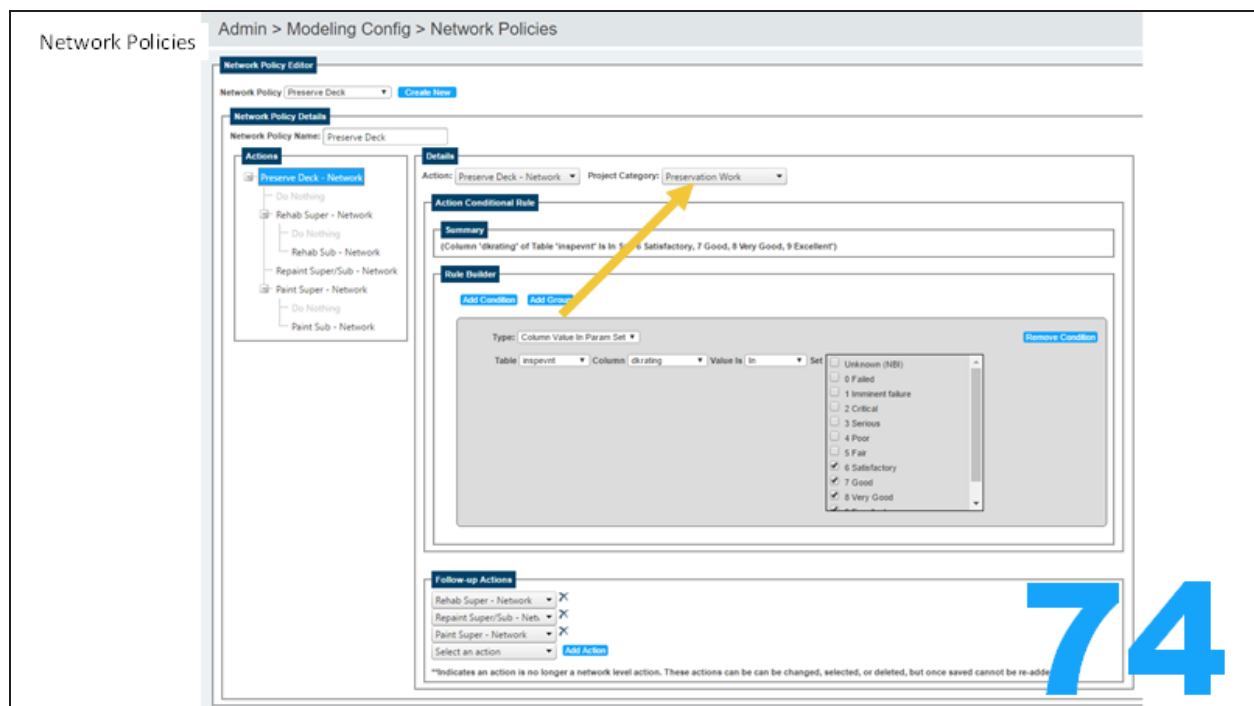
Because the optimizer will recommend a lot of projects, you have the option to define a project category that you would consider this work to be in. For example: Preservation, Rehab, Replacement. So you can sort these projects out by categories later.

Project Categories

Speaking of Project Categories, here is where you can define them. Project Categories can help you to both filter projects in a program by their category and filter out bridges which are candidates for this work in the needs list.

Funding Sources

Since this has been available since 5.2.2, I will only briefly mention funding sources here. Here you can create and edit funding sources, attach projects or programs to them and see how much of the funds have been allocated from each source to a project or program. This piece is not necessary for optimization, but some agencies will find it useful.
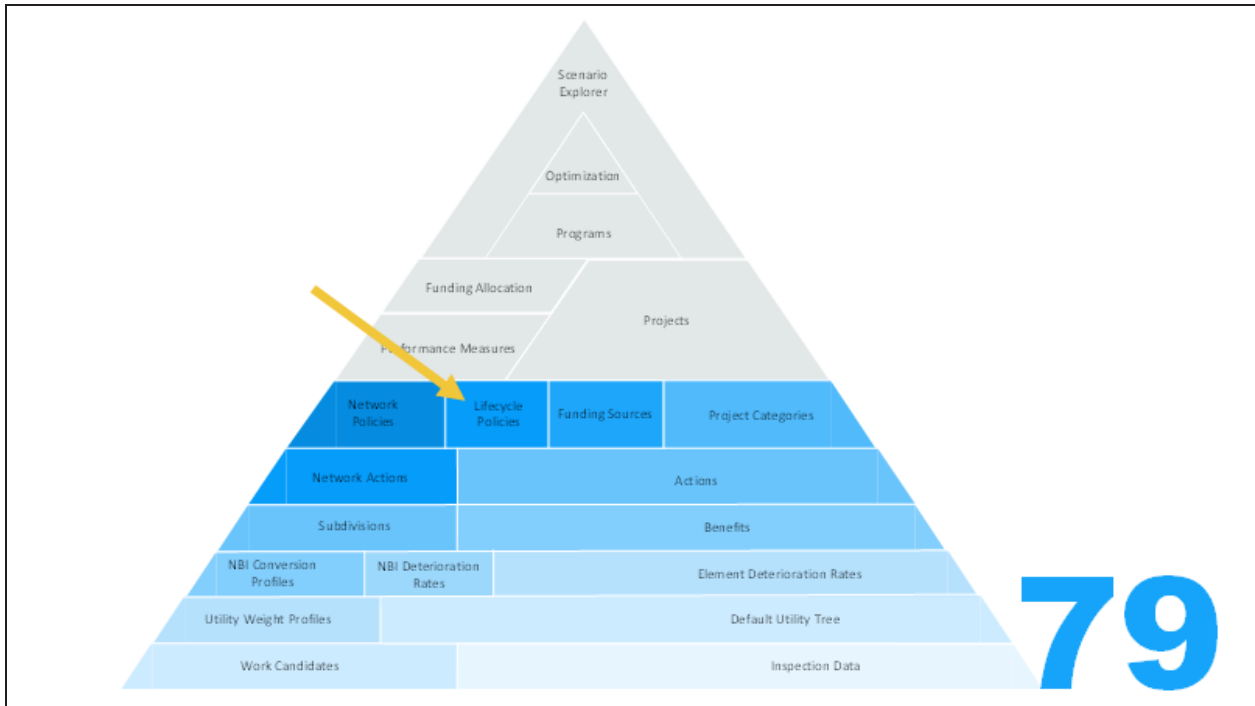
Lifecycle Policies

The next piece of the optimization logic is going to require some thought on your part: we're going to be dealing with the Life Cycle Cost Analysis (LCCA). Life Cycle Cost can be summarized as 'what is the value of doing the work now instead of later?' And in order for the software to answer that question, it needs to know what the typical 'later' scenario would look like.

For this reason, you need to codify your state's usual behavior for preservation, rehab, and replacement. You need to set up rules for what actions you would perform and when you would use them.

You then need to specify which structures use which policy. If you only have one policy for all your structures, this could be relatively straight forward.

But this also gives you the flexibility to define different policies for State vs. Locally owned bridges, or NHS vs. non-NHS, or differing strategies by District.

Projects

You can analyze work candidates and work recommendations for a structure, including their LCCA effects, and decide what you would like to add to a project from this page.

The *Reverse Calculation* page is similar (and available in 5.2.2) to *LCCA*, but does not include the future analysis. On this page, the system can try to apply different benefits, see their costs, and recommend to you certain actions based on their cost/benefit ratio. Once you select the actions you want, you click on the *Add to New Project* button to create a project with those actions.

Also previously mentioned, Projects can be made from the *Bridge Analysis* task: which lets you review the work candidates which have already been identified for that bridge.

And Projects can be made from the *Needs List*, where you can filter for work candidates of a similar type across many or all the bridges in your inventory.

On the Projects page, you can also create projects directly, selecting bridges by project category, by name, or by proximity on a map. Here you can also merge projects into one or split them up. These tools are also available in 5.2.2.

While not required, you can assign projects to a program. This way the optimizer will work with the projects you have already defined.

You can choose to:

- Freeze the projects to a program – the optimizer will include your projects as they fit in the cost/benefit rank.

- Freeze to a year: Any programs which respect frozen work will model this project as having been created.

- Freeze to a program and year – the optimizer will model this work as done and find other projects to fill out the budget (like recommending the rest of your STIP).
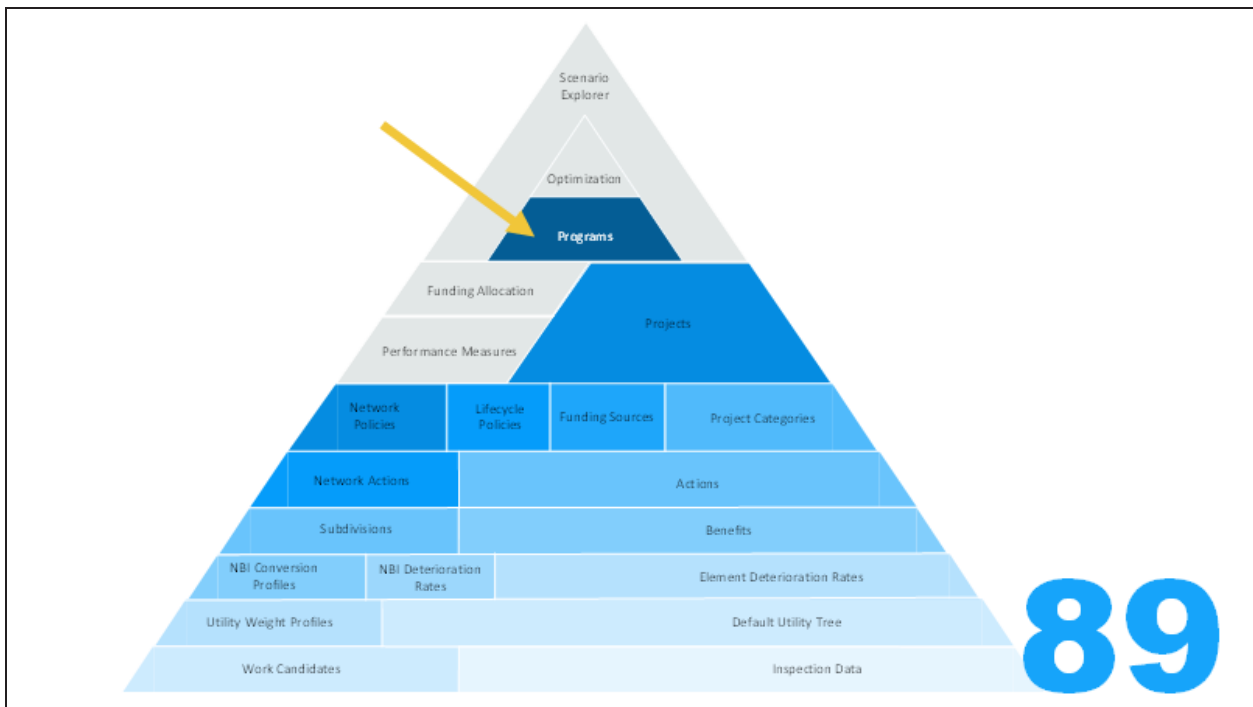
Programs: time to start pulling it all together.
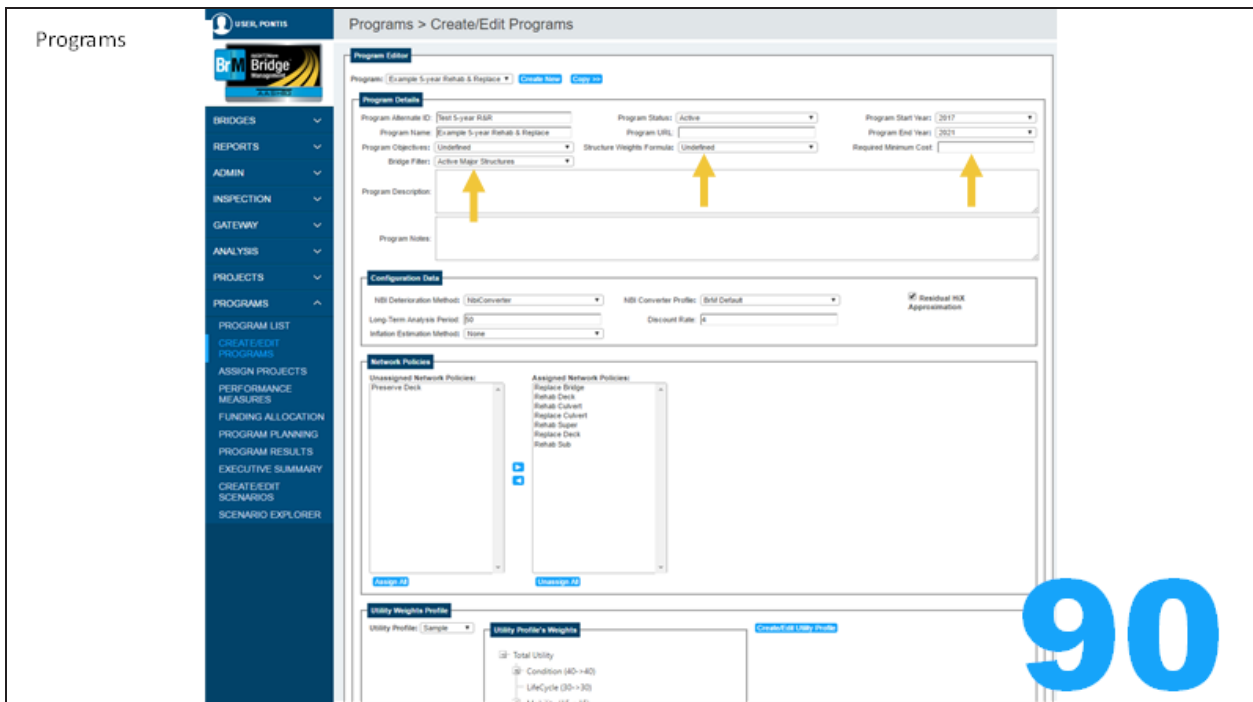
We're going to skip ahead to programs for a minute because this is the order you will use in the software to set up a program.

Let's talk about some of the program details first:

You can use any bridge filter from the bridge list to limit the bridges which you will be considering.

You have the option to apply a structure weight formula. There is an example one based on deck areas, but you can write a formula based on distance to the legislature, if you'd like.

You will need to set the years of your program on this screen.

And finally, we have here the Required Minimum Cost. We recommend that you start by setting a value in here before playing with action minimums. If you set a threshold of $50k, then projects less than $50k will not be recommended by the optimizer.
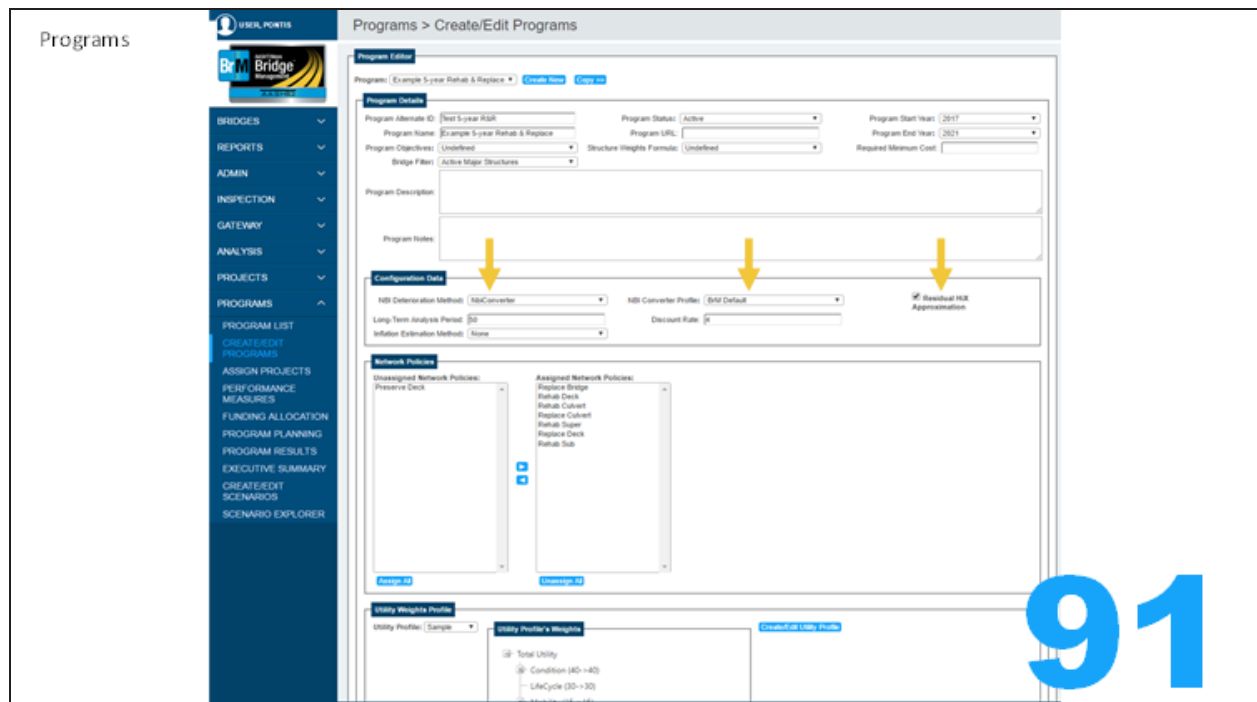
Configuration Data:

The NBI deterioration method is where you will choose if future NBI values should be based off the element deterioration plus NBI conversion, or on NBI deterioration curves. If you choose to use the converter, you will need to pick the conversion profile. Remember, we find the FHWA standard to be very aggressive.

Using the Residual Health Index Approximation can significantly reduce calculation time (in some cases up to 40%) but comes with a 5% to 10% loss in accuracy for LCCA values.

The Long Term Analysis Period is the single largest influencing factor on the runtimes. How long do you want to include in the LCCA calculation. Less than 30 years can give you wildly different answers, and more than 75 years results in almost imperceptible changes in accuracy.
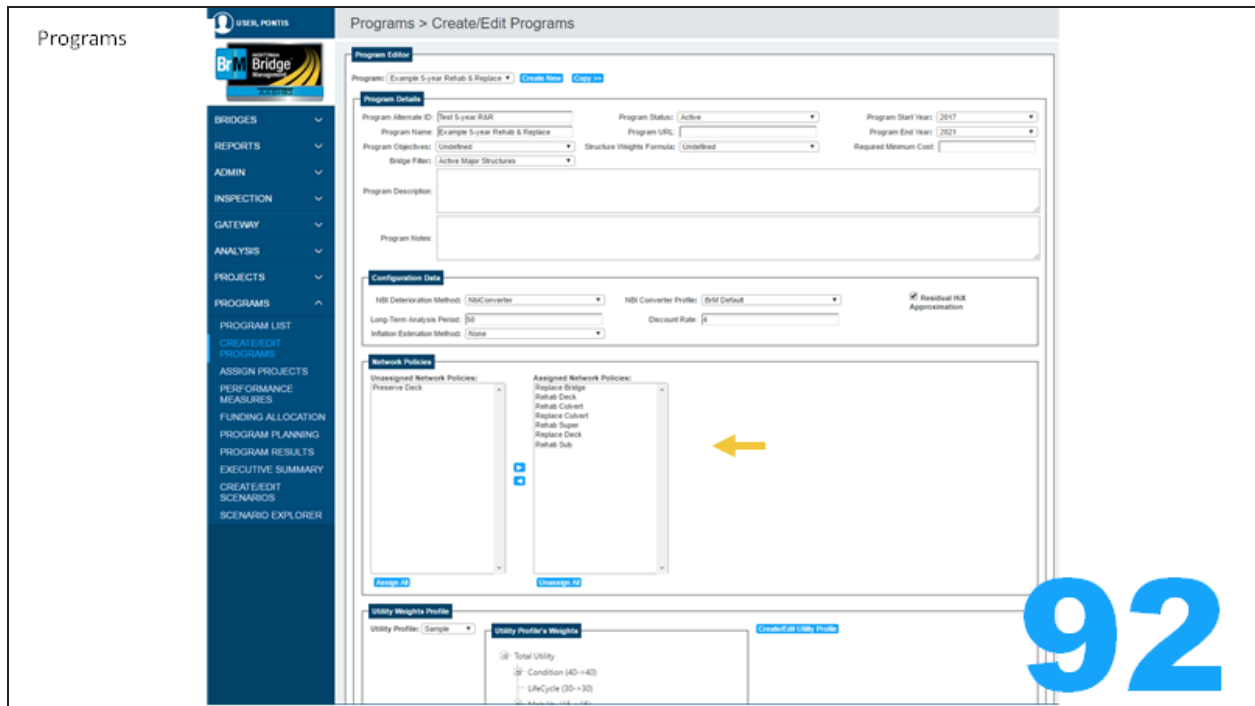
Pick which Network Policies to include in your analysis.

