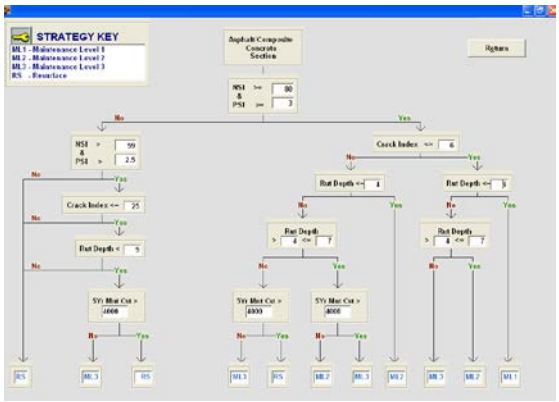
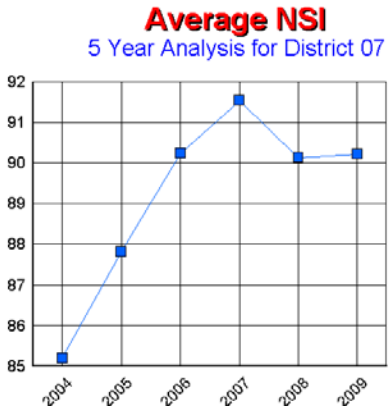
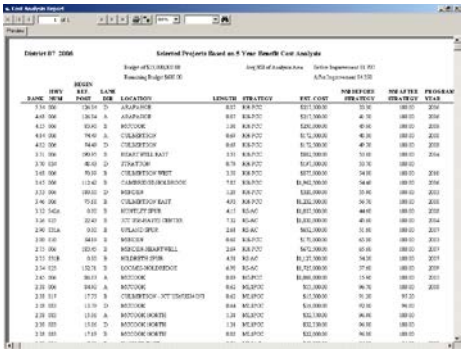
P. O. P.

P avement
O ptimization
P rogram







Materials and Research Division
Pavement Management Section-Version 4.0 Jan. 2014

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INTRODUCTION:

The Pavement Optimization Program(POP) has been developed by the Nebraska Dept. of Roads-Materials and Research Division-Pavement Management Section with the assistance of the Business Technology Support Division. This program allows you to investigate your current pavement ratings, create a map of the section, create a cross section diagram and links to our log book, the Bridge Information System application, historical condition graphs and to the Pathweb browser for viewing the roadway photos. It also has a life cycle cost analysis which prompts you to enter an analysis period and annual budgets. A yearly output report shows those selected sections that would be improved based on the budget and a benefit cost ratio or a risk assessment analysis. There is also a graph of the NSI rating after each year's improvements.

This program is loaded with pavement design sections, needs sections or recreation roads sections, depending on what you want to investigate.

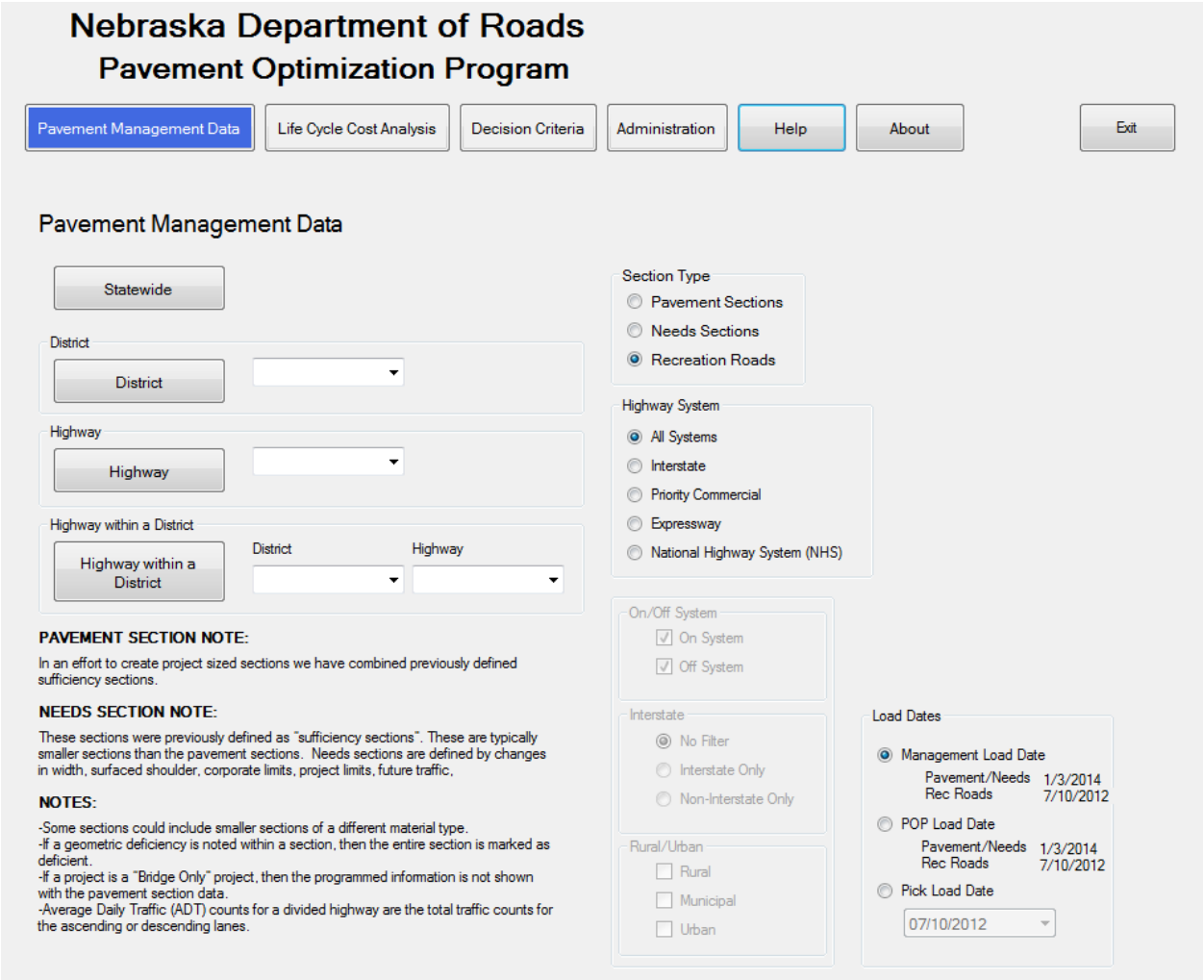
The program display is designed for a specific resolution. If you can not see the entire page on your screen, it is because your resolution is not setup the same as POP. The resolution should be 1280 x 1024 pixels. To set this you right click on the desktop and select "Screen resolution". Move the selection bar to get the appropriate setting(1280 x 1024). Select "Apply" and "OK". With the addition of wide screen monitors, you might want to experiment with higher resolutions.

If you need any further help, we are here to assist you. You can call/email Dan Nichols(479-4783)/Dan.Nichols@Nebraska.gov or Dave Medinger(479-4807) /David.Medinger@Nebraska.gov if you have any questions.

STARTING THE PROGRAM:

After POP has been installed you will have an ICON called POP on your desktop. Double click to start the program.

