



# Optimizer Lessons Learned

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User Group Meeting  
September 19, 2018  
Santa Fe, New Mexico



BrM Help Desk

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## Pyramid

# Sketch:

### NBI Conversion:

- On inspections
- Check Classifications, particularly of ADE's
- Consider your target: by count or deck area
- Dial in a small group, then compare to a larger one
- NBI Deterioration
  - Classification, again.
  - Again, small group, then compare to a larger one
- Risk Assessments
  - The types of Risk you need
  - Policies for Risk
- Work Candidates
  - Work entered by planners and inspectors
  - Action Types
  - Estimated Costs
- Utility
  - Don't include AADT, do things which can improve
  - Including Risk assessments
  - Weight Profiles for just risk, just scour, just seismic, just preservation
- Elements
  - Get the elements you need for proper management, consider the units and roll them up.
  - Element Relative weights and NBI relative weights
- Benefits
  - Name them for the effect, not the work
  - 100% effective can lead to infinite loops
  - NBI Deterioration

- Action Defs
  - Network Level actions
  - Indirect cost formulas
  - Syntax of formulas
- Project Categories
  - Make them your spending categories
- Funding sources
  - Less useful than originally envisioned, and you don't have to use it.
- Network Policies
  - Name policies with a count of how many branches are included
- Lifecycle policies
  - Start simple, then complicate.
- Structure Weight Formula
  - AADT order of magnitude swing
  - Deck Area
  - New Mexico combined solution
- Min Proj cost
- Programs
  - LCCA time frames
  - Subdivision profiles



# Where do I start?

## Start with the Pyramid

### Pyramid

Where to start

Inspection

Utility

Benefits

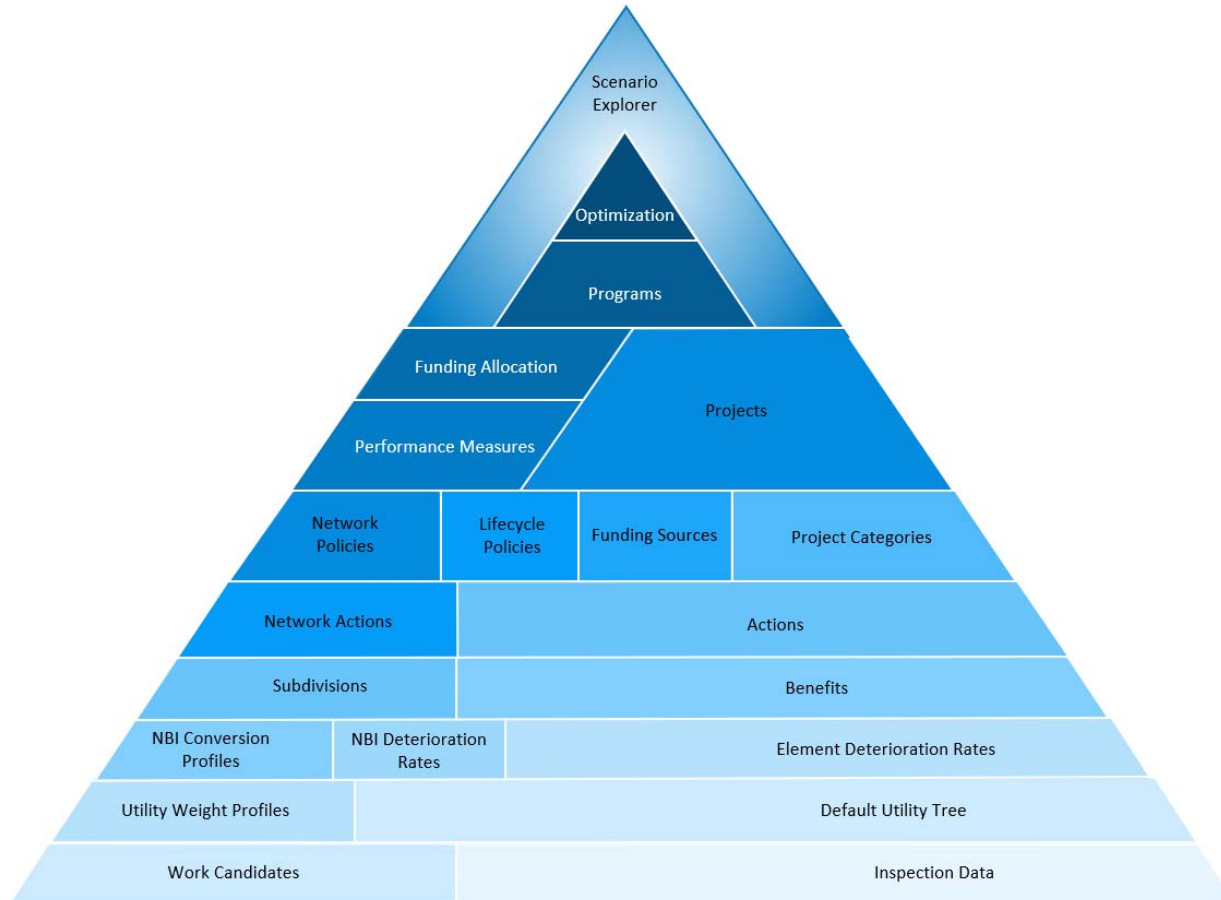
Actions

Network Policies

Lifecycle Policies

Project Categories

Program Setup





# Where do I start?

## The New Jersey Method:

Pyramid

Where to start

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Program Setup



Go down the pyramid to think about what you need.



# Where do I start?

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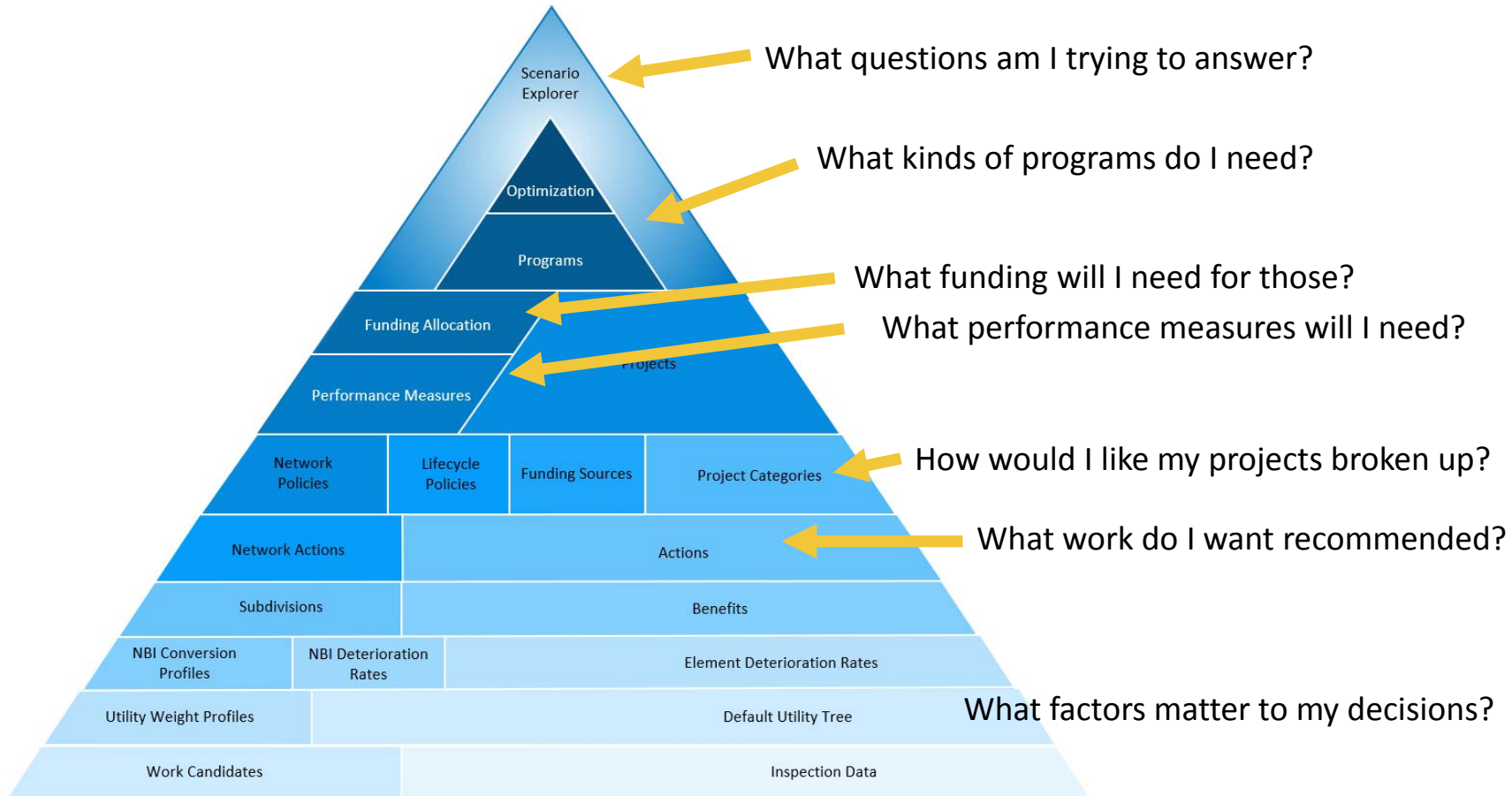
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# Where do I start?

## The New Jersey Method:

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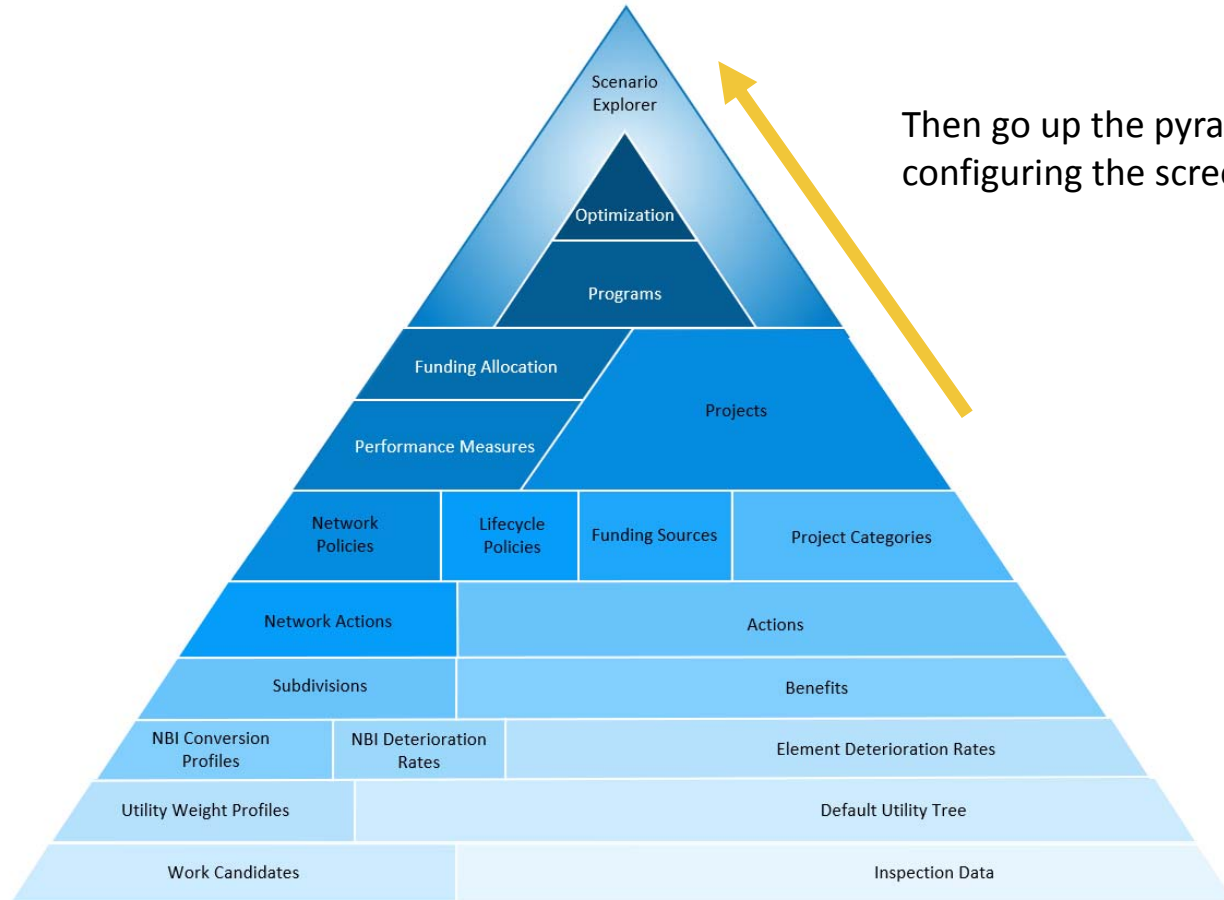
Actions

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Program Setup



Then go up the pyramid configuring the screens.