Then connect your Utility Weight Profile.

Finally, attach your subdivision profile and pick which segments to include.

Performance Measures

Programs > Performance Measures

Performance Measures

Program: [Example 5-year Rehab & Replace ▼] Scenario: [Default ▼]

Select Performance Measures

Performance Measures	Best Value	Worst Value		
Utility (Sample)	100.00	0.00		
Health Index	100.00	0.00	✎	✕
Pct. Deficient (Surface-Based)	0.00	100.00	✎	✕
➕ Add new record				

Performance Constraints by Segment

Segment	Utility (Sample)	Health Index	Pct. Deficient (Surface-Based)
0 Not on NHS	Min: ___ Target: ___	Min: ___ Target: ___	Target: ___
1 On the NHS	Min: ___ Target: ___	Min: ___ Target: ___	Target: ___

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Performance Measures are the types of data that we would like to track through the course of the optimization for analysis after. Utility is the only fixed performance measure since all optimization is done in terms of Utility.

Programs > Performance Measures

Performance Measures

Program: [Example 5-year Rehab & Replace ▼] Scenario: [Default ▼]

Select Performance Measures

Performance Measures	Best Value	Worst Value		
Utility (Sample)	100.00	0.00		
Health Index	100.00	0.00	✎	✕
Pct. Deficient (Surface-Based)	0.00	100.00	✎	✕
Deck NBI Rating		▼		

Deck NBI Rating
Superstructure NBI Rating
Substructure NBI Rating
Culvert NBI Rating
Pct. Good/Fair (Surface-Based)
Pct. Good/Fair (Count-Based)
Pct. Deficient (Count-Based)
Database Field Performance

	Utility (Sample)	Health Index	Pct. Deficient (Surface-Based)
	Min: ___ Target: ___	Min: ___ Target: ___	Target: ___
1 On the NHS	Min: ___ Target: ___	Min: ___ Target: ___	Target: ___

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You'll notice that there are these default performance measures built into the software and then you have the option to track other database fields if you would like (though you will only see changes to them if the benefits affect them).

Performance Measures

Programs > Performance Measures

Performance Measures	Best Value	Worst Value	
Utility (Sample)	100.00	0.00	
Pct. Deficient (Surface-Based)	0.00	100.00	✎ ✕
Health Index	100.00	0.00	✎ ✕

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You can add targets, which the Optimizer will strive to meet, or you can add minimum thresholds. For example, you can say 'don't return a solution that has a HI less than 50.'

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Funding Allocation

You can tie a program's funding to the funding sources mentioned earlier, though this is not required (and for hypothetical programs, probably not recommended).

For quick setups, you can enter an amount and distribute them evenly across all the years.

Funding
Allocation

Or you can enter funds specifically setting a funding each year.

Funding
Allocation

You can also get the current performance of each segment of your subdivision and distribute the funding based on their initial performance. In this case, if the non-NHS is further from its targets, it would get more funding.

Optimization

You have arrived at your destination. The *Run Optimization* button. We will discuss the scenario options in the last section. Notice also the summary of our previous selections.
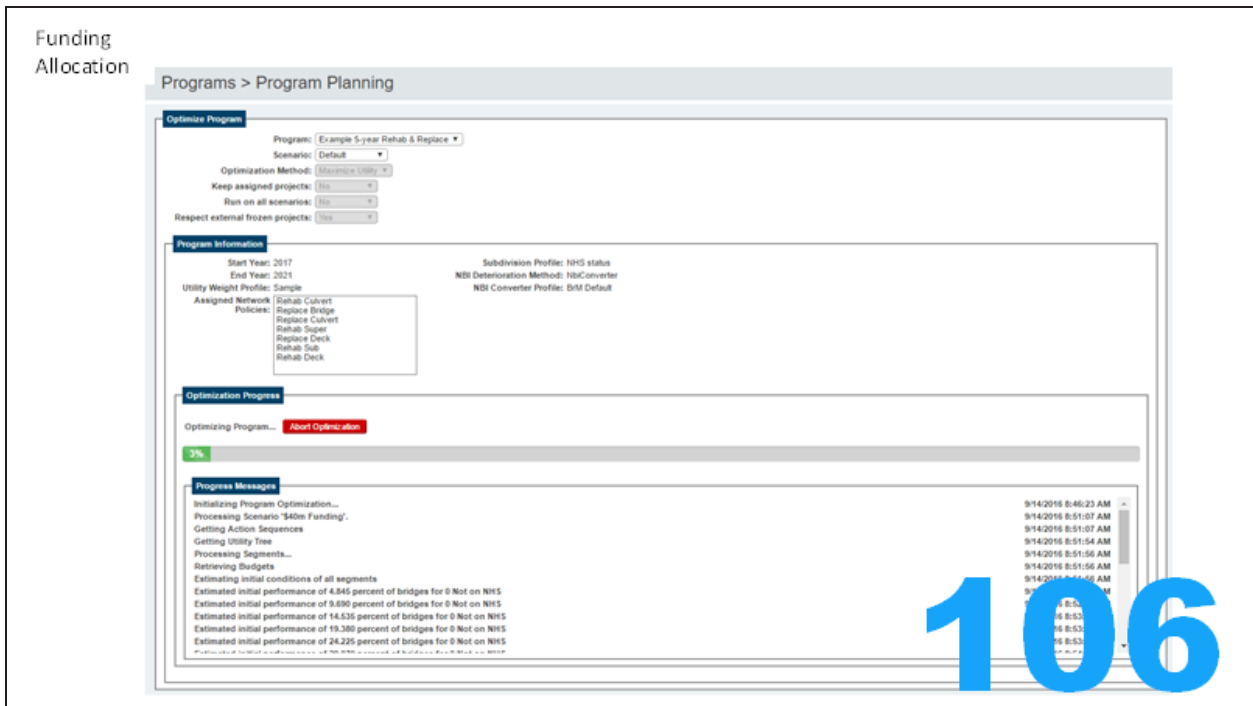
Once you click *Run Optimization*, the process will run in the background on the server. If you log out and come back, the process will still be running. This way it can run for hours, days or (if you go really crazy) weeks without you needing to keep the app logged in.

Should you need to abort the process, you can do so with the red *Abort Optimization* button.
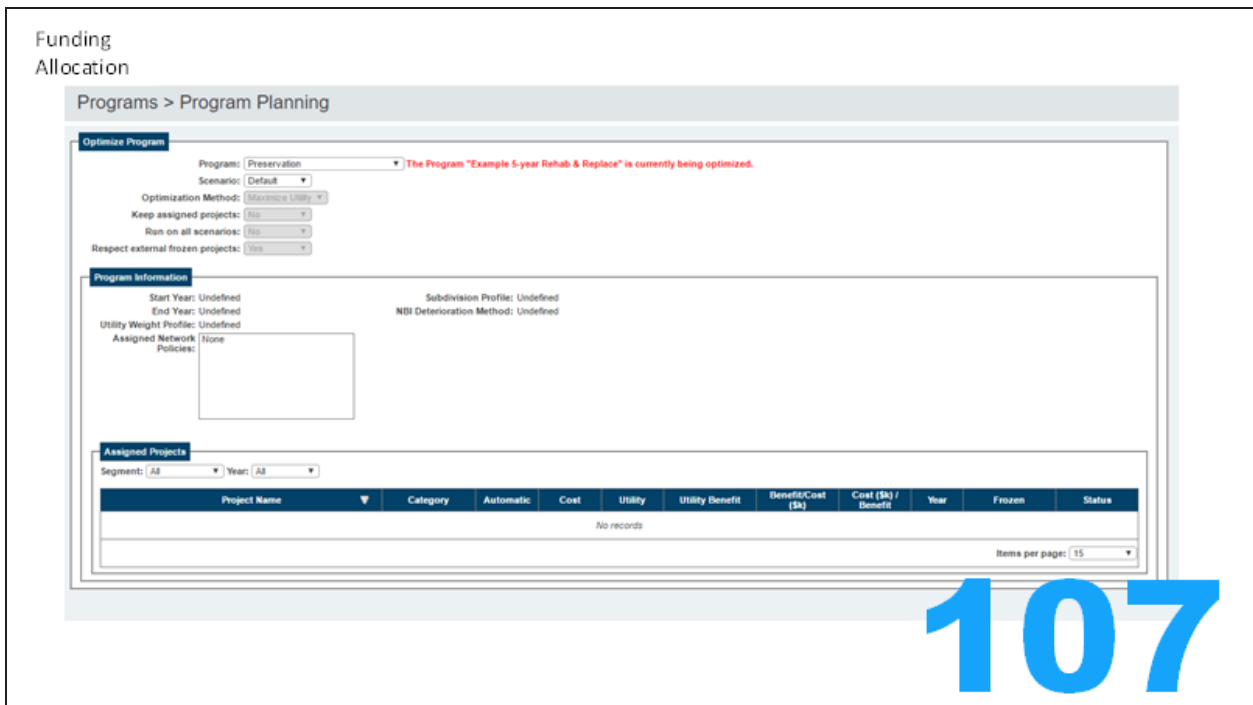
Only one optimization can be run at a time. This is what you would see if you went to a different program, or if you were another user accessing this page.
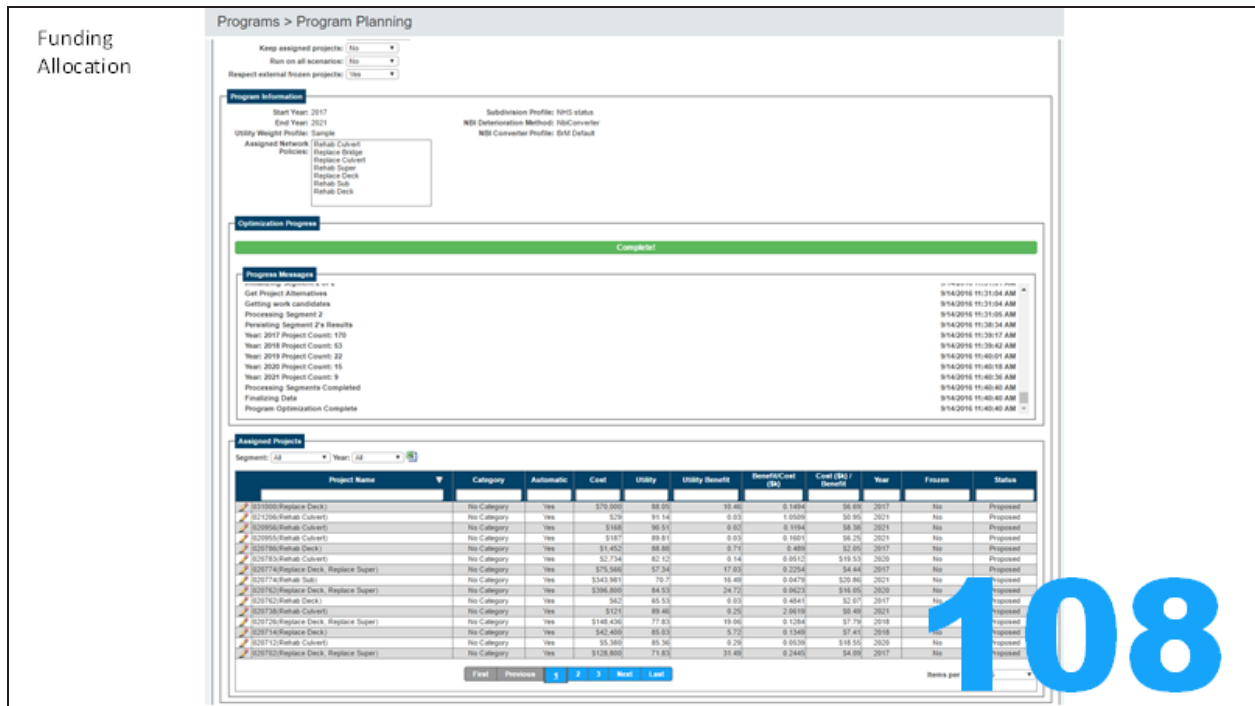
Once completed, the projects would be listed below. Notice a few things here:

- As all the low hanging fruit are caught in the first few years, the optimizer recommends more replacements in later years, leading to less projects recommended with each year.

- I did not set a minimum project amount, so the optimizer recommended a $62 project. Set a minimum to avoid seeing these.

The *Program Results* page has a few fixed graphs to give you information about the performance of your program.

- Notice that this program focused on NHS bridges in the first year, then moved on to non-NHS.

- Notice that the program is on the horizon for most-optimal. If we had applied minimum constraints to performance measures, this could have moved down and to the right.

- The overall slope of the future performance is very slightly downward: we should compare this to including preservation but we are probably not spending enough to counter the deterioration of the system – and that is visible.

The *Executive Summary* includes charts that you can configure to your agency's practice.
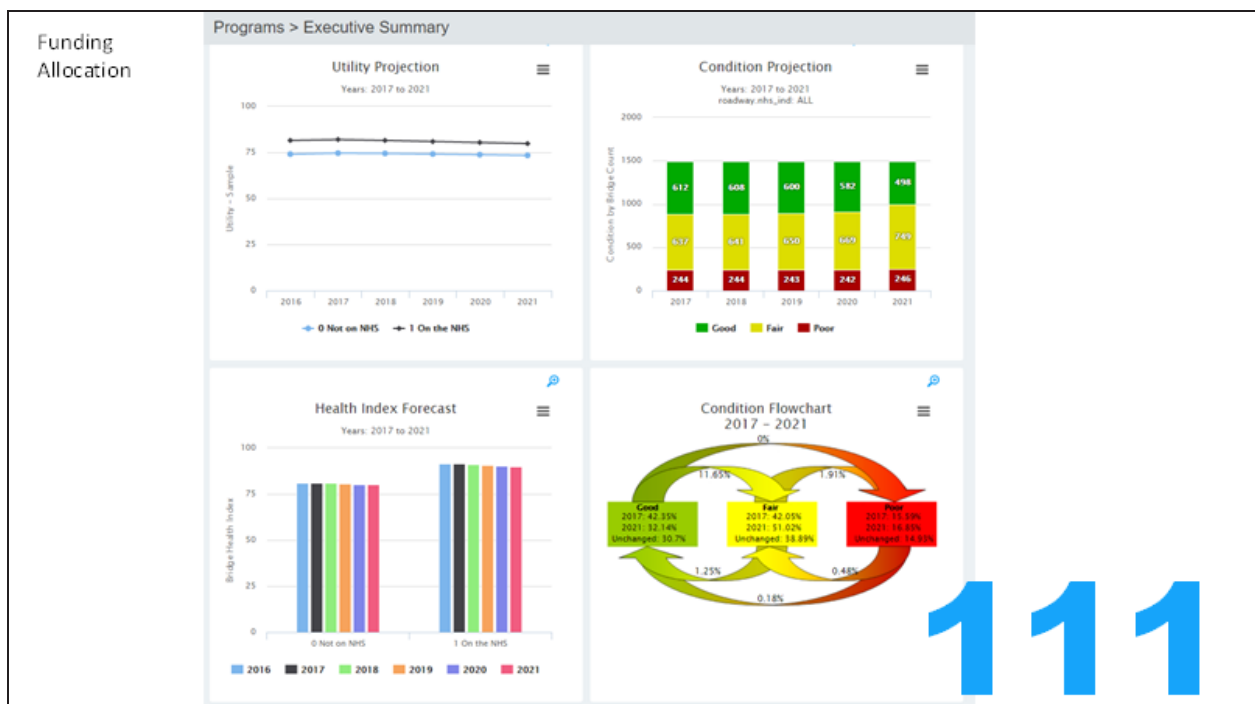
Lower on the same page, you can see on the "spider graph" that the percents moving from good to fair or fair to poor are higher than the program can restore. We're likely not spending enough on these structures.
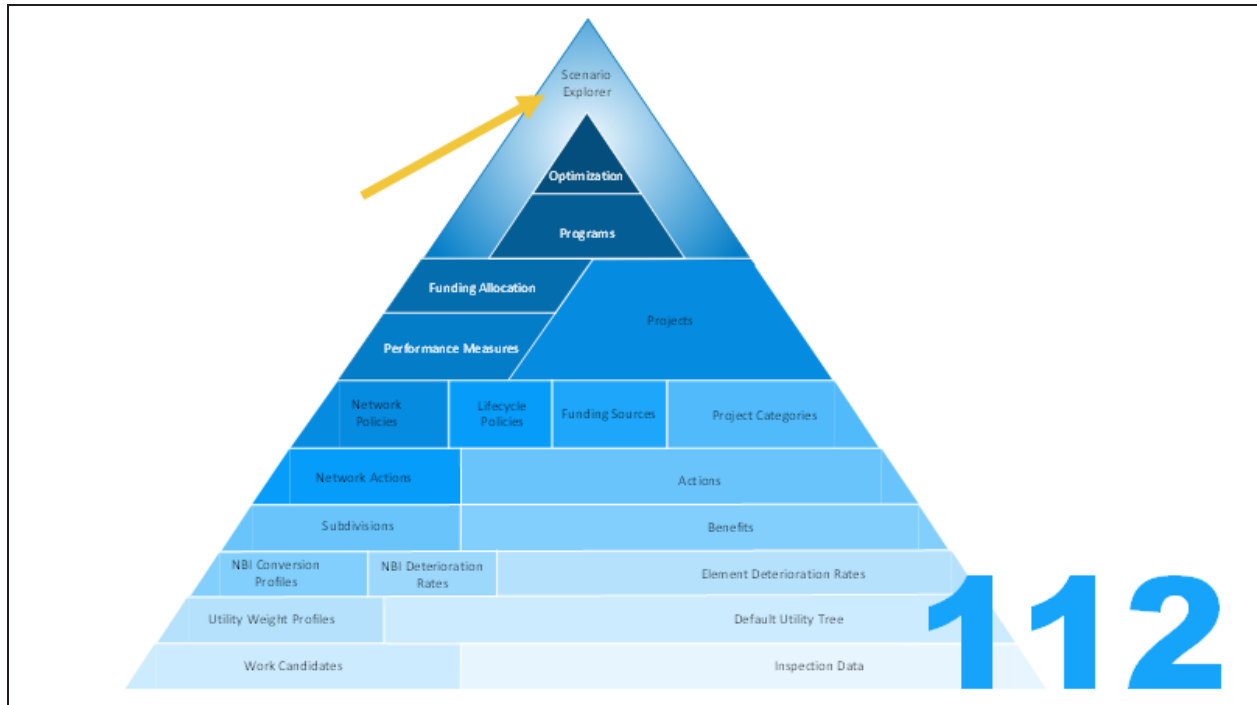
Scenario Explorer
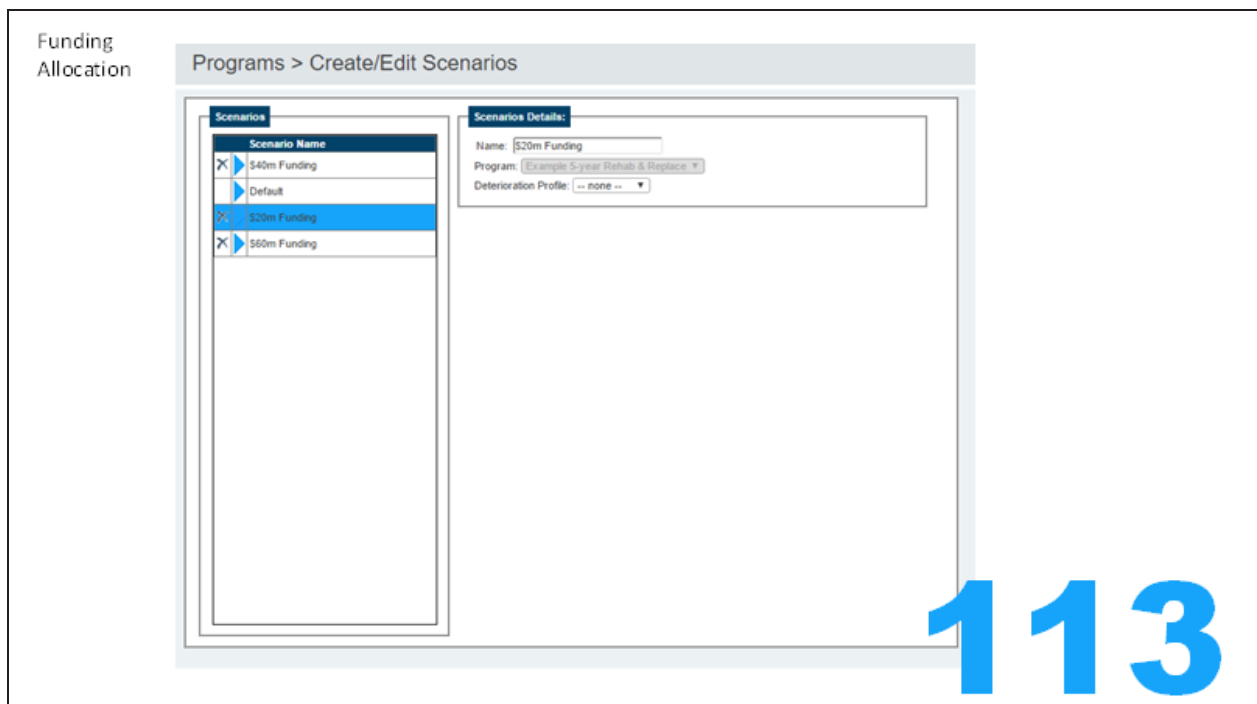
So we will create some scenarios where we will look at increased funding levels – for comparison.