OPENING SCREEN:

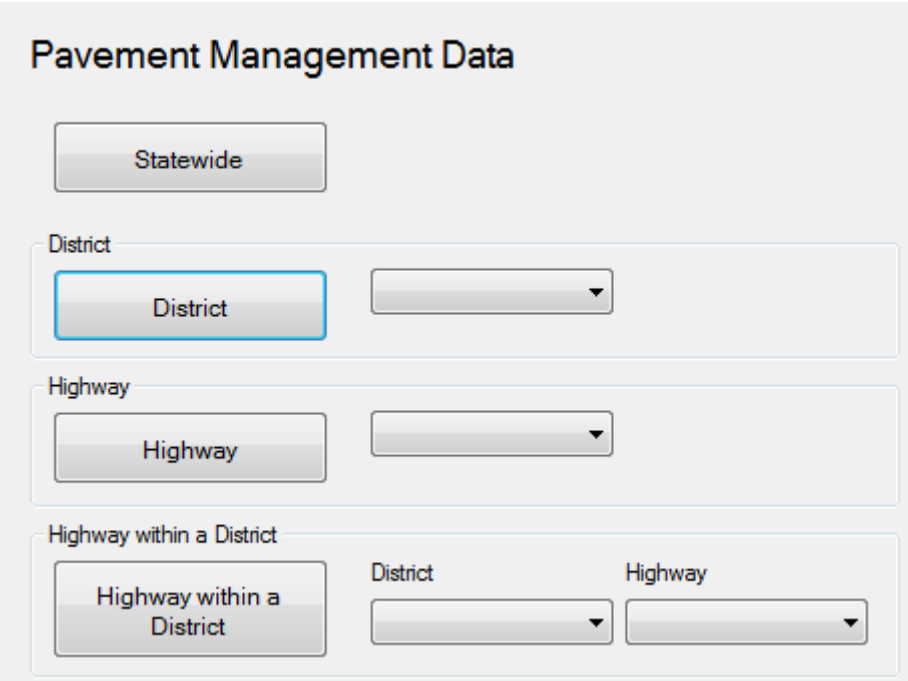


This first screen gives you six screens to select from with the tabs shown at the top. The screens are listed below:

- Pavement Management Data,
- Life Cycle Cost Analysis,
- Decision Criteria,
- Administration,
- Help,
- About,

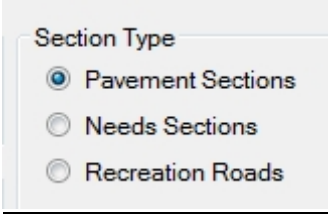
The screen that is selected as a default is the Pavement Management Data screen.

PAVEMENT MANAGEMENT DATA:



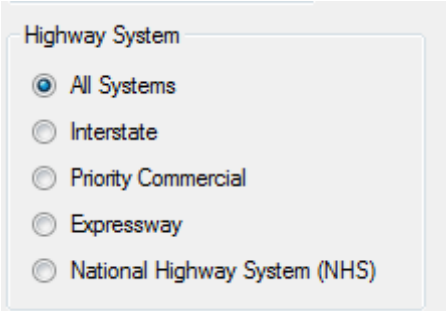
On this screen you select either Statewide, District, Highway or Highway within a District to pull up the desired section. Pull downs next to the District, Highway, and Highway within a District give you the possible selections. You must choose/enter a number in the appropriate box before you select by District Data or Highway Data buttons. Your data is sorted by Highway and Reference Post in ascending order.

Section Type



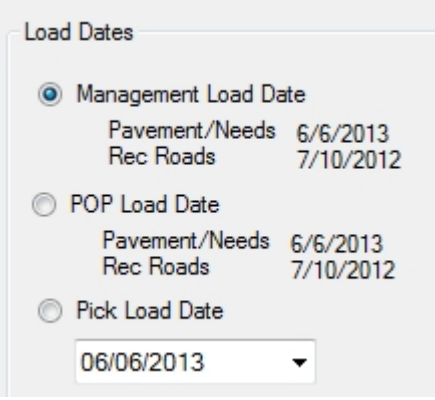
This refers to how you want to summarize the highway data. The Pavement sections have breaks for age, material type and number of lanes. These are typically projects sized sections that would be used for project scheduling. The Needs sections are smaller sections with breaks for corporate limits, shoulder width, projects limits, future traffic , etc. The Needs sections are used in the annual 20-Year Needs Assessment. You have the option of selecting Pavement, Needs or Recreation Road sections. Pavement sections are selected as the default.

Highway System



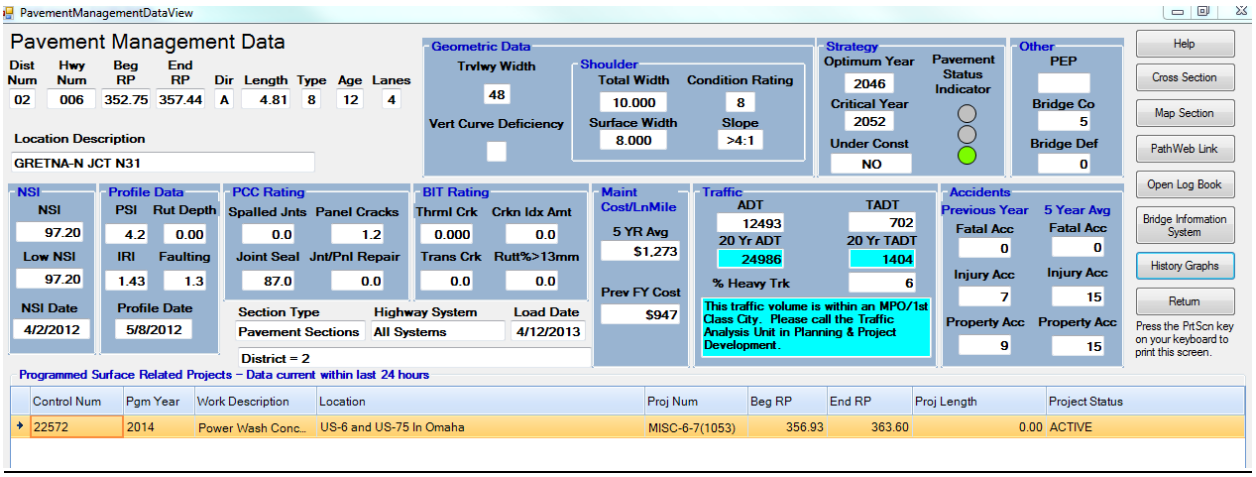
The user can select a Highway System as a filter for the Statewide/District/Highway selections. The default is All Systems.

Load Dates



The user has an assigned load date for the current POP data. The current POP date is assigned by management under the Administration button.

