# 5.2.2 AASHTO Bridge Management Design and Overview

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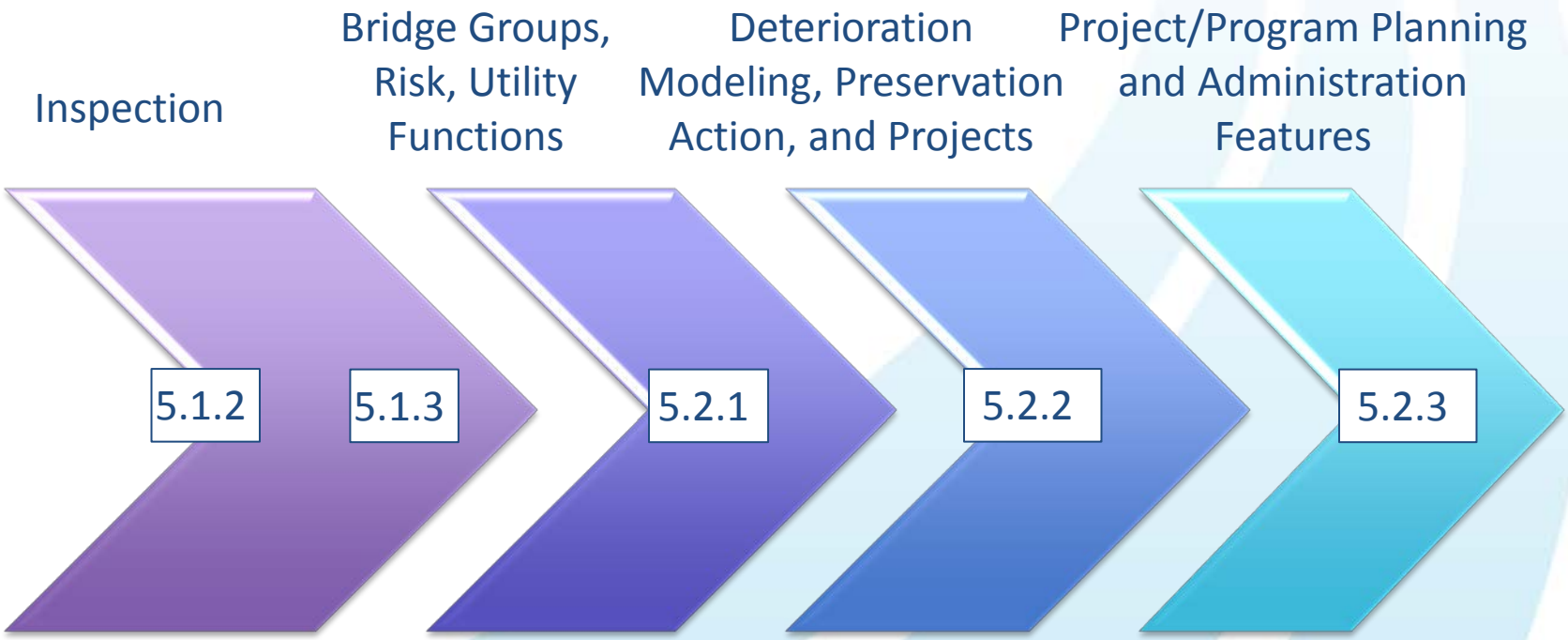
*Formerly*

# Outline of 5.X Presentations

- Presentation/Demonstration of 5.1.3
  - Support for AASHTO Elements
  - Currently Available!
- Presentation/Demonstration of 5.2.1
  - In last stage of updates and alpha testing
  - Onsite beta testing next month
- Presentation on next steps 5.2.2 / 5.2.3

# Pontis 5.2 Stages



# 5.2.1 Demo Part 2

- Dynamic filters, quick filters, and edit SQL filters
- New Layouts
- Bridge Analysis Groups (wizard or manual)
- GIS
- How to create/edit an action and benefit group

# GIS Requests

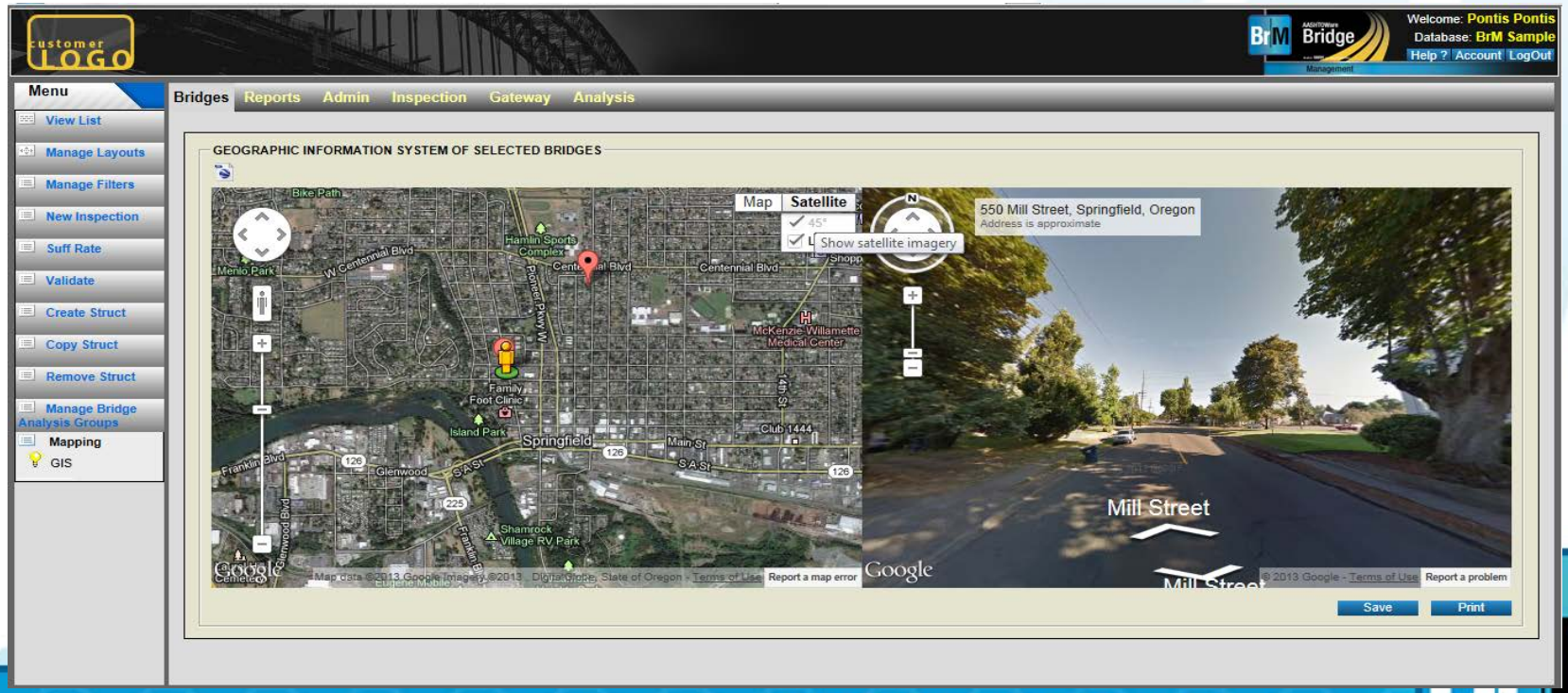
- Users already had the ability to generate filters (searches) and view results in a tabular grid format
- Users want to be able to easily visualize bridge information on a map
- Several other specific use cases were developed in which a map would provide assistance

# GIS Approach

- AASHTO Task Force and Bentley evaluated various options to meet user requets
- Main factors: web based, easy and intuitive to use, open API for integration, flexible licensing
- Variety of products identified
- Integrated Google Maps into the BrM product, allowing users to have a GIS system integrated into their existing Bridge Management product
- Ability to export to KML format

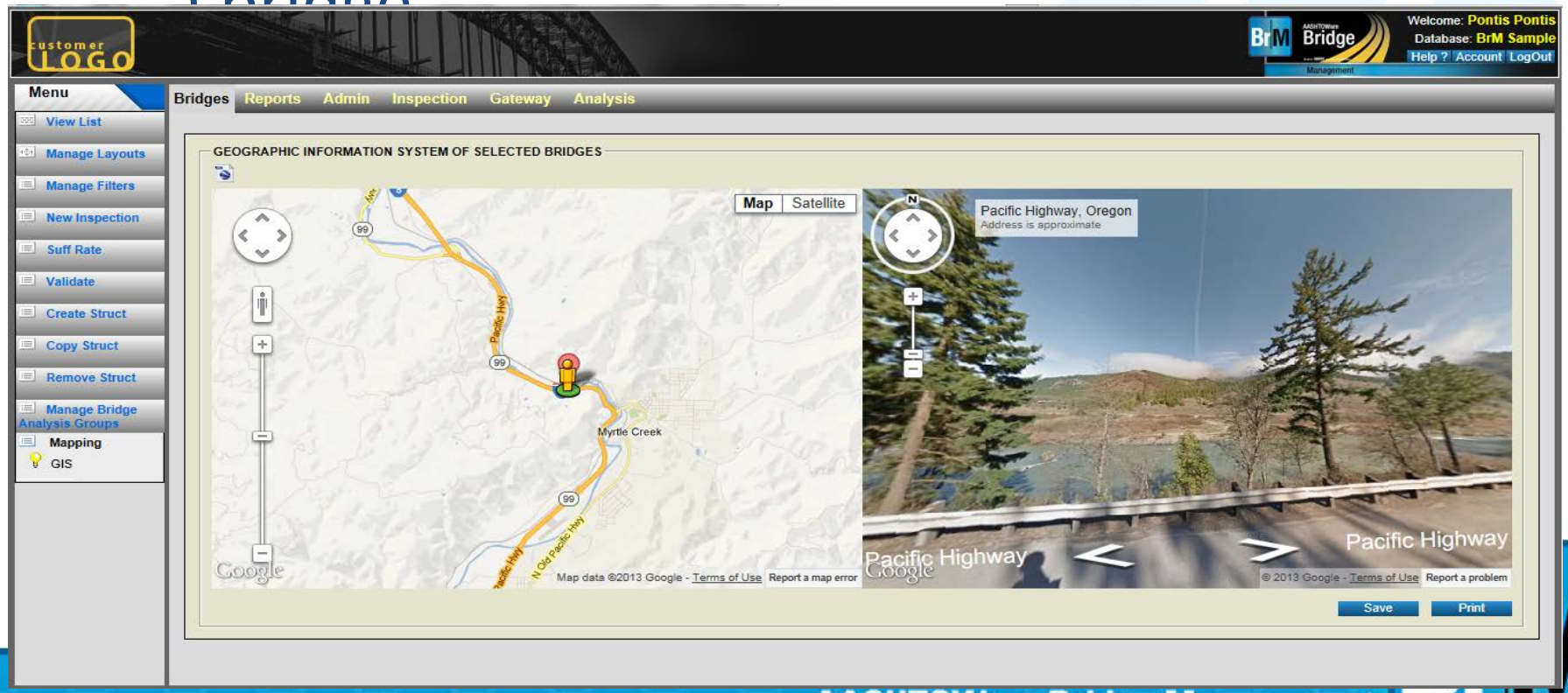
# Embedded dual view capability

- Displaying standard Google Maps view, as well as Google Maps Satellite view, this allows users to better determine location of bridges