Funding Allocation

On each scenario, we can set different funding levels.

Funding Allocation

Then at the optimization level, we analyze all the scenarios at the same time.

Programs > Scenario Explorer

Edit Parameters

Performance

Performance: Health Index
Segments: 0 Not on NHS

●— $20m Funding   ✦— $40m Funding   ●— $60m Funding   ✦— Default

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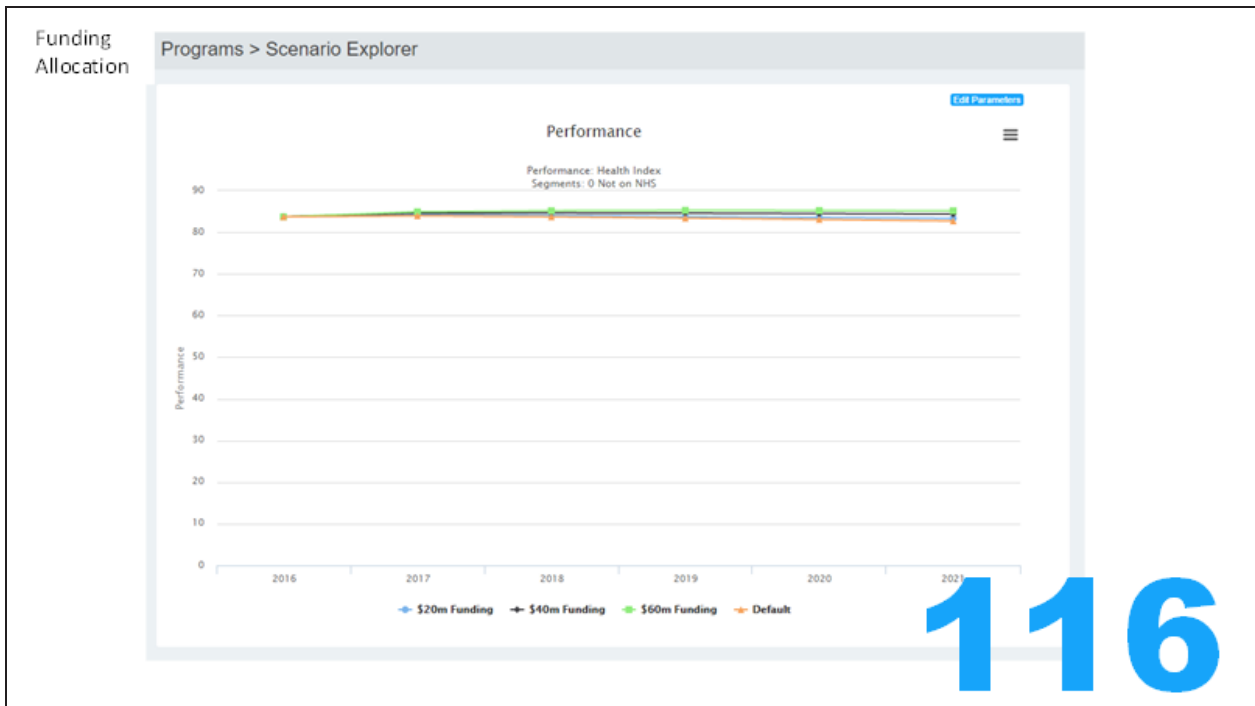
Then in the scenario explorer, we can see how each plan fares based on the performance measures we set initially.

In this case, spending $10m would result in an average HI of 81.3 and $60m would accomplish an HI of 85.4.

Your legislature would love to have this level of information.

Programs > Scenario Explorer

Edit Parameters

Performance

Performance: Pct. Deficient (Surface-Based)
Segments: 1 On the NHS

●— $20m Funding   ✦— $40m Funding   ●— $60m Funding   ✦— Default

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Looking at our other performance measure: notice how much of a difference the extra money makes in reducing the percent of structurally deficient bridges per year.

A pyramid diagram showing the hierarchy of BrM features. From top to bottom:
- Scenario Explorer
- Optimization
- Programs
- Funding Allocation / Projects
- Performance Measures
- Network Policies / Lifecycle Policies / Funding Sources / Project Categories
- Network Actions / Actions
- Subdivisions / Benefits
- NBI Conversion Profiles / NBI Deterioration Rates / Element Deterioration Rates
- Utility Weight Profiles / Default Utility Tree
- Work Candidates / Inspection Data

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So this concludes our tour of the features of BrM. The goal has been to create a data-driven process to help you manage your inventory, giving you the tools to model the decisions you've made, the effects those decisions will have, and to recommend some courses of action you should consider.

Appendix B

- BrM Basic Use Case Example 1 - Scour Mitigation Program

Scour Mitigation Program

This example will guide you through the steps to configure and run the BrM Program Optimization. It will guide you through some features which were released in 5.2.1 and 5.2.2 which influence the optimizer released in 5.2.3.

In this example, we will develop a scour mitigation program for state-owned bridges in a BrM database. This will take us through all the pages of configuration that your agency will need to consider in order to get realistic and reliable results from the Program Optimizer.

This example assumes that the user has BrM admin rights in order to configure the agency's policies.

BrM update scripts routinely update or reset example data. This guide will include notes like this to help you learn how to set up your data in a way that minimizes disruptions during future updates.

Inspection Data

The BrM Program Optimization is meant to assist states in developing a data-driven program for structure preservation, repair and replacement. Therefore, the first step is data quality.

The more detailed data your agency collects, the more fine-tuned the results will be. For example, if your agency only collects NBI data and not element data, your deterioration modeling will be limited to NBI deterioration, NBI-only benefit groups, and NBI-only lifecycle calculations.

In this example, scour will be evaluated in terms of the Scour Critical rating (NBI Item 113) and scour assessments. The bridges being analyzed will need to have NBI Item 113 filled out and/or risk assessments completed for the bridges.

Step 1: Verify that the structures to be programmed have ratings for NBI Item 113 and/or risk assessments.

Utility

Optimization will be primarily performed on the metric of Incremental Benefit per Cost as outlined in NCHRP 590. The "Benefit" part of that metric is the Δ Utility score. So we will now set up the Utility functions according to our agency's policies.

Default Utility Tree

Admin > Modeling Config > Utility

The default utility tree will need to include nodes which will reflect the benefits from the actions performed. If your agency does not want them to be part of the Utility score used elsewhere, you can give them a weight of zero for now and they will not affect the other utility scores.

Step 1: Create a Utility node for scour risk assessment. Give it a weight of 50, scale the graph so that 1 is worth 100 and 50 is worth 0.

Step 2: Review the Utility Node for NBI 113 Scour Critical Rating. It should have a weight of 50 (or appropriate to your agency's policy), it should be mapped to the inspevnt.scourcrit field of the database, and map the NBI ratings to a score. Notice: in this example, bridges with a rating of a 6 (Scour uncalculated) shouldn't be included in the program – we will filter them out shortly.
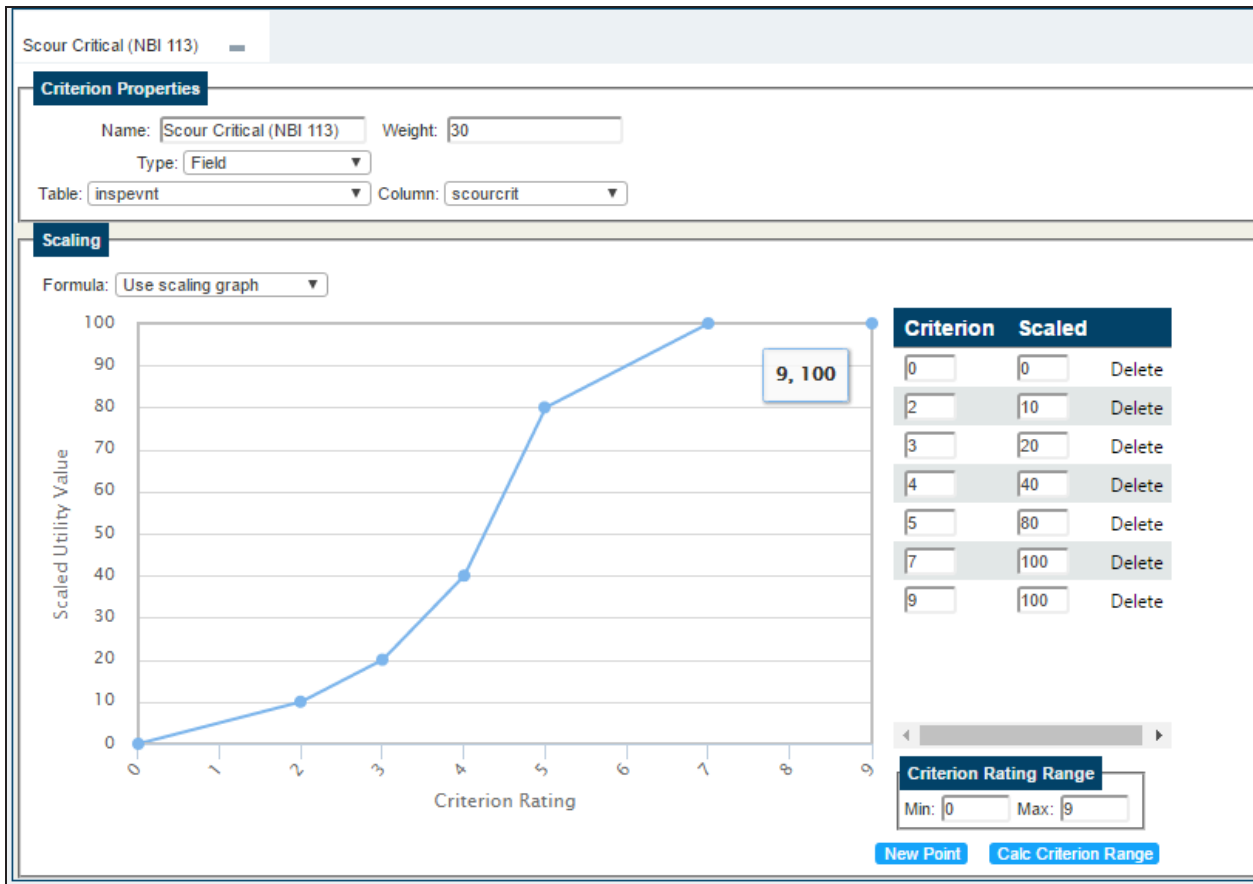
Step 3: Give the risk parent-node a weight of 0, or a weight according to your agency's policy.
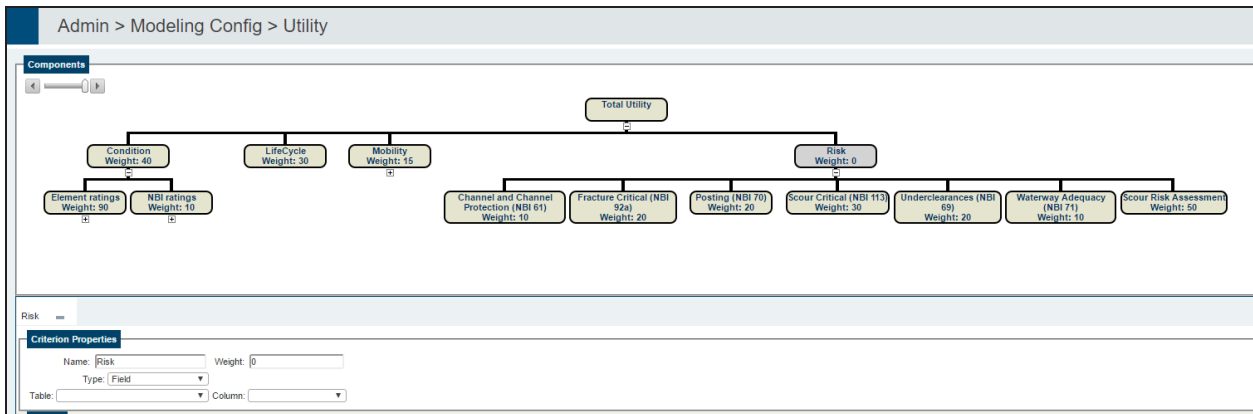
Utility Weight Profiles

Admin > Modeling Config > Weights Profile

The Utility Weight Profile allows you to temporarily change the weights of the different nodes in the Utility tree for use in specific programs. For example: your agency may use the utility score primarily as an indicator of condition, but for the purposes of this program you want the utility to focus on scour only. Rather than change the default utility weights and disrupt other users of the program, we will create a weight profile which leans exclusively on the risk node for this program only.

Step 1: Create a new Utility Weight Profile and name it "Scour Weight Profile."

Admin > Modeling Config > Weights Profile

Profiles

Selected Weight Profile: Scour Weight Profile ▼

Name: Scour Weight Profile

Utility Components

- Total Utility
  - Condition (40->40)
  - LifeCycle (30->30)
  - Mobility (15->15)
  - Risk (0->0)

Step 2: Re-weight the parent nodes of condition, lifecycle and mobility to 0 and risk to 1. Focus the weights on the Scour Rating (Item 113) and the Scour Risk Assessments.

Admin > Modeling Config > Weights Profile

Profiles

Selected Weight Profile: Scour Weight Profile ▼

Name: Scour Weight Profile

Utility Components

- Total Utility
  - Condition (40->0)
  - LifeCycle (30->0)
  - Mobility (15->0)
  - Risk (0->1)
    - Channel and Channel Protection (NBI 61) (10->0)
    - Fracture Critical (NBI 92a) (20->0)
    - Posting (NBI 70) (20->0)
    - Scour Critical (NBI 113) (30->50)
    - Scour Risk Assessment (50->50)
    - Underclearances (NBI 69) (20->0)
    - Waterway Adequacy (NBI 71) (10->0)

Scour Risk Assessment Criterion's Details

Default Sibling Total Weight: 160
Default Weight: 50   31%
Override Sibling Total Weight: 100
Override Weight: 50   50%

Reset to Default

Step 3: Save the profile.

Deterioration

Even in the dry deserts of southern Utah, bridges deteriorate. And their deterioration rates are different from bridges in the humid river deltas along the Gulf of Mexico. The default values in BrM are a good average starting point, but you should plan on spending some time to customize these to the environment of your agency.

The deterioration modeling comes in two forms: element-level deterioration and NBI-rating-level deterioration. Element-level rating analysis the deterioration of the individual elements and can provide more detailed future estimates, like distinguishing between the need to replace pins and hangers vs the need to replace entire beams. NBI-level deterioration is more generic and may be better suited for bridge-groups which do not have element-level inspection.

In either case, it is a good practice to check the default deterioration rates and adjust them to the deterioration you experience in your inventory.

We should also note that BrM does not currently have the ability to deteriorate other database fields at this time. So for this example, the scour assessment and scour criticality will not be worsening with time.

Element Deterioration Rates

Admin > Modeling Config > Element Spec

Review the deterioration rates of all the elements in your inventory, including your Agency Defined Elements (ADE's). ADE's do not come with a default deterioration value, so you may need to create a deterioration curve either from copying the values of a similar default element or figuring out the deterioration on your own.

A good 'gut' check of your deterioration rate is to look at the graph and see when the amount in CS4 passes 10%. In this example, Elem 12 Reinforced Concrete Deck crosses the 10% CS4 range at 35 years. This is close to Utah's experience, but how does it compare to your area?
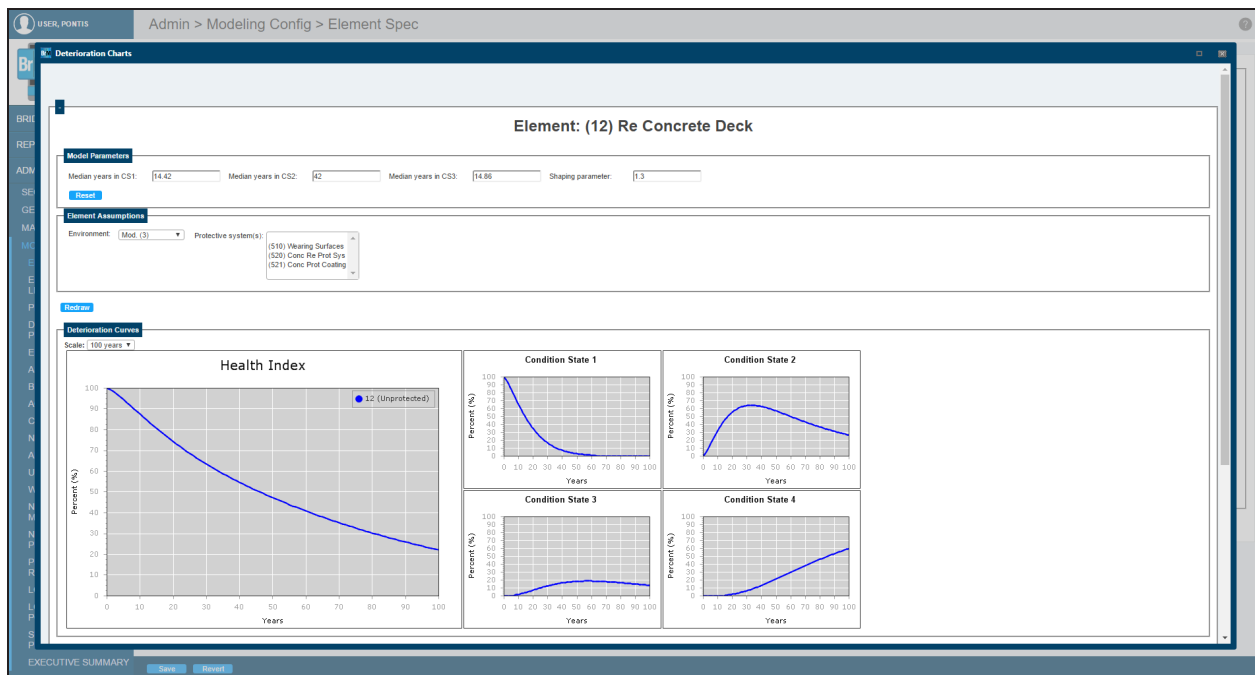
Step 1: Look over your element deterioration rates to reflect conditions in your agency.

*Note: Some agencies have chosen to use service units to have Bentley analyze their element data and recommend deterioration rates for their elements.

NBI Deterioration Rates

Admin > Modeling Config > NBI Deterioration Models

To set the proper rate of deterioration for your NBI ratings, you will want to set the transition times of the NBI Components. If your agency has been conducting inspections with NBI ratings since the 90's, the average transition times should be data easier to come by.