Pavement Management Data Screen



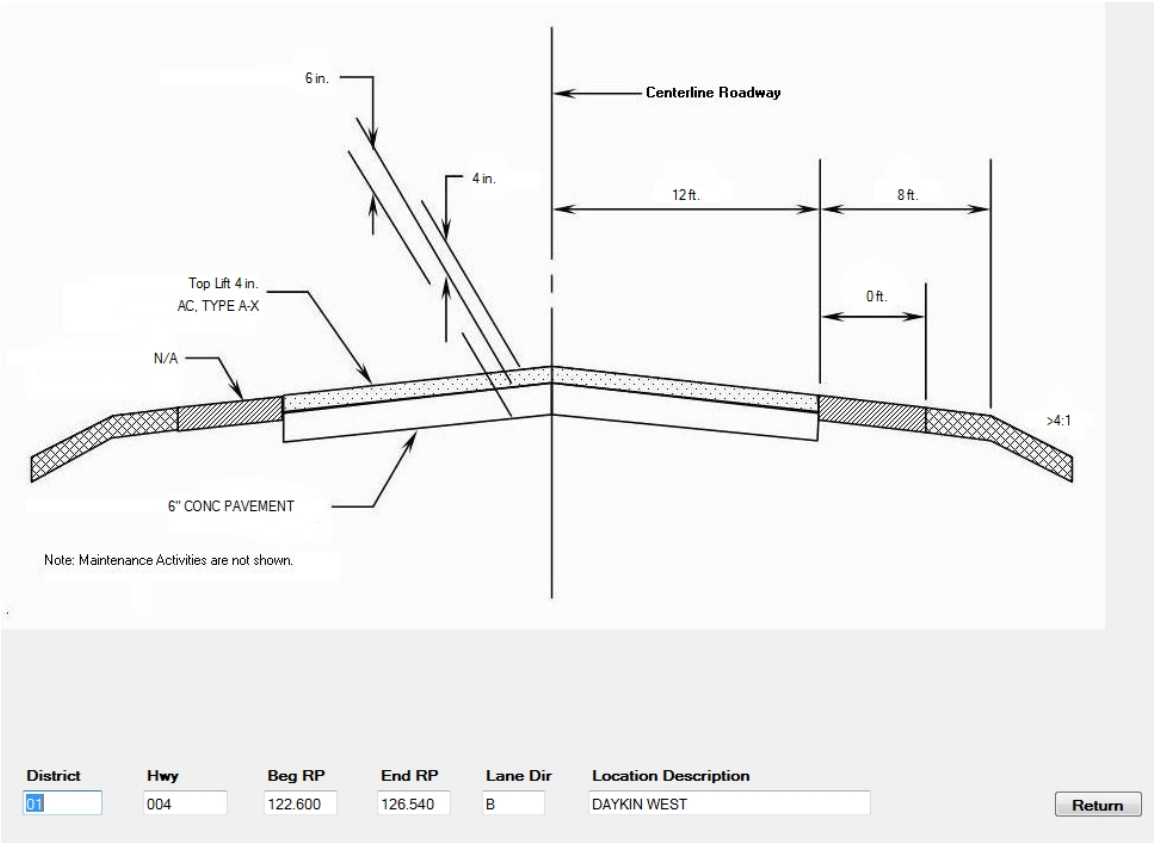
Data Windows-The top portion of the screen has related data displayed in separate windows for easier viewing. The groupings are for the inventory data, geometric data, strategies, NSI, Profile Data, pavement condition, maintenance costs, traffic counts, accident rates, and other. There is also an area that shows the selections you have made for Section Type, Highway System and Load Date. As you move from one record to another on the bottom tabulated grid, you will see that record summarized on the top windows.

Colors for Deficiencies-Any of the Geometric Data that is highlighted in red is deficient. The NSI and Profile data uses the color of yellow for marginal and red for poor conditions. The Pavement Status Indicator is a Stop Light that is red when the section is past critical year and yellow when it is only past optimum year and all others are green.

Collection Dates-The NSI date is the date of the visual inspection of the highway, the Profile date is the date the profiler collected the sensor data and photos, and the Load date is the date POP was loaded.

Links to Other Applications

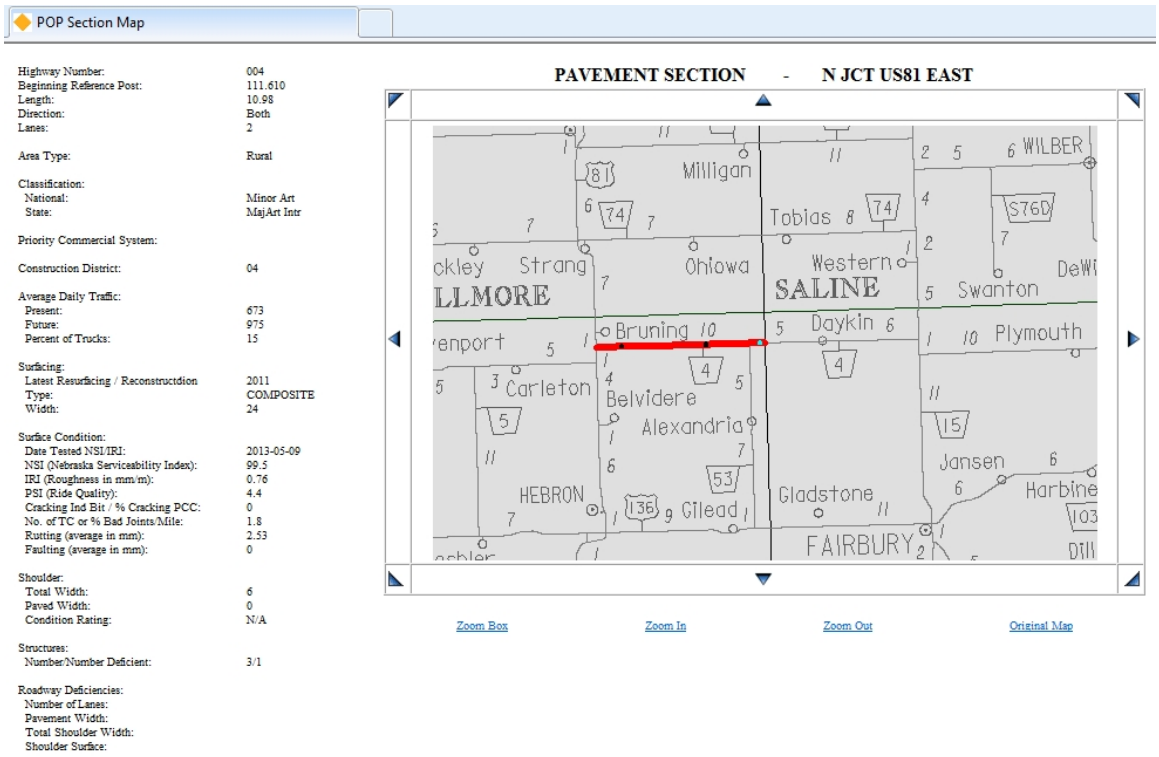
Cross Section-This is a roadway cross section of the highway section selected. It shows the material type and limits for the surface, base and shoulder.