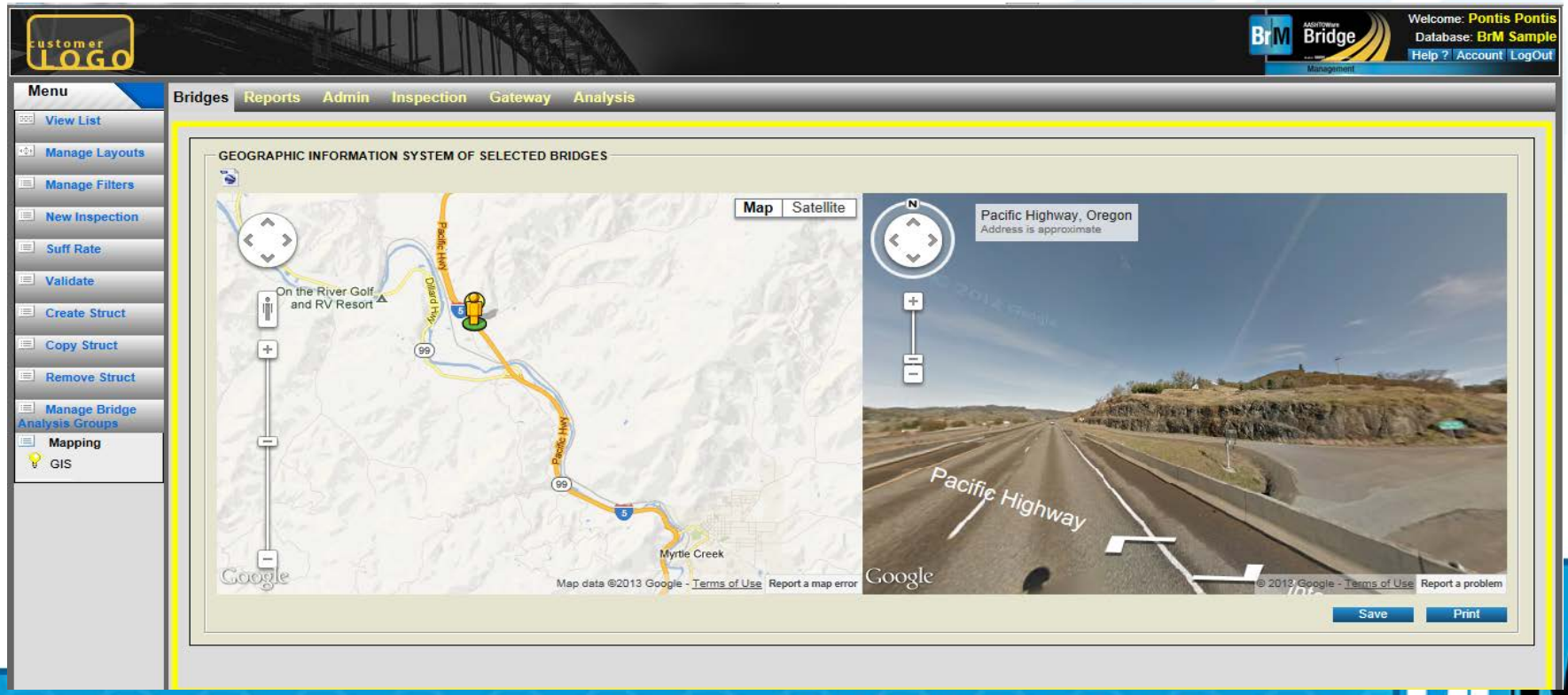
# StreetView

- Allows users to use streetview to view the area surrounding a bridge



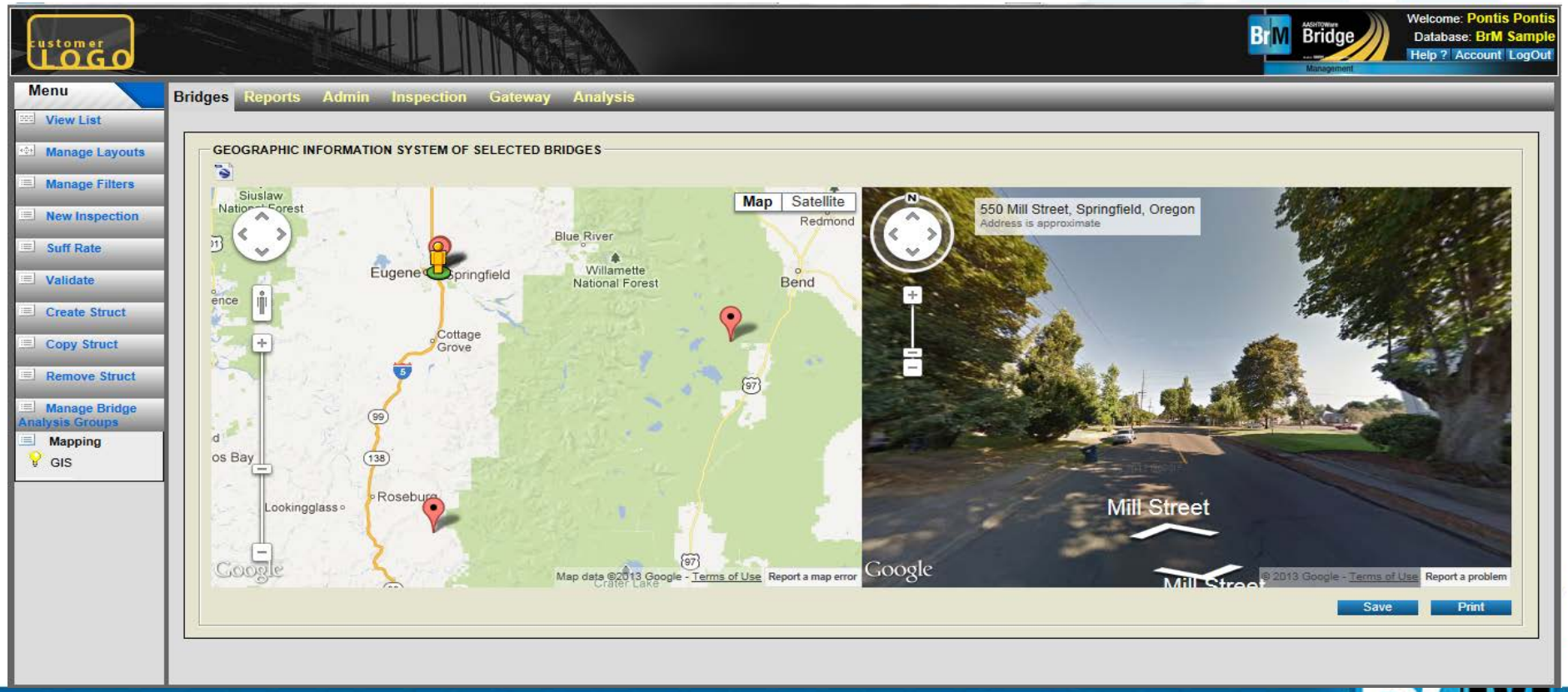
# Correct placement of bridges

- Allows users to relocate the associated GPS coordinates of a bridge, ensuring better accuracy



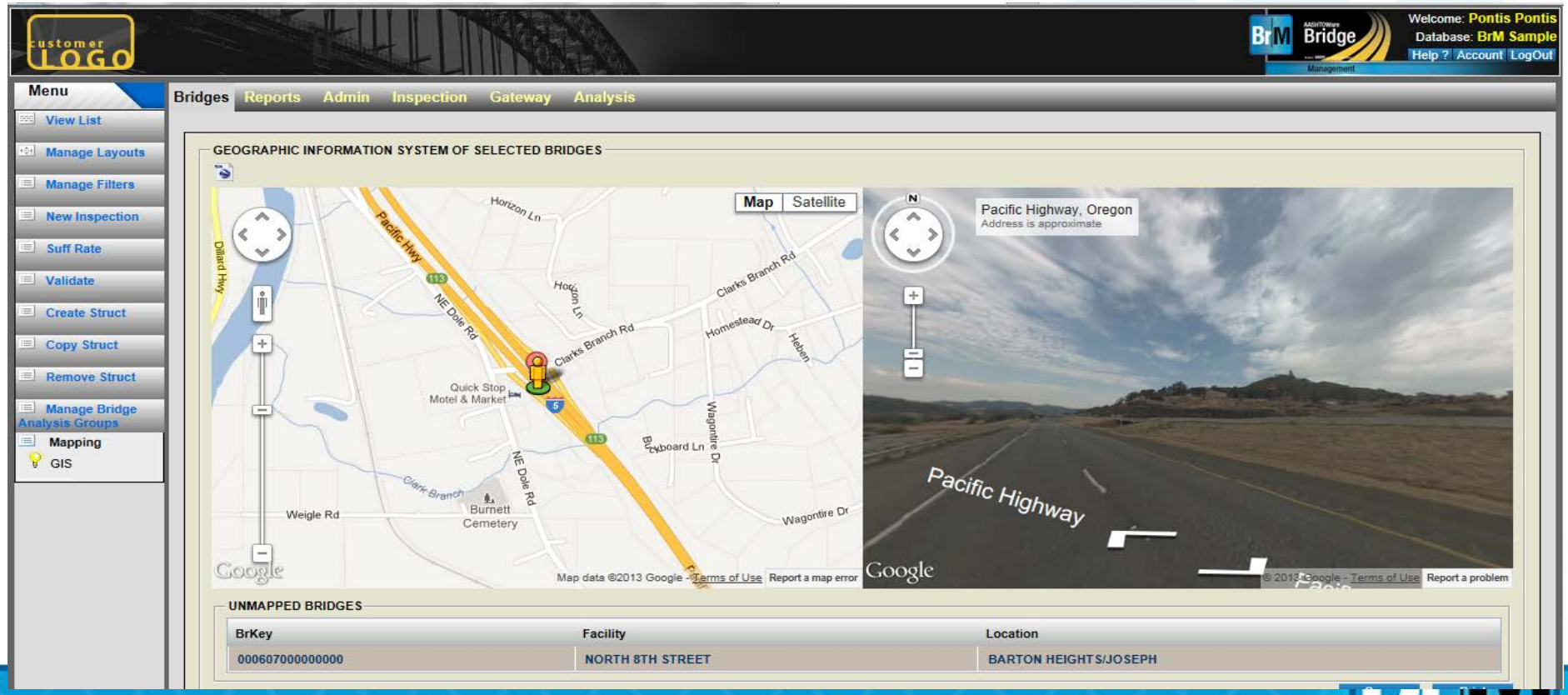
# Easily locate new bridges

- Plots many bridges at a time, allowing agencies to plot groups of bridges at a time, and to print out the results