In this example, an average bridge would spend 2 years at a deck NBI of 9, 18 1/5 years at NBI of 8 and then 13.75 years at a 7. Meaning the average deck for this agency would take 35 years to reach a deck NBI of 6. If this feels too long for your experience, you should consult your data and make your own component deterioration rates.

For this example, we will now set up our own deterioration rate for decks. It's important to change the values to reflect your agency's experience.

This step is to help educate you on the behavior of the NBI deterioration rates. It is not necessary to run the optimization.

Step 1: Readjust the years to sum up to 40 years to reach an NBI of 4 (or if you have a good feel for what your agency experiences, go ahead and put it in).

Admin > Modeling Config > NBI Deterioration Models

Components

Component Name
Deck
Superstructure
Substructure
Culvert

Component Specification

Name: Deck

Description:

Category: Decks/Slabs ▼

Table Name: inspevnt ▼   Column Name: ▼

Min NBI Value: 1   Max NBI Value: 9

Component Deterioration Modeling

☑ Model

Model Parameters

NBI Transition Time in Years 9 : 2
NBI Transition Time in Years 8 : 3
NBI Transition Time in Years 7 : 15
NBI Transition Time in Years 6 : 10
NBI Transition Time in Years 5 : 10
NBI Transition Time in Years 4 : 5
NBI Transition Time in Years 3 : 2.6
NBI Transition Time in Years 2 : 0
NBI Transition Time in Years 1 : 0

Step 2: Save your NBI deterioration rate.

Step 3: Re-estimate the results for the entire network. Compare the number of good / fair and poor bridges with what you would expect. Also watch for significant drops over the next 5 years. Seeing changes of thousands of structures could indicate improper configurations.

Network NBI Rating distributions

Bridge Filter: Entire Network ▼   **Re-estimate results**
Component: Deck ▼

	Latest Inspection Reported	Current	+5 Years	+10 Years
NBI Rating 9	4	4	0	0
NBI Rating 8	1	0	3	0
NBI Rating 7	5	5	5	8
NBI Rating 6	8	7	5	2
NBI Rating 5	2	3	6	8
NBI Rating 4	4	4	1	1
NBI Rating 3	0	1	2	0
NBI Rating 2	0	0	1	1
NBI Rating 1	0	0	1	1

NBI Conversion Profiles

Admin > Modeling Config > NBI Conversion Profiles

Because it's sometimes more convenient to do preservation policies in terms of NBI or network policies based on NBI ratings, but to use element deterioration. To help the computer convert between the two, we have NBI Conversion Profiles.

The Profile is a little counter-intuitive to populate, so consider this example of the BrM Default profile:

The value typed in is the 'upper limit.' So if I have a deck with 1.1% of its deck area in CS2, it has to have an NBI rating of 8 or lower. If it had 2% in CS3 and 3% in CS4, the more restrictive (in this case the CS4 percentage) will govern and give us an NBI of 6 for the deck.

When using these conversion profiles as part of deterioration modeling, you will want to be careful of the small percentages. For example, a pristine deck will have 0.001% of its surface area in CS4 after 4 years, and that tiny amount will take a long time to develop into a sizeable amount. But if you put 0 tolerance for CS4 in the NBI conversion profile – it will convert that tiny amount to an NBI of 4. That is why it is recommended to leave the fields blank or with a nominal percentage when using them in deterioration curves.

The default NBI profiles (FHWA and BrM Default) also get updated in upgrades, create a copy to keep your agency ones.

This example is not necessary to run the optimization, but is valuable for learning how the conversion process works.

Step 1: Copy the BrM Default NBI Profile. Name your example 'Agency Test.'

Step 2: Modify the conversion profile to be more generous on NBI's of 7 by increasing the CS2 tolerance to 30%.

Admin > Modeling Config > NBI Conversion Profiles

NBI Profiles

NBI Profile Name
✕ BrM Default - Copy
▶ FHWA Profile
▶ BrM Default

Profile Details:

Name: BrM Default - Copy

☑ Profile enabled

Generic | Deck | Superstructure | Substructure | Culvert

Generic Upper Limits

☑ Group enabled

Method of CS averaging: Element weighting ▼

NBI	Enabled	CS1 %	CS2 %	CS3 %	CS4 %
9	☑	100	1	1	1
8	☑		5	5	1
7	☑		30	5	2
6	☑			10	3
5	☑			20	5
4	☑				15
3	☑				100
2	☐				
1	☐				

Step 3: Save your profile.

Step 4: Re-Estimate the "Good / Fair / Poor" distributions. Notice the distribution of the latest inspection and the Current (deterioration modeled between the inspection dates and today). Large movements could indicate that you need to reconsider your settings.

Network NBI Rating distributions

Bridge Filter: [Entire Network ▼]   [Re-estimate results]

Component: [Bridge-Level ▼]

	Latest Inspection Reported	Latest Inspection Converted	Current	+5 Years	+10 Years
NBI Rating 9	4	6	0	0	0
NBI Rating 8	2	2	6	0	0
NBI Rating 7	2	1	3	9	8
NBI Rating 6	6	7	6	4	4
NBI Rating 5	4	0	1	3	2
NBI Rating 4	8	10	9	9	10
NBI Rating 3	1	1	2	2	3
NBI Rating 2	0	0	0	0	0
NBI Rating 1	0	0	0	0	0

Network Policies

In this next section, we will define the work that your agency would perform on bridges. There are three principle pieces of this section, the benefits, the actions, the network policies, and the project and program categories. In rough summary:

The Benefits define for the computer what the effects of your work are, and how it should model the bridge after the work is completed.

The Actions define what benefits should be grouped together, and then what costs should be associated with that work. There are bridge-level actions, which are intended to be very specific for individual projects and work candidates, and then there are network-level actions, which are intended to be very generic and high level to reduce optimization runtime.

The Policies then define what combinations of actions your agency would consider together.

Benefits

Admin > Modeling Config > Benefit Groups

The benefits should reflect the changes that the bridge will experience with your work. They should affect the various nodes of your utility tree – if a benefit does not affect your utility score, the software will see no benefit to performing that work.

In my experience, it is good practice to break up the benefits into many smaller ones so that their definitions can be re-used with many separate actions. For example: repairing concrete parapet to CS2 should be its own benefit, which can then be associated with network actions like 'rehabbing a deck' and 'rehabbing a culvert,' and bridge level actions like 'concrete parapet repair.' A few days' practice in creating and customizing benefits will help you to see where you can recycle definitions, which will make maintaining and adjusting the configuration easier.

Deck Rehab	Deck Rehab		✏ ⌃			Link to Child Groups
Deck-Install Protection System	Deck-Install Protection System		✏ ✕			Link to Child Groups
Deck-Place Overlay	Deck-Place Overlay		✏ ✕			Link to Child Groups
Deck-Repair(Potholes)	Deck-Repair(Potholes)		✏ ✕			Link to Child Groups
Deck-Replace	Deck-Replace		✏ ✕			Link to Child Groups
Joints-Rehabiliatate	Joints-Rehabiliatate		✏ ✕			Link to Child Groups
Joints-Repair	Joints-Repair		✏ ✕			Link to Child Groups

|◁ ◁ [1] 2 3 ▷ ▷| Page size: 20 ▾   54 items in 3 pages

Approach Slab Repair - Changed Elements ▬

➕ Add new record

Element	Parent	Grandparent	Origin State	CS1	CS2	CS3	CS4		
▾ **320 Pre Conc Appr Slab**									
320 Pre Conc Appr Slab	None	None	CS3		100%			✏	✕
320 Pre Conc Appr Slab	None	None	CS4		100%			✏	✕
▾ **321 Re Conc Approach Slab**									
321 Re Conc Approach Slab	None	None	CS3		100%			✏	✕
321 Re Conc Approach Slab	None	None	CS4		100%			✏	✕

|◁ ◁ [1] ▷ ▷| Page size: 20 ▾   4 items in 1 pages

Approach Slab Repair - Removed Elements ➕

Approach Slab Repair - Replaced Elements ➕

Approach Slab Repair - Created Protecting Systems ➕

Approach Slab Repair - Fields ➕

Approach Slab Repair - Risks- to reduce risk, use negative values ➕

Let's first discuss the benefit title block. The benefit can be named after the action it is intended to model, or it can be named exactly what benefit it contains. The default examples are given a sort order in the 9990's to help separate them from your agency-defined benefits. Some states sort their deck work together, others like to group their replacement work together.

A benefit can also be made a parent benefit with many child elements. For example: you may have a benefit which moves concrete parapet elements back to CS2, and one that moves metal railings back to CS1, but to make referencing both of them easier in the actions you might create a parent-benefit called railing-repair. This is not required.

A benefit can have any combination of 6 effects:

Changed Elements – here you can specify how a repair moves units of bridge elements from one condition state to another. You can specify if the repair moves the unit to CS2 or CS1, and you can model the effectiveness of a repair (maybe only 90% is really fixed with a pothole patch). If no parent element is specified, every instance of that protective element will be modified. Costs for these benefits are calculated as cost per unit changed.

Remove Defects – This allows you to remove defects from a bridge as part of a benefit. Note that this will not affect your utility scores, it exists only to clean up the book-keeping in your future hypothetical conditions.

Replaced Elements – This does exactly what it sounds like it does, and again you can model the effectiveness of a replacement. You also have the option to replace with a different element, so you could remove a thin-bonded polymer overlay and replace with an asphalt surface treatment. Costs for these benefits are calculated as cost per unit with the whole element changed.

Created Protective Systems – This allows you to add a protective system to a bridge that did not already exist. Again, if a parent is named, it will only add the protective system to that parent element. Cost is per unit of new system, with the quantity inherited from its parent element.

Change – This is where you can change the values of any numeric database field (NBI ratings for deck, super, sub, culvert for example). No direct costs are reflected with these changes at the action level – you will need to make sure the action includes indirect costs where appropriate. Make sure fields you are changing are reflected in your utility tree. If you decide to increment the improvement, say add 2 to your NBI rating, pay attention that this will only add to numeric values and not to letters like "N."

Risk – This is where you can change the assessment risk, either incrementally or to a set value. Like the field changes, no direct costs are reflected with these changes – you will need to include indirect costs for these.

For this example, we will be making 4 actions:

- Repair the scour hole
- Repair the scour hole and place rip-rap
- Repair the scour hole and place ajax
- Repair the scour hole and pave the channel

To model this, we will create benefits which change the scour-critical rating and some which modify the risk.

Step 1: Create a new benefit. Name it "Scour Rating to 4," and change its sort order to 900, and check the "insert" checkbox.

Step 2: Add a record to the Fields portion. The table name is 'inspevnt' and the column name is 'scourcrit'. The new value will be '4' and check the insert checkbox. Then save your benefit.

Step 3: Add second benefit, name it "Scour Rating to 7," and change its sort order to 900, and check the "insert" checkbox. Add a record to the Fields portion. The table name is 'inspevnt' and the column name is 'scourcrit'. The new value will be '7' and check the insert checkbox. Then save your benefit.

Step 4: Add third benefit, name it "Scour Risk -2," and change its sort order to 998, and check the "insert" checkbox. Add a record to the Risk portion. The assessment type will be 'scour'. The increment will be '-2' and check the insert checkbox. Then save your benefit.

Step 5: Repeat step 4 twice more, once to reduce the scour risk by 3 and once to reduce it by 4.

Assessment Name	New Value	Increment
Scour		-4

Scour Risk -4 - Risks- to reduce risk, use negative values =

+ Add new record

Example benefits get reset by upgrade scripts. To minimize upgrade disruptions, it is recommended that you copy the example benefits and then customize your own.

Action Definitions

Admin > Modeling Config > Action Definitions

The actions are where we will now tie together the benefits and give them an associated cost. There are two types of actions: bridge-level actions and network level actions.

Bridge-level actions – These actions are intended to be very specific, to represent a single work item or a small group. These can be called out by inspectors as work candidates and can be part of the LCCA of a bridge, where the software makes a very detailed recommendation for work to be performed.

Network-level actions – These actions are designed to be rather generic, a top-down approach to an entire network of bridges. Instead of detailing if parapet work should or should not be included with the deck rehab, these actions are more intended to answer questions like if this should be a deck rehab or a replacement.

Having the software correctly model the costs is a large part of getting proper results. The costs should be based off your agency's experience where possible.

The 'Required Minimum Cost' will prevent this action from being considered a viable action by the program optimization until the work reaches this value. So for example you could prevent deck rehab from being recommended until there's at least $10,000 worth of pothole patching and joint work to be done. We recommend that you only use this field when you consider yourself a more advanced user and are fine-tuning your system.

The deferment rules will set the amount of time in a life-cycle analysis before the named follow-up action can be performed.

We will now create the actions for our 4 types of scour work:

- Repair the scour hole
- Repair the scour hole and place rip-rap
- Repair the scour hole and place ajax
- Repair the scour hole and pave the channel

Step 1: Add an action with the following properties:

Name: Scour Hole Repair
Description: Fill in a scour hole
Notes: Scour Example
Order: 900
Network Level: True

Admin > Modeling Config > Action Defs

Action Defs

Search   Search

Name	Description	Notes	Order	Network Level	Bridge Replace	Required Minimum Cost	Action Type	
Scour Hole Repair	Fill in a scour hole	Scour Example	900	✔	☐	$	▼	Add

Step 2: Assign the benefit 'Scour Rating to 4.' Enable the indirect cost, set the estimation method to flat indirect cost, and give it a cost of $2,000. Save the action.

Step 3: Add an action with the following properties:

Name: Scour – Place Riprap
Description: Place riprap to address scour
Notes: Scour Example
Order: 900
Network Level: True

Step 4: Assign the benefits: 'Scour Rating to 7' and 'Scour Risk -2.' Enable the indirect cost, set the estimation method to flat indirect cost, and give it a cost of $5,000. Save the action.

Step 5: Add an action with the following properties:

Name: Scour – Place Ajax
Description: Place concrete ajax
Notes: Scour Example
Order: 998
Network Level: True

Step 6: Assign the benefits: 'Scour Rating to 7' and 'Scour Risk -3.' Enable the indirect cost, set the estimation method to flat indirect cost, and give it a cost of $25,000. Save the action.

Step 7: Add an action with the following properties:

Name: Scour – Concrete Floor
Description: Pave the channel floor
Notes: Scour Example
Order: 998
Network Level: True

Admin > Modeling Config > Action Defs

Name	Description	Notes	Order	Network Level	Bridge Replace	Required Minimum Cost	Action Type	
Scour - Concrete Floor	Pave the Channel Floor	Scour Example	900	✔	☐	$	▼	Add

Step 8: Assign the benefits: 'Scour Rating to 7' and 'Scour Risk -4.' Enable the indirect cost, set the estimation method to fixed price, and give it a cost of $75,000. Save the action.

Network Policies

Admin > Modeling Config > Network Policies

The network policies are where we tie the various actions together into possible combinations that we would be willing to consider. Without this piece, the software would have no way of knowing that a superstructure replacement is only really an option if the deck has been removed. This saves you from having to make an action for 'deck replacement,' another for 'deck & super replacement,' and yet another for 'deck replacement and super rehab' and so on. With network policies you can make one action for deck replacement, and then define that possible additional actions would be super rehab or replacement.

Crucially, you can also define when a combination is valid. Your agency probably would never consider a super-structure replacement when it has an NBI super rating of 7. To keep the computer from making such outlandish recommendations (and to save you the calculation time it would take to consider such a combination), you can add conditions to say when a combination should be considered.

When designing your network policies, it's best to think of them in terms of the root action and then the additional actions. For this example, the scour repair will be our root action, and then the various countermeasures will be possible follow-up actions.

You will also notice the Project Category field. By giving your work project categories at this stage, you can filter through long lists of optimization recommendations. For example, a wearing surface replacement might be "preservation work," but adding pothole patching would move it into a "rehab work" category. Each node of the policy can have a different category.

Step 1: Create a new network policy by clicking on the "Create New" button.

Step 2: Name the policy 'Scour Policy'

Step 3: Set the root action as "Scour Hole Repair," assign the project category of "Scour Work" and save.

Network Policy Editor

Network Policy [Scour Policy ▼] [Create New]

Network Policy Details

Network Policy Name: [Scour Policy]

Actions

Scour Hole Repair

Details

Action: [Scour Hole Repair ▼]   Project Category: [Scour Work ▼]

Action Conditional Rule

Rule Builder

[Add Condition] [Add Group]

Follow-up Actions

[Select an action ▼] [Add Action]

**Indicates an action is no longer a network level action. These actions can be can be changed, selected, or deleted, but once saved cannot be re-added.

Step 4: Add a condition to the root action. The type will be 'Column Value in Param Set,' the table is inspevnt and the column is scourcrit. Select the values of 0 , 1, 2, 3, and 4.

Network Policy Editor

Network Policy [Scour Policy ▼] [Create New]

Network Policy Details

Network Policy Name: [Scour Policy]

Actions

Scour Hole Repair

Details

Action: [Scour Hole Repair ▼]   Project Category: [Scour Work ▼]

Action Conditional Rule

Summary

(Column 'scourcrit' of Table 'inspevnt' Is In Set '0 SC - Bridge Failed, 1 SC - Fail Imminent, 2 SC - Extensive Scour, 3 SC - Unstable, 4 Stable, needs action')

Rule Builder

[Add Condition] [Add Group]

Type: [Column Value In Param Set ▼]   [Remove Condition]

Table [inspevnt ▼] Column [scourcrit ▼] Value Is [In ▼] Set

☐ Not Applicable (P)
☐ Unknown (P)
☐ Unknown (NBI)
☑ 0 SC - Bridge Failed
☑ 1 SC - Fail Imminent
☑ 2 SC - Extensive Scour
☑ 3 SC - Unstable
☑ 4 Stable, needs action
☐ 5 Stable w/in footing
☐ 6 Calcs not made

Follow-up Actions

[Select an action ▼] [Add Action]

**Indicates an action is no longer a network level action. These actions can be can be changed, selected, or deleted, but once saved cannot be re-added.

Step 5: Add additional actions for the placing of riprap, ajax and concrete floor. Save the policy.

The example network policies can be updated routinely by BrM update scripts; it is therefore good practice to make your own copies of the examples.

Lifecycle

When making decisions about bridge treatments, your primary concern is doing what is right for the bridge now. But part of your thinking is also considering what's the best thing for the future. In the software, that future consideration part is called the Lifecycle Cost Analysis (LCCA).

In order to assess how a project will alter the future, the software needs to know how you generally treat bridges, and if you treat separate groups differently, which approach do you apply to each bridge. The information of how your agency treats bridges will be described in Lifecycle Policies, and then we will assign those policies to bridges.

Because the scour rating does not deteriorate and the risk does not increase year-upon-year, we will not be creating lifecycle policies as part of this example. If you are interested in trying to model scour deterioration, consider creating a scour Agency Defined Element (ADE), and then including that ADE in your utility tree.

Lifecycle Policies

Admin > Modeling Config > LCCA Policy Rules

The lifecycle policies are the part where you tell the software when you would treat a group of elements (like a deck rehab), or when you would replace a structure. Does your agency normally replace a bridge when it gets two NBI ratings of 4? This is where you would set up that modeling.

Examples get reset, create your own.

Assign Lifecycle Policies

Admin > Modeling Config > LCCA Assign Policies

If your agency replaces non-NHS or local agency bridges at different stages from your NHS bridges, you can define which policies apply to which structures.

Examples get reset, create your own.

Funding Sources

Next the software needs to know how much money you have, or at least how much you think you will have, so it can recommend what is the best projects for this year, and which should be held onto until next year. The funding section can also help your planning group identify how much has been allocated, and how much remains to be spent, from each of your sources.

It's worth mentioning that only active funding sources can have projects assigned to them.

Create Funding Sources

Projects > Manage Funding > Funding List

BrM has two example funding sources out of the box: a federal and a state fund. Here your agency will likely want to create funds for the actual funding, and then separate funds for hypothetical future funding.

So we will now create a funding source for our scour projects.

Step 1: Go to Projects > Manage Funding > Create/Edit Funding Sources. Name the new source "Scour Fund" and save it.

Step 2: Change the status to "active."