# The Setup

Yellow tips for the simplest setup.

Blue tips for the more advanced things.

Pyramid

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Actions

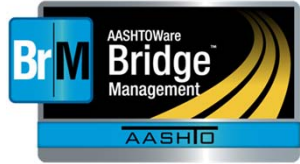
Network Policies

Lifecycle Policies

Project Categories

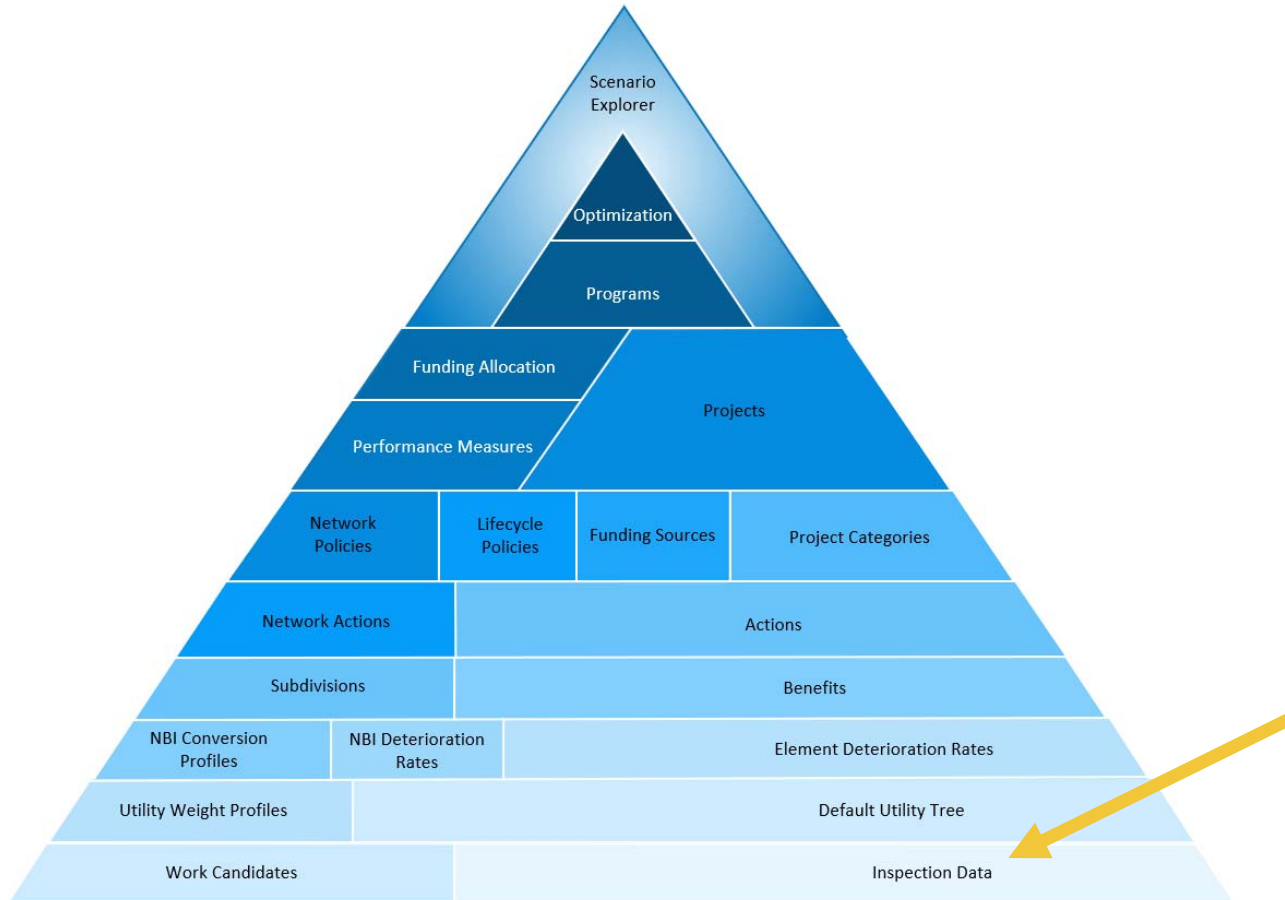
Program Setup





# Inspection

- Pyramid
- Where to start
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# Inspection

The Validate button runs the NBI  
submittal check on this inspection.

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Inspection > Condition

**Condition Ratings**

Deck (058):	4 Poor	Channel (061):	5 Bank Prot Eroded	
Superstructure (059):	5 Fair	Culvert (062):	N N/A (NBI)	
Substructure (060):	5 Fair	Waterway (071):	6 Equal Minimum	
		Unrepaired Spalls:		(SF)

NBI Converter Profile: BrM Default

**Element Conditions**

Hide Elem Inspection Details Arrow Key Grid Navigation Help

Element:  Struct. Unit.:  Env.:    Quantity  Percent

Elem.	Str. Unit.	Env.	Element Description	Tot. Qty.	Units	Qty1	Qty2	Qty3	Qty4			
▶ 12	101	Low (2)	Re Concrete Deck	1493.299	sq.ft	595.826	597.32	300.153	0			
▶ 107	101	Low (2)	Steel Opn Girder/Beam	630	ft	446.273	170.604	13.123	0			
▶ 120	101	Low (2)	Steel Truss	142.999	ft	126.999	16	0	0			
▶ 152	101	Low (2)	Steel Floor Beam	137.999	ft	108.471	29.528	0	0			
215	101	Low (2)	Re Conc Abutment	54.101	ft	27.697	16.404	10	0			
311	101	Low (2)	Moveable Bearing	2	each	0.000	2	0	0			
313	101	Low (2)	Fixed Bearing	2	each	0.000	2	0	0			

**Inspection Notes**



# Inspection

Run the Insp009 – Network Element Summary Report to find outliers

Pyramid

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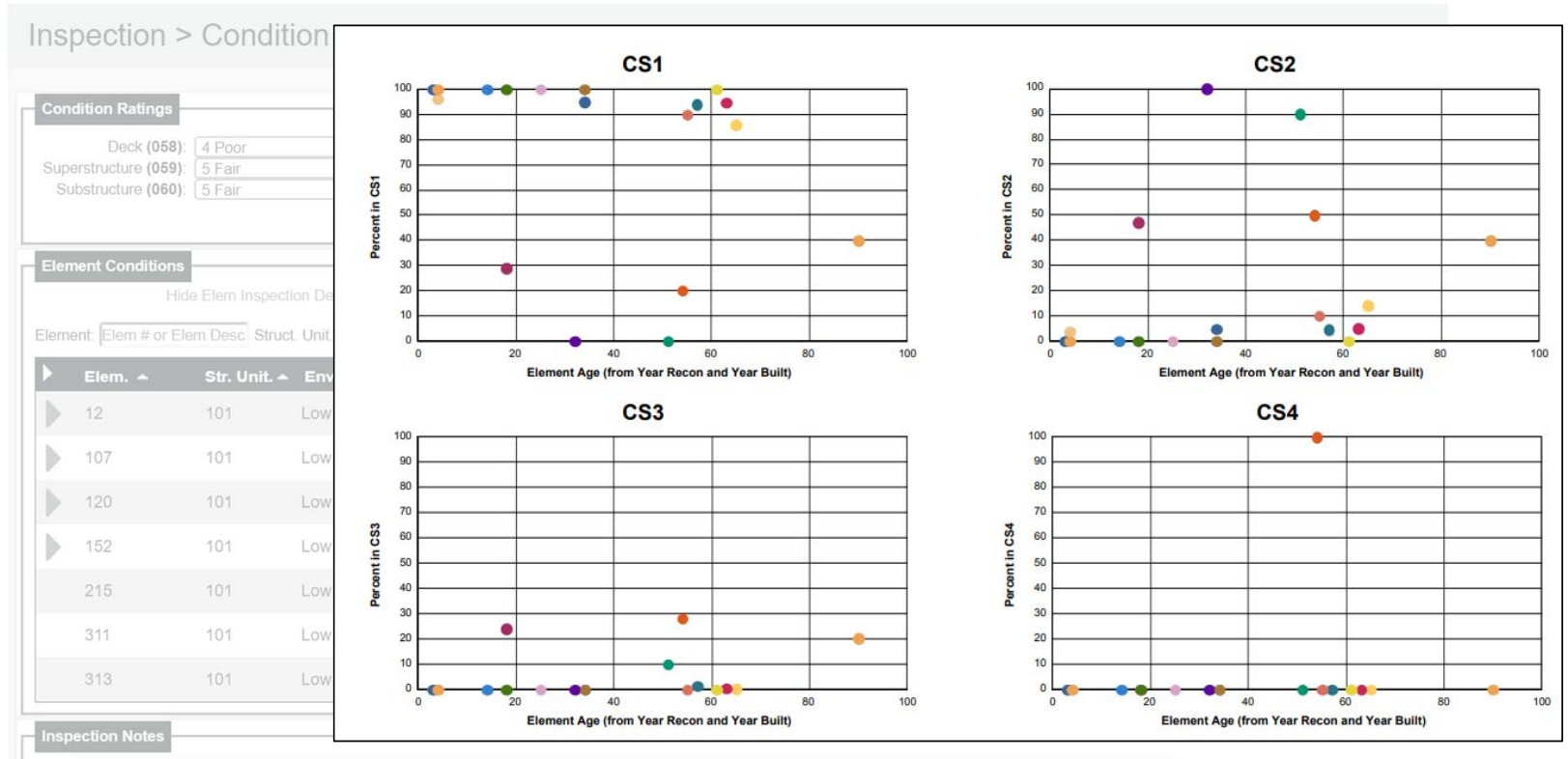
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# Inspection

Inspection > Work > Work Candidates

Candidate Name	Action	Date Recommended	Target Year	Estimated Cost	Status	Work Assignment	Priority	Structure Unit	Date Completed	Description	Source
6E14F0A-257F-090518-8E2005E9A7	Rehab Deck - Network	8/4/2014	2018	\$41,888.05	Unknown	0	High	2 / Type = F			Inspector Recommended <span style="color: red;">✖</span>

Sort your actions into Action Types to help inspectors find the right action

**Type of Work**

Candidate Name: 6E14F0A-257F-090518-8E2005E9A7

Structure Unit: 2 / Type = F

Action Type: Network

Action: Rehab Deck - Network

Date Recommended: 8/4/2014

Priority: High

Date Completed:

Target Year: 2018

Assigned: No

Work Assignment: Agency

Status: Unknown

Source: Inspector Recommended

**Work Estimates**

Estimated Quantity:

Cost per unit:

Calculate

Estimated Cost (\$): 41888

Generated by user "pontis" on 9/5/2018

Work Candidate sources for better sorting.

Pyramid

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Inspection > Work > Work Candidates

Candidate Name	Action	Date Recommended	Target Year	Estimated Cost	Status	Work Assignment	Priority	Structure Unit	Date Completed	Description	Source
6E14F0A-257F-090518-8E2005E9A7	Rehab Deck - Network	8/4/2014	2018	\$41,888.05	Unknown	0	High	2 / Type = F			Inspector Recommended <span style="color: red;">✖</span>

Actions with benefits and cost info estimate when you save them.

### Type of Work

Candidate Name: 6E14F0A-257F-090518-8E2005E9A7  
 Structure Unit: 2 / Type = F  
 Action Type: Network  
 Action: Rehab Deck - Network  
 Date Recommended: 8/4/2014  
 Priority: High  
 Date Completed:   
 Target Year: 2018  
 Assigned: No  
 Work Assignment: Agency  
 Status: Unknown  
 Source: Inspector Recommended

### Work Estimates

Estimated Quantity:   
 Cost per unit:   
  
 Estimated Cost (\$): 41888

Generated by user "pontis" on 9/5/2018

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# Inspection

Using Risk Assessments as part of your bridge management is a more advanced use case, but work it into your policies.