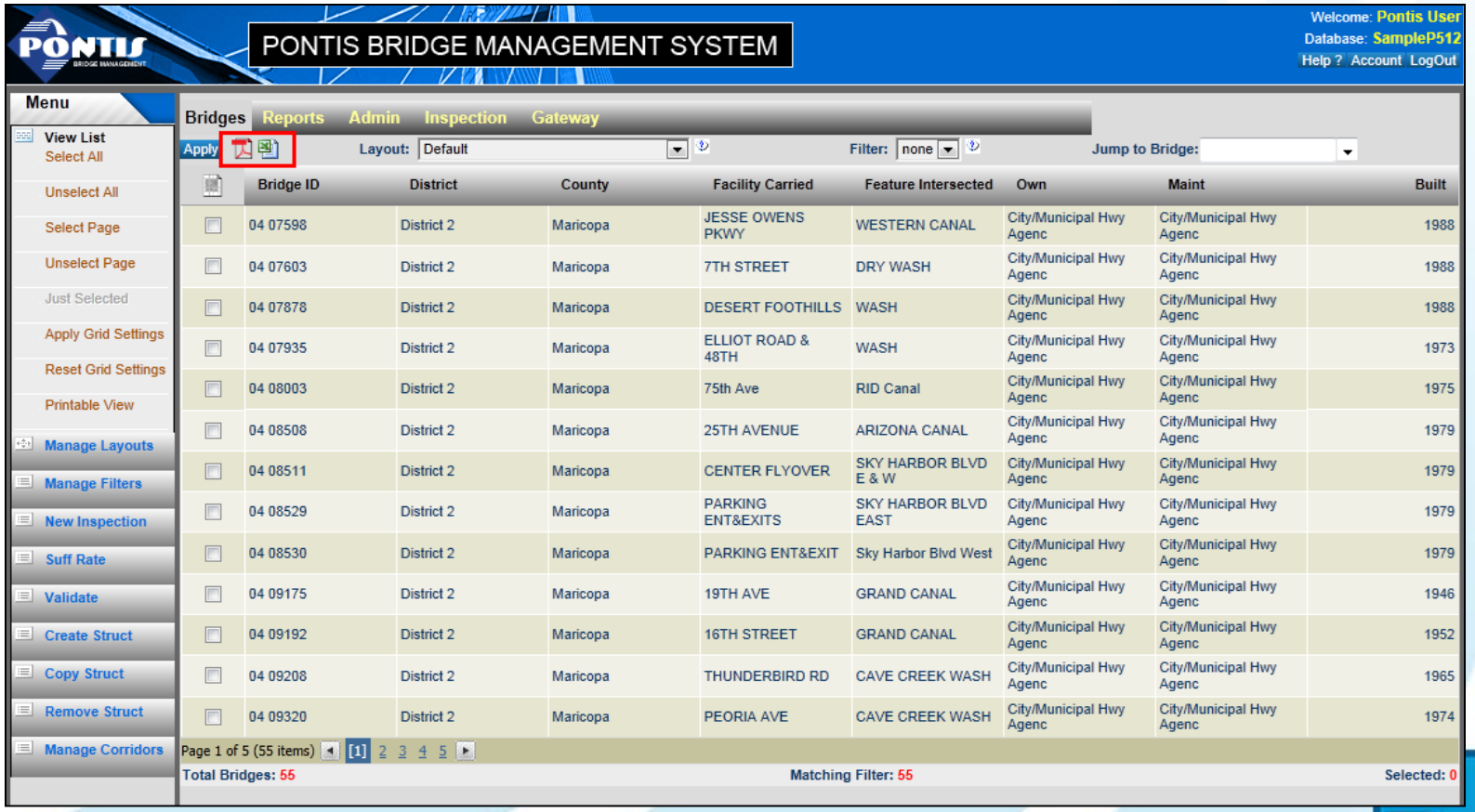


# Verification

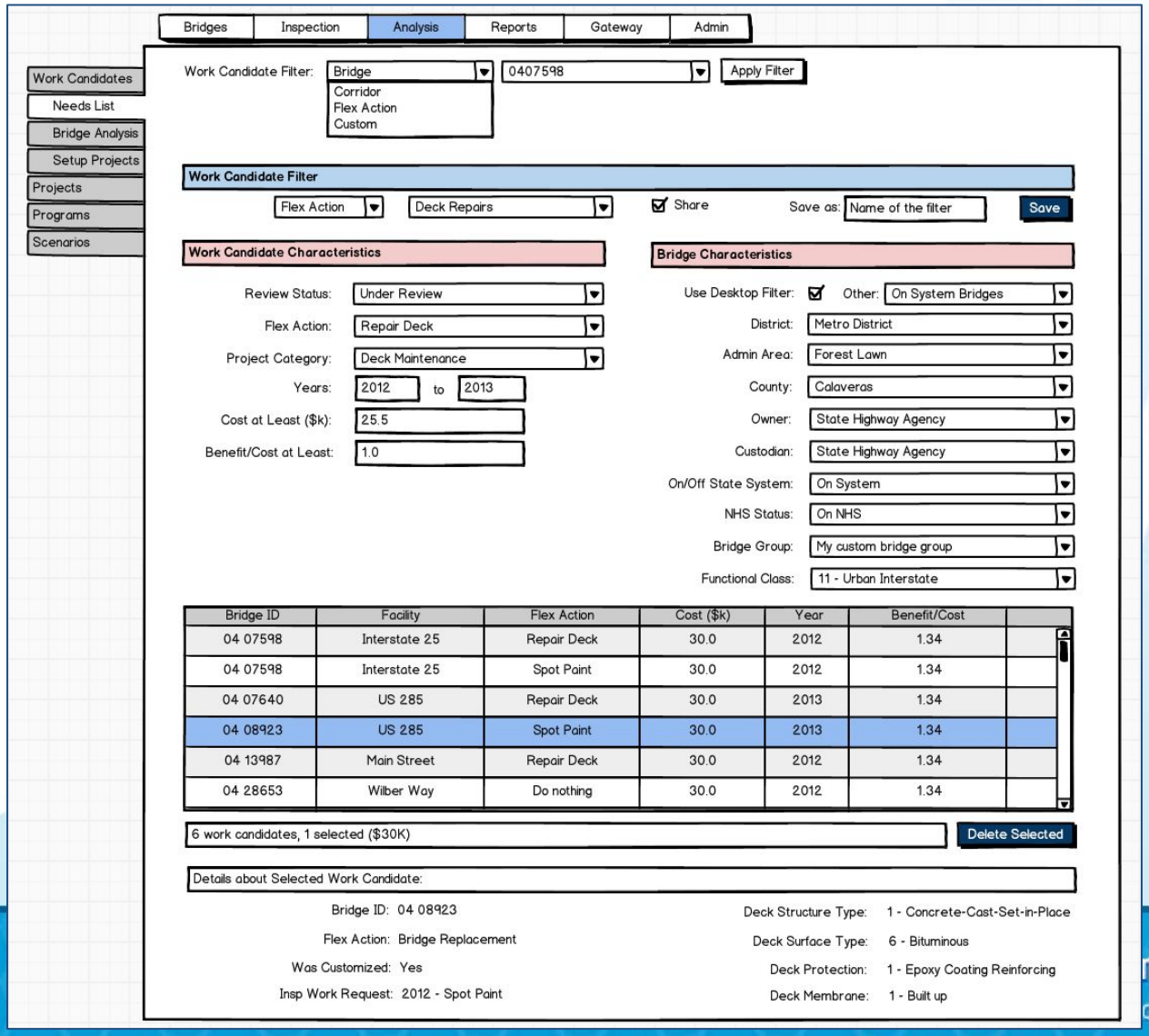
- Allows agencies to view bridges that have invalid coordinates, and to map them appropriately



# Excel/PDF Outputs



# Needs List


Bridges
Inspection
Analysis
Reports
Gateway
Admin
Work Candidates
Needs List
Bridge Analysis
Setup Projects
Projects
Programs
Scenarios
Work Candidate Filter:
Bridge
0407598
Apply Filter
Corridor
Flex Action
Custom
Work Candidate Filter
Flex Action
Deck Repairs
Share
Save as:
Name of the filter
Save
Work Candidate Characteristics
Review Status:
Under Review
Flex Action:
Repair Deck
Project Category:
Deck Maintenance
Years:
2012
to
2013
Cost at Least ($k):
25.5
Benefit/Cost at Least:
1.0
Bridge Characteristics
Use Desktop Filter:
Other:
On System Bridges
District:
Metro District
Admin Area:
Forest Lawn
County:
Calaveras
Owner:
State Highway Agency
Custodian:
State Highway Agency
On/Off State System:
On System
NHS Status:
On NHS
Bridge Group:
My custom bridge group
Functional Class:
11 - Urban Interstate
Bridge ID
Facility
Flex Action
Cost ($k)
Year
Benefit/Cost
04 07598
Interstate 25
Repair Deck
30.0
2012
1.34
04 07598
Interstate 25
Spot Paint
30.0
2012
1.34
04 07640
US 285
Repair Deck
30.0
2013
1.34
04 08923
US 285
Spot Paint
30.0
2013
1.34
04 13987
Main Street
Repair Deck
30.0
2012
1.34
04 28653
Wilber Way
Do nothing
30.0
2012
1.34
6 work candidates, 1 selected ($30K)
Delete Selected
Details about Selected Work Candidate:
Bridge ID: 04 08923
Flex Action: Bridge Replacement
Was Customized: Yes
Insp Work Request: 2012 - Spot Paint
Deck Structure Type: 1 - Concrete-Cast-Set-in-Place
Deck Surface Type: 6 - Bituminous
Deck Protection: 1 - Epoxy Coating Reinforcing
Deck Membrane: 1 - Built up

# 5.2.2+ Highlights

- Database overhaul
- API integration and cross browser compatibility
- Deterioration Modeling
- Support for Preservation Actions/Benefits
- Project Planning

# Database overhaul for New NBEs

- The database overhaul will help to normalize the BrM database, increase performance and allow for full integration of new NBEs.