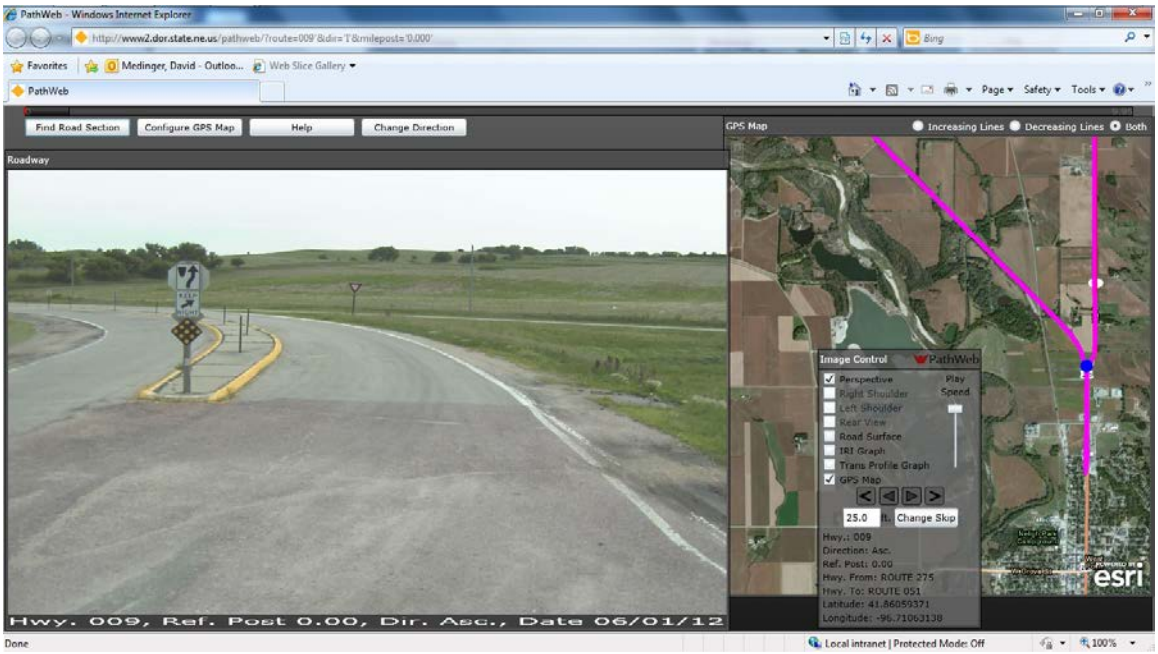
District	Hwy	Beg RP	End RP	Lane Dir	Location Description
01	004	122.600	126.540	B	DAYKIN WEST

Return

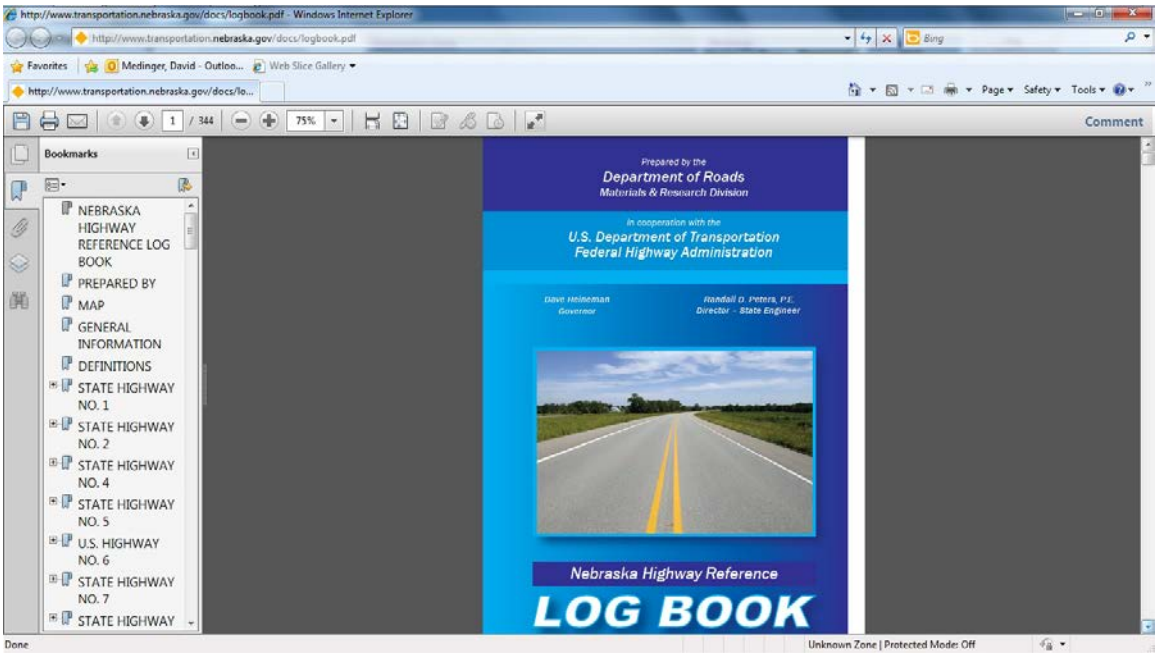
Map Section-This will create a map of the highway section selected. It has black dots within the red highlighted section to represent bridges in that section. The column on the left has some of the same data as the pavement management data screen but in a different format. There are tools for zooming in and out and panning around.



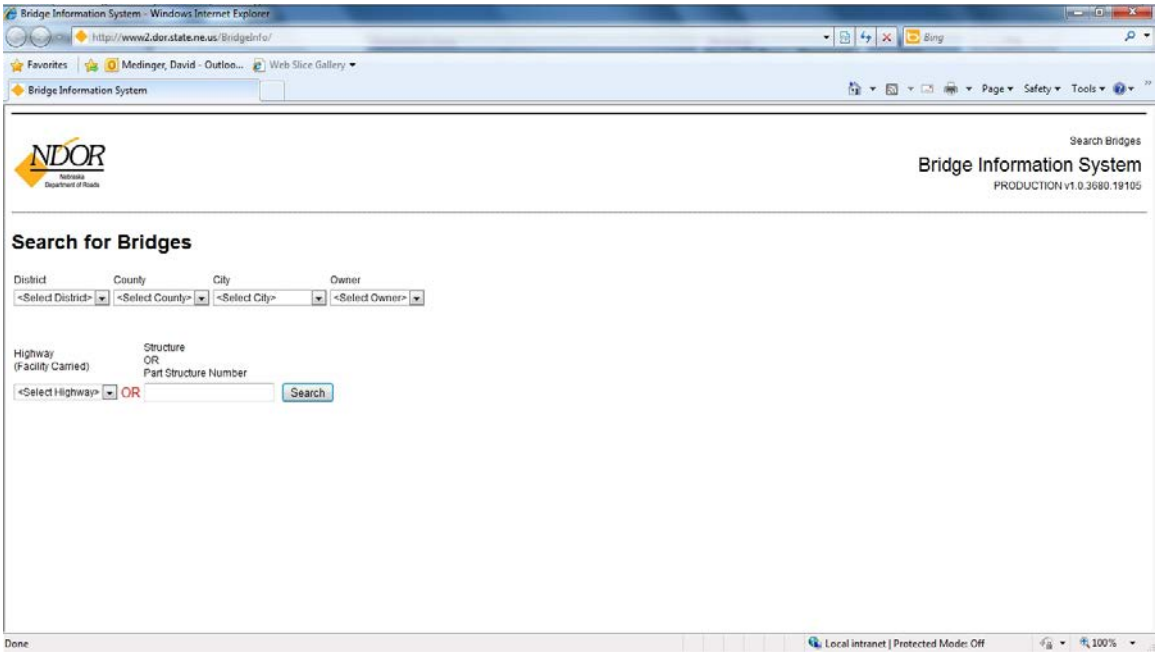
PathWeb Link-This connects you to the PathWeb browser. The browser displays roadway photos and synchronized data with GPS tools. A HELP tab is available for instructions in Pathweb.