Step 3: Add 5 new Funding Source Targets, set their Target Date to September 1st for the next 5 years, and set the target fund amount to $10,000 ($500,000 if you're not using the sample database). Save the Funding Source.

The example funding sources can be reset by upgrades; we recommend that you delete these or copy them as you set up your funding.

Segments

Program segments, as you will see below in the example, are used to divide out subsets of the bridges we will be analyzing in the optimization. You can add more than one segment to a program, and you can give each segment different performance measure goals and differing levels of funding.

Create Segments

Admin > Modeling Config > Subdivision Profiles

For this example, we will want to specify that we're only analyzing scour critical bridges, and we're going to want to break up the metrics and funding for State-owned and locally-owned.

Step 1: Create a new subdivision profile. Name it "Scour"

Step 2: Map the field inspevnt.scourcrit.

Step 3: Save the subdivision profile.

Programs

Congratulations, you are now ready to use the *Programs* tab. Just a few more pieces to go before we can optimize the scour program, but we will now be dealing with the program itself.

It is highly recommended that for the first few iterations of a program, you limit your optimization to a discrete subset of structures, like a single district, where there are enough bridges to exemplify optimization with a realistic funding amount, but that is small enough to allow several iterations as you check the results and calibrate all of the pieces.

Create Program

Programs > Create/Edit Programs

In this example, we have set the actions associated with the Scour Network Policy to use fixed costs, so the Required Minimum Cost will not help to achieve more meaningful results. If we were to use actions which incorporate per-element-unit costs, setting a minimum project cost to the smallest amount of work your agency would consider in a project helps eliminate very small projects from the results.

Some agencies have pool-contracts to address very small sums of work and may set this value as low as $2,000. Others may not use this contract method and so it is not cost-effective for their agency to bid projects for less than $100,000. Also consider that projects can be combined (manually after the fact) if the bridges are nearby, so perhaps recommendations of $50,000 and higher would be more appropriate. Every agency will be unique.

At this stage of defining the program, we also have the ability to filter down our bridges that we will consider based on any of the filters you use on the bridge list.

**Step 1: Create a new program. Name it "Scour Example," set the Program Status to 'Planned."**

Step 2: Give the program a start-year for the current year, and an end year 5 years from now, matching our scour funds we set up earlier. Also set the Bridge Filter to the "BrM – Active Status" or your agency's equivalent.
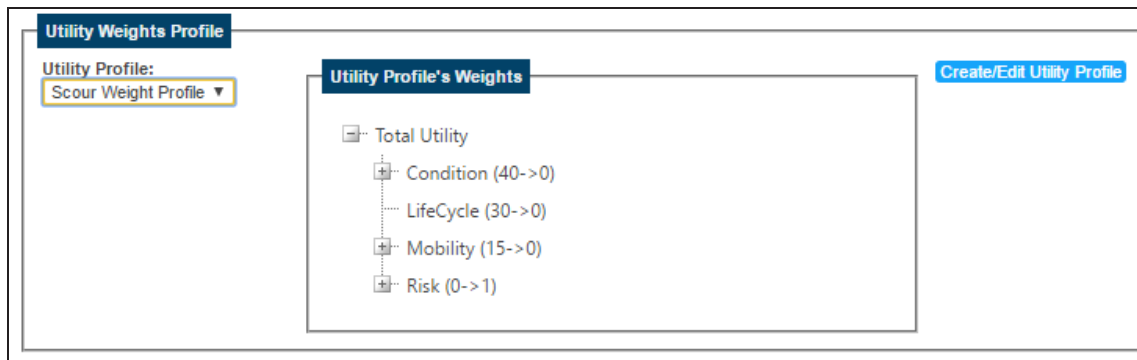

Step 3: For your NBI estimation, use the NBI Converter and select the BrM Default conversion profile. Select the HiX approximation (to save time), give the Long-Term analysis 50 years.

Step 4: Select the Scour Network Policy we created earlier.
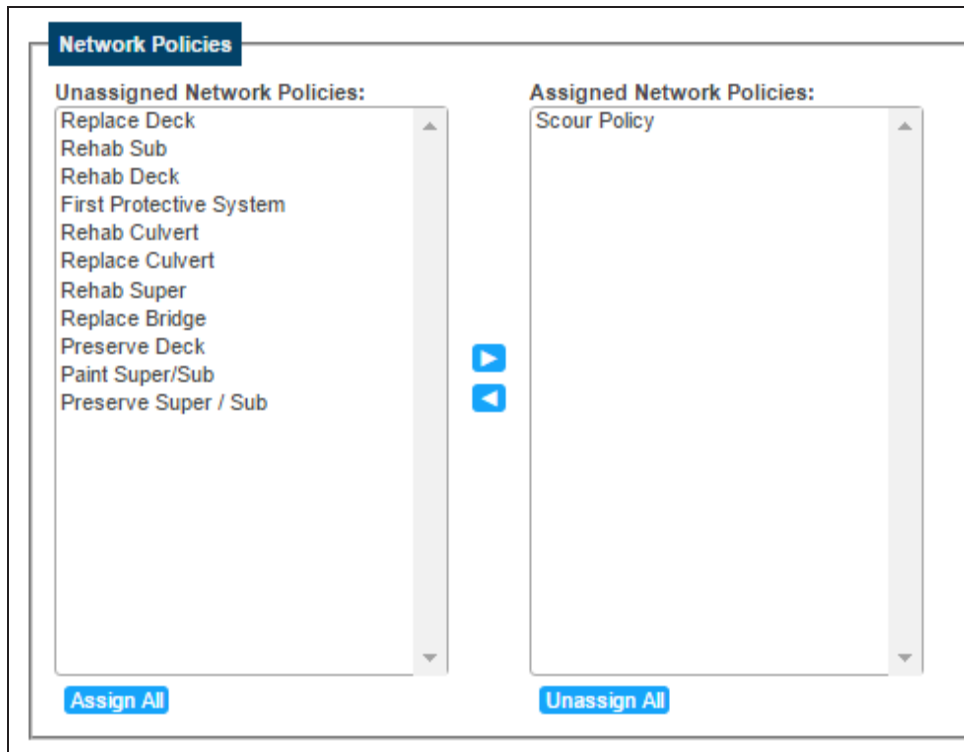
Step 5: Set the Utility Weight Profile to the "Scour Weight Profile" we created earlier.

Step 6: Set the Subdivision Profile to "Active + Scour + Owner" that we created earlier.

Step 7: Add subdivision segments for "Active" "State-owned" structures with scour ratings between 0 and 3. Our goal is to get about 100 bridges in this category. If your agency inventory has less than 100 state owned scour critical structures, add county-owned segments (or even city- and town-owned structures) until you get about 100 bridges.

Step 8: Delete segments which have 0 bridges. Save the program.

Assign Projects

Programs > Assign Projects

If the program you are optimizing already has some projects defined (perhaps you just want it to fill out the remainder of your STIP), you can freeze projects to the program. If the year is fixed, freeze them to both the program and the year.

In this example, we will not be working with pre-existing projects.

Assign Performance Measures

Programs > Performance Measures

Optimization is done primarily in terms of benefit (Δ Utility) per cost, but the software has the ability to take into account additional goals, or at least measure the effects a program will have on other metrics. The Performance Measures are how you define those metrics you want to track or try to meet. And the two pieces are exactly that: you define the performance measures above, and then if there is a constraint that the optimization needs to meet, you can define that below.

For this example, we have limited our utility tree to just return the scour criticality and scour risk – but if we had been including element condition, perhaps we would like to see how the optimized program improved the health index of the system. Or how it reduced the % of structurally deficient bridges. To do that, we would add those performance measures here.

To tell the software to attempt to eliminate all structurally deficient bridges with the program (even if it is not the most optimal thing to do with our money), you could set a target value of 0 for that performance measure. And you can tell it to use different targets for each segment.

Step 1: Add a new performance measure based on a database field.

Step 2: Set that field to inspevnt and scourcrit.

Step 3: Define the best value for scour ratings is 9 and the worst value is 0.

Step 4: Insert this performance measure.

We will not set targets or minimums at this time.

Funding Allocation

Programs > Funding Allocation

Now we will tie the funds from our Scour Fund to this optimization program.

Then we will have the opportunity to add additional, hypothetical funds to the program. If some projects are already associated with the program, you would see their funding summed up on the "allocated funds" line.

Finally, we will distribute the funds to the different segments of the program. When you click on "get performances" the software will analyze the current performance of your segments compared to the performance measures you have defined. The results will color-code the different segments.

If you do not specify quantities to a segment, then the funds can be used as needed between the segments. If you define a quantity to a segment, the money will be dedicated for use on that segment and projects on that segment will not exceed the amount allocated. The remaining funds will be used by the unallocated segments.

Step 1: Add 5 funding sources. Set all of them to draw from the Scour Fund, for the amount of $10,000 (try $500,000 if you're not using the sample db) and set the years to be every year of the scour fund we established earlier. Save the Funding Allocation.

Step 2: If you would like to model a hypothetical funding surge, type the funds into the Additional Funds line. For this example, add $10k, $30k, $50k, $100k.

Step 3: Press the button "Get Performances" (This could take more than 10 minutes. Don't worry, the page won't time out.)

We will not distribute the funds at this time because we want the funds to be used on either the Scour ratings of 3 or 4 – wherever they may be used to best effect.

Step 4: Save the funding allocation.

Program Planning

Programs > Programs Planning

You have arrived at your destination.

This is the last step of our example: to run the optimization. You have the choice to either have the optimization recommend the cheapest program which would meet the performance measure constraints, or to spend all of the funds to get as close to the highest utility as is possible. If you have previously-created projects assigned to the program already, you can tell the optimizer to honor them and work with the remaining funds and bridges.
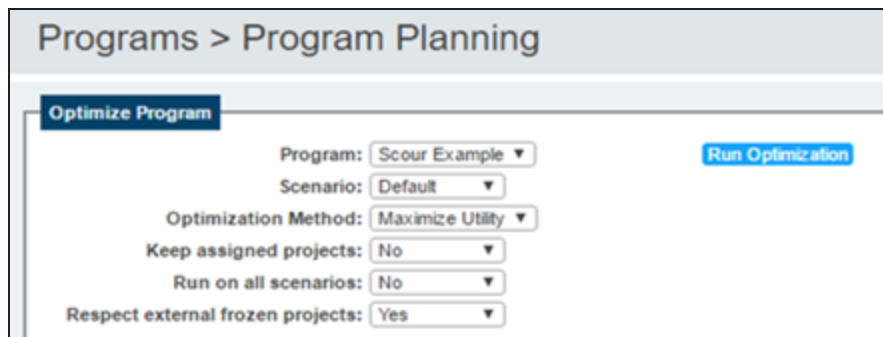
The speed with which the optimization will run will depend largely on the available application server resources. If there are a lot of crystal reports running, or your enterprise version shares a server with other resource-heavy programs, then a full analysis of your entire inventory could take many days.

Only one optimization can be run at a time – if the optimization calculator is in use, this page will tell you which program is being optimized at the time and the progress of that optimization. When the optimization is complete, a list of proposed projects will be listed below. Review these results: if they do not recommend projects your agency would consider, some of the previously discussed settings here may need to be customized more to what your agency would do.

This is why we recommend that you start out your first iterations with a few (around 100) bridges to allow your first iterations to hone in on the largest problems quickly. As the results look more reasonable, up the number of bridges you are analyzing to a full district, and then up to a full system when your agency requires it.

And so now, your reward for persevering this far into this example:

Step 1: Select "Maximize Utility" and opt not to keep assigned projects. Don't worry about running all scenarios in this example. And keep frozen projects if you assigned any.

Step 2: Run Optimization

Step 3: Go get a drink of water, it's going to be a few minutes.

Program Results

After your optimization has run, there will be 3 places to see your results: the individual projects returned by the optimization, the *Program Results* task, and the executive summary. Each will give you varying levels of detail for you to drill down into your results.

Returned Projects

Programs > Program Planning

Once the optimizer has run, the bottom of the page will populate with the projects selected by the optimizer. You can select each of these individual projects and look at them in the *Projects > Create/Edit Project > Analysis* subtask. This will give you the best feedback on what about your program needs to be tweaked.
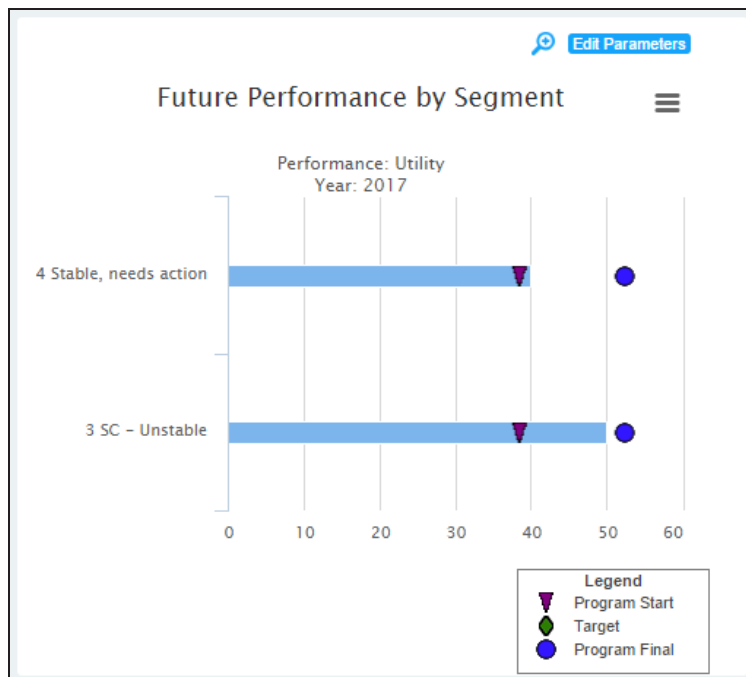

Program Results

Programs > Program Results

In order to get an aggregate view of how the program performs in terms of Utility and the performance measures, the *Program Results* task gives a good overview. There are 4 hard-coded graphs on this page:


Performance by Segment: This graph shows you how each segment does toward reaching the performance measures of your choice. It shows where your program started and how close it got to the target for each year.
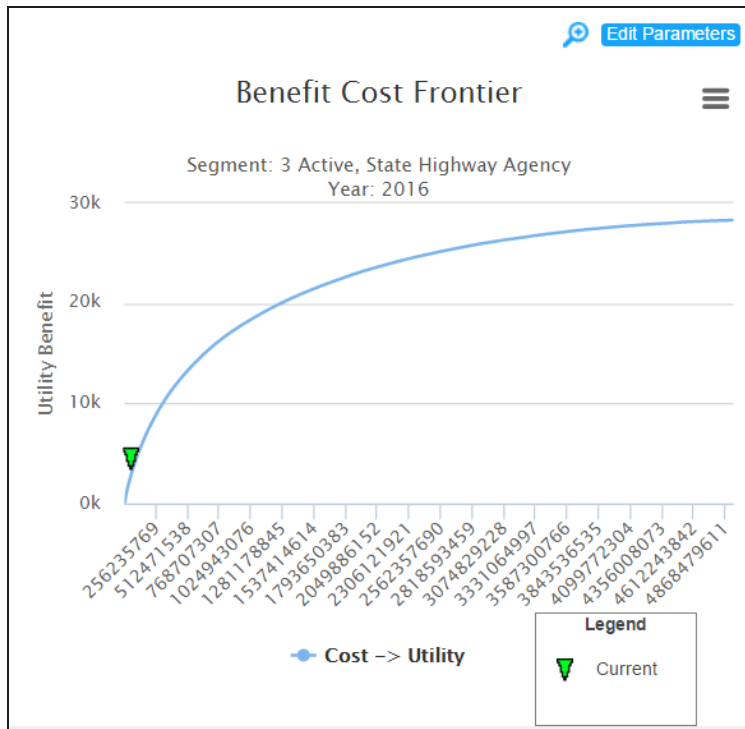
Benefit Cost Frontier: (The graph shown here is from a different example with a larger set of structures and options, to explain the graph.) If you are accustomed to looking at 'Pareto Horizons' of multivariable optimization graphs, that is exactly what this graph shows.

For those who have not wandered across the Wikipedia articles on Vilfredo Pareto: this graph shows the line of 'most optimal' possible combinations. If your current program is on the line, it is one of the most optimal combinations of plans possible. As you apply constraints to the performance measures, your program could become less optimal since you are chasing additional targets. This graph will tell you how far from optimal your choices take you.
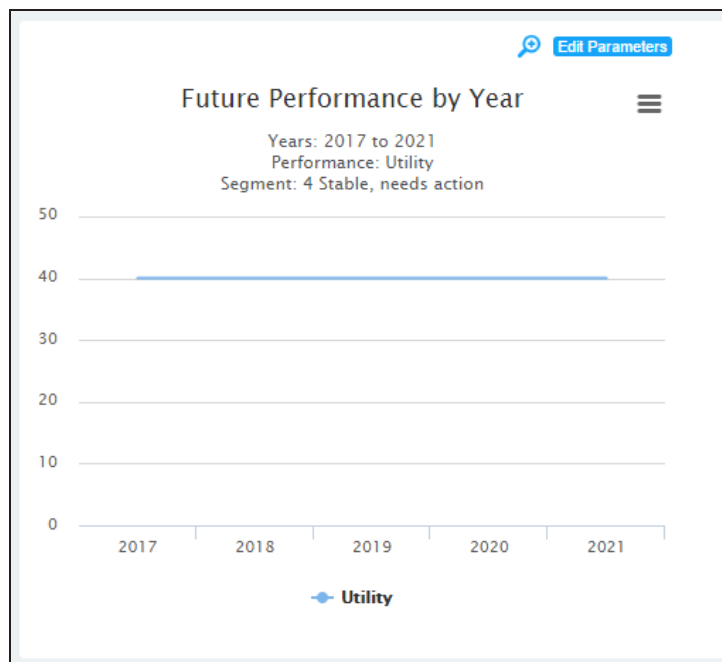
Future Performance by Year: Allowing you to make a year-by-year comparison of your network.
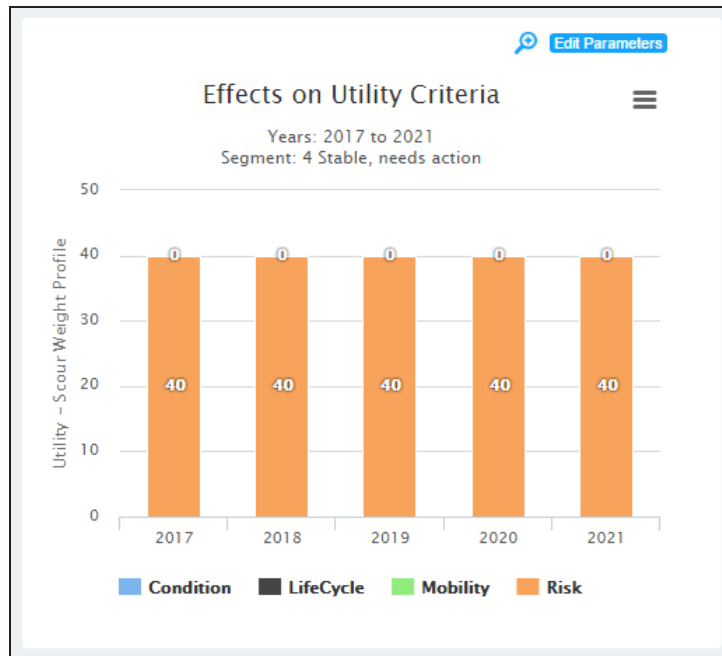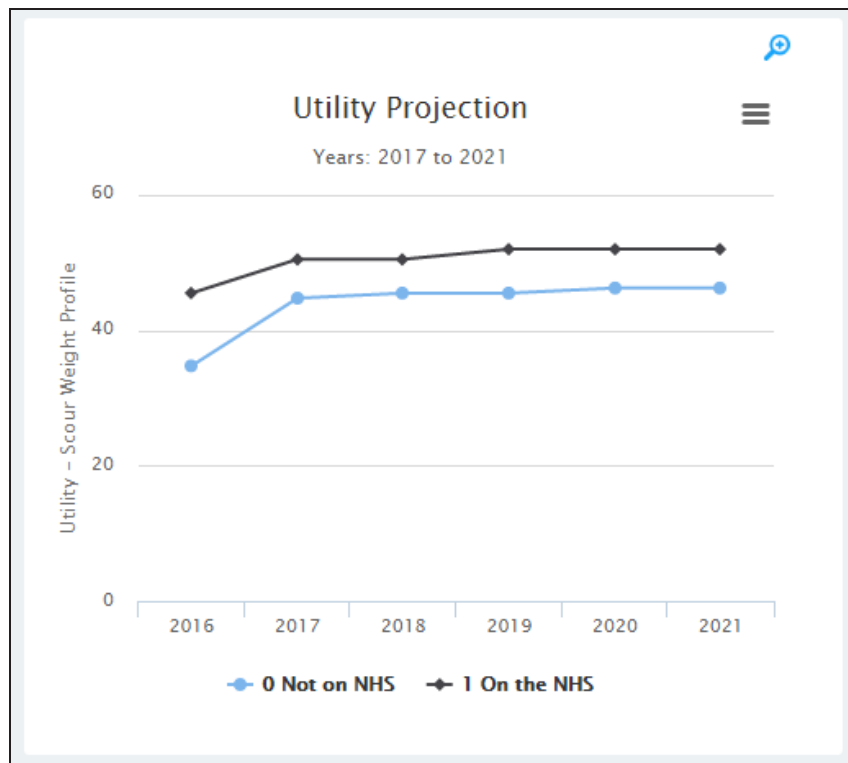
Effects on Utility Criteria: Breaking down the Utility score into its first-tier components, you can see which node is most affected by the benefits we're applying. For this example, if you zeroed out the other nodes as part of your utility weight profile, then only the risk node should remain. If your benefits affect NBI values, element condition, risk, mobility and lifecycle, then this graph becomes more important for seeing potential issues.