- Full integration of the new NBEs, as well as their associated support and handling with modeling
  - Element Categories
  - Element Classes
  - Element Inventory
  - Standardize condition data in database (quantities, calculated percents)
  - Standardize  and streamline database tables
  - **Convert agency usage to views to retrieve data (rather than direct tables)**

# Identifying and Recording Elements

- Standardized numbering
- Standard element classes
  - NBE, BME, ADE
- Standard element major categories
  - Superstructure, substructure, etc.
- Standard element categories
- History of element inventory
- Ongoing inspection of element condition

# Database Normalization

- Store only state quantities, calculate state percentages
  - Provide off the shelf view that will calculate percentages, to allow easier to digest information for users reliant on this feed.
- Store overall element quantity as element inventory item

# Element Inventory

- Element inventory table will track bridge element changes over time.
  - Changes related to any element attributes will create a new historical inventory record in the inventory table. For example:
    - Total Quantity
    - Structure Unit
    - Environment
    - Element Number

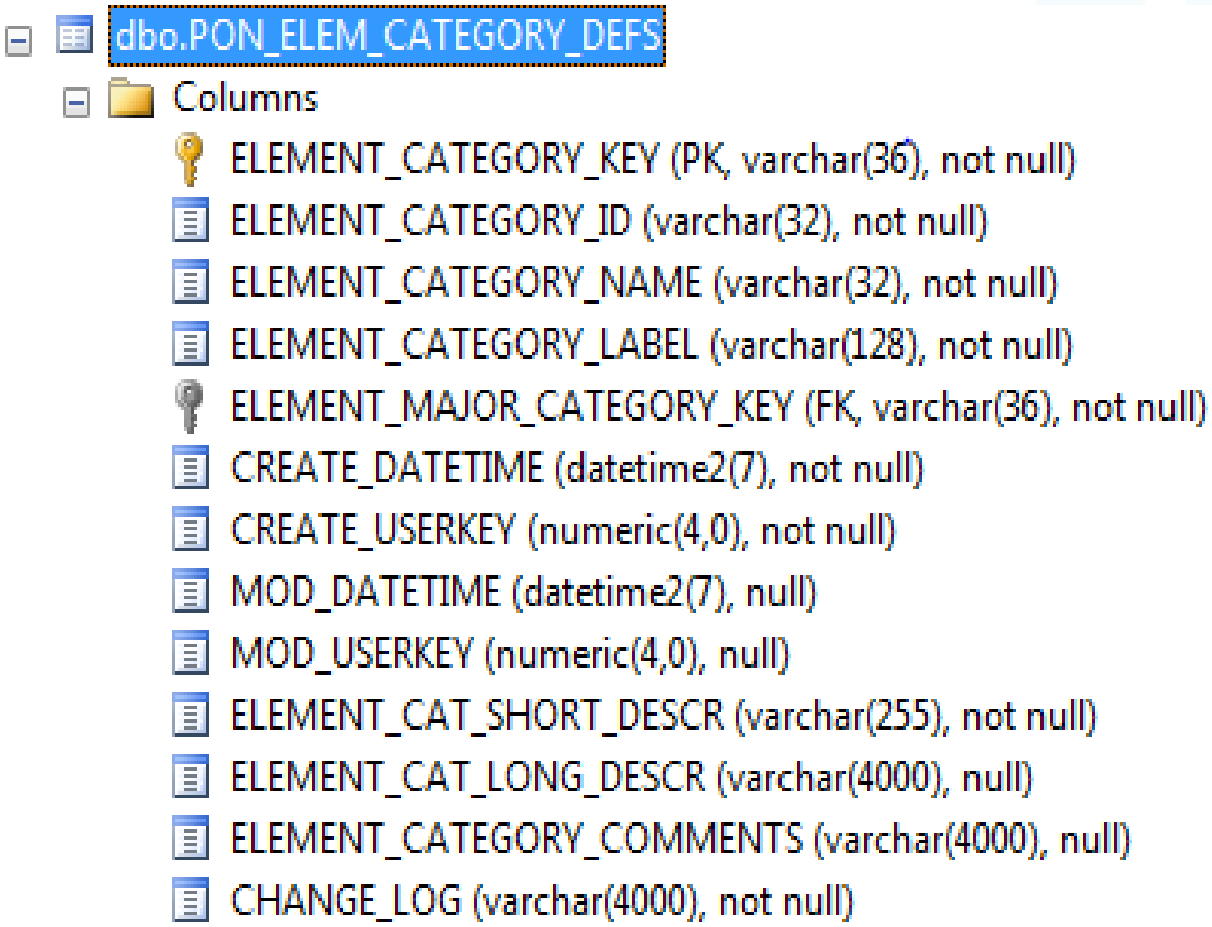
# Implementing Utility Functions

- Create a multi-objective framework that can be used to show the value (utility) of an action for a bridge
- Utility will also be shown for each sub-area
  - Mobility
  - Condition
  - Risk
  - Life Cycle Cost (5.2.2 / deterioration models needed)
- Work candidates are evaluated for how they contribute to mobility, lifecycle cost, condition and risk weightings

# Table Standardizations

- Virtually all tables have GUID primary key
  - Not attributes
  - Globally unique
  - Support replication (field inspection)
  - Single primary key / foreign key joins
    - Multi-part key joins largely removed
- Views will be created that will provide a more seamless transition for existing feeds and reports

# Example Definitional Table



# API Integration

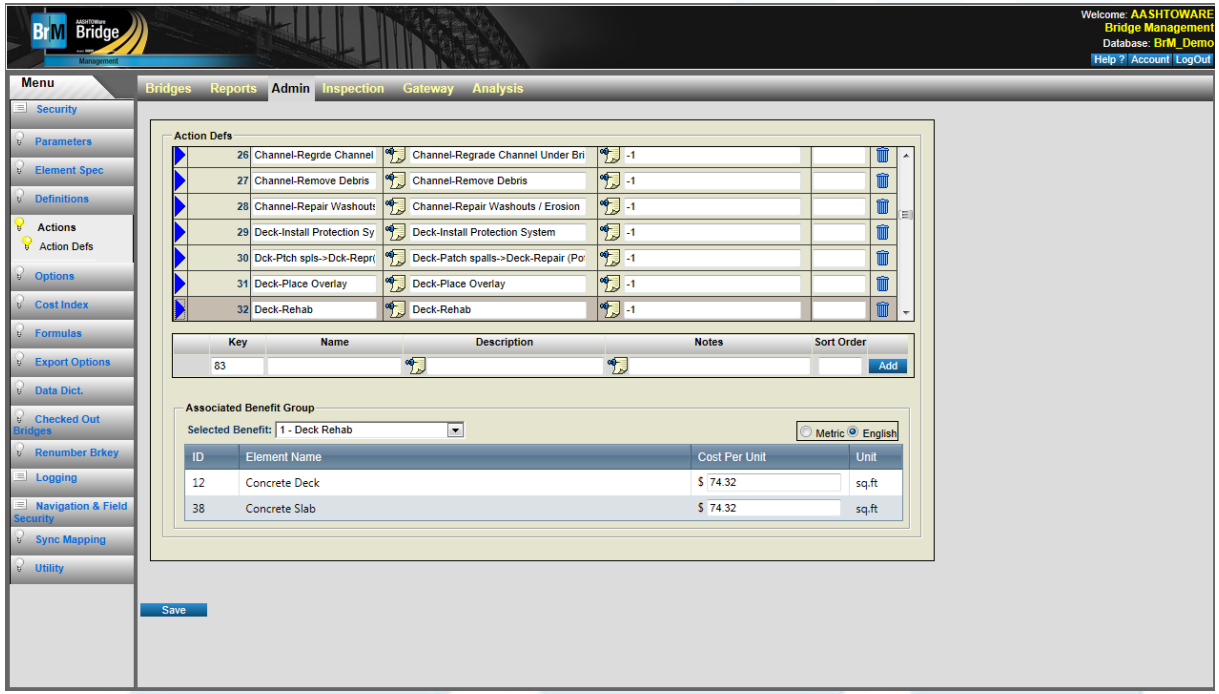
- Creating API to allow BrM to interface with external agency software
  - Reduce reliance on direct database calls.
  - Reduce risk of BrM internal structure changes breaking custom agency forms, reports, and data feeds.
  - Allow re-use of BrM built-in functionality pieces
  - Integration into Bentley or 3rd party plug-ins.