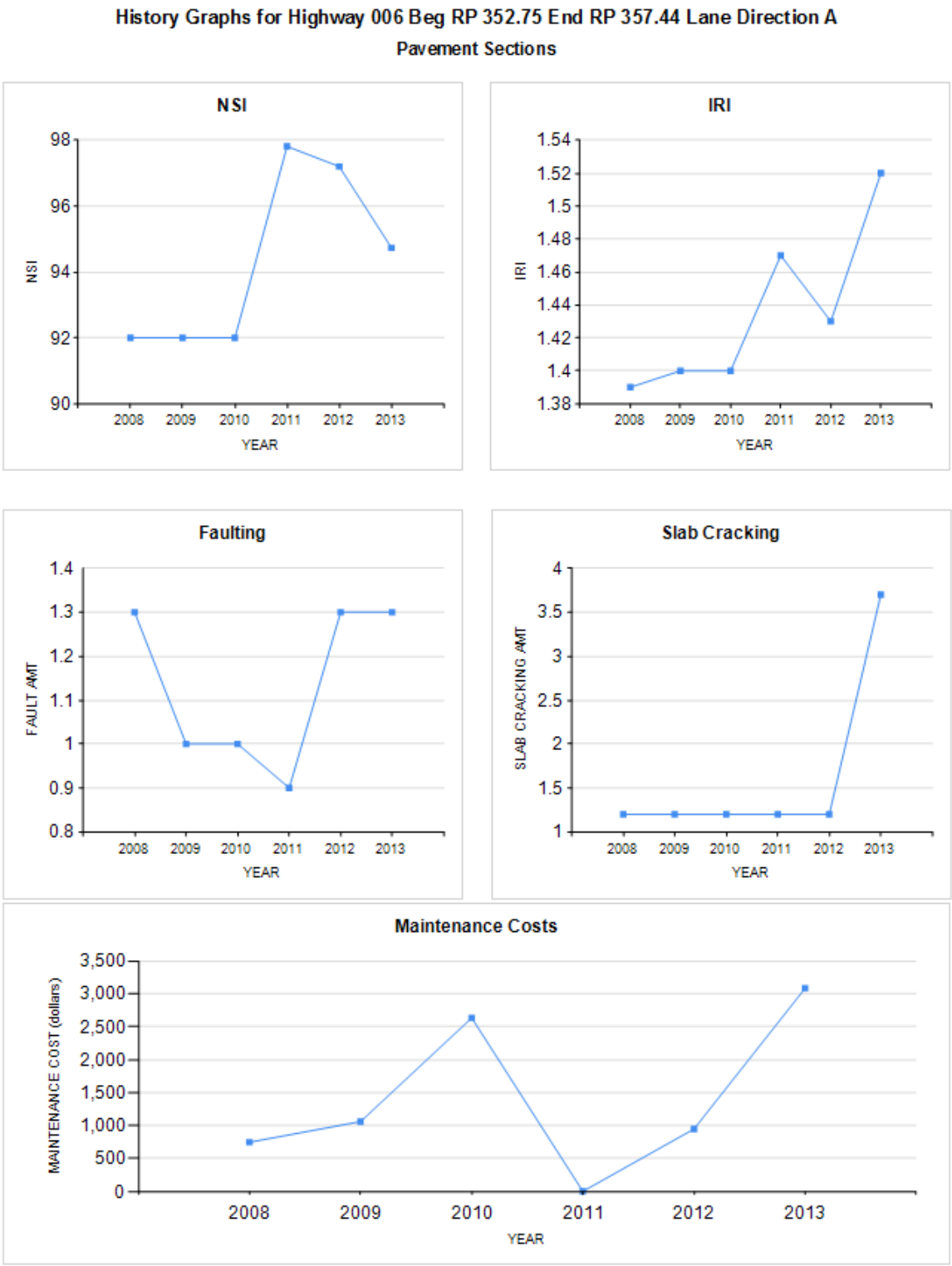
Open Log Book-This links you to the electronic version of Nebraska's Highway Reference Log Book



<u>Bridge Information Systems</u>-This links you to the Bridge Information System Application where you can view all the bridge related data and photos.



History Graphs-This link provides history graphs for rutting, cracking index, slab cracking, faulting, NSI, IRI and maintenance.



Programmed Surface Related Projects

Programmed Surface Related Projects

Control Num	Pgm Year	Work Description	Location	Proj Num	Beg RP	End RP	Proj Length	Project Status
22201	2013	Joint Seal	Mahoney State Park - Millard	IM-80-9(63)	427.450	442.350	14.90	ACTIVE
22565	2014	Barrier Seal	I-80/480/680 In Omaha	MISC-80-9(1195)	438.660	455.310	0.00	ACTIVE
22153	2019	Gr, Br, S-Shld	126th St - N-50, Omaha	IM-NH-80-9(909)	441.100	442.470	1.37	ACTIVE
22152	2020	Interchange	N-50 Interchange	NH-80-9(908)	440.410	440.910	0.50	ACTIVE

This is a list of programmed surface related projects starting from 3 years prior to the current fiscal year. A section must have at least 0.05 miles in the project before project data is displayed. A scroll bar will appear on the right side if there are more projects to view. This data is updated on a daily basis and whenever POP is reloaded. This is the only data in POP that is updated daily.

Pavement Management Data Grid:

Drag a column here to group by this column.

Hwy Num	Beg Ref	End Ref	Dir	Location	Length	Thru Lanes	Surf T...	Crkng Idx A...	Bad Joints	Bad Panels	Joint Seal	Repair Amt	Surf Desc	
R02A	0.00	2.97	B	GROVE LAKE	2.97	2	ASPH	19.9	0.0	0.0	0.0	0.0	AC, TYPE B	UNKNOWN
R02D	0.00	9.14	B	ASHFALL STATE HIST...	9.14	2	ASPH	12.4	0.0	0.0	0.0	0.0	AC, TYPE 17	UNKNOWN
R02DB	0.00	0.86	B	ASHFALL STATE HIST...	0.86	2	ASPH	0.0	0.0	0.0	0.0	0.0	AC, TYPE 17	UNKNOWN
R02DC	0.00	0.12	B	ASHFALL STATE HIST...	0.12	2	ASPH	0.0	0.0	0.0	0.0	0.0	AC, TYPE 17	UNKNOWN
R07B	0.00	13.96	B	BOX BUTTE RESERVO...	13.96	2	ASPH	5.6	0.0	0.0	0.0	0.0	AC, TYPE B	UNKNOWN
R07BB	0.00	2.00	B	BOX BUTTE RESERVO...	2.00	2	ASPH	2.4	0.0	0.0	0.0	0.0	AC, TYPE B	UNKNOWN
R09B	0.00	0.19	B	LONG PINE	0.19	2	ASPH	30.6	0.0	0.0	0.0	0.0	ASPH CONC	UNKNOWN
R09BB	0.00	0.51	B	LONG PINE INTERIOR...	0.51	1	ASPH	11.6	0.0	0.0	0.0	0.0	ASPH CONC	UNKNOWN
R09BC	0.00	0.46	B	LONG PINE INTERIOR...	0.46	2	ASPH	7.2	0.0	0.0	0.0	0.0	ASPH CONC	UNKNOWN
R10H	0.00	0.85	B	WINDMILL STATE REC...	0.85	2	ASPH	2.2	0.0	0.0	0.0	0.0	ASPH CONC	UNKNOWN
R10HB	0.00	0.47	B	WINDMILL STATE REC...	0.47	2	ASPH	0.0	0.0	0.0	0.0	0.0	ASPH CONC	UNKNOWN

All Columns Grid Layout | Basic Columns Grid Layout | My Grid Layout | Save Grid Layout | Export to Excel | Print | Grid Layout File Name = popDefault.xml