Executive Summary

Programs > Executive Summary

and *Admin > Modeling Config > Executive Summary*

You also have the ability to create additional graphs to view the projections of your program. On the Admin tab you can set up these charts, and on the Programs tab you can view them. Your Agency can break the data down by the measures that are important to you, and color them the way your agency is accustomed to seeing them. Think of this page as a dynamic infographic page.

We will now demonstrate how to use BrM to run a set of scenarios. In particular, we will demonstrate how more or less money could change your agency's scour ratings in the future. We will be using the scour program from above with different funding scenarios.

Scenario Setup

Scenarios are essentially the ability to rerun a program optimization with tweaks, allowing you to compare the results. The principle example of this would be to create a graph for your state legislature, demonstrating the cost-to-benefit relationship between your current funding and what you could do with more (or even less) funding. Perhaps removing funding from your organization would significantly increase the need for bridge replacements – in which case BrM can help you to provide those answers.

In the first part of the example, we ran the scenario with 6 bridges and $10,000 to $100k / year of funding. Let's demonstrate what would happen if we ran the same bridges for no funding, $10k, $30k, $50k and $100k each year.

Create/Edit Scenarios

Programs > Create/Edit Scenarios

We'll begin by creating the scenarios of the scour program.

Step 1: Create a new scenario named "Scour Example No Funding." Assign it to the Scour Example and save.

Step 2: Copy the program we just created, renaming it "Scour Example $10k."

Step 3: Repeat for $30k, $50k and $100k (remember, the surged funding is the default scenario).

Programs > Create/Edit Scenarios

For the next sections, we will review the data associated with our program and see some of the options we have for editing our scenarios.

Performance Measures

Programs > Performance Measures

Trying to hit additional targets can have an impact on optimization. Say you would like to compare the difference between trying to spend your money to reduce the number of structurally deficient bridges vs. preservation work on a larger number of bridges.

On this screen you could define different performance measures for your program for each scenario you want to model.

Funding Allocation

Programs > Funding Allocation

This is where we will make the changes to our funding for each scenario. The funding in the "default" scenario

Step 1: Verify that the "Default" Scenario includes the surge funding from the first part of the example.

Programs > Funding Allocation

Program: Scour Example ▾ **Scenario:** Default ▾

Funding Allocation

	Funding Source	Amount	Date	Notes
✕	Scour Fund ▾	$10,000	01/01/2021 ▾	
✕	Scour Fund ▾	$10,000	01/01/2020 ▾	
✕	Scour Fund ▾	$10,000	01/01/2019 ▾	
✕	Scour Fund ▾	$10,000	01/01/2017 ▾	
✕	Scour Fund ▾	$10,000	01/01/2018 ▾	

A new Funding Source Target in Projects > Funding Sources may be created for new Funding Allocations

Add New

Budget Distribution

Total budget: $240,000
Total allocated funds: $0

	2017	2018	2019	2020	2021
Identified annual funds:	$10,000	$10,000	$10,000	$10,000	$10,000
Additional funds:	$10,000	$30,000	$50,000	$100,000	$0
Total annual budget:	$20,000	$40,000	$60,000	$110,000	$10,000
Allocated funds:	$0	$0	$0	$0	$0
Available Funds:	$20,000	$40,000	$60,000	$110,000	$10,000

Step 2: For the "No Funding" scenario, remove all the funding by making the allocated funding -$10,000. Make sure there are no funds distributed to the segments.

Programs > Funding Allocation

Program: Scour Example ▾ **Scenario:** Scour Example No Funding ▾

Budget Distribution

Total budget: $0
Total allocated funds: $0

	2017	2018	2019	2020	2021
Identified annual funds:	$10,000	$10,000	$10,000	$10,000	$10,000
Additional funds:	$-10,000	$-10,000	$-10,000	$-10,000	$-10,000
Total annual budget:	$0	$0	$0	$0	$0
Allocated funds:	$0	$0	$0	$0	$0
Available Funds:	$0	$0	$0	$0	$0

Step 3: For the "$10k" scenario, change the funding to $0 per year.

Budget Distribution

Total budget: $50,000
Total allocated funds: $0

	2017	2018	2019	2020	2021
Identified annual funds:	$10,000	$10,000	$10,000	$10,000	$10,000
Additional funds:	$0	$0	$0	$0	$0
Total annual budget:	$10,000	$10,000	$10,000	$10,000	$10,000
Allocated funds:	$0	$0	$0	$0	$0
Available Funds:	$10,000	$10,000	$10,000	$10,000	$10,000

Step 4: Repeat for $30k, $50k and $100k scenarios.

Run Optimization

Programs > Program Planning

We will now run the optimization for the many scenarios. It is possible to run just one scenario if you only want to update one of them.

Step 1: Select the Scour Example Program.

Step 2: Select to run all scenarios for the program

Step 3: Run the Optimization – this is going to take a while. Expect it to take around 3x as long as the default optimization only.

Step 4: Check that each scenario at the bottom has results, except for the "No Funding" one – we would expect no work on that one.
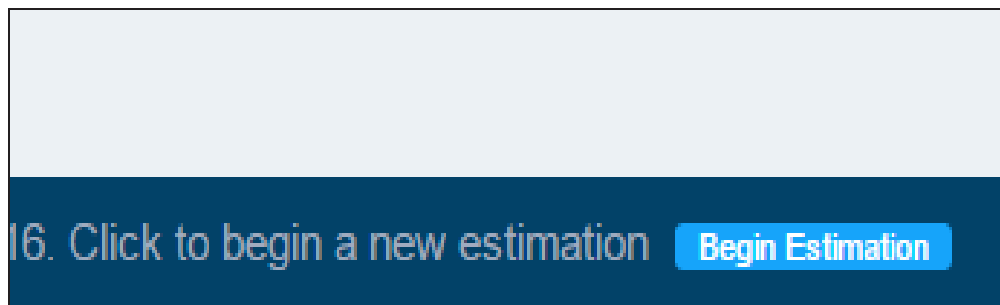

Begin Estimation

Programs > Scenario Explorer

After the optimization has run, we can now go see the overall results in a single graph on the *Scenario Explorer* task. If we had run the scenarios with multiple performance measures, we can see how the network performed in regards to each performance measure by editing the preferences at the top right.

You should be able to see that depending on how quickly we dedicate funding to our network will change how quickly our agency meets its goal. This will help your agency choose, or present to politicians who chose, which scenario to follow.

If you change something at one of the base levels, like the utility profile, you can get a very rough estimation of how that would change the results by clicking on the "estimation" button at the bottom of the page. This would estimate using the currently-identified projects as a rough base for how the results would change.

As you change base data, the graphs on the scenario explorer will not be updated. This is to make the data from the last run available until you update the scenarios because of how time and resource intensive the scenario explorer can be. To update the graphs fully, you will need to optimize the scenarios again.

Appendix C

- BrM Use Case Example 2 - Preservation Program

In this example, we will build on the concepts established in *Appendix B - Example 1 – Scour Mitigation Program*. This example will give less explanation of the various pieces of the optimization and focus more on the configurations for this example. For more explanation, see *Appendix B - Example 1*.

For this example, we will exemplify the use of BrM to create a preservation program, spending $1.5m for the next three years on state-owned NHS bridges. We will be using element inspection data with protective systems to model deterioration.

Element Data

Protective Systems

You will want to verify that the protective systems you intend to use in this example are listed as options for protective systems on the elements we will be considering. In this example, we will be using the default protective systems:

> 510 – Wearing Surfaces

> 515 – Steel Protective Coating

You may use any protective systems your agency has defined for your preservation program.

Step 1: For each deck element in your inventory, verify that the correct protective systems are checked as options to use with that element.
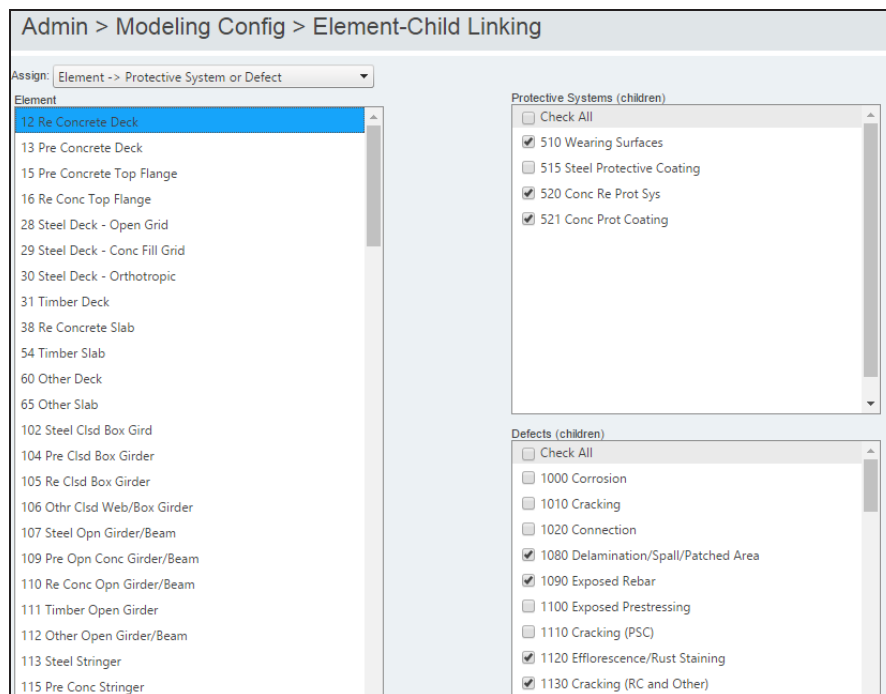
A sign that this step has not been properly performed would be for the protective systems to show up as 'orphaned' elements when looking at the *Inspection > Condition* task – they will be highlighted in yellow and typically will be listed first among the elements. These are child elements which have not been properly connected to their parent element.

Step 2: Repeat the process for all steel superstructure and substructure elements that you have in your inventory.

Element Categories

Because we are going to use the wearing surfaces heavily in the lifecycle node (which we will discuss in a minute), it is very handy to make sure that your wearing surface elements are in an element category (and likewise your other protective systems if you have more than just element 515.) So we will create an element category to put our wearing surfaces in.

Step 1: Verify the existence of the Element Categories called "Wearing Surfaces" and "Steel Protection".

Step 2: Make sure your wearing surface and protective system elements (510 and 515) are assigned to the appropriate Element Category.

Inspection Data

In this example, we will be using protective systems to model the impact to lifecycle of preservation treatments. Therefore, in order to use this example, the data set you are using needs to include NBE element data. For best results, your starting inspection data should also include current protective systems and their conditions.

Step 1: Verify that your state NHS bridges have NBE elements and protective systems reflecting their current condition.

Utility

BrM optimizes actions on a structure by maximizing the incremental benefit per cost as outlined in the NCHRP Report 590. The "incremental benefit" is the change in the utility value achieved by performing an action. How an agency defines the structure of the utility tree as well as the relative weights and scaling functions will directly impact the incremental benefit. Therefore, an agency needs to ensure that the utility and related attributes are setup functions according to its policies.

Preservation projects typically have very little to do with improving the condition of a bridge and more to do with keeping the condition high over a long time. Therefore, in this program the Lifecycle node will be very important to us. Because the Utility tree can be modified freely by your agency, this node could have been deleted (it wasn't used in 5.2.2 or 5.2.1 – it could have been deleted by your agency at that time).

Utility Tree Setup

As previously mentioned in order for an attribute to affect the utility and provide a 'benefit' the utility tree needs to include criterion (nodes) which will reflect the benefits from the actions performed. The first level of the utility tree are the primary criteria to determine the utility value based on the multi-criteria analysis. Subsequent levels of criterion can be added as sub-criteria or child criterion that affect the primary criteria. The relative weight determines how impact each criterion has on the overall utility. The higher the relative weight the greater the effect on the change in the utility value. Additionally, the magnitude of the effect of any and all criterion, for a specific objective/goal, can be modified by changing the relative weights through the Utility Weight Profile. The Utility Weight Profiles will be discussed in further detail in subsequent sections.

Step 1: Verify that the LifeCycle node exists for your agency. If you have to add such a node, giving it a default weight of 0 will keep it from affecting other work in your agency.

Admin > Modeling Config > Utility
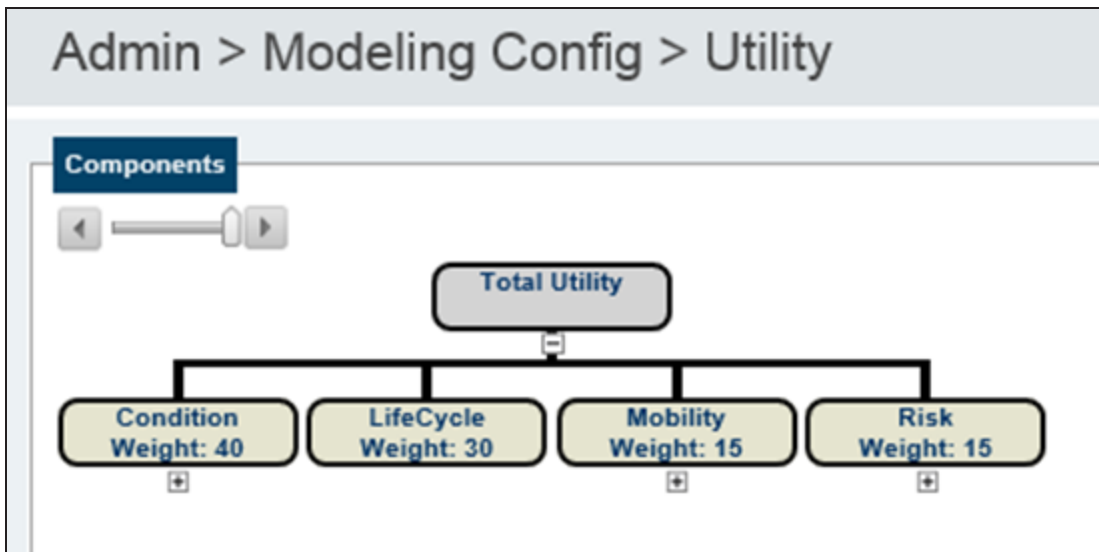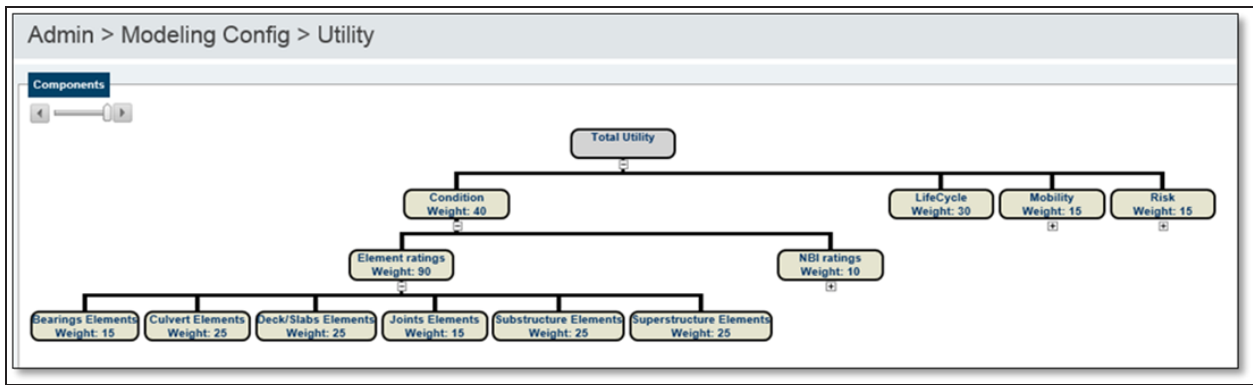
In addition to relative weights all of the criterion need to be converted to a common 0-100 scale. This is done through a scaling function. This can be done through a function or a scaling graph. For example, Deck/Slab Elements are on a 0-4 scale while the Deck component is on a 0-9 scale. In order to combine these criteria that have different scales they need to be converted to a common scale. The following images illustrate the different scaling functions for each criterion.
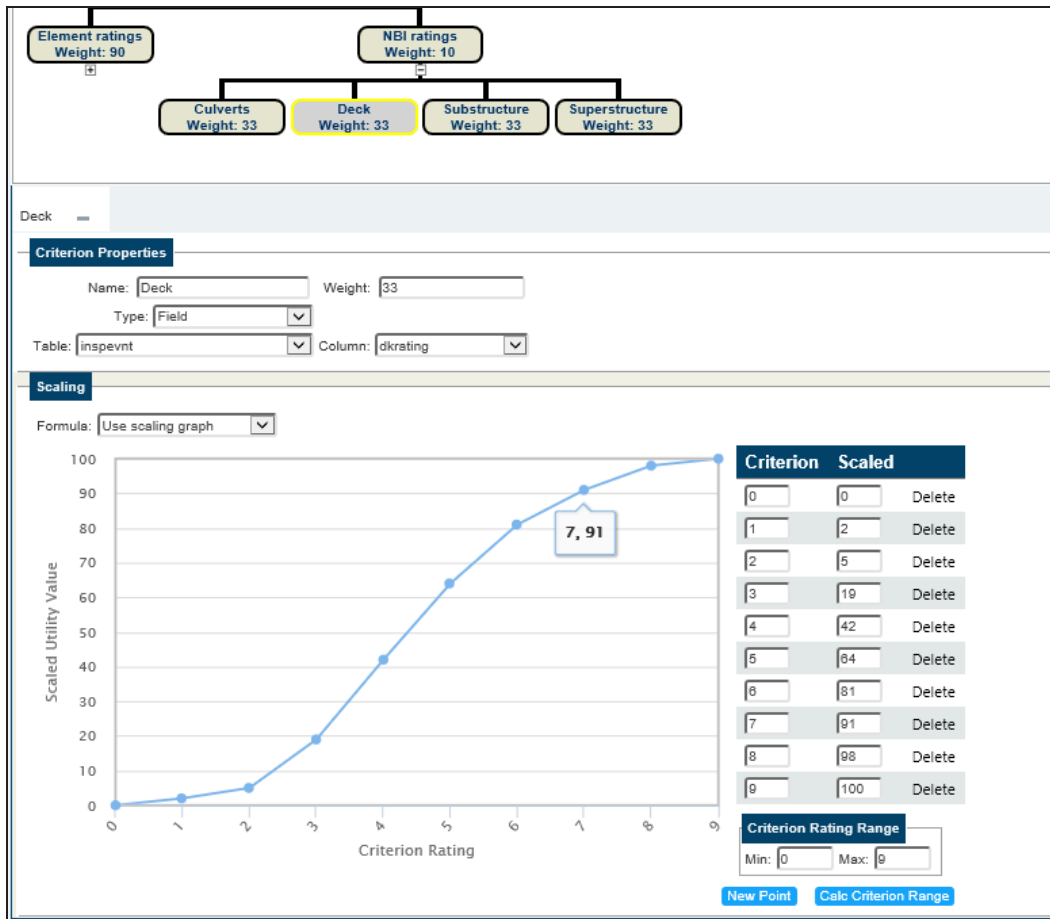
Utility Weight Profile

Utility weight profiles allow the user to define utility weights that correspond to the objectives/goals of a specific program without changing the relative weights in the actual utility tree, for any of the criterion defined in the utility tree. This feature is critical in the development of projects and programs with specific objectives/goals. For example, an agency may use the utility score primarily as an indicator of condition, but for the purposes of something such as a scour improvement program the incremental benefit of the utility needs to emphasis the Risk criterion. The example creates a utility weight profile that focuses on the condition and life cycle criteria with the relative ratio changing from approximately 40% of the weight on condition criteria and 30% on the life cycle criteria to 25% and 75% respectively.