# Cross browser compatibility

- Support for all major browsers
  - IE 8,9,10+
  - Chrome
  - Firefox
  - Safari
- Stabilize BrM interface as new browsers and versions are released and legacy browsers lose support
- Allow for newer technologies to be integrated in the future (e.g. HTML5)

# Actions

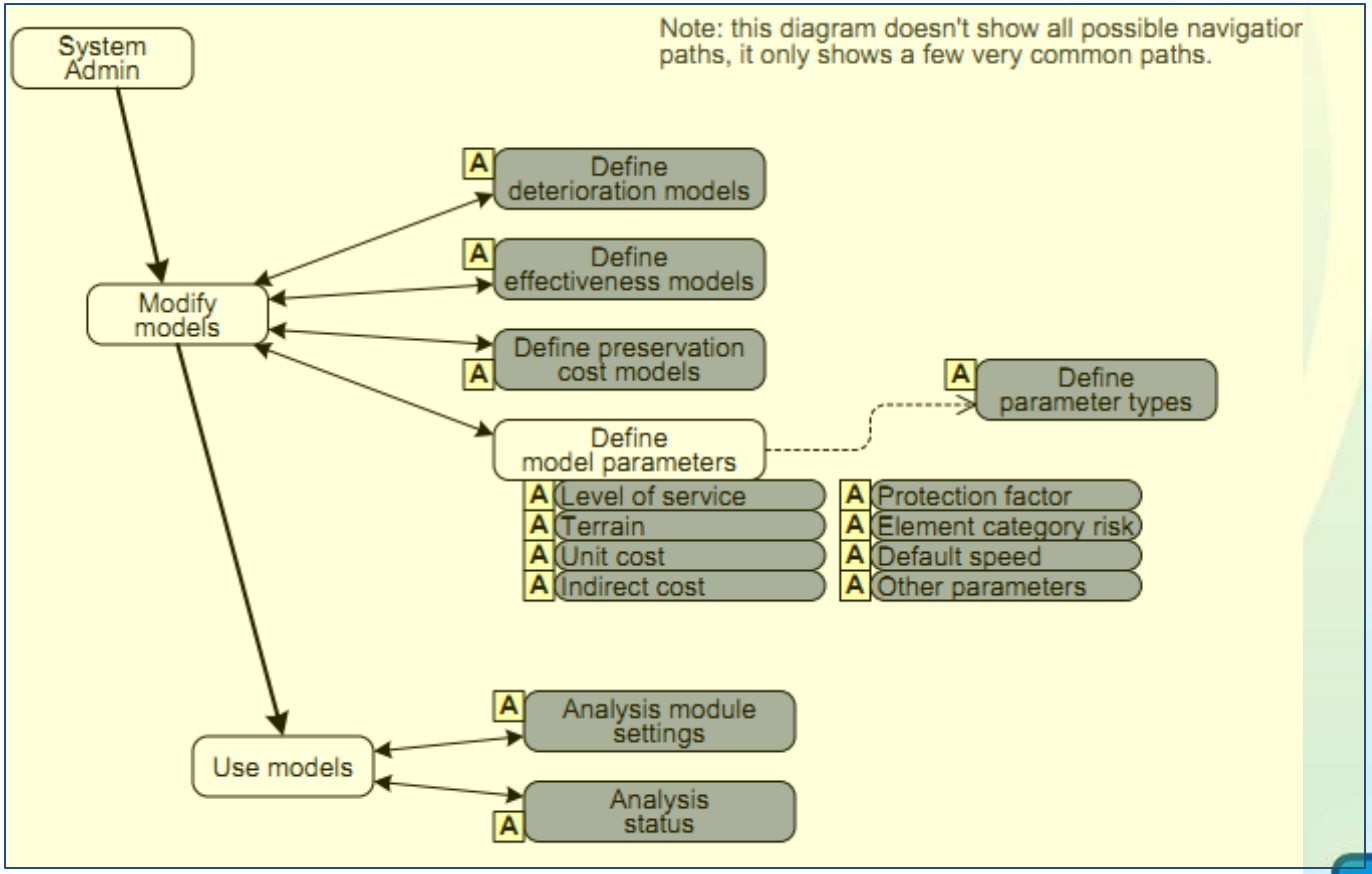
- Default Actions supplied by TRT
- Apply element costs to actions
- Attach actions to benefit groups



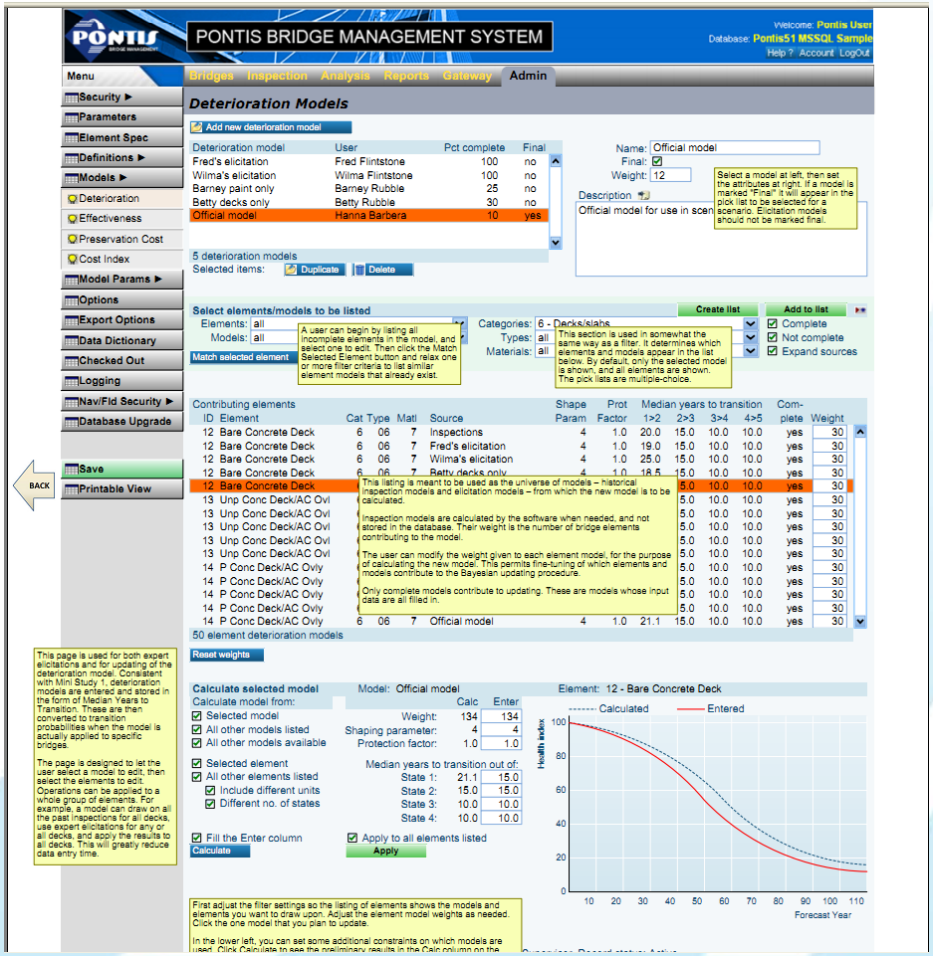
# Deterioration Modeling

- Implement new deterioration model logic
  - Weibull approach to include time factor
- Easy to construct/new elicitation process
- Utilize AASHTO  Elements
  - Protective Systems
  - Defect Flags
- Allow for Multi-path deterioration

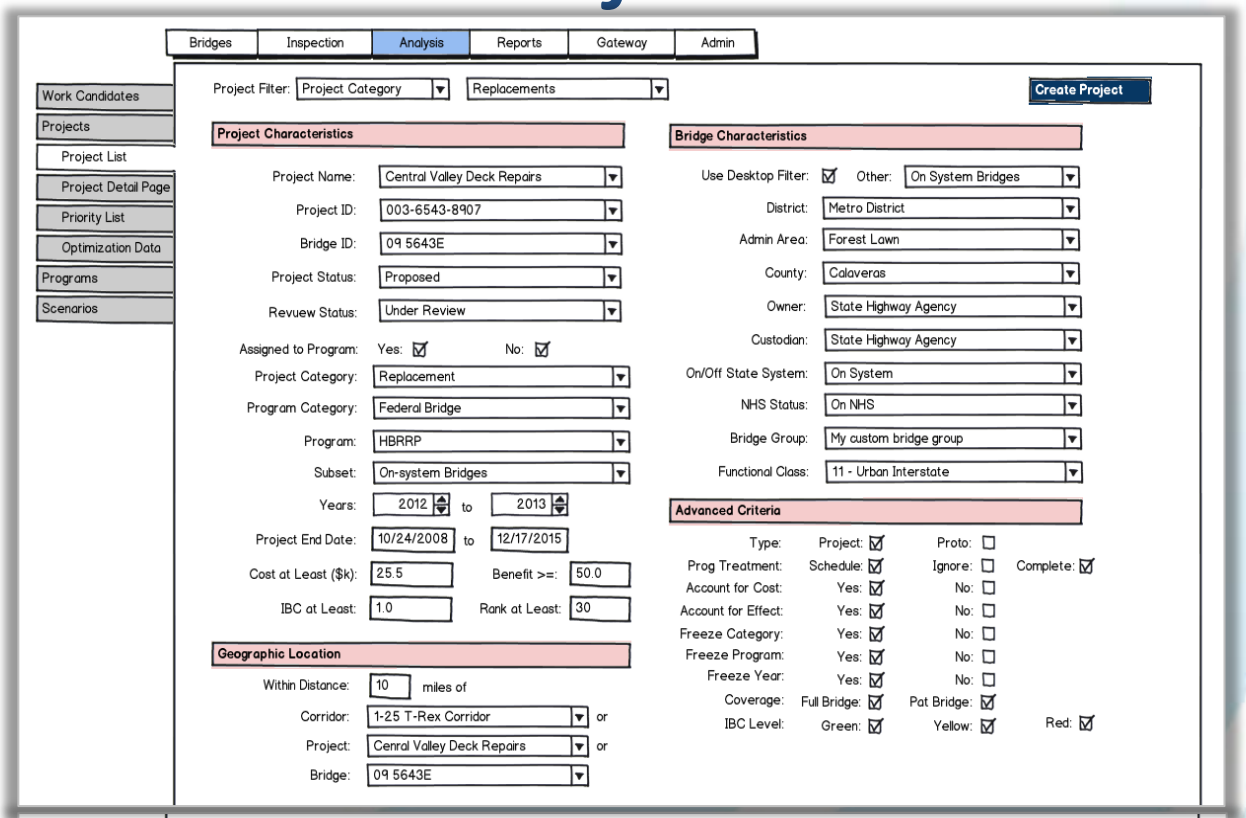
# Deterioration Modeling



# Deterioration Modeling



# Project List




Go to Project: Replace 123456

| Project Name | Project ID | Category | Program | Year | Treatment | Status | Cost ($K) |
|---|---|---|---|---|---|---|---|
| Replace 123456 | 003-6543-8970 | Replacement | HBRRP | 2012 | Comp CPY | Proposed | 30.5 |
| Replace 123456 | 003-6543-8970 | Replacement | State | 2012 | Sched CE | Proposed | 30.5 |
| Replace 123456 | 003-6543-8970 | Replacement | HBRRP | 2012 | Comp C | Proposed | 36.5 |
| Replace 123456 | 003-6543-8970 | Replacement | State | 2013 | Ignore | Proposed | 21.0 |
| Replace 123456 | 003-6543-8970 | Replacement | State | 2012 | Comp CPY | Proposed | 19.5 |
| Replace 123456 | 003-6543-8970 | Replacement | HBRRP | 2012 | Comp CE | Proposed | 30.5 |