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## Inspection > Assessments

### Identified Risks

[Add New Assessment](#)

Assessment	Date	Status	Likelihood	Conseq	Value	Next
Scour	9/7/2016	2	3	6	18	9/7/2016

1 assessments (1 active)

Selected Assessment: [Delete](#)

### Risk Details

Risk Assessment Value										
Likelihood of hazard										
High	5	10	15	20	25	30	35	40	45	50
4	4	8	12	16	20	24	28	32	36	40
3	3	6	9	12	15	18	21	24	27	30
2	2	4	6	8	10	12	14	16	18	20
Low	1	2	3	4	5	6	7	8	9	10
	Low	2	3	4	5	6	7	8	9	High
										Consequence of hazard

Vulnerability Type:

Likelihood of Hazard:

Assessment Date:

Consequences to Structure:

Assessment Key/Date:

Assessment Final Value:

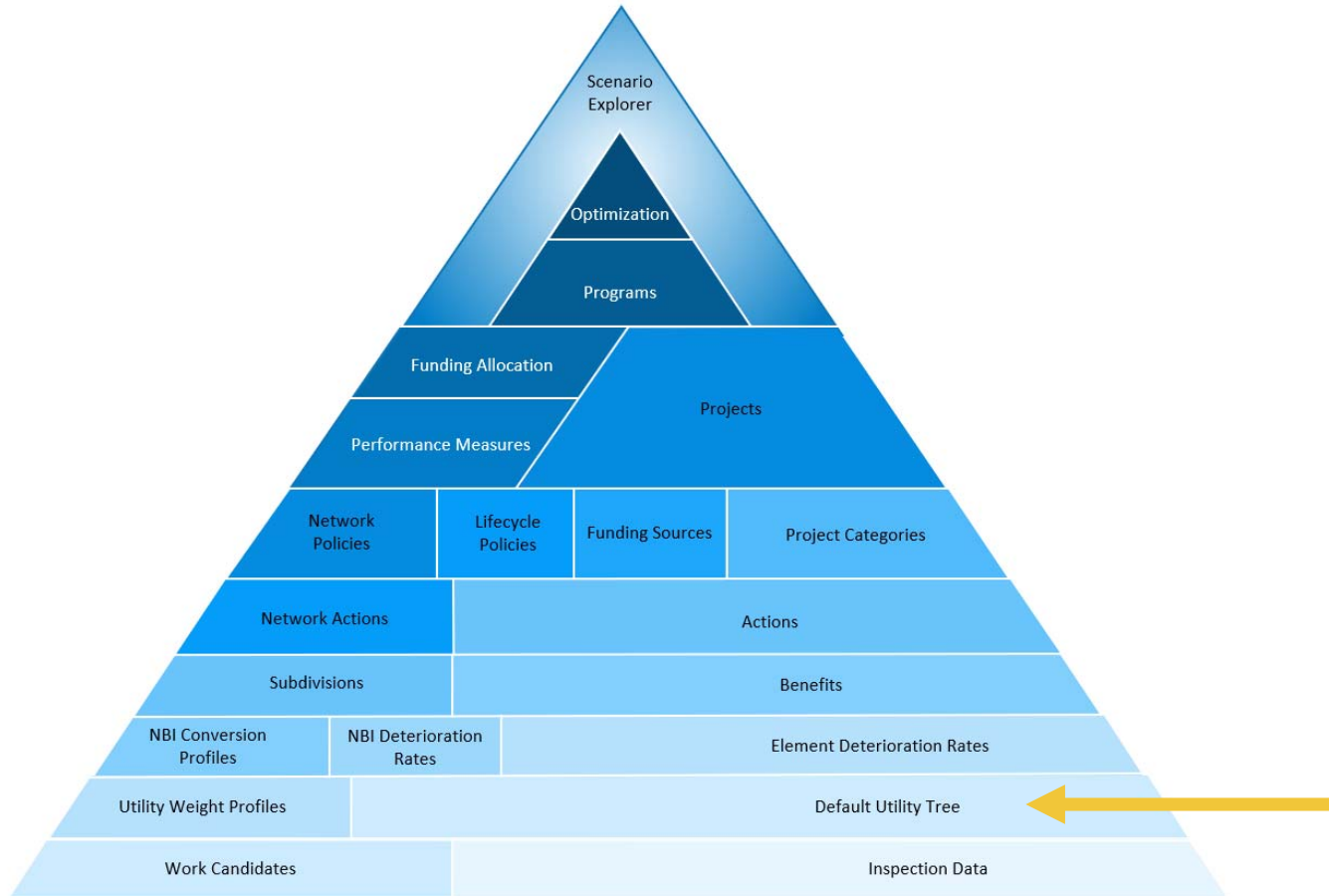
Workflow Status:

Next Assessment Date:



# Utility

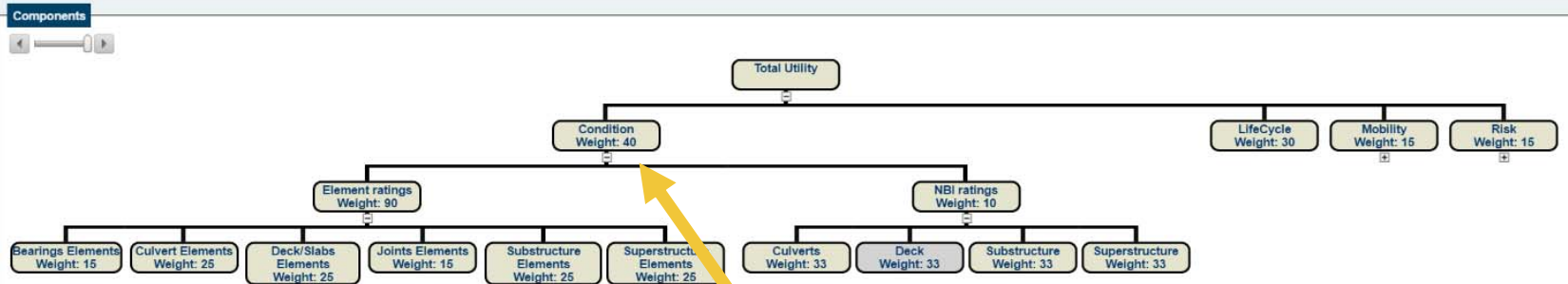
- Pyramid
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# Utility

Admin > Modeling Config > Utility



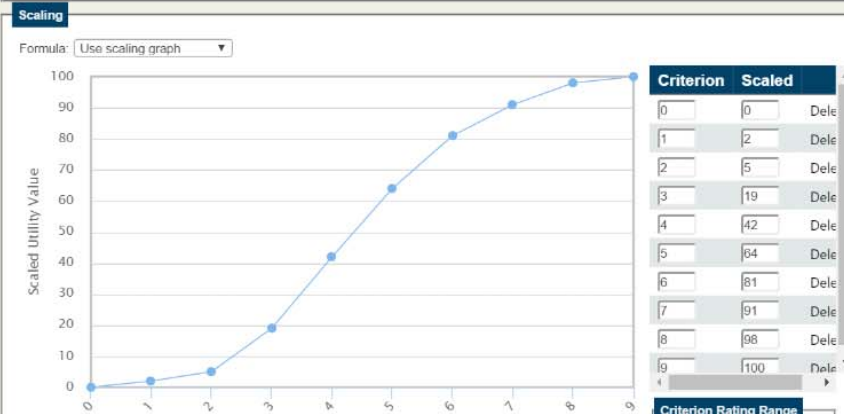
Deck =

**Criterion Properties**

Name:  Weight:

Type:

Table:  Column:



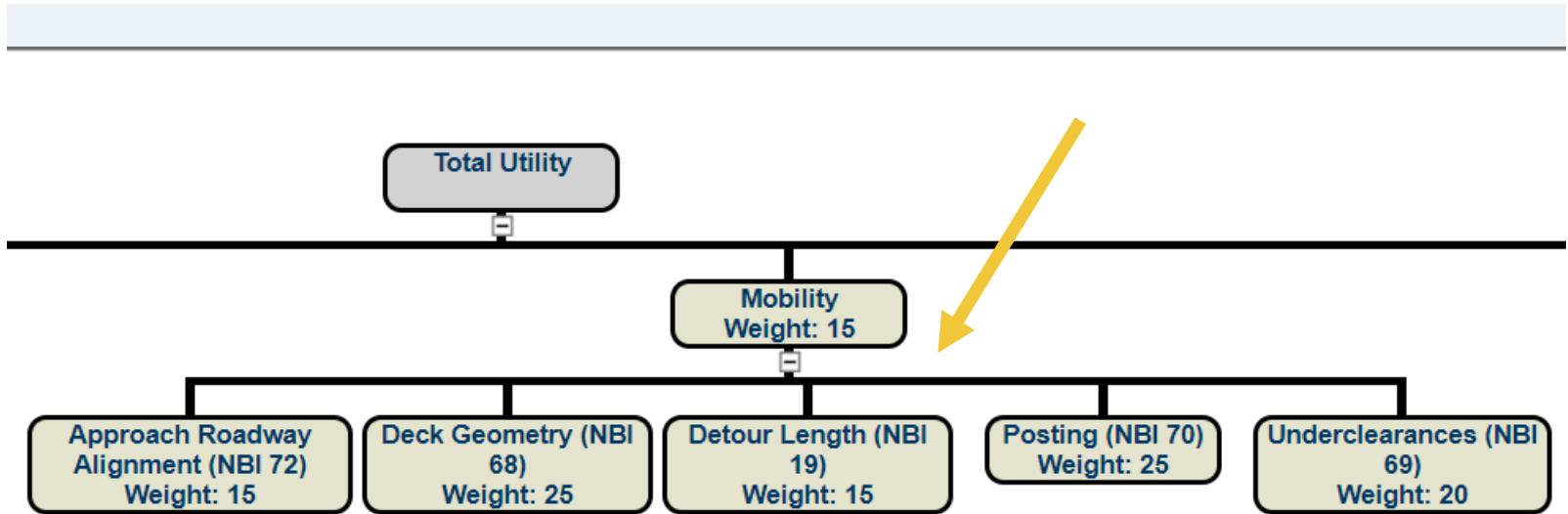
When starting, focus on Condition (and maybe Risk) and don't worry about Mobility.

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# Utility



Remember: include in Utility the things which can be improved from doing work. Detour length and AADT are rarely fixed by maintenance work.

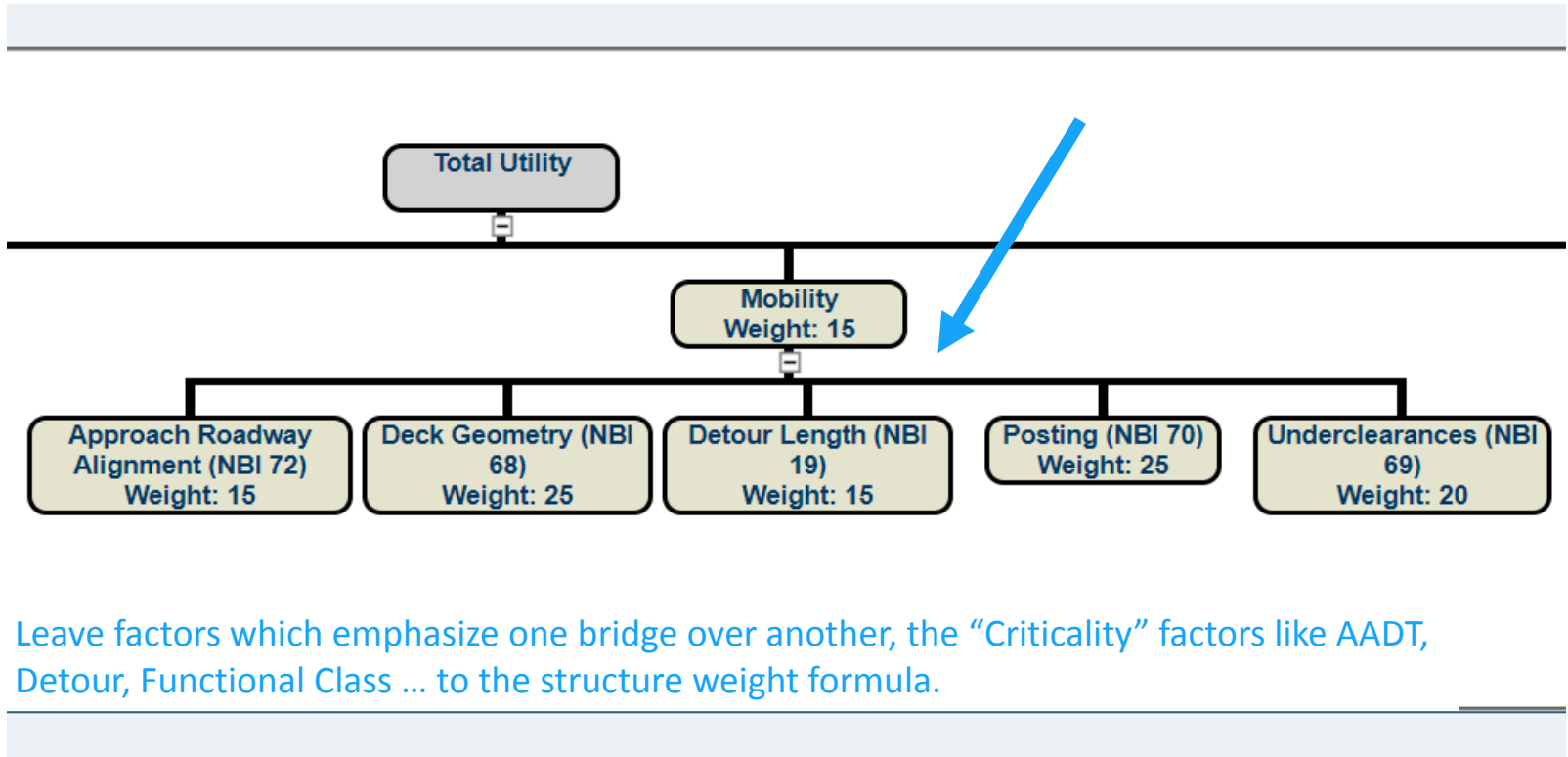
But if you include a formula, like  $AADT/\# \text{ of Lanes}$ , then work can improve things.