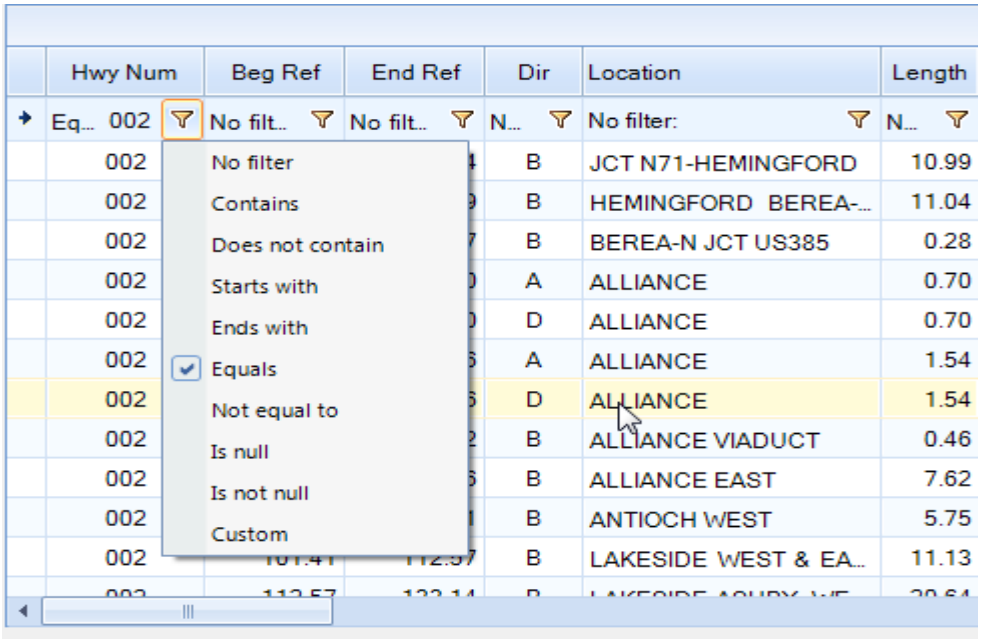
The lower tabulated information has all of the data that we store for a section. You can use the bottom scroll bar to move over several times to see all of the additional data. We have selected the data that should be more useful to appear to the far left.

Grid Functions

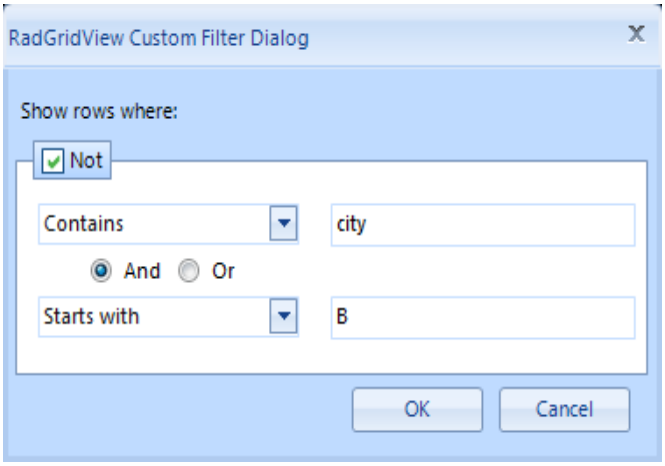
Customizing Grid Layout-This grid allows you to click and drag on the column headings to move them to any order you wish. You can also use the Column Chooser or Hide Column features available when you right click on the column heading. You can pin columns to remain on the left as you scroll through the table to the right. If you hide the column it will un-pin it. This feature is available when you right click on the column header. This grid layout can be saved and used for a report formatting when printing. The original grid layout option can be restored by clicking the All Columns Grid Layout button on the bottom of the screen. The Basic Columns Grid Layout gives you a small set to add columns to. My Grid Layout button on the bottom of the screen will give you a list of the saved layouts. The current Grid Layout file name is listed for your information.

Filtering

When filtering is enabled, each **GridViewDataColumn** displays a filter box beneath the corresponding header. The user can click the filter icon to display a drop-down list of comparison criteria (e.g. "Starts with", "Equals"...). The user can click in the textbox next to the filter button to enter a comparison value. (Example; Hwy Equals 002), only records that match the criteria are listed in the column.



The user can select Custom from the drop down list to display a dialog that allows a more complex filter to be built. In this dialog the user can select comparison criteria from the drop down list on the left and enter a value in the textbox on the right. Then a second criteria and value pair can be entered. Between the two criteria is a radio button with choices for "And" or "Or". If the user leaves the value at the default "And", both criteria must be true for a given record to display. The condition can be inverted using the “Not” option.



Sorting

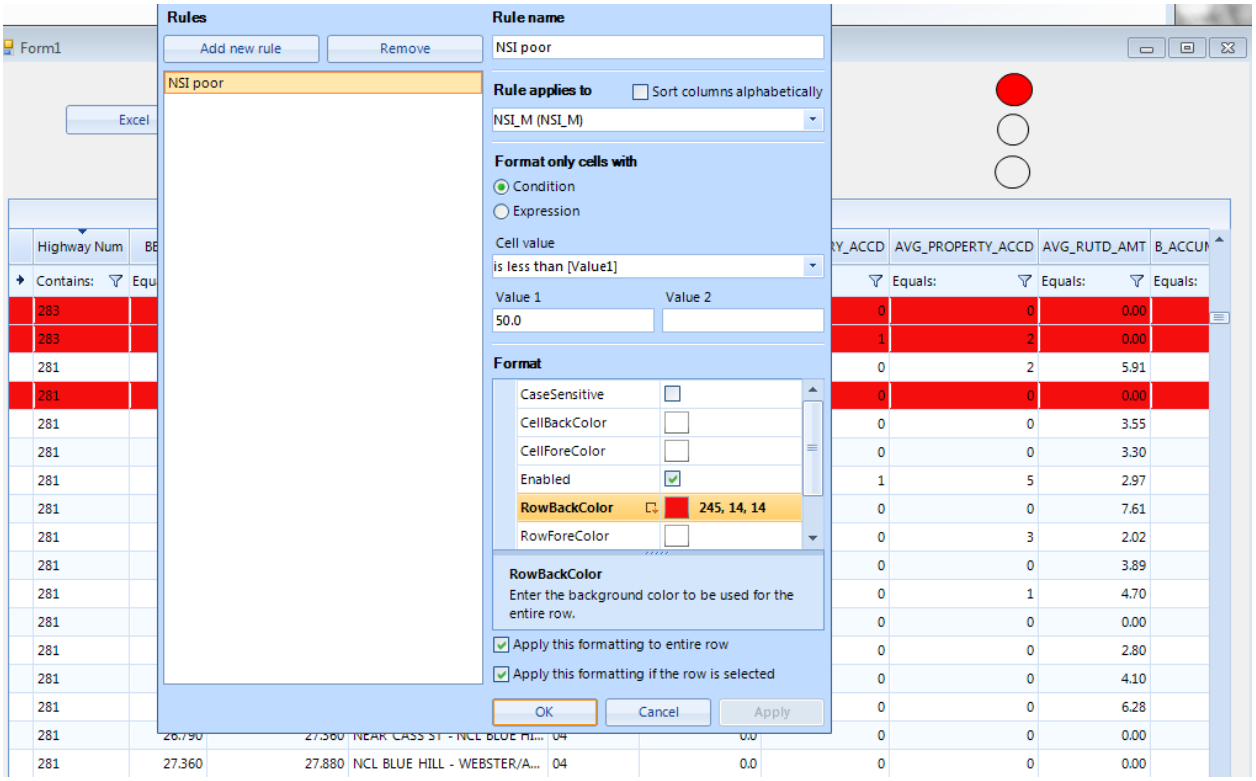
Clicking the column header sorts by that column in ascending order. The column header displays an upward pointing arrow.Clicking the header for a second time sorts by that column in descending order. The column header displays a downward pointing arrow.