6 Projects, 1 Selected ($36.5K)

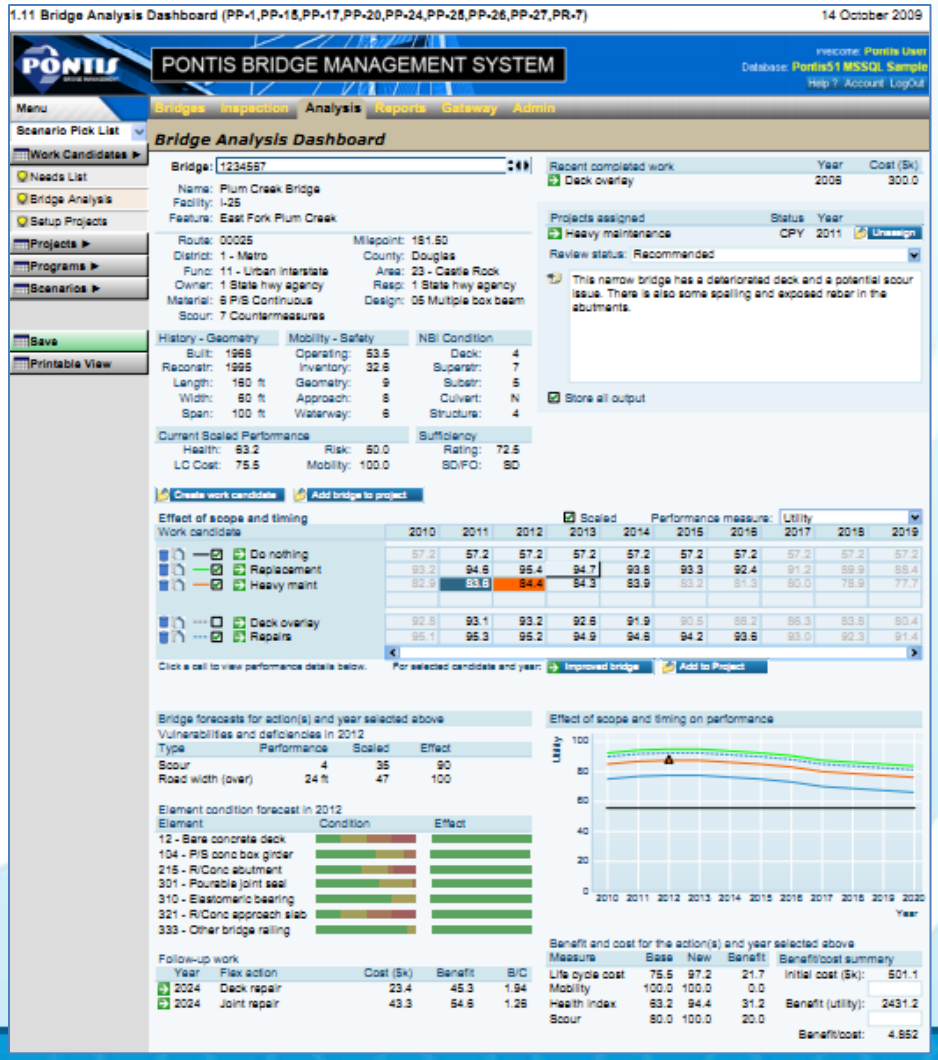
Selected Project(s)

Delete

# Project Planning and Bridge Level Analysis

- Bridge Level Analysis
  - Show the list of specific needs by bridge and all the associated details and the ability to filter needs by any field and see detailed information. The dashboard will show the basic bridge statistics, information on a bridge's vulnerability/risks and other utility function related items including their weights and combined results.

# Project Planning and Bridge Analysis



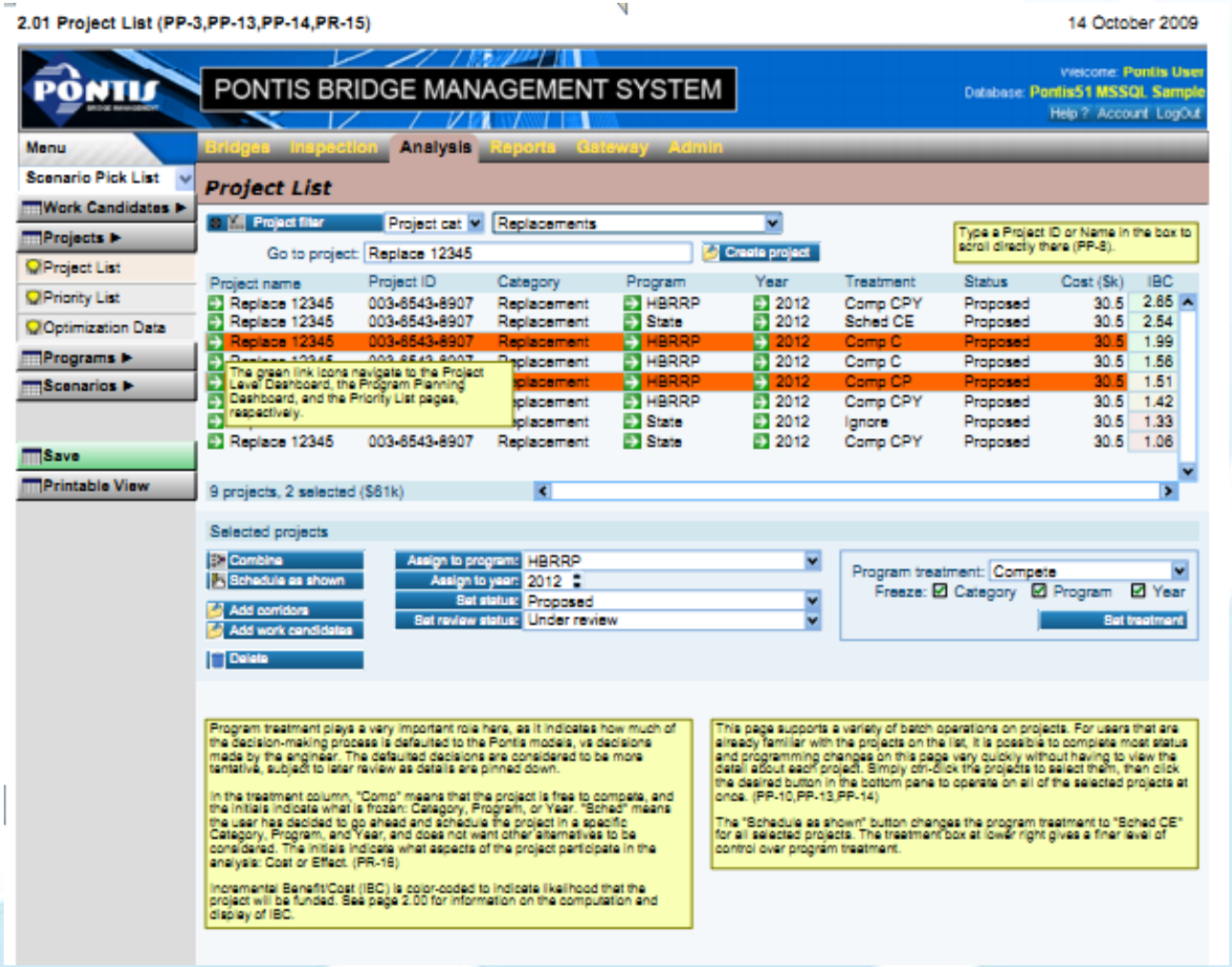

AASHTOWare Bridge Management

www.AASHTOWareBridge.com

# Project Planning and Bridge Level Analysis

- Project Planning
  - Ability to create and view projects .
  - Define projects by grouping together work items and bridges
  - Determine cost and effectiveness of projects and the end result of performing the selected work on the selected bridges.
  - Dashboards to view higher level numbers and effects, while also being able to drill down to specific results and details

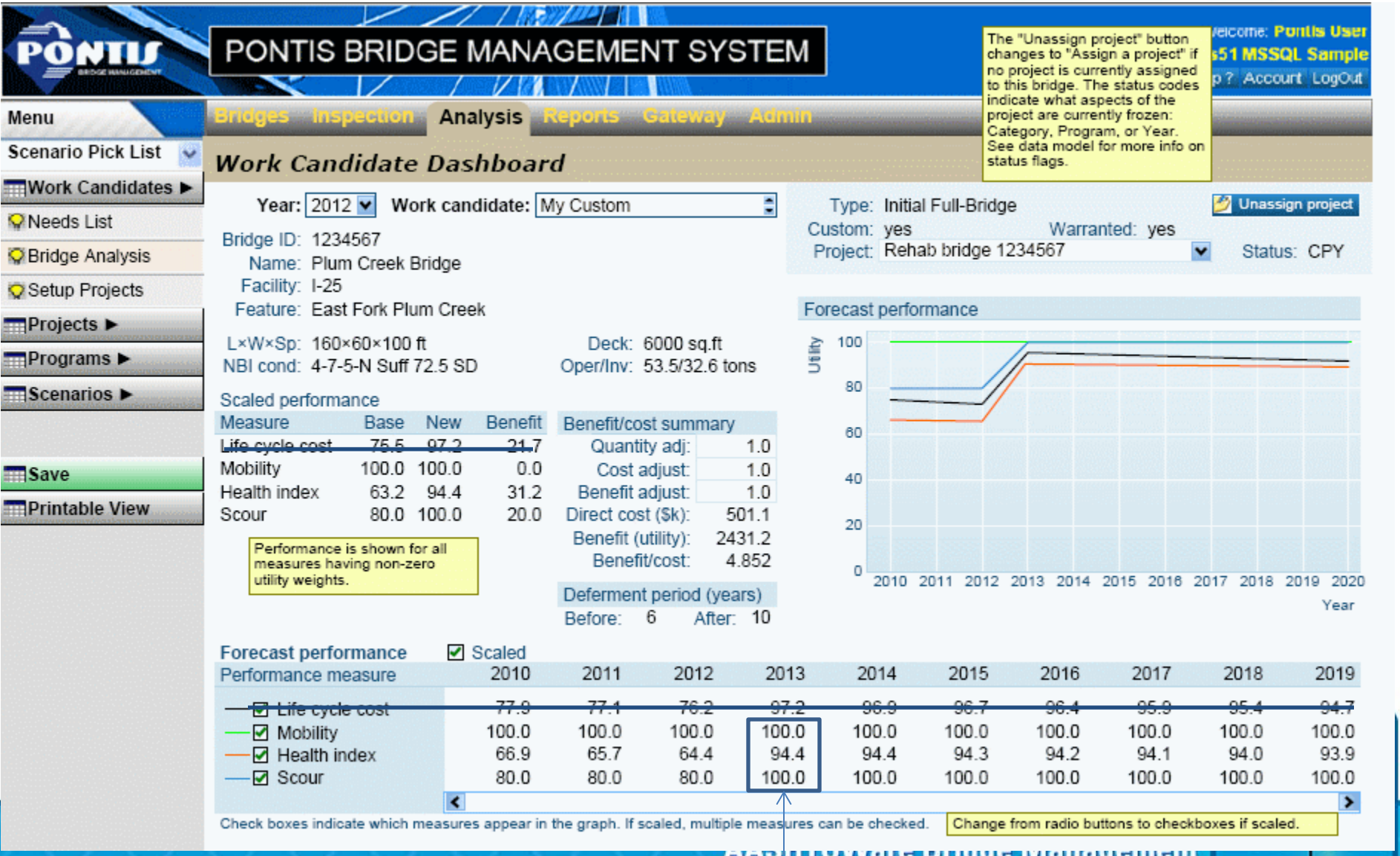
# Project Planning and Bridge Analysis



# Phase III (5.2.3)

- Completion of programming module
  - Projects
  - Programs
- Scenario Creation
- Results Browsing/Dashboards
- Additional administration features
- Complete Project Planning module