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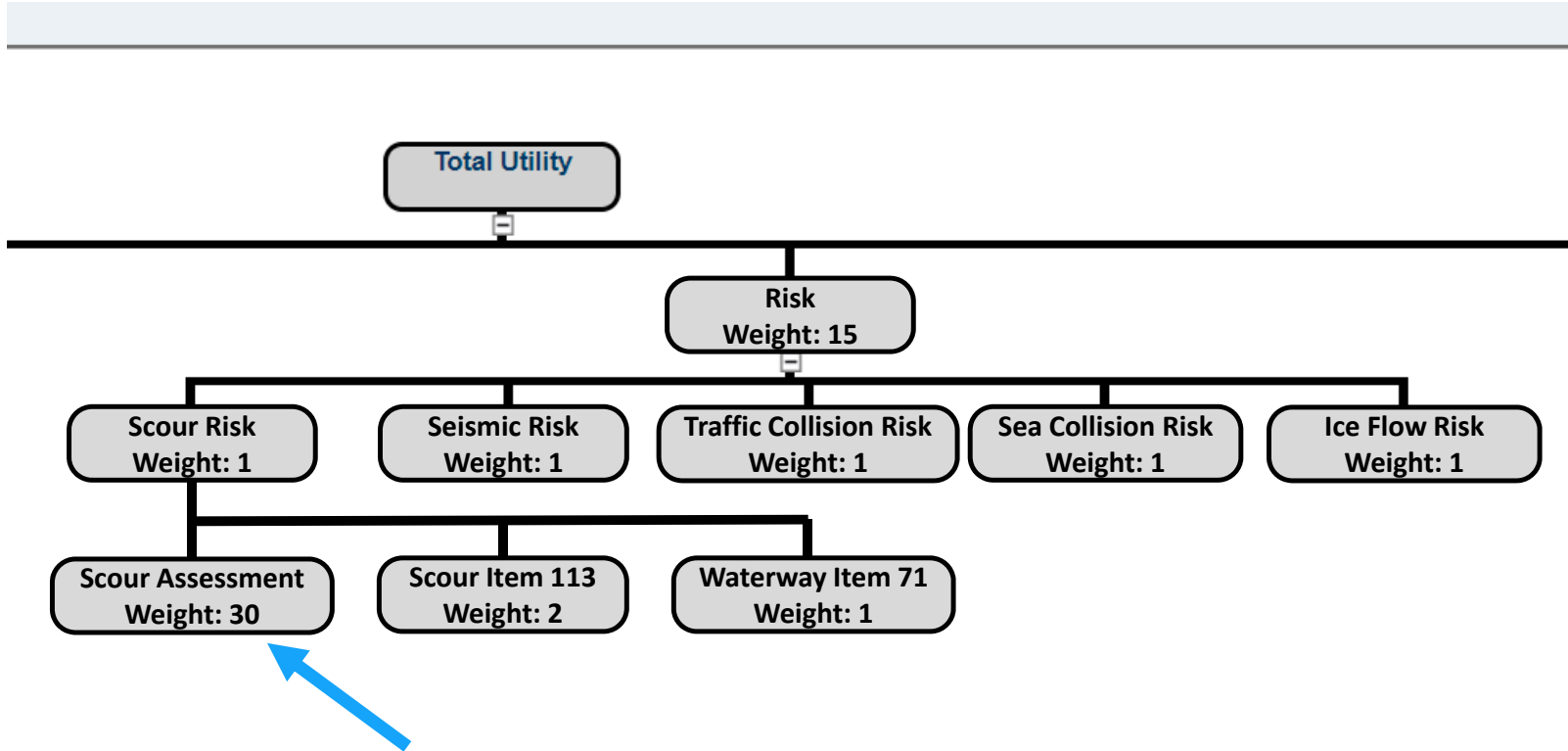


Leave factors which emphasize one bridge over another, the “Criticality” factors like AADT, Detour, Functional Class ... to the structure weight formula.



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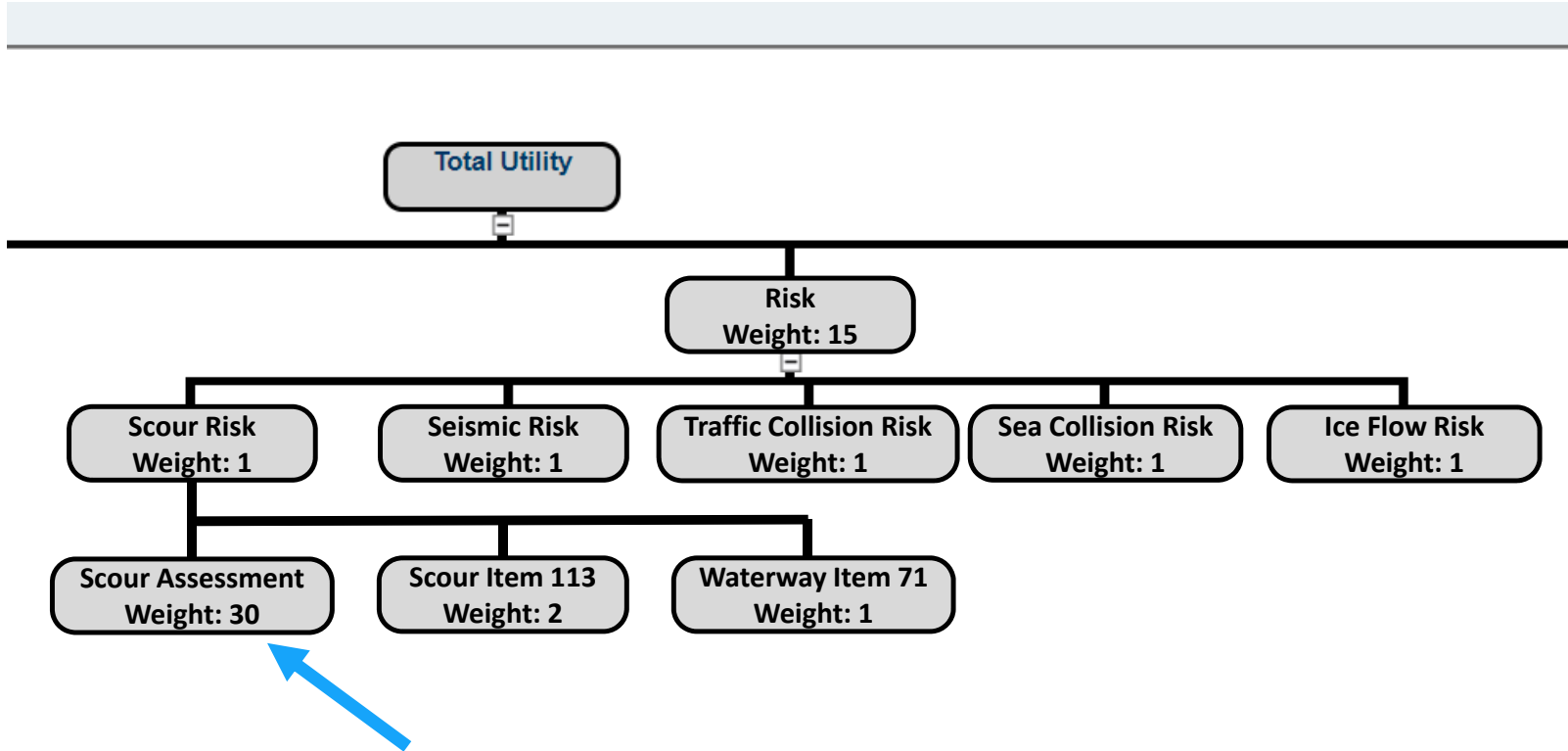


The "Alaska Trick": give incredible weight to scour assessments and some weight to other stand-in items.



# Utility

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The "Alaska Trick": give incredible weight to scour assessments and some weight to other stand-in items.



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# Utility

Admin > Modeling Config > Weights Profile

## Profiles

Selected Weight Profile: Preservation Ex  
Name: Preservation Ex

## Utility Components

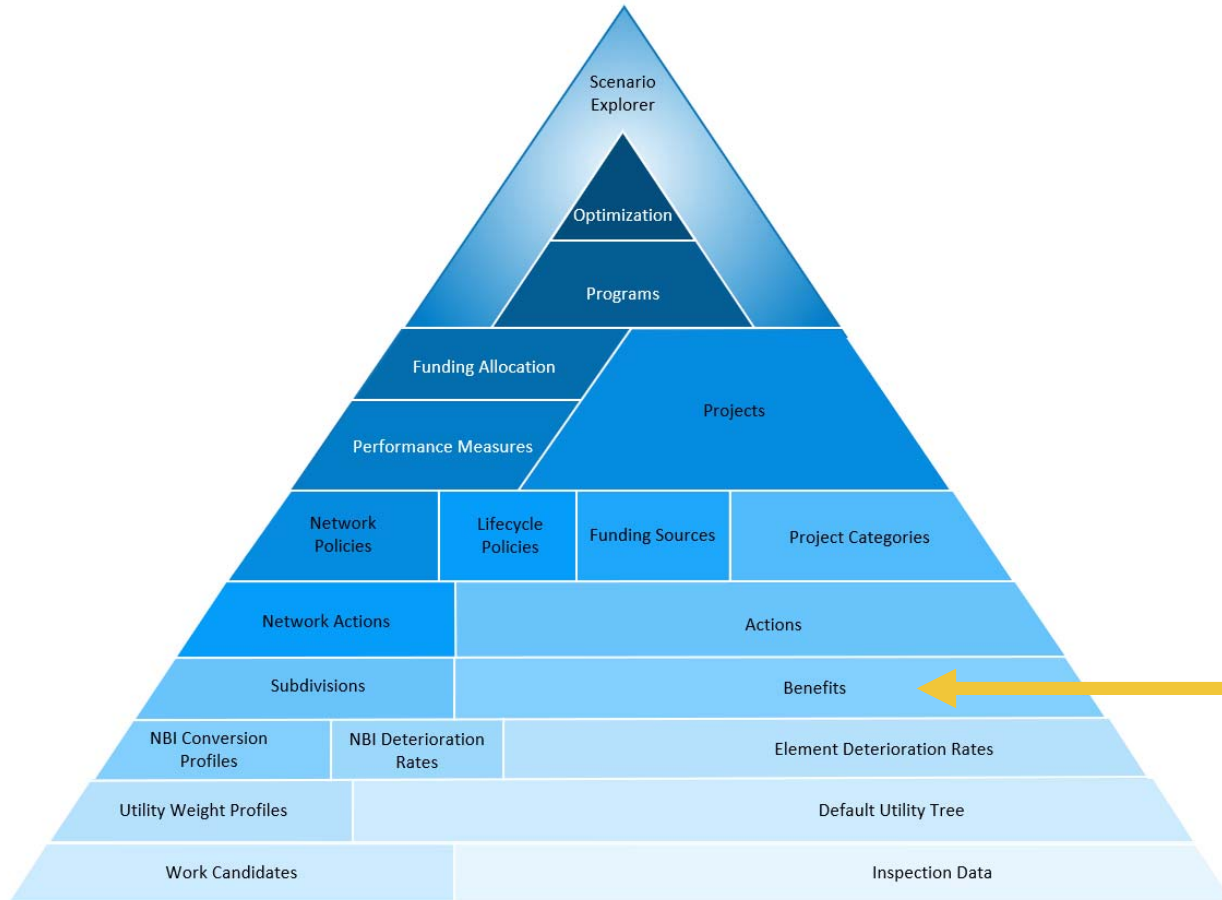
- Total Utility
  - Condition (40->25)
  - LifeCycle (30->75)
  - Mobility (15->0)
  - Risk (15->0)

Create different Utility Weight profiles to focus on the aspects of Utility for special funding cases, like funds to mitigate specific types of Risk.