“Clear Sorting” from the context menu returns to a natural sort (i.e. no sorting). No arrow is displayed on the column header.

By default, clicking on a column triggers the sorting operation for that column and prevents the other columns from being sorted. By holding down the **Shift** key the user can retain the sort for an existing column and the headers of other columns to add additional sorting.

Conditional Formatting

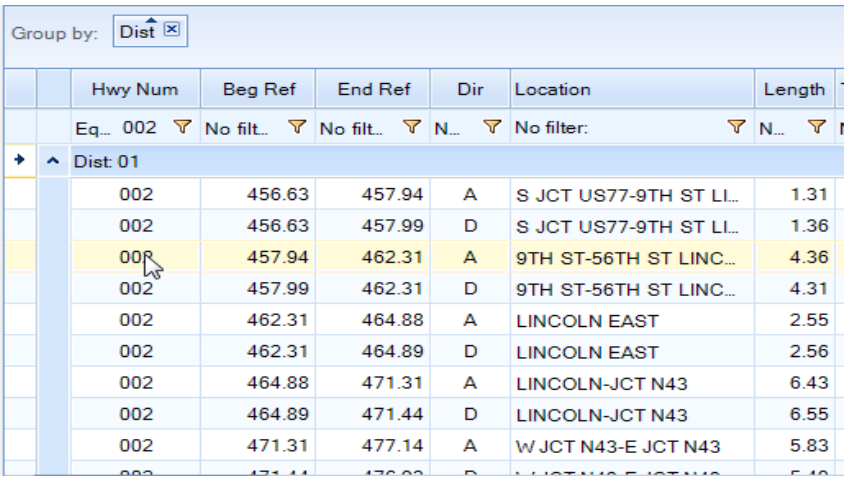
This is available when you right click on the column header. This allows you to create rules for your data base and assign background colors to the records that match your criteria. These rules can be saved and retrieved for different scenarios. The user needs to select the column the rules apply to, then selects a condition or expression format and assign values desired. Lastly a color needs to be selected for the row background color.



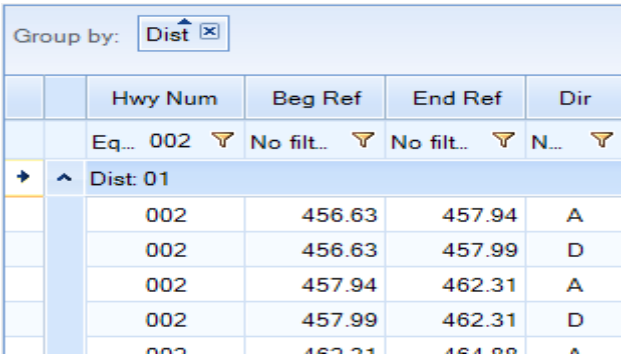
For example, you could make rows with an NSI less than 50.0 have a background color of Red.

Grouping

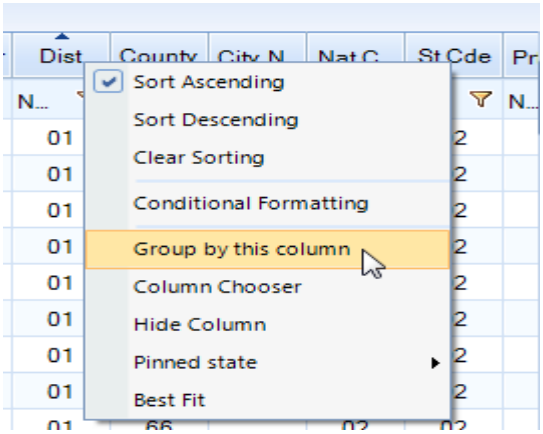
The end-user can drag column headings to the grouping panel at the top of the grid to group by the column: Example: District Grouping.



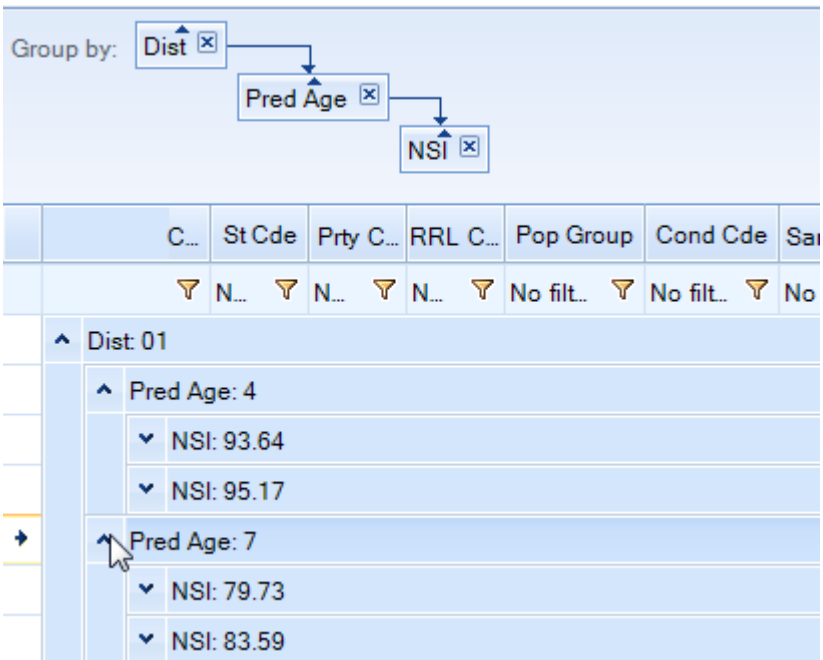
To un-group, click the close button of the group header button:



The user can also right-click a column and select Group by this Column from the context menu:



Multiple levels of grouping can be created by dragging additional column names to the grouping panel. Column names can be rearranged within the panel by dragging. In the screenshot below the top level grouping is by Country and the second by ContactTitle.