Step 1: Create a new Weight Profile and Save the profile.

Step 2: Change the Override Weight for each node to 0, except for the Lifecycle Node. Save the profile.

Deterioration

We will now check that the element deterioration, and the interaction between the protective system and the parent elements closely resembles what you experience in your area.

Since we will be using the element deterioration exclusively, we will not be dealing with NBI deterioration in this example nor will we get into details of NBI deterioration rates or NBI Conversion Rates. We will, however, leave the conditional NBI condition on the Network Policy, so it might be worth reviewing the NBI Conversion Rate if you are unfamiliar with it.

Element Deterioration Rates

Check the deterioration rates of your elements. More detail on how to do this is given in *Appendix B - Example 1*.

Step 1: Evaluate your element deterioration rates.

Protective Coating Deterioration Rates

You will also want to more carefully consider how the protective systems change the standard deterioration rate. We will now walk through how to see how your protective system changes the parent element's rate.

Step 1: Select a protective element and view its deterioration modeling graphs. (Shown here: 510)
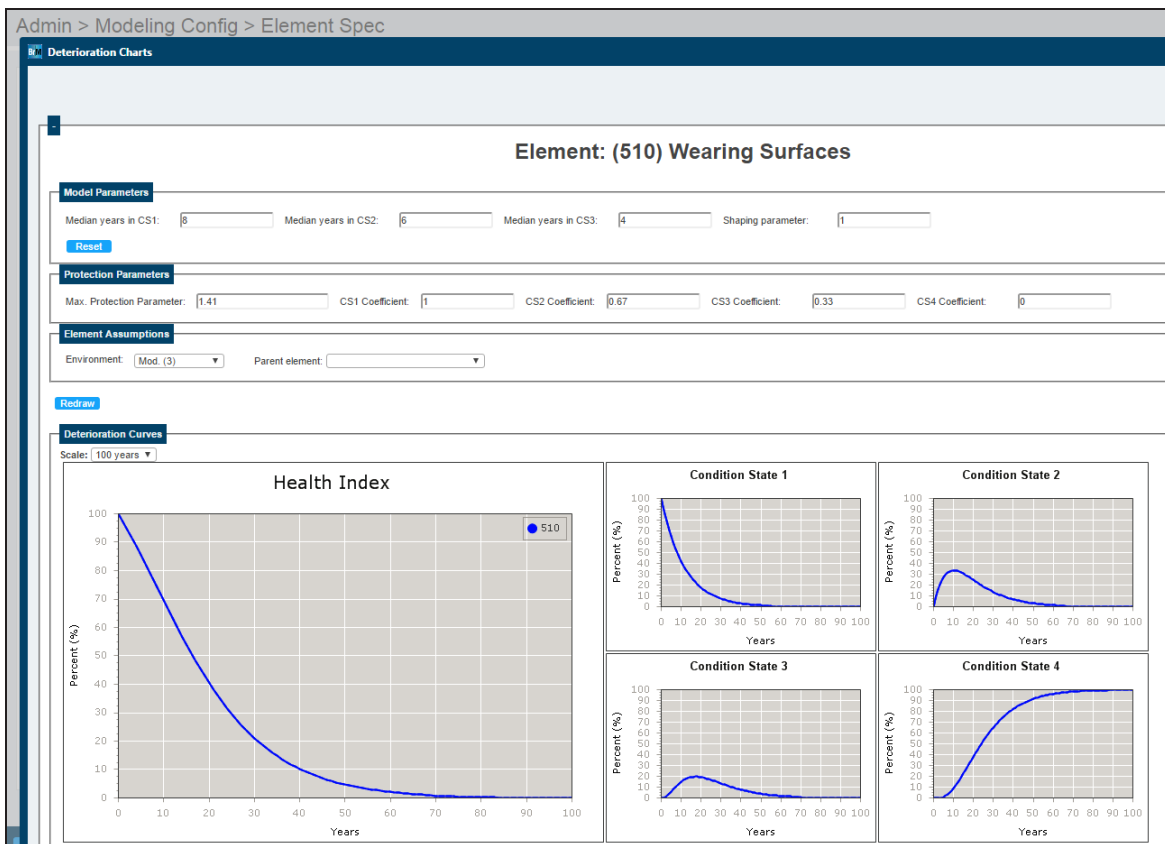
Step 2: Under Element Assumptions, select a parent element. Redraw the graphs. (Shown here: 12 – Re Concrete Deck)

Deterioration Charts

Element: (510) Wearing Surfaces

Model Parameters

Median years in CS1: 8   Median years in CS2: 6   Median years in CS3: 4   Shaping parameter: 1

Reset

Protection Parameters

Max. Protection Parameter: 1.41   CS1 Coefficient: 1   CS2 Coefficient: 0.67   CS3 Coefficient: 0.33   CS4 Coefficient: 0

Element Assumptions

Environment: Mod. (3)   Parent element: (12) Re Concrete Deck

Redraw

Deterioration Curves

Scale: 100 years

The graphs will then display the deterioration of the wearing surface (the green line), the unprotected parent element (the red line) and the protected element (the blue line)

Network Policies

For this example, the work we will want to consider will be creating a preservation program. In particular wearing surface on the deck and protective systems for steel elements.

Benefits

Step 1: Review the benefit 'Wearing Surface Overlay' (Sort Order: 9999). This should include replacing a wearing surface if it exists or adding a new one if it does not.

Step 2: Review the benefit 'Seal Joints' (Sort Order: 9999). It should include a replacement of joint seals.

Seal Joints - Replaced Elements

+ Add new record

Orig. Element	Orig. Parent	New Element	Percent Replaced		
302 Compressn Joint Seal	None	302 Compressn Joint Seal	100	✎	✕
300 Strip Seal Exp Joint	None	300 Strip Seal Exp Joint	100	✎	✕
301 Pourable Joint Seal	None	301 Pourable Joint Seal	100	✎	✕

|◀ ◀ 1 ▶ ▶| Page size: 20 ▾   3 items in 1 pages

Step 3: Review the benefit 'Repair Paint' (Sort Order: 9999). This should consist of repairs to all steel protective coatings.

Repair Paint - Changed Elements

+ Add new record

Element	Parent	Grandparent	Origin State ▲	CS1	CS2	CS3	CS4		
⌄ 515 Steel Protective Coating									
515 Steel Protective Coating	None	None	CS2	100%	0%	0%	0%	✎	✕
515 Steel Protective Coating	None	None	CS3	100%	0%	0%	0%	✎	✕
515 Steel Protective Coating	None	None	CS4	100%	0%	0%	0%	✎	✕

|◀ ◀ 1 ▶ ▶| Page size: 20 ▾   3 items in 1 pages

Actions

Step 1: Review the action 'Preserve Deck – Network.' Verify that both benefits ('Seal Joints' and "Wearing Surface Overlay') are associated with the action. Verify that the costs are reflective of your agency's experience and that the action defers itself for the number of years based on your agency's experience, and set the indirect costs to an appropriate percentage.

Place Wearing Surface - Network	First Wearing Surface	Example	999	✔	☐		Network ▾	✕
Preserve Deck - Network	Wearing Surface / Repair	Example	999	✔	☐	$	Network ▾	✕
Preserve Super - Network	Repair Paint	Example	999	✔	☐		Network ▾	✕
Rehab Culvert - Network	Rehab culvert, parapets, approaches	Example	999	✔	☐		Network ▾	✕
Rehab Deck - Network	Repair deck, joints and parapets	Example	999	✔	☐		Network ▾	✕
Rehab Sub - Network	Repair Columns, Piers, Abutments, Piles, Walls	Example	999	✔	☐		Network ▾	✕
Rehab Super - Network	Repair beams, paint and bearings	Example	999	✔	☐		Network ▾	✕
Replace Deck - Network	Replace Deck	Example	999	✔	☐		Network ▾	✕
Replace Structure - Network	Replace Structure	Example	999	✔	✔		Network ▾	✕

First	Previous	**1**	2	Next	Last

Associated Benefit Groups for Action Preserve Deck - Network

○ Metric ● English

Benefit Groups

Please Select ▾	Add
Seal Joints	✕
Wearing Surface Overlay	✕

Overriding Direct Cost (overrides unit-costs) ▬

Enabled	Field Name	Cost Per Unit	Unit
☐	Deck Area	$ 5	sq.ft

Unit Costs ▬

ID	Element Name	Cost Per Unit	Unit	?	
300	Strip Seal Exp Joint (Replace)	$ 18	ft	🟩	✕
301	Pourable Joint Seal (Replace)	$ 5	ft	🟩	✕
302	Compressn Joint Seal (Replace)	$ 65	ft	🟩	✕
510	Wearing Surfaces (Create)	$ 5	sq.ft	🟩	✕
510	Wearing Surfaces (Replace)	$ 5	sq.ft	🟩	✕

Indirect Cost ▬

Enabled	Component	Estimation Method	
✔	Total Indirect Cost	Percentage ▾	10

Deferment Rules ▬

Action Name	Deferment Interval (Years)	
Please Select ▾		Add
Preserve Deck - Network	10	✕

Step 2: Review the action 'Preserve Super – Network.' Verify that the benefit 'Repair Paint' and 'Replace Paint' are associated with the action (notice that paint repair will also cover substructure elements that are linked to element 515 because the paint was not specified to any particular parent elements). Verify that the costs are reflective of your agency's experience and that the action defers itself for the number of years based on your agency's experience, and set the indirect costs to an appropriate percentage.

▶	Place Wearing Surface - Network	First Wearing Surface	Example	999	✔	☐		Network ▼	✗
▶	Preserve Deck - Network	Wearing Surface / Repair Joints	Example	999	✔	☐		Network ▼	✗
▶	Preserve Super - Network	📋 Repair Paint	📋 Example	999	✔	☐	$	Network ▼	✗
▶	Rehab Culvert - Network	Rehab culvert, parapets, approaches	Example	999	✔	☐		Network ▼	✗
▶	Rehab Deck - Network	Repair deck, joints and parapets	Example	999	✔	☐		Network ▼	✗
▶	Rehab Sub - Network	Repair Columns, Piers, Abutments, Piles, Walls	Example	999	✔	☐		Network ▼	✗
▶	Rehab Super - Network	Repair beams, paint and bearings	Example	999	✔	☐		Network ▼	✗
▶	Replace Deck - Network	Replace Deck	Example	999	✔	☐		Network ▼	✗
▶	Replace Structure - Network	Replace Structure	Example	999	✔	✔		Network ▼	✗

First | Previous | **1** | 2 | Next | Last

Associated Benefit Groups for Action Preserve Super - Network

○ Metric ● English

Benefit Groups

Please Select ▼	Add
Repair Paint	✗
Replace Paint	✗

Overriding Direct Cost (overrides unit-costs) —

Enabled	Field Name	Cost Per Unit	Unit
☐	Deck Area	$ 0	sq.ft

Unit Costs —

ID	Element Name	Cost Per Unit	Unit	?	
515	Steel Protective Coating (Condition improved)	$ 18	sq.ft	🟩	✗
515	Steel Protective Coating (Replace)	$ 25	sq.ft	🟩	✗

Indirect Cost —

Enabled	Component	Estimation Method	
✔	Total Indirect Cost	Percentage ▼	10

Deferment Rules —

Action Name	Deferment Interval (Years)	
Please Select ▼		Add
Preserve Super - Network	5	✗

Network Policies

Step 1: Review the 'Preserve Deck' network policy. Verify that the actions reviewed earlier are referenced here. If your agency would not "preserve" a bridge with a deck NBI of 5, copy this policy and change your custom one here. (Example policies can be overwritten in update scripts).

Admin > Modeling Config > Network Policies

Network Policy Editor

Network Policy | Preserve Deck ▼ | Create New

Network Policy Details

Network Policy Name: | Preserve Deck

Actions

- ⊟ Preserve Deck - Network
  - Do Nothing
  - Preserve Super - Network

Details

Action: | Preserve Deck - Network ▼ | Project Category: | Preservation Work ▼

Action Conditional Rule

Summary

(Column 'dkrating' of Table 'inspevnt' Is In Set '5 Fair, 6 Satisfactory, 7 Good, 8 Very Good, 9 Excellent')

Rule Builder

Add Condition | Add Group

Type: | Column Value In Param Set ▼ | Remove Condition

Table | inspevnt ▼ | Column | dkrating ▼ | Value Is | In ▼ | Set

- ☐ Unknown (NBI)
- ☐ 0 Failed
- ☐ 1 Imminent failure
- ☐ 2 Critical
- ☐ 3 Serious
- ☐ 4 Poor
- ☑ 5 Fair
- ☑ 6 Satisfactory
- ☑ 7 Good
- ☑ 8 Very Good

Follow-up Actions

| Preserve Super - Network ▼ | ✕

| Select an action ▼ | Add Action

**Indicates an action is no longer a network level action. These actions can be can be changed, selected, or deleted, but once saved cannot be re-added.

Lifecycle & Funding Sources

This example will lean heavily on the Lifecycle criteria of the utility tree, so it is worth spending some time reviewing the Life cycle policies to make sure they reflect your agency's policies. For more details on this, see the Lifecycle section of *Appendix B - Example 1*. The LCCA Policy Rules used for this program are as follows.

Funding Sources

Next the software needs to know how much money you have, or at least how much you think you will have, so it can recommend what are the best projects for this year, and which should be held onto until next year. The funding section can also help your planning group identify how much has been allocated, and how much remains to be spent, from each of your sources. However, for speed and simplicity's sake, we will just use the 'Additional Funds' section of the *Programs > Funding Allocation* task in a few steps. If you would like to set up a funding source, refer to *Appendix B - Example 1*.

Segments

We will now create the program segments which will allow us to filter the structures down into state owned and NHS bridges.

Subdivision Profiles

Step 1: Create a new Subdivision Profile. Name it 'Owner + NHS + District.'

Step 2: Add division fields for Bridge.Owner, Roadway.NHS_ind and Bridge.District

Programs

Okay, you are now ready to set up your program.

Create Program

Step 1: Create a new Program. Name it "Example Preservation Program"

Step 2: Give the start year of this year and the end year two years later (three years total). Save the Program.

Step 3: Use the NBI Converter Method and choose the BrM Default profile. Check on the HiX Approximation, give a long-term analysis period of 50 years, a discount rate of 0%, and an inflation rate of 2%.

Step 4: Select the Preserve Deck network policy.

Step 5: Select your "Preservation Ex" utility weight profile.

Step 6: Select the 'Network-Wide' subdivision profile and it will include all 27 bridges of the sample database.

Programs > Create/Edit Programs

Network Policies

Unassigned Network Policies:
```
Replace Deck
Rehab Sub
Rehab Deck
Scour Policy
First Protective System
Rehab Culvert
Replace Culvert
Rehab Super
Replace Bridge
Paint Super/Sub
Preserve Super / Sub
```

Assigned Network Policies:
```
Preserve Deck
```

Assign All   Unassign All

Utility Weights Profile

Utility Profile:
Preservation Ex ▼

Utility Profile's Weights   Create/Edit Utility Profile

- Total Utility
  - Condition (40->25)
  - LifeCycle (30->75)
  - Mobility (15->0)
  - Risk (15->0)

Subdivision Profile

Subdivision Profile: Network-Wide ▼   Create/Edit Subdivision Profile

Filter Segments

Add Filter Segments:
Filter Segments:

Index	Combinations	# of Bridges	
1	ALL	27	✕
	Total:	27	

Assign Projects

If the program you are optimizing already has some projects defined (perhaps you just want it to fill out the remainder of your STIP), you can freeze projects to the program. If the year is fixed, freeze them to both the program and the year.

In this example, we will not be working with pre-existing projects.

Performance Measures

For this program, we will add two performance measures to track how effective our work is. We will track the percent of Good and Fair bridges by both their fraction of surface area and their structure count. We will not set targets or minimums at this time.

Step 1: Add a new performance measure for 'Pct. Good/Fair (Surface-Based)'

Step 2: Add a new performance measure for 'Pct. Good/Fair (Count-Based)'

Funding Allocation

For this example, we did not guide you through the setup of specified funding sources. But if you did this step, you can now allocate those funding sources to this program. If you did not, we will now add the $1.5m/year to the additional funds.

Step 1: Insert $1,500,000 per year to the three years of the program.

Step 2: Distribute the funds to your segments: where there is only one segment, it may be faster to just type it in by hand. And press the button "Get Performances" (This could take more than 10 minutes. Don't worry, the page won't time out.)

Segment	Pct. Good/Fair (Surface-Based)	Pct. Good/Fair (Count-Based)	Utility	Total Budget per segment	Pct. overall budget	2016 ☐		2017 ☐		2018 ☐	
ALL	56.79	59.26	72.42	$4,500,000	100%	$1,500,000	✗	$1,500,000	✗	$1,500,000	✗
Total				$4,500,000		$1,500,000		$1,500,000		$1,500,000	

Optimization

We are now ready to run the optimization.

Step 1a: Run Optimization.

Step 1b: Good time for a bathroom break.

Program Results

After your optimization has run, there will be three places to see your results: the individual projects returned by the optimization, the *Program Results* task, and the *Executive Summary* task. Each will give you varying levels of detail for you to drill down into your results.

Returned Projects

Once the optimizer has run, the bottom of the page will populate with the projects selected by the optimizer. You can select each of these individual projects and look at them in the *Projects > Create/Edit Project > Analysis* subtask. This will give you the best feedback on what about your program needs to be tweaked.

Assigned Projects

Segment: All ▼ Year: All ▼

Project Name	Category	Automatic	Cost	Utility	Utility Benefit	Benefit/Cost ($k)	Cost ($k) / Benefit	Year	Frozen	Status
7-7-6 PS Conc 4span(Preserve Deck)	Preservation Work	Yes	$497,698	93.85	1.88	0.0038	$264.73	2017	No	Proposed
6-6-6 Steel 1span(Preserve Deck, Preserve Super)	No Category	Yes	$400,871	77.83	11.29	0.0282	$35.51	2018	No	Proposed
6-6-5 PS Conc 1span(Preserve Deck)	Preservation Work	Yes	$536,864	68.49	10.02	0.0187	$53.58	2016	No	Proposed
6-6-5 Cont Conc 3span(Preserve Deck)	Preservation Work	Yes	$178,431	93.61	4.56	0.0256	$39.13	2016	No	Proposed
6-6-4 Cont Conc 3span(Preserve Deck)	Preservation Work	Yes	$507,949	76.32	9.96	0.0196	$51.00	2017	No	Proposed
6-5-6 Steel Arch(Preserve Deck)	Preservation Work	Yes	$279,111	87.37	6.26	0.0224	$44.59	2016	No	Proposed
4-6-6 Steel 5span(Preserve Deck)	Preservation Work	Yes	$275,646	91.42	2.81	0.0102	$98.09	2016	No	Proposed

Program Results

In order to get an aggregate view of how the program performs in terms of Utility and the performance measures, the *Program Results* task gives a good overview. There are 4 hard-coded graphs on this page:

Performance by Segment

The chart on the top left will show the performance of your segments for each year. If we had set targets for our performance measures, it would show us how each segment performed against the target.

Let's take a look at the data for the different years.