# Benefits

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# Benefits

Admin > Modeling Config > Benefit Groups

Benefit Groups

+ Add New Benefit Group

Benefit Group Name	Description	Linked Actions	Active	Sort Order	Child Benefit Groups
Deck NBI =8	Set to new deck	Bridge Replacement, LCCA Super Replace, Replace Deck	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Deck Repair to CS2	Pothole Patching	Pothole Patching, AC Repair w/ Pothole Patching, Thin Overlay w/ Pothole Patching, Polyester C, MMC Partia, Placemen	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Deck Replace in Kind	Replace each deck element in kind.	Bridge Replacement, LCCA Super Replace, Replace Deck	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Scour to 4	Sub Repair Scour Damage	Sub Repair Scour damage	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Scour to 7	Sub Scour Countermeasures	Culvert Scour Countermeasures, Sub Scour Countermeasure	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Conc Elem to CS2	Sub Conc Repair	Sub Concrete Repair	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Defect 1020 to CS1	Sub Timber Splice	Sub Timber Splice	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Defect 1080 to CS2	Sub Concrete Repair	Sub Concrete Repair	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Defect 1130 to CS2	Sub Concrete Repair	Sub Concrete Repair	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Defect 1140 to CS1	Sub Timber Splice	Sub Timber Splice	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>
Sub Defect 1150 to CS1	Sub Timber Splice	Sub Timber Splice	<input checked="" type="checkbox"/>	8888	<a href="#">Link to Child Groups</a>

Name your benefits for what they do.

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# Benefits

Admin > Modeling Config > Bene

Benefit Groups

+ Add New Benefit Group

Benefit Group Name	Description	
Deck NBI =8	Set to new deck	
Deck Repair to CS2	Pothole Patching	
Deck Replace in Kind	Replace each deck element in kind.	
Scour to 4	Sub Repair Scour Damage	
Scour to 7	Sub Scour Countermeasures	
Sub Conc Elem to CS2	Sub Conc Repair	
Sub Defect 1020 to CS1	Sub Timber Splice	
Sub Defect 1080 to CS2	Sub Concrete Repair	
Sub Defect 1130 to CS2	Sub Concrete Repair	
Sub Defect 1140 to CS1	Sub Timber Splice	
Sub Defect 1150 to CS1	Sub Timber Splice	

Name Benefits for what they do. It will make Actions easier to read.

## Associated Benefit Groups for Action Concrete Super Major Repair

Benefit Groups	
Please Select	Add
Super Conc Repair to CS2	X
Super Defect 1080 to CS1	X
Super Defect 1100 to CS1	X
Super Defect 1110 to CS2	X
Super Defect 7000 to CS1	X
Super NBI +2	X



Overriding Direct Cost (overrides unit-costs)

Enabled	Field
<input type="checkbox"/>	Deck Area

Unit Costs

ID	Element Name
104	Pre Clsd Box Girder (Condition im
105	Re Clsd Box Girder (Condition imp
106	Othr Clsd Web/Box Girder (Condit
109	Pre Opn Conc Girder/Beam (Conc
110	Re Conc Opn Girder/Beam (Cond
115	Pre Conc Stringer (Condition impr
116	Re Conc Stringer (Condition impr
143	Pre Conc Arch (Condition improve
144	Re Conc Arch (Condition improve
154	Prestress Floor Beam (Condition i

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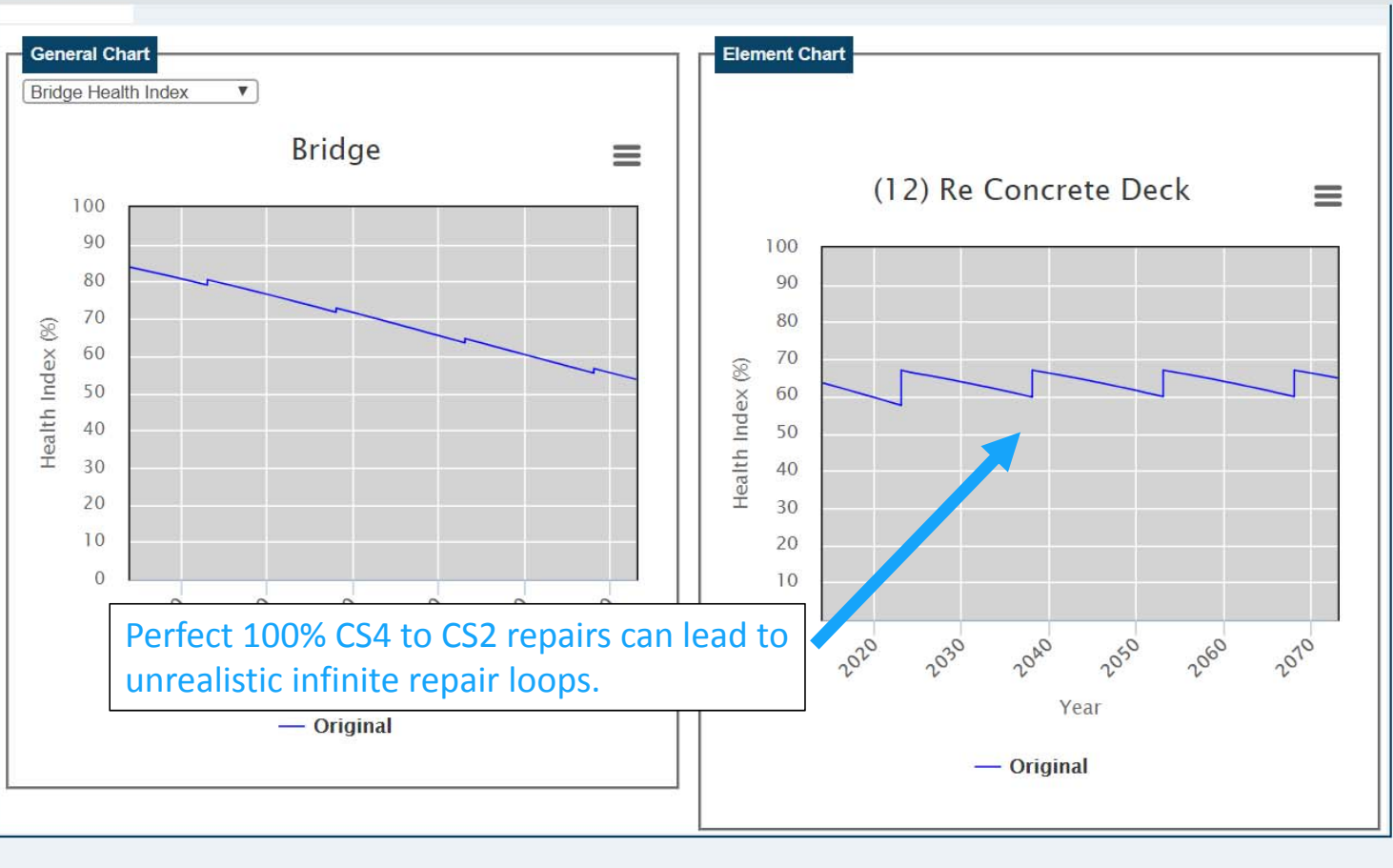




# Benefits

Analysis > LCCA

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# Benefits

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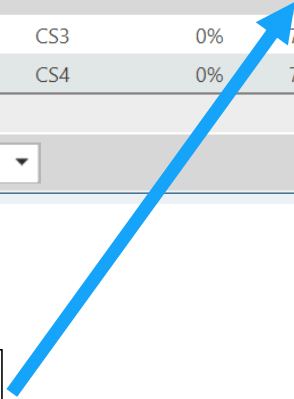
Deck Rehab - Changed Elements

+ Add new record

Element	Parent	Grandparent	Origin State	CS1	CS2	CS3	CS4		
12 Re Concrete Deck									
12 Re Concrete Deck	None	None	CS3	0%	70%	30%	0%		
12 Re Concrete Deck	None	None	CS4	0%	70%	0%	30%		
38 Re Concrete Slab									
38 Re Concrete Slab	None	None	CS3	0%	70%	30%	0%		
38 Re Concrete Slab	None	None	CS4	0%	70%	0%	30%		

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Consider modeling "less than perfect" repairs.





# Actions

Pyramid

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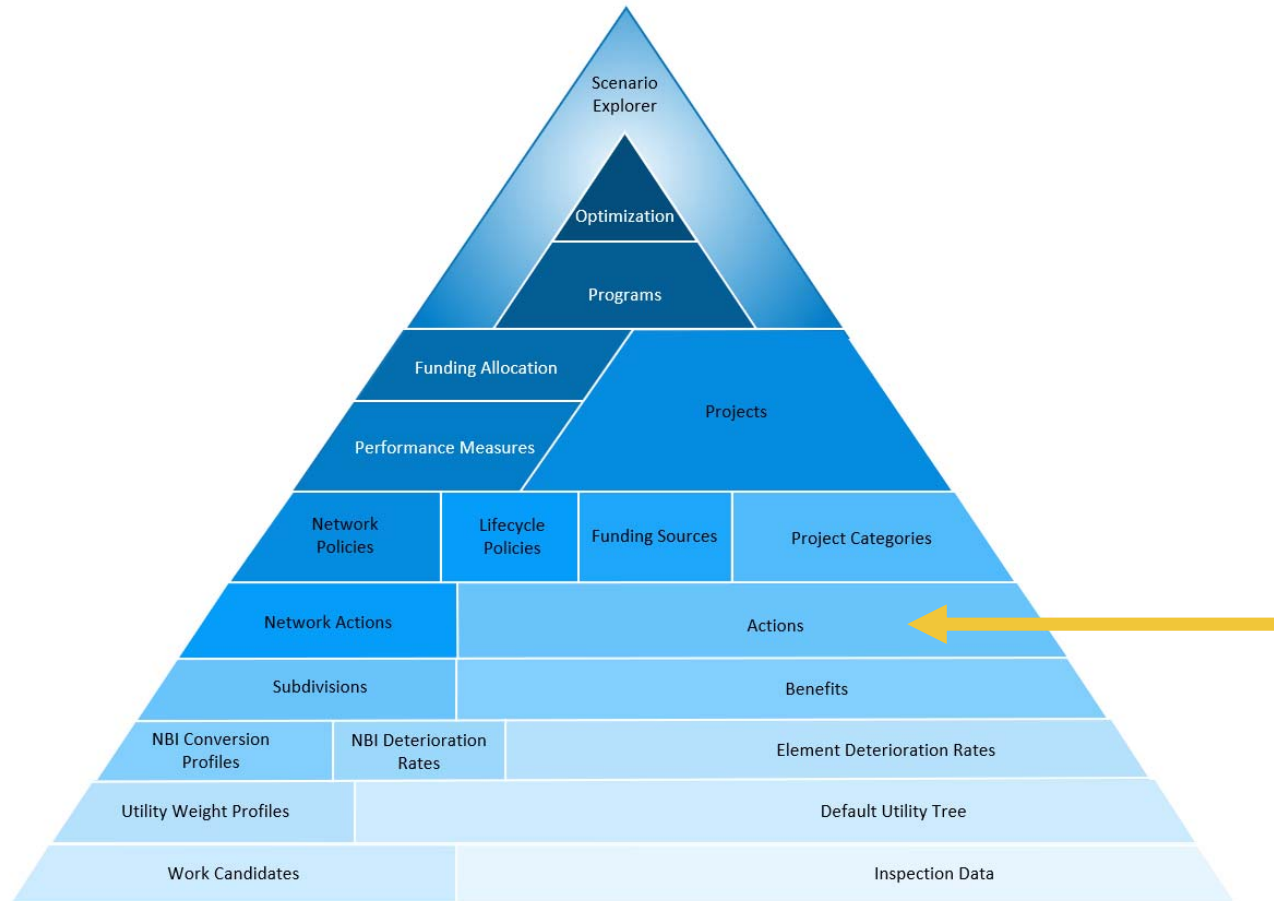
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# Actions

Admin > Modeling Config > Action Defs

Action Defs										
Search <input type="text"/> <input type="button" value="Search"/>										
Name	Description	Notes	Order	Network Level	Bridge Replace	Required Minimum Cost	Action Type	Active		
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	\$ <input type="text"/>	<input type="text"/>	<input checked="" type="checkbox"/>	<input type="button" value="Add"/>	
AC Repair	Repair 510 +1 condition state	\$15/sqft	888	<input type="checkbox"/>	<input type="checkbox"/>		Deck	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
AC Repair w/ Pothole Patching	Repair 510 +1 CS, Deck repair to CS2, Deck NBI +1	\$15/sqft, \$30/sqft	888	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Deck	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Add Steel Panels	Super NBI +2, defect 1000 to CS2, Posting +1?	\$200/location	888	<input type="checkbox"/>	<input type="checkbox"/>		Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Bridge Replacement	Replace Bridge		888	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Network	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Concrete Patch	Super NBI +1, Defect 1080 CS3 to CS2	\$400/ft	888	<input type="checkbox"/>	<input type="checkbox"/>		Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Concrete Patch w/ FRP	Super NBI +2, Defect 1080 CS4,3 and 2 to 1, 7000 to 1, 1100 to 1, 1130 to 1						Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Concrete Replacement	NBI Super = 8, Replace in Kind						Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Concrete Super Major Repair	Super NBI +2, Defects 1110						Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Concrete Super Minor Repair	Super NBI +1, Defects 1110, 1080,						Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Culv Grade Control Downstream	Culv NBI +1, Channel rating?						Channel	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Culvert Concrete Epoxy Inject	Culv NBI +1, CS3 to 2, Defect 1130						Channel	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Culvert Replace	Culv NBI = 8, Replace elem in kind	\$1500/ft	888	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Channel	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Culvert Scour Countermeasures	Scour Rating to 7, Defect 6000 fixed		888	<input type="checkbox"/>	<input type="checkbox"/>		Channel	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Epoxy Inject Cracks	Super NBI +1, Defect 1110 repaired to CS2	\$10/ft	888	<input type="checkbox"/>	<input type="checkbox"/>		Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	
Heat Straigten	Super NBI +2, defect 7000 to CS1	\$10k	888	<input type="checkbox"/>	<input type="checkbox"/>		Superstruct	<input checked="" type="checkbox"/>	<input type="button" value="X"/>	

We mentioned the Action types for work candidates. Also, mark inactive any actions you don't want used anymore.