# Bridge Level Screens –Supporting Future Years




For Phase 1C – look only at effect of action in current year. Can do future years with deterioration model

PONTIS BRIDGE MANAGEMENT SYSTEM

Welcome: Pontis User
Database: Pontis51 MSSQL Sample
Help ? Account LogOut

Menu

Bridges Inspection Analysis Reports Gateway Admin

Scenario Pick List

- Work Candidates ▶
- Needs List
- Bridge Analysis
- Setup Projects
- Projects ▶
- Programs ▶
- Scenarios ▶
- Save
- Printable View

# Work Candidate Dashboard

Year: 2012 Work candidate: My Custom

Type: Initial Full-Bridge — Unassign project
Custom: yes Warranted: yes
Project: Rehab bridge 1234567 Status: CPY

Bridge ID: 1234567
Name: Plum Creek Bridge
Facility: I-25
Feature: East Fork Plum Creek

L×W×Sp: 160×60×100 ft
NBI cond: 4-7-5-N Suff 72.5 SD
Deck: 6000 sq.ft
Oper/Inv: 53.5/32.6 tons

Scaled performance

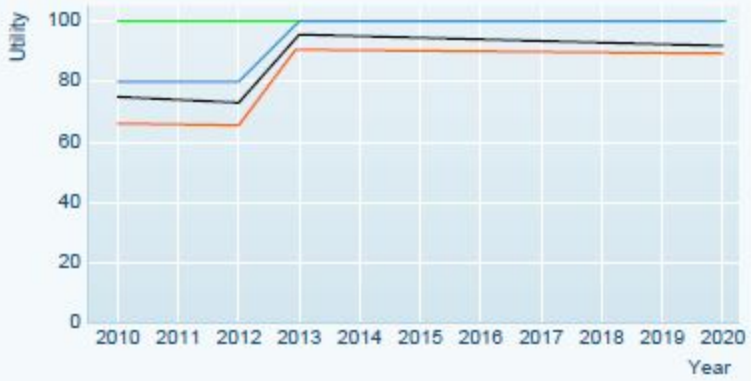
| Measure | Base | New | Benefit |
|---|---|---|---|
| Life cycle cost | 75.5 | 97.2 | 21.7 |
| Mobility | 100.0 | 100.0 | 0.0 |
| Health index | 63.2 | 94.4 | 31.2 |
| Scour | 80.0 | 100.0 | 20.0 |

Benefit/cost summary

| | |
|---|---|
| Quantity adj: | 1.0 |
| Cost adjust: | 1.0 |
| Benefit adjust: | 1.0 |
| Direct cost ($k): | 501.1 |
| Benefit (utility): | 2431.2 |
| Benefit/cost: | 4.852 |

Deferment period (years)
Before: 6 After: 10

Forecast performance




Forecast performance ☑ Scaled

| Performance measure | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|
| ☑ Life cycle cost | 77.9 | 77.1 | 76.2 | 97.2 | 96.9 | 96.7 | 96.4 | 95.9 | 95.4 | 94.7 |
| ☑ Mobility | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| ☑ Health index | 66.9 | 65.7 | 64.4 | 94.4 | 94.4 | 94.3 | 94.2 | 94.1 | 94.0 | 93.9 |
| ☑ Scour | 80.0 | 80.0 | 80.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Check boxes indicate which measures appear in the graph. If scaled, multiple measures can be checked.

Add work task

| Flex action | Warrant | Performance After | Performance Base | Utility Benefit | Direct Cost ($k) | B/C | Template |
|---|---|---|---|---|---|---|---|
| ☑ Replace wearing surf | yes | | | 538.34 | 156.5 | 3.44 | |
| 12 - Bare concrete deck (6000 sq.ft) | yes | | | | | | |
| 321 - R/Conc approach slab (2 ea) | no | | | | | | |
| Health index | | 100 | 65 | | | | |
| Concrete repair | yes | | | 23.3 | 34.3 | 0.68 | |
| 104 - P/S conc box girder (1120 lf) | yes | | | | | | |
| State 1: Do nothing | | 700 | 0 | | | | |
| State 2: Patch concrete | | 300 | 120 | | | | |

Printable View

| | | | |
|---|---|---|---|
| Health index | 63.2 | 94.4 | 31.2 |
| Scour | 80.0 | 100.0 | 20.0 |

| | |
|---|---|
| Benefit adjust: | 1.0 |
| Direct cost ($k): | 501.1 |
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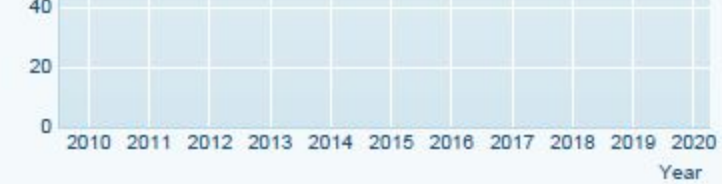
| Benefit/cost: | 4.852 |

Deferment period (years)
Before: 6 After: 10

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|---|---|---|---|---|---|---|---|---|---|---|
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| ☑ Mobility | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| ☑ Health index | 66.9 | 65.7 | 64.4 | 94.4 | 94.4 | 94.3 | 94.2 | 94.1 | 94.0 | 93.9 |
| ☑ Scour | 80.0 | 80.0 | 80.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

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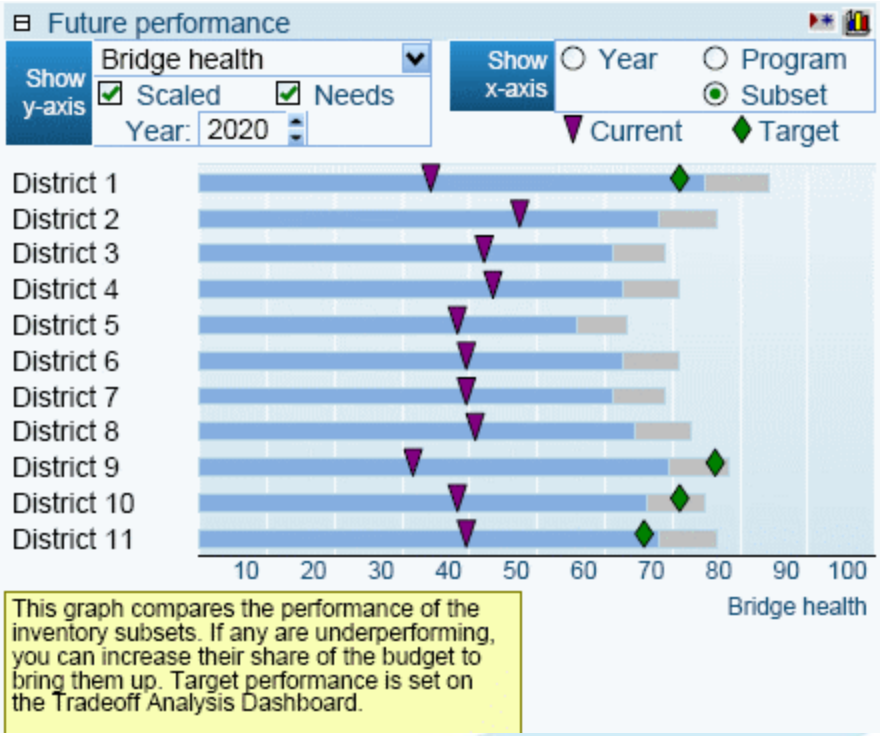
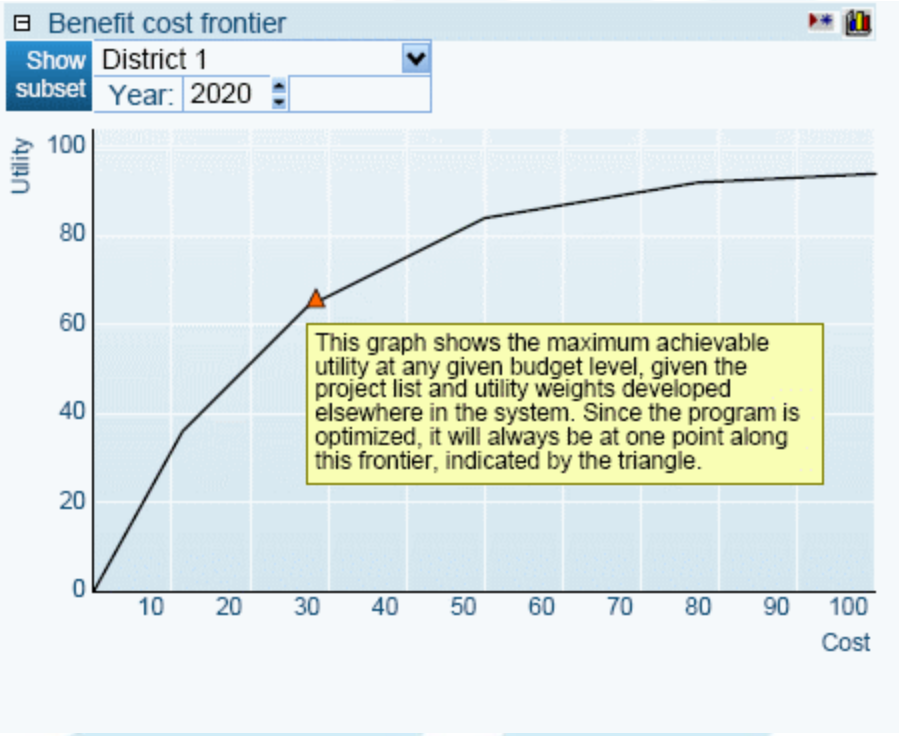
| ☑ Concrete repair | yes | | | 23.3 | 34.3 | 0.68 | |
| 104 - P/S conc box girder (1120 lf) | yes | | | | | | |
| State 1: Do nothing | | 700 | 0 | | | | |
| State 2: Patch concrete | | 300 | 120 | | | | |
| State 3: Clean steel and patch | | 120 | 200 | | | | |
| State 4: Clean steel and patch | yes | 0 | 800 | | | | |
| 215 - R/Conc abutment (120 lf) | | | | | | | |
| Health index | yes | 95 | 72 | | | | |
| ☑ Reseal joint | no | | | 9.0 | 9.4 | 0.96 | |
| 301 - Pourable joint seal (120 lf) | no | | | | | | |
| State 1: Do nothing | | 70 | 70 | | | | |
| State 2: Replace seal | | 30 | 30 | | | | |
| State 3: Replace seal | no | 20 | 20 | | | | |
| Health index | | 81 | 81 | | | | |
| ☑ Place rip rap (400 tons) | | | | 83.6 | 25.5 | 3.28 | |
| Scour assessment | yes | 7 | 6 | | | | |
| ☑ Widen structure (14 ft) | | | | 1776.3 | 275.4 | 6.45 | Widening in-kind |
| Accident risk (AAMDV) | yes | 81 | 120 | | | | |