Step 1: mouse over the segment and note the utility performance of the segment.
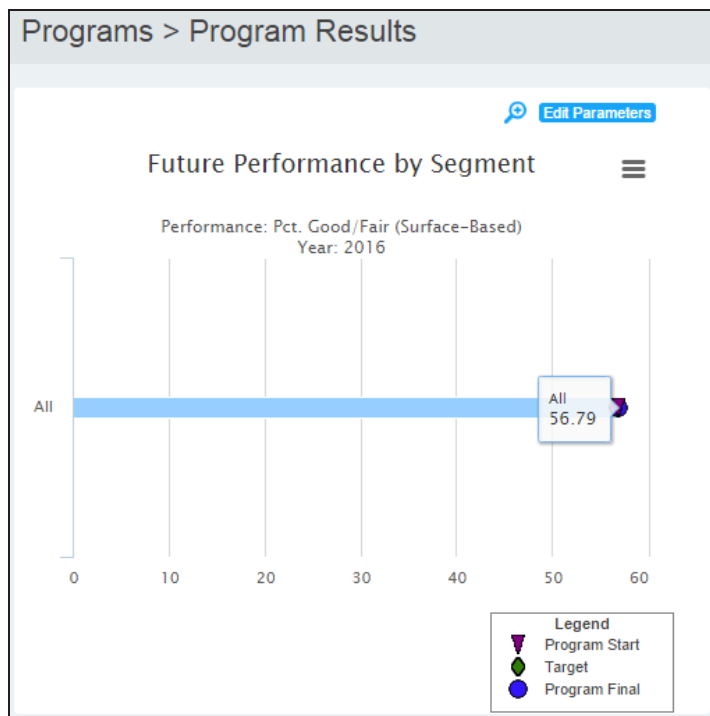
Step 2: click on "Edit Parameters" and select the next year of the program.
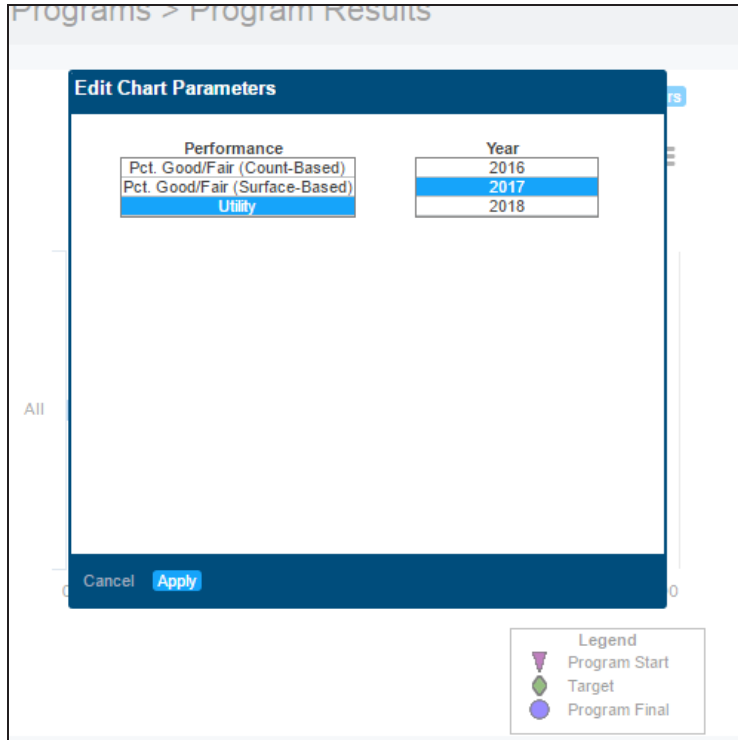
Step 3: Note the hover performance for the next year.

Benefit Cost Frontier

The graph on the top-right is a Pareto Horizon graph. If you are not familiar with Vilfredo Pareto's work on multi-object-ive optimization, Wikipedia can provide some in-depth information (see the articles both on 'Multiple-criteria Decision Analysis' and 'Multi-objective Optimization' – and be sure to pick up your honorary math degree before leaving).

If you don't feel like reading that much, here's the summary version: vertically you have the most utility benefit possible and horizontally you have how much that would cost (these are the two objectives of our multi-objective analysis). The horizon line represents the very most optimal program possible for that funding. As you add performance measure tar-gets or boundary conditions, the software will depart from the very most optimal to try to meet your other criteria. The distance between the plan and the line is how far from optimal your proposed program is.
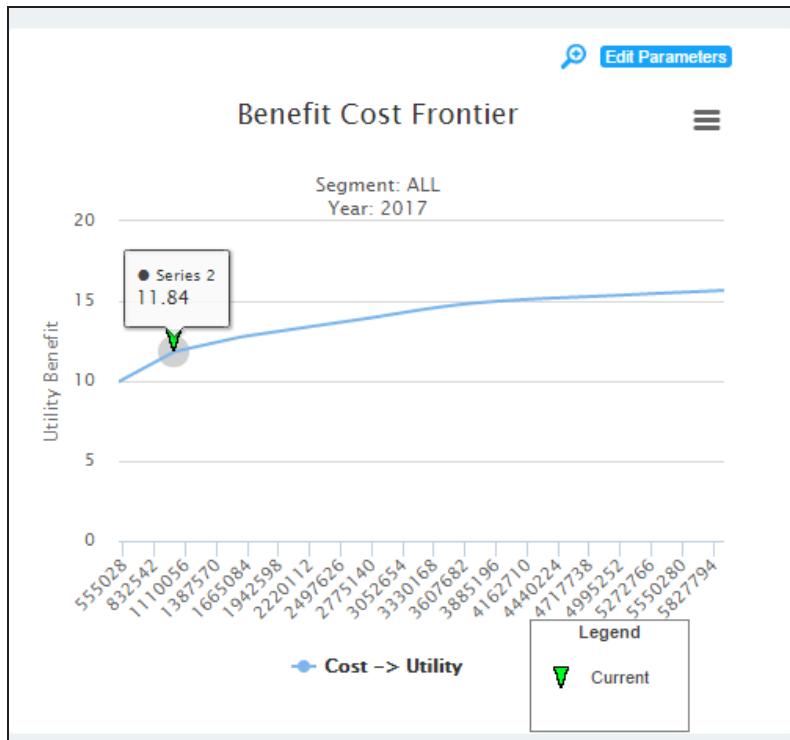
Future Performance by Year

In the bottom left is Future Performance by Year. This graph will show you how your network improves (or decays) by year. Editing the preferences, you can see different segments or different performance measures. For large networks, the delta utility can be very small sometimes.
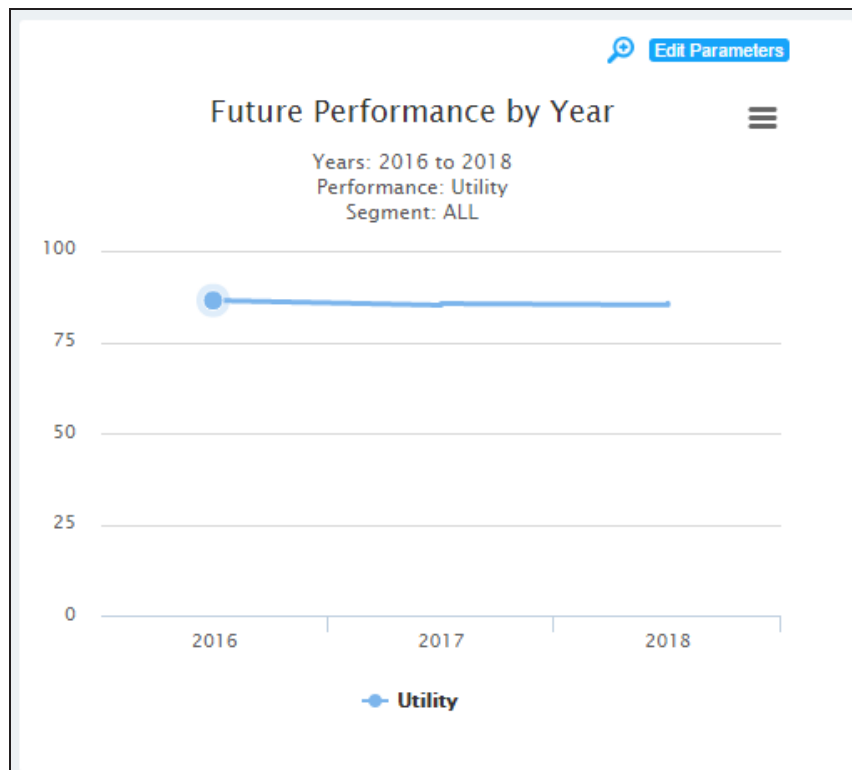
Effects on Utility Criteria

The last chart helps you to determine which node of your utility tree is causing most of the utility benefits. In this example, we 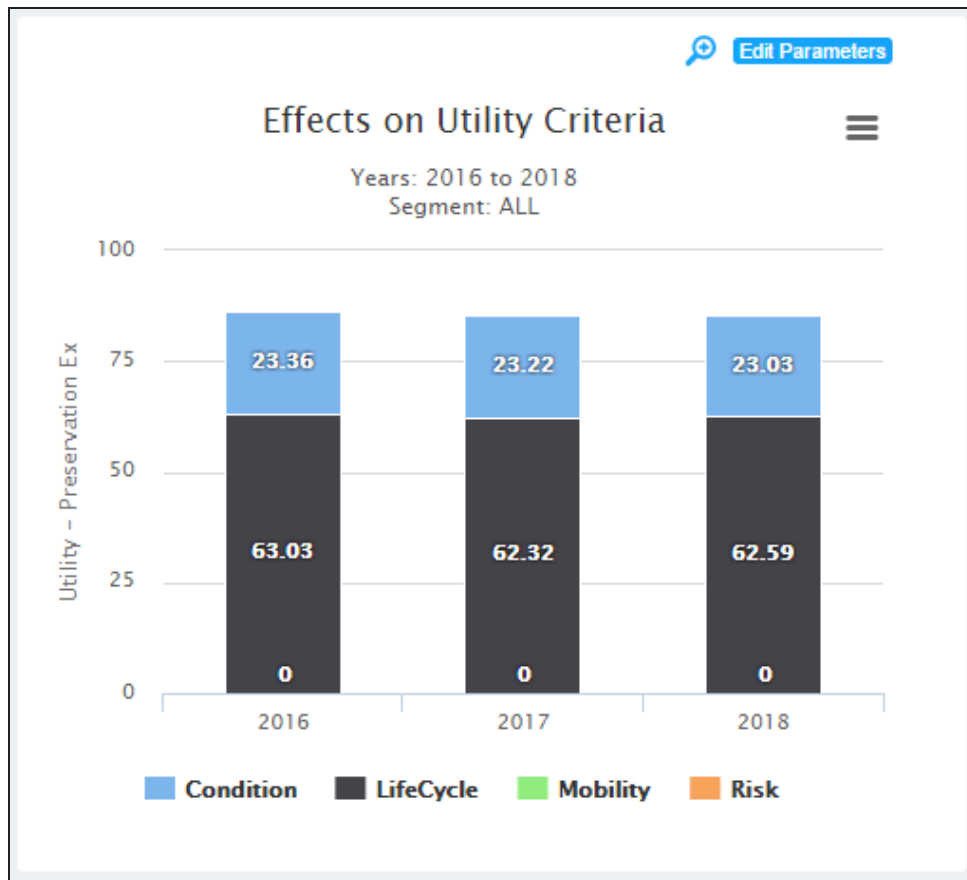zeroed out all but the lifecycle node. So, as expected, all of the benefit is coming from the lifecycle node. When you reach out with your models to examine more situations, for example a widening could impact mobility, life-cycle and condition – this graph will tell you which benefits are driving the results and in what proportion.

Executive Summary

If there are other graphs your agency would like to pull from the data, the *Executive Summary* task can be configured to your agency's needs. To set up the dashboard, use the configuration tools on the *Admin > Programs > Executive Summary* task.

You also have the ability to create additional graphs to view the projections of your program. On the *Admin* tab you can set up these charts, and on the *Programs* tab you can view them. Your agency can break the data down by the measures that are important to you, and color them the way your agency is accustomed to seeing them. Think of this page as a dynamic infographic page.

We will now demonstrate how to use BrM to run a set of scenarios. In particular, we will demonstrate how more or less money could change your agency's scour ratings in the future. We will be using the scour program from above with different funding scenarios.

Scenario Setup

Scenarios are essentially the ability to rerun a program optimization with tweaks, allowing you to compare the results. The principle example of this would be to create a graph for your state legislature, demonstrating the cost-to-benefit relationship between your current funding and what you could do with more (or even less) funding. Perhaps removing funding from your organization would significantly increase the need for bridge replacements – in which case BrM can help you to provide those answers.

In the first part of the example, we ran the scenario with 27 bridges and $1,500,000/ year of funding. Let's demonstrate what would happen if we ran the same bridges for no funding, $500k, and $1m and each year.

Create/Edit Scenarios

We'll begin by creating the scenarios of the scour program.

Step 1: Create a new scenario named "Preservation Example No Funding." Assign it to the Preservation Example and save.

Step 2: Copy the program we just created, renaming it "Preservation Example $500k."

Step 3: Repeat for $1m (remember, the $1.5m per year funding is the default scenario).

For the next sections, we will review the data associated with our program and see some of the options we have for editing our scenarios.

Performance Measures

Trying to hit additional targets can have an impact on optimization. Say you would like to compare the difference between trying to spend your money to reduce the number of structurally deficient bridges vs. preservation work on a larger number of bridges.

On this screen you could define different performance measures for your program for each scenario you want to model.

Funding Allocation

This is where we will make the changes to our funding for each scenario. The funding in the "default" scenario

Step 1: For the "No Funding" scenario, remove all the funding. Make sure there are no funds distributed to the segments.
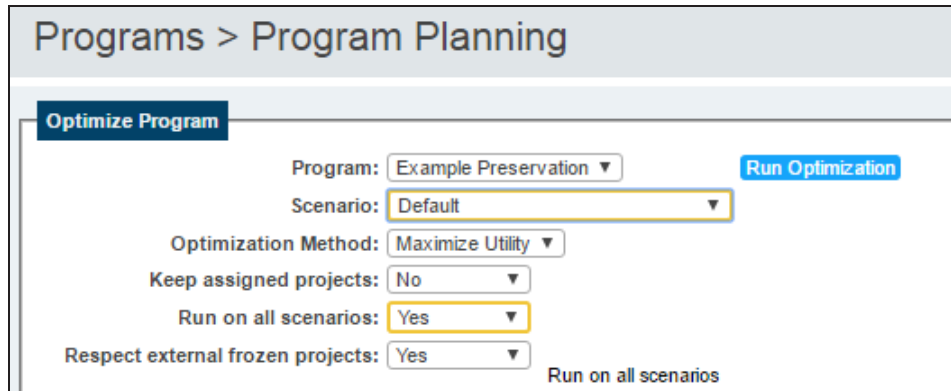

Step 2: Repeat for $500k and $1m scenarios.

Run Optimization

We will now run the optimization for the many scenarios. It is possible to run just one scenario if you only want to update one of them.

Step 1: Select the Preservation Example Program.

Step 2: Select to run all scenarios for the program

Step 3: Run the Optimization – this is going to take a while. Expect it to take around 3x as long as the default optimization only.

Step 4: Check that each scenario at the bottom has results, except for the "No Funding" one – we would expect no work on that one.

Begin Estimation

After the optimization has run, we can now go see the overall results in a single graph on the *Scenario Explorer* task. If we had run the scenarios with multiple performance measures, we can see how the network performed in regards to each performance measure by editing the preferences at the top right.

You should be able to see that depending on how quickly we dedicate funding to our network will change how quickly our agency meets its goal. This will help your agency choose, or present to politicians who chose, which scenario to follow.

If you change something at one of the base levels, like the utility profile, you can get a very rough estimation of how that would change the results by clicking on the "estimation" button at the bottom of the page. This would estimate using the currently-identified projects as a rough base for how the results would change.

As you change base data, the graphs on the scenario explorer will not be updated. This is to make the data from the last run available until you update the scenarios because of how time and resource intensive the scenario explorer can be. To update the graphs fully, you will need to optimize the scenarios again. So for example the variation in the previous image is very small. So by going back to the actions and reducing the costs and the deferment period, as show in the following images, the variation in the scenario explorer graph, shown below, become greater because more work can be done.

Place Wearing Surface - Network	First Wearing Surface	Example	999	✔	☐		Network ▼	✕
Preserve Deck - Network	Wearing Surface / Repair	Example	999	✔	☐	$	Network ▼	✕
Preserve Super - Network	Repair Paint	Example	999	✔	☐		Network ▼	✕
Rehab Culvert - Network	Rehab culvert, parapets, approaches	Example	999	✔	☐		Network ▼	✕
Rehab Deck - Network	Repair deck, joints and parapets	Example	999	✔	☐		Network ▼	✕
Rehab Sub - Network	Repair Columns, Piers, Abutments, Piles, Walls	Example	999	✔	☐		Network ▼	✕
Rehab Super - Network	Repair beams, paint and bearings	Example	999	✔	☐		Network ▼	✕
Replace Deck - Network	Replace Deck	Example	999	✔	☐		Network ▼	✕
Replace Structure - Network	Replace Structure	Example	999	✔	✔		Network ▼	✕

First **Previous** **1** **2** **Next** **Last**

Associated Benefit Groups for Action Preserve Deck - Network

○ Metric ● English

Benefit Groups

Please Select ▼	Add
Seal Joints	✕
Wearing Surface Overlay	✕

Overriding Direct Cost (overrides unit-costs) —

Enabled	Field Name	Cost Per Unit	Unit
☐	Deck Area	$ 5	sq.ft

Unit Costs —

ID	Element Name	Cost Per Unit	Unit	?	
300	Strip Seal Exp Joint (Replace)	$ 18	ft	▪	✕
301	Pourable Joint Seal (Replace)	$ 5	ft	▪	✕
302	Compressn Joint Seal (Replace)	$ 65	ft	▪	✕
510	Wearing Surfaces (Create)	$ 5	sq.ft	▪	✕
510	Wearing Surfaces (Replace)	$ 5	sq.ft	▪	✕

Indirect Cost —

Enabled	Component	Estimation Method	
✔	Total Indirect Cost	Percentage ▼	10

Deferment Rules —

Action Name	Deferment Interval (Years)	
Please Select ▼		Add
Preserve Deck - Network	5	✕

▶	Place Wearing Surface - Network	First Wearing Surface	Example	999	✔	☐		Network ▼	✕
▶	Preserve Deck - Network	Wearing Surface / Repair Joints	Example	999	✔	☐		Network ▼	✕
▶	Preserve Super - Network	📋 Repair Paint	📋 Example	999	✔	☐	$	Network ▼	✕
▶	Rehab Culvert - Network	Rehab culvert, parapets, approaches	Example	999	✔	☐		Network ▼	✕
▶	Rehab Deck - Network	Repair deck, joints and parapets	Example	999	✔	☐		Network ▼	✕
▶	Rehab Sub - Network	Repair Columns, Piers, Abutments, Piles, Walls	Example	999	✔	☐		Network ▼	✕
▶	Rehab Super - Network	Repair beams, paint and bearings	Example	999	✔	☐		Network ▼	✕
▶	Replace Deck - Network	Replace Deck	Example	999	✔	☐		Network ▼	✕
▶	Replace Structure - Network	Replace Structure	Example	999	✔	✔		Network ▼	✕

First	Previous	**1**	2	Next	Last

Associated Benefit Groups for Action Preserve Super - Network

○ Metric ● English

Benefit Groups

Please Select ▼	Add
Repair Paint	✕
Replace Paint	✕

Overriding Direct Cost (overrides unit-costs) ▬

Enabled	Field Name	Cost Per Unit	Unit
☐	Deck Area	$ 0	sq.ft

Unit Costs ▬

ID	Element Name	Cost Per Unit	Unit	?	
515	Steel Protective Coating (Condition improved)	$ 5	sq.ft	🟩	✕
515	Steel Protective Coating (Replace)	$ 10	sq.ft	🟩	✕

Indirect Cost ▬

Enabled	Component	Estimation Method	
✔	Total Indirect Cost	Percentage ▼	10

Deferment Rules ▬

Action Name	Deferment Interval (Years)	
Please Select ▼		Add
Preserve Super - Network	5	✕