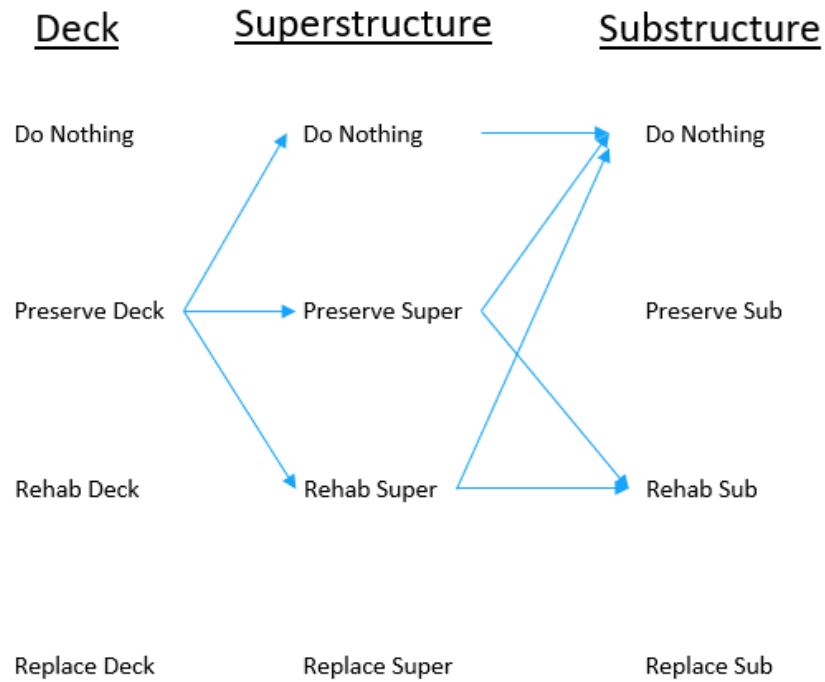
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# Actions

For initial setup, focus on these actions. And if that is too much, focus on deck work at first.

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# Actions

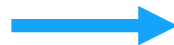
Admin > Modeling Config > Action Defs

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Please Select	<input type="button" value="Add"/>
Concrete Overlay	<input checked="" type="checkbox"/>
Rehab Deck Conc	<input checked="" type="checkbox"/>
Rehab Deck Steel	<input checked="" type="checkbox"/>
Rehab Railings	<input checked="" type="checkbox"/>
Replace Joint Seals	<input checked="" type="checkbox"/>
Replace Wearing Surface	<input checked="" type="checkbox"/>

Consider the units of your costs.  
 Idaho preferred to set their per/unit costs based on bridge item bid costs. But the optimizer budgets are given in total program costs.

Consider using indirect formulas to mark up the difference.



Enabled	Field Name	Cost Per Unit	Unit
<input type="checkbox"/>	Deck Area	\$ 0	sq.ft

ID	Element Name	Cost Per Unit	Unit	?	
12	Re Concrete Deck (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	Pre Concrete Deck (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
15	Pre Concrete Top Flange (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16	Re Conc Top Flange (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
28	Steel Deck - Open Grid (Condition improved)	\$ 100	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
29	Steel Deck - Conc Fill Grid (Condition improved)	\$ 100	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
30	Steel Deck - Orthotropic (Condition improved)	\$ 100	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
38	Re Concrete Slab (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
54	Timber Slab (Condition improved)	\$ 100	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
300	Strip Seal Exp Joint (Replace)	\$ 65	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
301	Pourable Joint Seal (Replace)	\$ 15	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
302	Compressn Joint Seal (Replace)	\$ 65	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
303	Assem Jnt With Seal (Replace)	\$ 1250	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
304	Open Expansion Joint (Replace)	\$ 25	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
305	Assem Jnt Wthut Seal (Replace)	\$ 1250	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
306	Other Joint (Replace)	\$ 1250	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
320	Pre Conc Appr Slab (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
321	Re Conc Approach Slab (Condition improved)	\$ 25	sq.ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
330	Metal Bridge Railing (Condition improved)	\$ 100	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
331	Re Conc Bridge Railing (Condition improved)	\$ 70	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
332	Timb Bridge Railing (Condition improved)	\$ 100	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
333	Other Bridge Railing (Condition improved)	\$ 100	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
334	Masry Bdge Rling (Condition improved)	\$ 70	ft	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

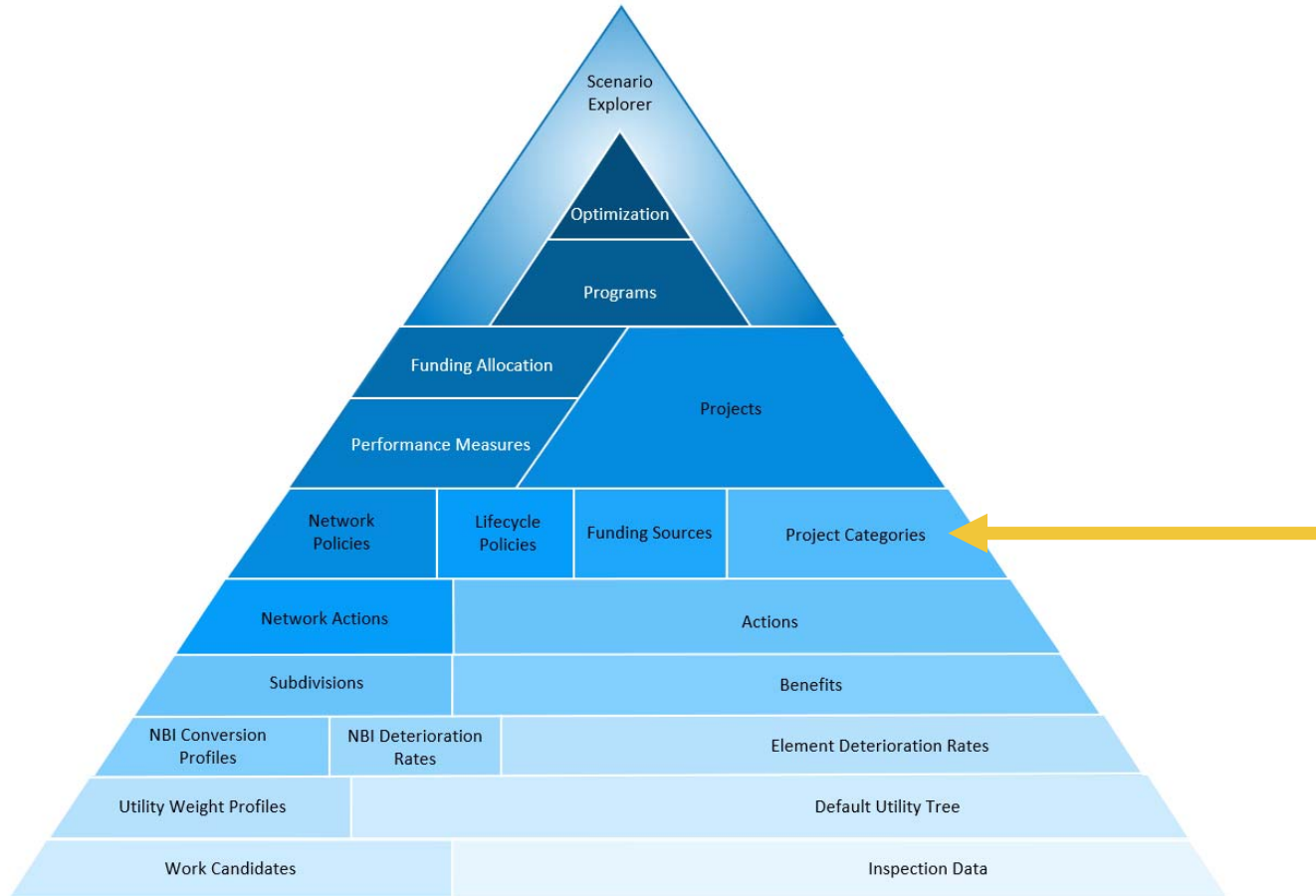
  

Enabled	Component	Estimation Method
<input type="checkbox"/>	Total Indirect Cost	Percentage 0



# Project Setup

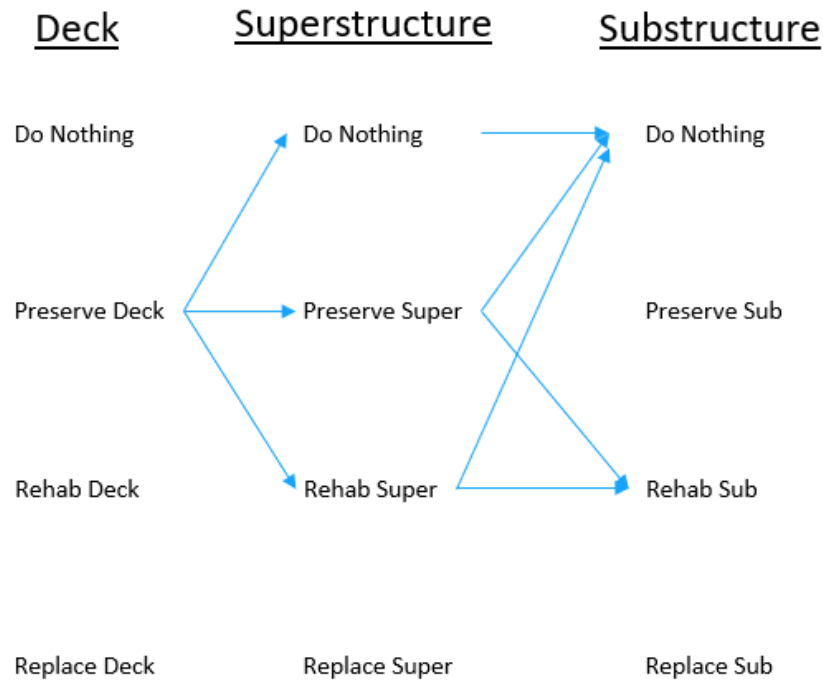
- Pyramid
- Where to start
- Inspection
- Utility
- Benefits
- Actions
- Network Policies
- Lifecycle Policies
- Project Categories
- Program Setup





# Network Policies

- Pyramid
- Where to start
- Inspection
- Utility
- Benefits
- Actions
- Network Policies**
- Lifecycle Policies
- Project Categories
- Program Setup



Keep it pretty simple at first. You can make it more complex later.





# Network Policies

Admin > Modeling Config > Network Policies

**Network Policy Editor**

Network Policy: AZ MMC Partial Combinations (36) [Create New](#)

**Network Policy Details**

Network Policy Name: AZ MMC Partial Combinations

**Actions**

- MMC Partial Depth Replacement
  - Do Nothing
  - Sub Timber Splice
- Concrete Super Major Repair
  - Do Nothing
  - Sub Concrete Repair
  - Sub Timber Splice
  - Sub Replace Columns
- Timber Fix Splits & Checks
  - Do Nothing
  - Sub Timber Splice
  - Sub Concrete Repair
  - Sub Replace Columns
- Concrete Replacement
  - Do Nothing

**Details**

Action: MMC Partial Depth Repl: Project Category: Major Rehab Work

**Action Conditional Rule**

**Summary**

(Column 'dkrating' of Table 'inspevnt' Is In Set '0 Failed, 1 Imminent failure, 2 Critical, 3 Serious, 4 Poor, 5 Fair, 6 Satisfactory')

**Rule Builder**

[Add Condition](#) [Add Group](#)

Type: Column Value In Param Set

Table: inspevnt Column: dkrating Value Is: In

- Unknown (NBI)
- 0 Failed
- 1 Imminent failure
- 2 Critical
- 3 Serious
- 4 Poor

Name your Network Policies to indicate they are a combination and how many possible combinations there are.