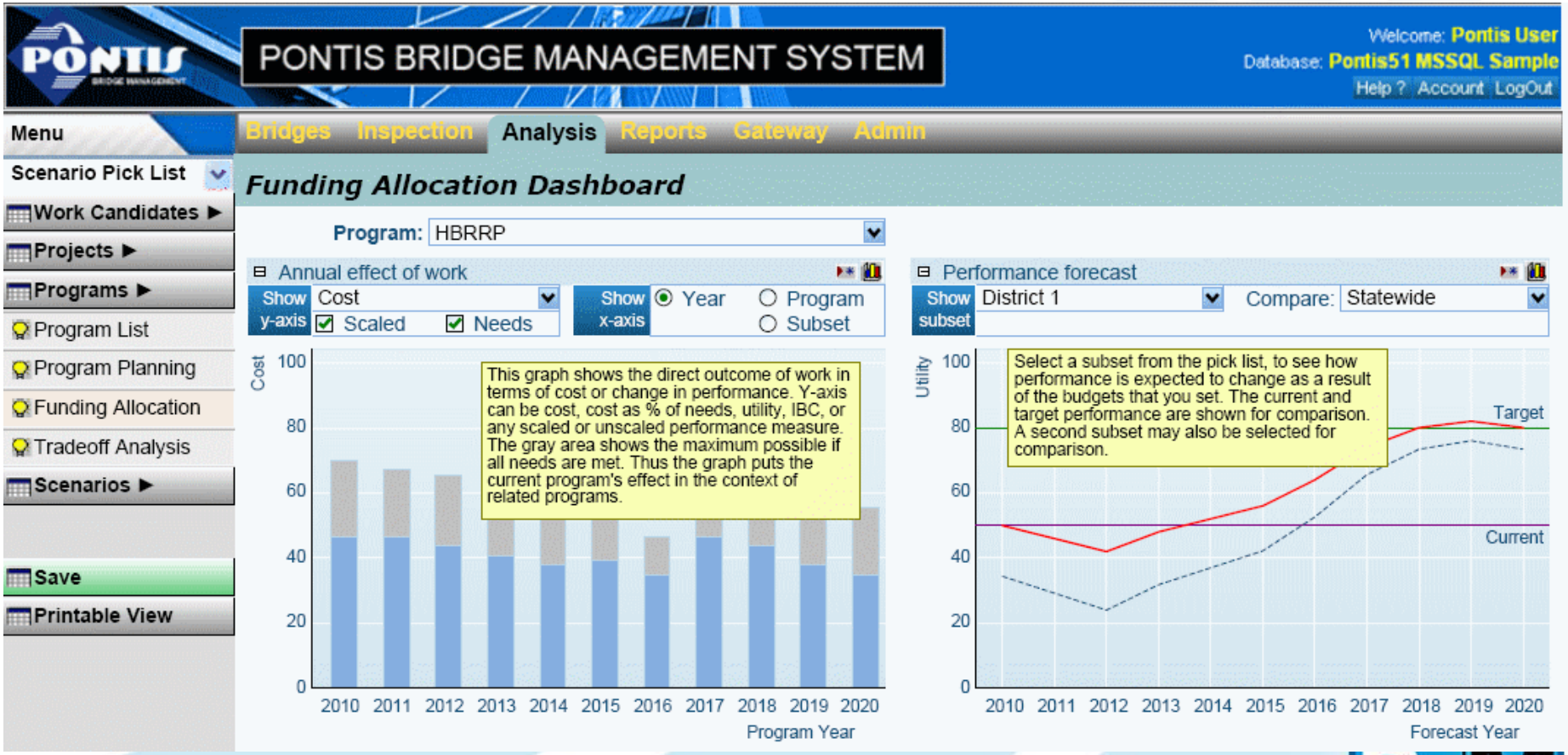
Selected work task: Duplicate Delete

# Network Level Planning



# Program Level Planning



# Planned Bentley Add-Ons And Services

- AASHTO / Bentley Agreement supports new add-ons in coordination with Task Force:
  - Hosting/SaaS
  - Mobile applications
  - Workflow
  - 3D interactive inspection models
  - ProjectWise linkage
  - User credentialing

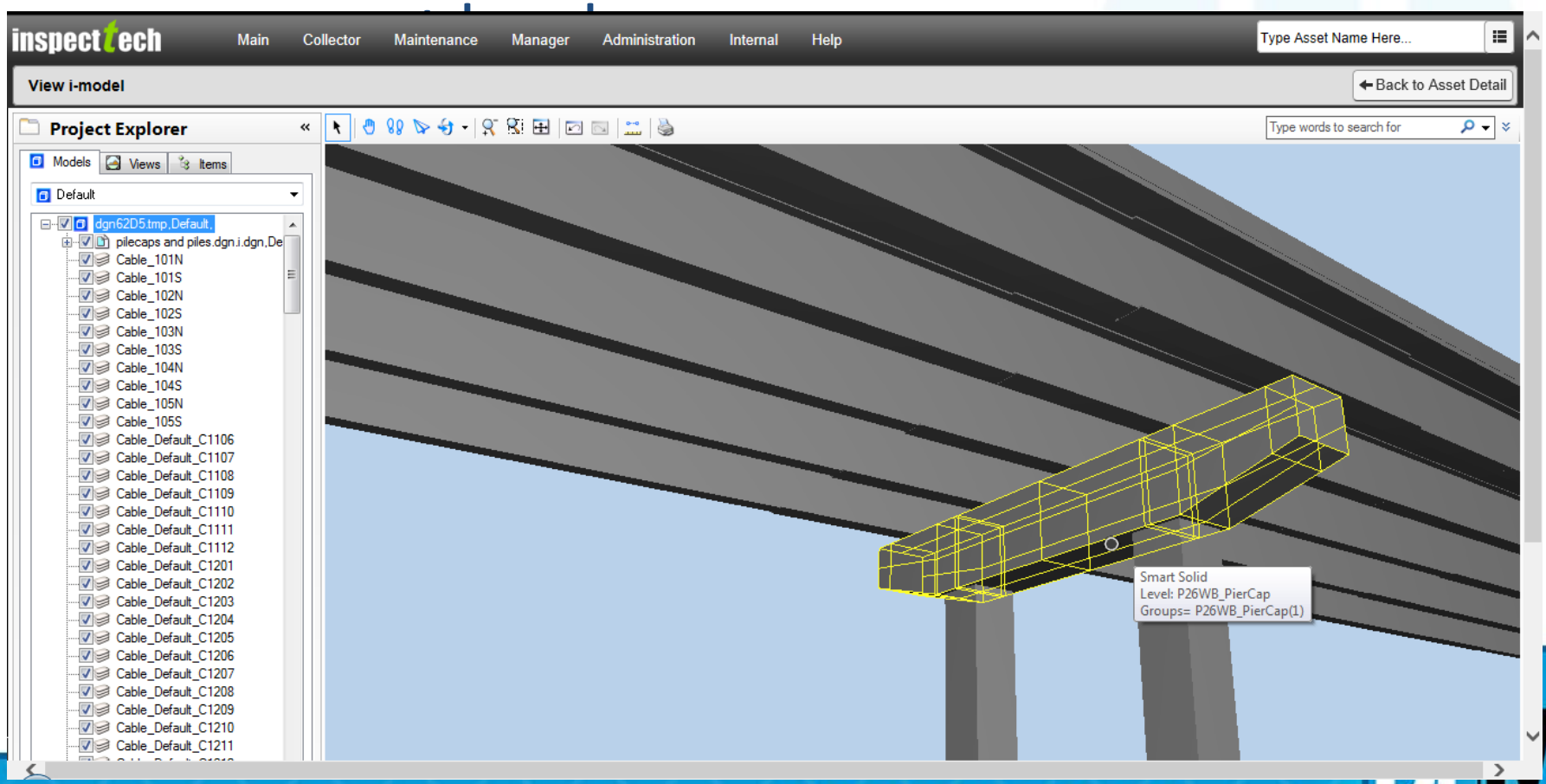
….

# Hosting / SaaS Solutions

- Bentley able to provide reliable and secure hosting environment for Pontis solutions
- Bentley applies all patches and updates needed
  to Pontis
- Storage, processing and servers tuned for Pontis maximum performance
- Can result in significant cost savings to DOT and performance/satisfaction improvement

# Interactive Inspections

- Collect and report condition data at the



# Current Activities

- Bi-weekly Task Force Meetings (webinar)
- Quarterly Task Force Meetings (in person)
- Development of Phase 1C – Utility Functions
- Coordinate with TRT
- Incorporate any TAG feedback on 5.1.3
- Launch Phase 2
- Continue update webinars to the user community
- Expanding overall team

# Questions?