- Pyramid
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# Network Policies

## Programs > Create/Edit Programs

NBI Deterioration Method:

Long-Term Analysis Period:  Discount Rate:

Inflation Estimation Method:

### Network Policies

#### Unassigned Network Policies:

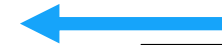
- Replace Deck
- AZ Culvert Replace
- AZ Sub Column Repair Only (1)
- Rehab Sub
- AZ Super Timber Repair Combinations
- AZ Super Steel Replacement Combinations
- Rehab Deck
- AZ Super Conc Replace Combinations
- AZ Sub Column Replace Only (1)
- AZ Super Conc Major Combinations (4)
- AZ Culvert Conc Epoxy Inject (1)
- First Protective System
- AZ Sub Timber Splice Only (1)
- AZ Super Steel Minor Combinations (4)
- AZ Super Timber Replace Combinations
- AZ Super Conc Minor Combinations (4)
- Rehab Culvert
- Replace Culvert
- Rehab Super
- Replace Bridge

[Assign All](#)

#### Assigned Network Policies:

- AZ Culvert Steel Line (1)
- AZ Thin Overlay Combinations (32)
- AZ AC w/ Patching Combinations (36)
- AZ Bridge Replacement (1)
- AZ MMC Partial Combinations (36)
- AZ Polyester Conc Combinations (32)
- AZ Replace Deck Combinations (36)

[Unassign All](#)



At a glance, you will have an impression of how long the optimizer might take to run.

### Utility Weights Profile

Utility Profile:

[Utility Profile's Weights](#)

[Create/Edit Utility Profile](#)

Pyramid

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# Lifecycle Policies

- Pyramid
- Where to start
- Inspection
- Utility
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- Actions
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- Lifecycle Policies
- Project Categories
- Program Setup

Admin > Modeling Config > Preservation and Replacement Policy

**Policy Editor**  
 Policy: AZ Bridge Replace Policy [Create New](#) [Copy >>](#)

**Policy Details**

Name: AZ Bridge Replace Policy

Description: Replace Bridge when: (Deck of 3 while super + sub are 6 or below) or super of 3 or sub of 3.

Created 5/14/2018

Notes:

User Cost Calculation:

User Cost Formula String:

**Policy Rules**

Name	Condition
Replace Bridge	((NBI Component Rating of 'Substructure' Must Be Less Than Or Equal To Number Value 3 OR (NBI Component of 'Deck' Must Be Less Than Or Equal To Number Value 3 AND NBI Component Rating of 'Superstructure' Must Be Less Than Or Equal To Number Value 6 AND NBI Component Rating of 'Superstructure' Must Be Less Than Or Equal To Number Value 6) OR (NBI Component Rating of 'Superstructure' Must Be Less Than Or Equal To Number Value 4 AND NBI Component Rating of 'Superstructure' Must Be Less Than Or Equal To Number Value 4) OR (NBI Component Rating of 'Deck' Must Be Less Than Or Equal To Number Value 4 AND NBI Component Rating of 'Substructure' Must Be Less Than Or Equal To Number Value 4) OR (NBI Component Rating of 'Superstructure' Must Be Less Than Or Equal To Number Value 4 AND NBI Component Rating of 'Substructure' Must Be Less Than Or Equal To Number Value 4)))



Focus on the Bridge Replacement first.

Then replacement of culvert, deck, then super.

Deal with repair frequencies after, if your agency has firmly set policies for these.



# Lifecycle Policies

Admin > Modeling Config > LCCA Assign Policies

Bridge List				Bridge Policy	Culvert Policy	Deck Policy	Substructure Policy	Superstructure Policy
Bridge ID	District	County		No Policy Selected	No Policy Selected	No Policy Selected	No Policy Selected	No Policy Selected
				Assign To Selected Assign To All	Assign To Selected Assign To All	Assign To Selected Assign To All	Assign To Selected Assign To All	Assign To Selected Assign To All
<input type="checkbox"/>	00002	Northwest	(007)Gila	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00009	Southwest	(027)Yuma	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00015	Southeast	(013)Maricopa	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00025	Northeast	(017)Navajo	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00026	Central	(013)Maricopa	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00027	Southeast	(013)Maricopa	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00028	Southeast	(013)Maricopa	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00029	Southeast	(007)Gila	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00031	Southeast	(013)Maricopa	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00036	Southeast	(007)Gila	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00037	Southeast	(007)Gila	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00040	Northcentral	(025)Yavapai	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00041	Northwest	(025)Yavapai	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00042	Northwest	(025)Yavapai	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00045	Southeast	(007)Gila	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00051	Northcentral	(005)Coconino	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00052	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00053	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00054	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00055	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00056	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00057	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00058	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00059	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy
<input type="checkbox"/>	00060	Southeast	(003)Cochise	AZ Bridge Replace Policy	AZ Culvert Policy	AZ Deck Policy	AZ Substructure Policy	AZ Super Policy

Also focus on the most generic policy first. Then branch out to different policies per road-type and signature bridges.

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- Lifecycle Policies
- Project Categories
- Program Setup



# Project Categories

Pyramid

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Program Setup

Admin > Modeling Config > Project Categories

Add New Project Category

**Project Category**

- Bridge Rail
- Deck Work
- Joint Seals
- Major Rehab Work
- Minor Rehab Work
- Paint
- Preservation Work
- Replacement
- Scour Work
- SD NHS Bridges

Total Categories: 11

Delete

**Project Category:**

**Description:**

**Default Filter:**

**Default Layout:**

**Related Actions:**

Name	Description
<input type="checkbox"/> AC Repair	
<input type="checkbox"/> AC Repair w/ Pothole Patching	
<input type="checkbox"/> Add Steel Panels	
<input type="checkbox"/> Bridge Replacement	
<input type="checkbox"/> Concrete Patch	Super NBI +1, Defect 1080 CS3 to CS2
<input type="checkbox"/> Concrete Patch w/ FRP	Super NBI +2, Defect 1080 CS4,3 and 2 to 1, 7000 to 1, 1100 to 1, 1130 to 1
<input type="checkbox"/> Concrete Replacement	NBI Super = 8, Replace in Kind
<input type="checkbox"/> Concrete Super Major Repair	Super NBI +2, Defects 1110, 1080, 7000, 1100, 1300
<input type="checkbox"/> Concrete Super Minor Repair	Super NBI +1, Defects 1110, 1080,
<input type="checkbox"/> Culv Grade Control Downstream	Culv NBI +1, Channel rating?

Total Actions: 147

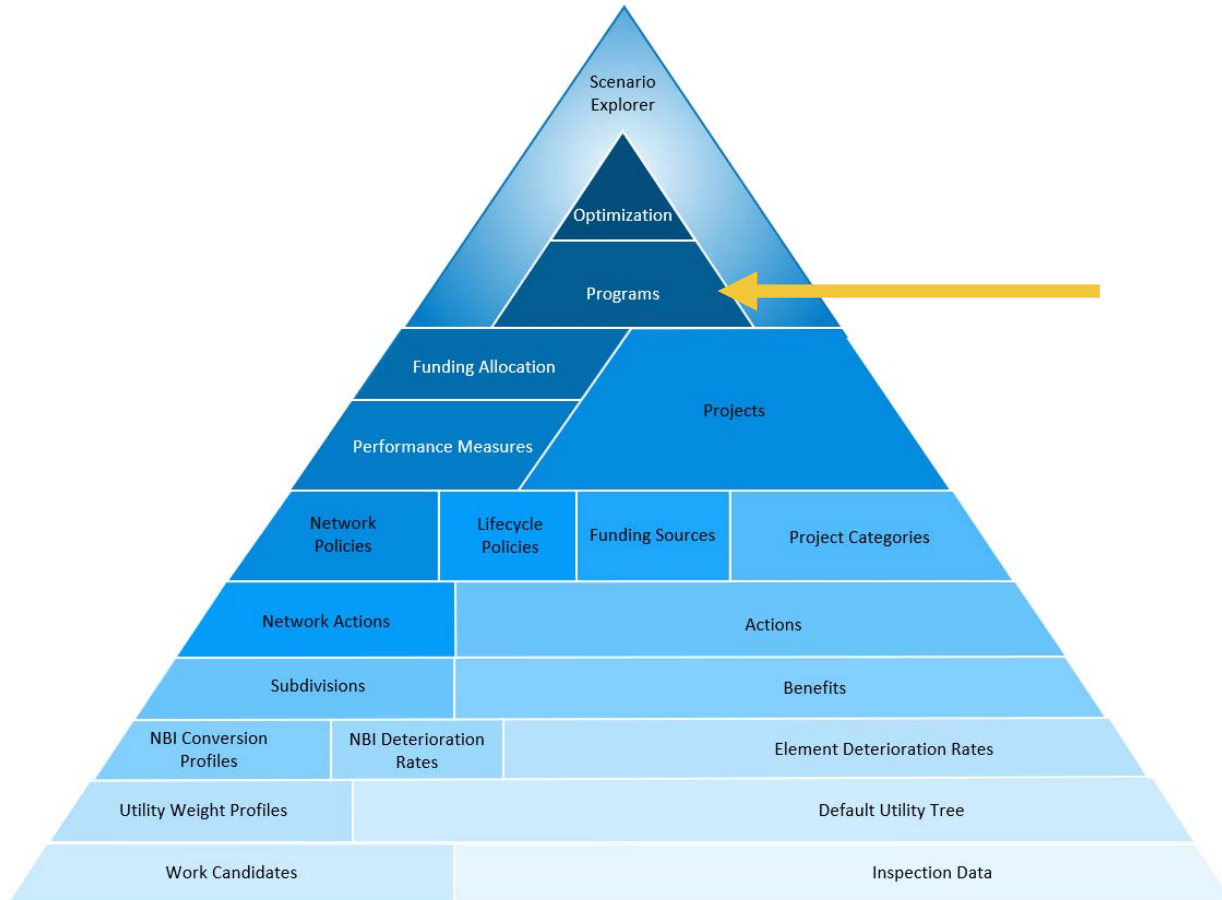
Create Project Categories for the different types of funding you have: Preservation, Rehab, Replacement, State Forces ...

**Set as Default Category**



# Program Setup

- Pyramid
- Where to start
- Inspection
- Utility
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- Network Policies
- Lifecycle Policies
- Project Categories
- Program Setup





# Program Setup

Programs > Create/Edit Programs

**Program Editor**

Program: Full Systems Test Create New Copy >>

---

**Program Details**

Program Alternate ID:  Program Status: Planned Program Start Year: 2018

Program Name: Full Systems Test Program URL:  Program End Year: 2021

Program Objectives: Undefined Structure Weights Formula: AZ Priority Required Minimum Cost: 50000

Bridge Filter: ADOT - Bridges

Program Description:

Program Notes:

---

**Configuration Data**

NBI Deterioration Method: ComponentLevelDeterioration

Long-Term Analysis Period: 50 Discount Rate: 4

Inflation Estimation Method: None

---

**Network Policies**

**Unassigned Network Policies:**

- Replace Deck
- AZ Culvert Replace
- AZ Sub Column Repair Only (1)
- Rehab Sub
- AZ Super Timber Repair Combination
- AZ Super Steel Replacement Combri
- Rehab Deck
- AZ Super Conc Replace Combination
- AZ Sub Column Replace Only (1)
- AZ Super Conc Major Combinations (
- AZ Culvert Conc Epoxy Inject (1)
- First Protective System
- AZ Sub Timber Splice Only (1)
- AZ Super Steel Minor Combinations (
- AZ Super Timber Replace Combinati
- AZ Super Conc Minor Combinations (
- Rehab Culvert
- Replace Culvert

**Assigned Network Policies:**

- AZ Culvert Steel Line (1)
- AZ Thin Overlay Combinations (32)
- AZ AC w/ Patching Combinations (36)
- AZ Bridge Replacement (1)
- AZ MMC Partial Combinations (36)
- AZ Polyester Conc Combinations (32)
- AZ Replace Deck Combinations (36)

$$W_{structure} = AADT \times Detour Length$$

Pyramid

Where to start

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Actions

Network Policies

Lifecycle Policies

Project Categories

Program Setup



# Program Setup

Programs > Create/Edit Programs

**Program Editor**

Program: Full Systems Test Create New Copy >>

---

**Program Details**

Program Alternate ID:  Program Status: Planned Program Start Year: 2018

Program Name: Full Systems Test Program URL:  Program End Year: 2021

Program Objectives: Undefined Structure Weights Formula: AZ Priority Required Minimum Cost: 50000

Bridge Filter: ADOT - Bridges {greater[1978]}{(bridge.yearbuilt)}+{greater[1972]}{(bridge.yearbuil

Program Description:

Program Notes:

---

**Configuration Data**

NBI Deterioration Method: ComponentLevelDeterioration

Long-Term Analysis Period: 50 Discount Rate: 4

Inflation Estimation Method: None

---

**Network Policies**

**Unassigned Network Policies:**

- Replace Deck
- AZ Culvert Replace
- AZ Sub Column Repair Only (1)
- Rehab Sub
- AZ Super Timber Repair Combination
- AZ Super Steel Replacement Combri
- Rehab Deck
- AZ Super Conc Replace Combination
- AZ Sub Column Replace Only (1)
- AZ Super Conc Major Combinations (
- AZ Culvert Conc Epoxy Inject (1)
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- AZ Sub Timber Splice Only (1)
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- AZ AC w/ Patching Combinations (36)
- AZ Bridge Replacement (1)
- AZ MMC Partial Combinations (36)
- AZ Polyester Conc Combinations (32)
- AZ Replace Deck Combinations (36)

$$W_{structure} = 2 - \left( \frac{AADT_{max} - AADT_{bridge}}{AADT_{max}} \right) - \left( \frac{Detour_{max} - Detour_{bridge}}{Detour_{max}} \right)$$

Pyramid

Where to start

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# Program Setup

Programs > Create/Edit Programs

**Program Editor**

Program: Full Systems Test Create New Copy >>

---

**Program Details**

Program Alternate ID:  Program Status: Planned Program Start Year: 2018

Program Name: Full Systems Test Program URL:  Program End Year: 2021

Program Objectives: Undefined Structure Weights Formula: AZ Priority Required Minimum Cost: 50000

Bridge Filter: ADOT - Bridges (greater[1978]((bridge.yearbuilt))+greater[1972]((bridge.yearbu

Program Description:

Program Notes:

---

**Configuration Data**

NBI Deterioration Method: ComponentLevelDeterioration

Long-Term Analysis Period: 50 Discount Rate: 4

Inflation Estimation Method: None

---

**Network Policies**

**Unassigned Network Policies:**

- Replace Deck
- AZ Culvert Replace
- AZ Sub Column Repair Only (1)
- Rehab Sub
- AZ Super Timber Repair Combination
- AZ Super Steel Replacement Combir
- Rehab Deck
- AZ Super Conc Replace Combination
- AZ Sub Column Replace Only (1)
- AZ Super Conc Major Combinations (
- AZ Culvert Conc Epoxy Inject (1)
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- AZ Bridge Replacement (1)
- AZ MMC Partial Combinations (36)
- AZ Polyester Conc Combinations (32)
- AZ Replace Deck Combinations (36)

$$\begin{aligned}
 W_{structure} &= Area_{deck} \\
 &\times \left[ 2 - \left( \frac{AADT_{max} - AADT_{bridge}}{AADT_{max}} \right) \right. \\
 &\quad \left. - \left( \frac{Detour_{max} - Detour_{bridge}}{Detour_{max}} \right) \right]
 \end{aligned}$$

- Pyramid
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# Program Setup

Programs > Create/Edit Programs

**Program Editor**

Program: Full Systems Test Create New Copy >>

**Program Details**

Program Alternate ID:  Program Status: Planned Program Start Year: 2018  
Program Name: Full Systems Test Program URL:  Program End Year: 2021  
Program Objectives: Undefined Structure Weights Formula: AZ Priority Required Minimum Cost: 50000  
Bridge Filter: ADOT - Bridges  $(greater[1978]((bridge.yearbuilt))+greater[1972]((bridge.yearbuilt)))$

Program Description:

Program Notes:

**Configuration Data**

NBI Deterioration Method: Component Level Deterioration  Residual HIX Approximation  
Long-Term Analysis Period: 50 Discount Rate: 4  
Inflation Estimation Method: None

**Network Policies**

**Unassigned Network Policies:**

- Replace Deck
- AZ Culvert Replace
- AZ Sub Column Repair Only (1)
- Rehab Sub
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- AZ Super Steel Replacement Comb
- Rehab Deck
- AZ Super Conc Replace Combination
- AZ Sub Column Replace Only (1)
- AZ Super Conc Major Combinations (
- AZ Culvert Conc Epoxy Inject (1)
- First Protective System
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- AZ Super Steel Minor Combinations (
- AZ Super Timber Replace Combinati
- AZ Super Conc Minor Combinations (
- Rehab Culvert
- Replace Culvert

**Assigned Network Policies:**

- AZ Culvert Steel Line (1)
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- AZ AC w/ Patching Combinations (36)
- AZ Bridge Replacement (1)
- AZ MMC Partial Combinations (36)
- AZ Polyester Conc Combinations (32)
- AZ Replace Deck Combinations (36)

For a very quick analysis, like a test run, turn the lifecycle timeframe to 0 years.

Pyramid

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# Program Setup

- Pyramid
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**Subdivision Profile**

Subdivision Profile:  **Subdivision Profile Segments** [Create/Edit Subdivision Profile](#)

Table Name	Field Name
bridge	district

**Filter Segments**

Add Filter Segments:   [Add](#)

Filter Segments:

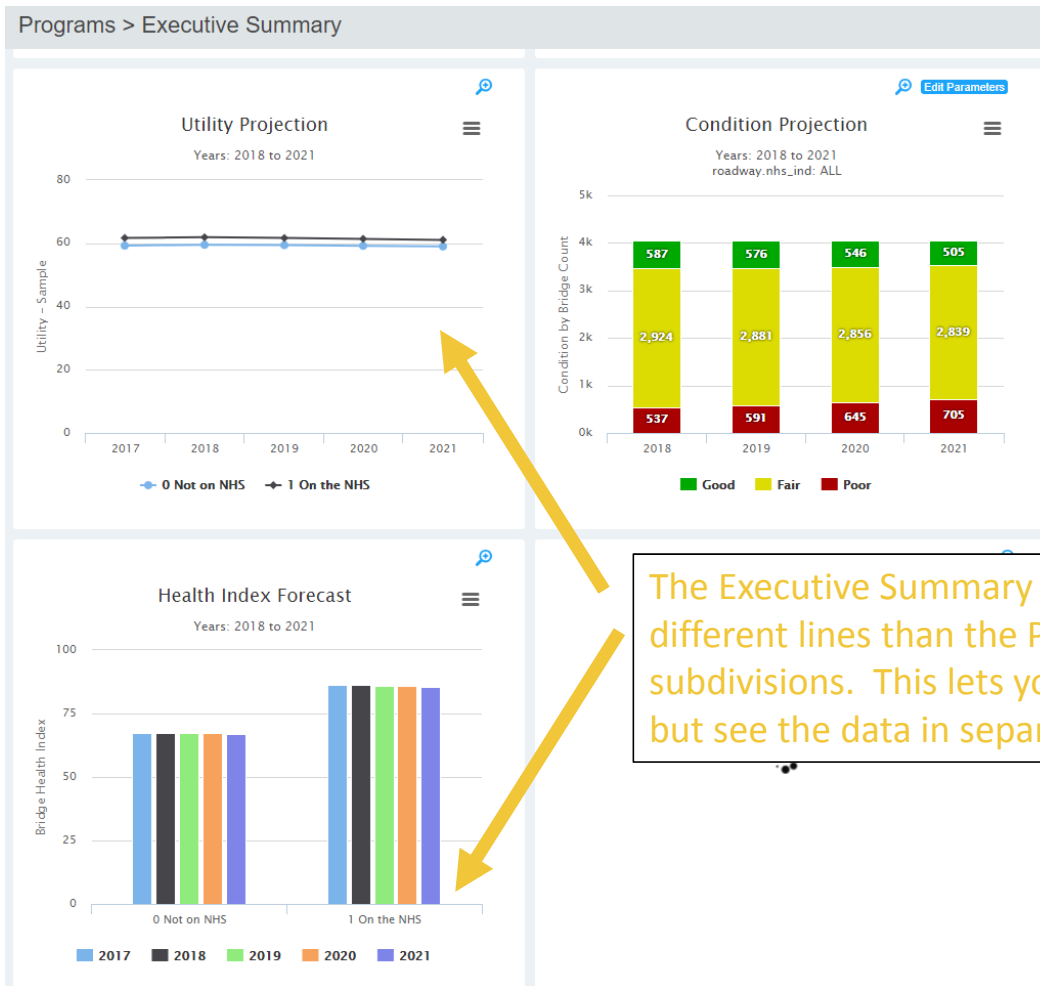
Index	Combinations	# of Bridges	
1	Central	1399	
2	Northeast	235	X
3	Northwest	465	X
4	Southeast	402	X
5	Southwest	373	X
Total:		2874	

Segments really only make sense when groups of bridges *cannot* share funds.



# Program Setup

- Pyramid
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- Network Policies
- Lifecycle Policies
- Project Categories
- Program Setup



The Executive Summary can be split along different lines than the Program subdivisions. This lets you share funding but see the data in separate formats.



# The Pyramid

## Pyramid

Where to start

Inspection

Utility

Benefits

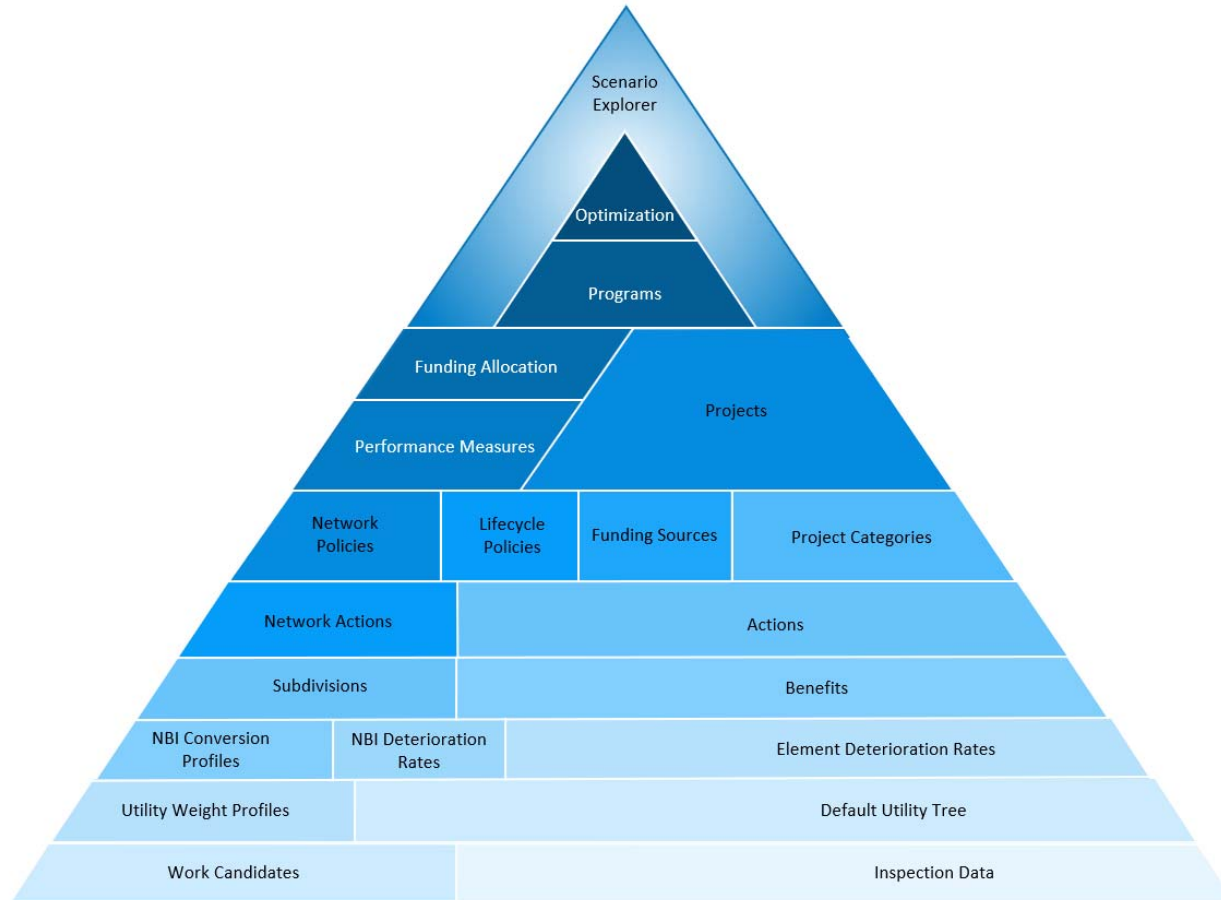
Actions

Network Policies

Lifecycle Policies

Project Categories

Program Setup





BrM Help Desk

[AASHTOWareBridge.com](http://AASHTOWareBridge.com)

[BrM@Bentley.com](mailto:BrM@Bentley.com)

JIRA tickets: [bridgeware.atlassian.net](https://bridgeware.atlassian.net)

Zachary Boyle, PE

BrM Solutions Consultant

[Zac.Boyle@Bentley.com](mailto:Zac.Boyle@Bentley.com)

Or add '@ZacBoyle' to your JIRA tickets