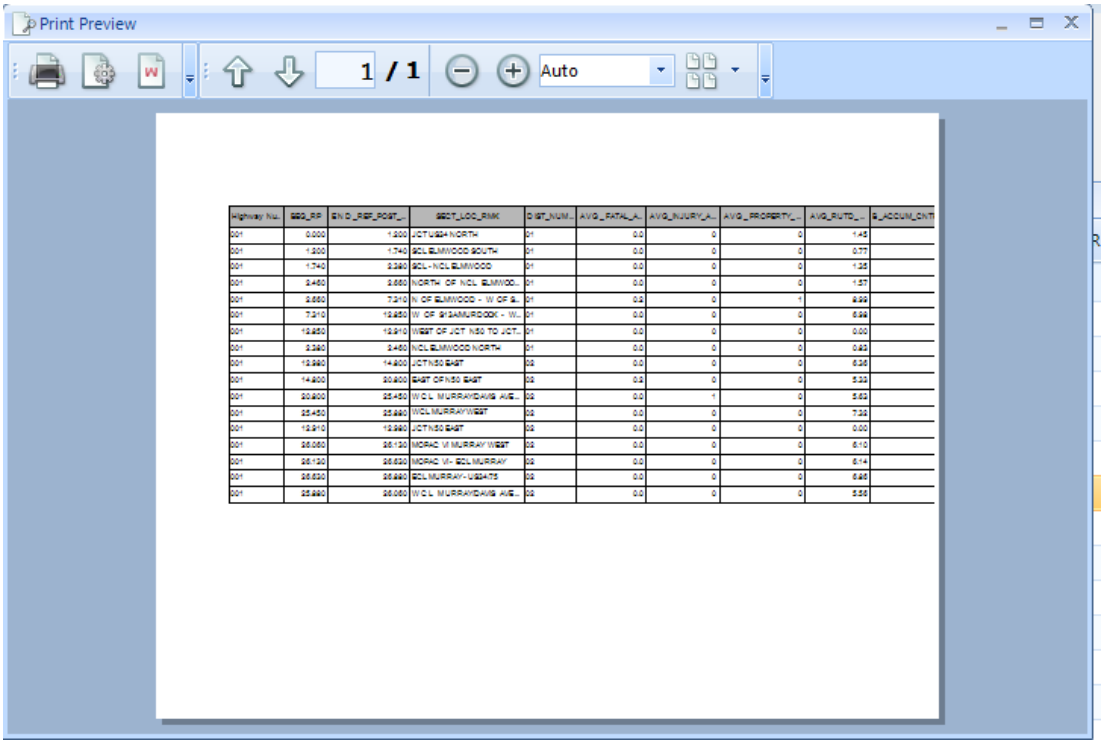


Exporting to Excel

The user can create a delimited file which can be imported into Excel. The columns and order will be the current grid selections. A confirmation window will pop up warning you that the file is an Excel file but not created with the latest native version. This is ok, answer yes and continue on. The user can save multiple grid layouts for various formats for exporting to Excel.

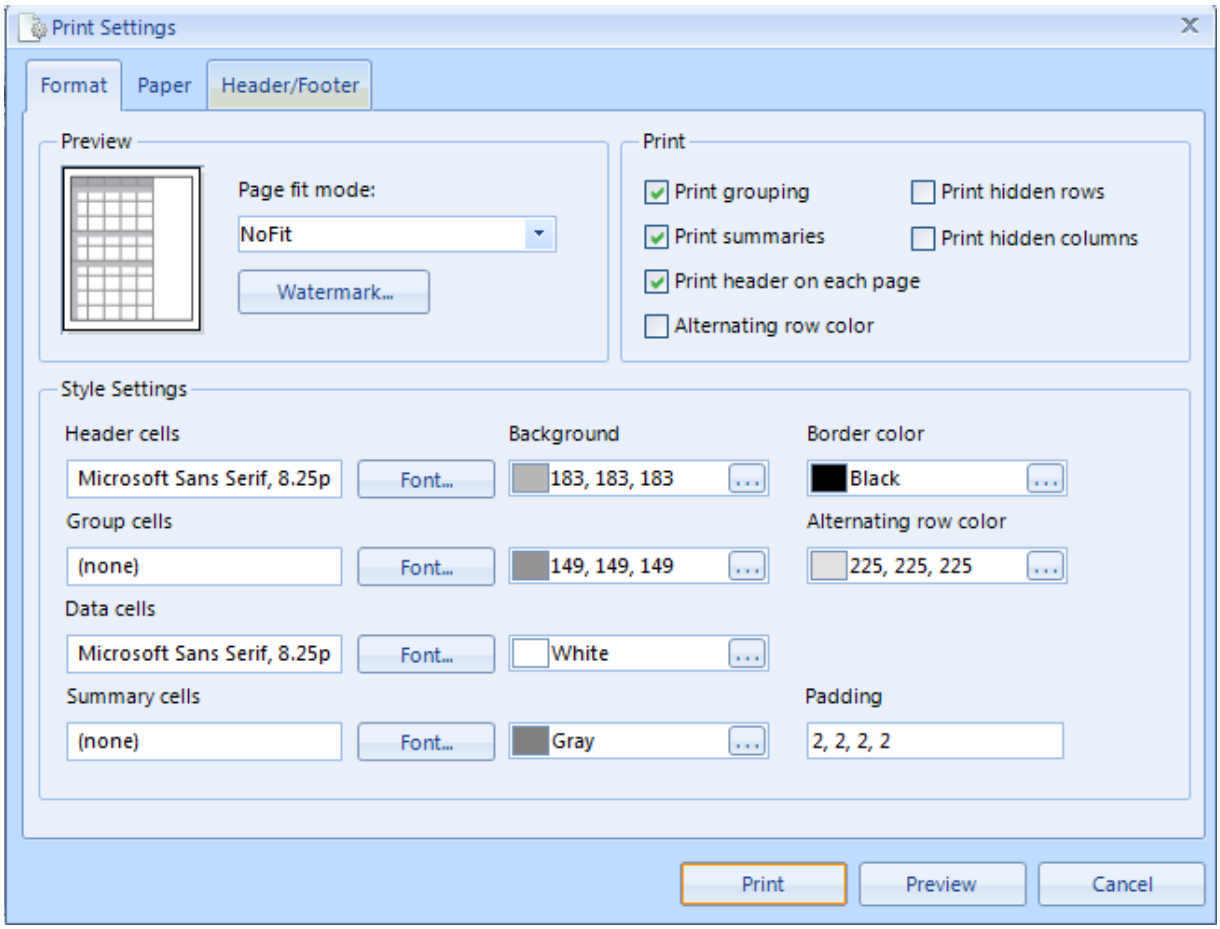
Printing

Clicking on the Print button will bring up the print preview dialog:



Highway Nu...	BEG_RP	END_REF_POST_...	SECT_LOC_RMK	DIST_NUM...	AVG_FATAL_A...	AVG_INJURY_A...	AVG_PROPERTY_...	AVG_RUTD_...	S_ACCUM_CNT
001	0.000	1.200	JCT US24 NORTH	01	0.0	0	0	1.45	
001	1.200	1.740	SCL ELMWOOD SOUTH	01	0.0	0	0	0.77	
001	1.740	2.380	SCL - NCL ELMWOOD	01	0.0	0	0	1.28	
001	2.460	2.660	NORTH OF NCL ELMWOO...	01	0.0	0	0	1.57	
001	2.660	7.310	N OF ELMWOOD - W OF S...	01	0.0	0	1	2.99	
001	7.310	12.850	W OF S12AMURDOCK - W...	01	0.0	0	0	6.98	
001	12.850	12.910	WEST OF JCT N50 TO JCT...	01	0.0	0	0	0.00	
001	2.380	2.460	NCL ELMWOOD NORTH	01	0.0	0	0	0.93	
001	12.990	14.400	JCT N50 EAST	02	0.0	0	0	6.36	
001	14.400	20.400	EAST OF N50 EAST	02	0.0	0	0	5.33	
001	20.900	25.450	W C L MURRAYDAVIS AVE...	02	0.0	1	0	5.63	
001	25.450	25.690	WCL MURRAYWEST	02	0.0	0	0	7.35	
001	12.910	12.990	JCT N50 EAST	02	0.0	0	0	0.00	
001	26.060	26.120	MDRAC W MURRAY WEST	02	0.0	0	0	6.10	
001	26.120	26.630	MDRAC W- SCL MURRAY	02	0.0	0	0	6.14	
001	26.630	26.990	SCL MURRAY - US24/75	02	0.0	0	0	6.96	
001	25.990	26.060	W C L MURRAYDAVIS AVE...	02	0.0	0	0	5.56	

The default is for the print preview to try to put all of the columns on to one page. To change this, click the Print Settings (second icon on the left, next to the printer icon) to get the following dialog:

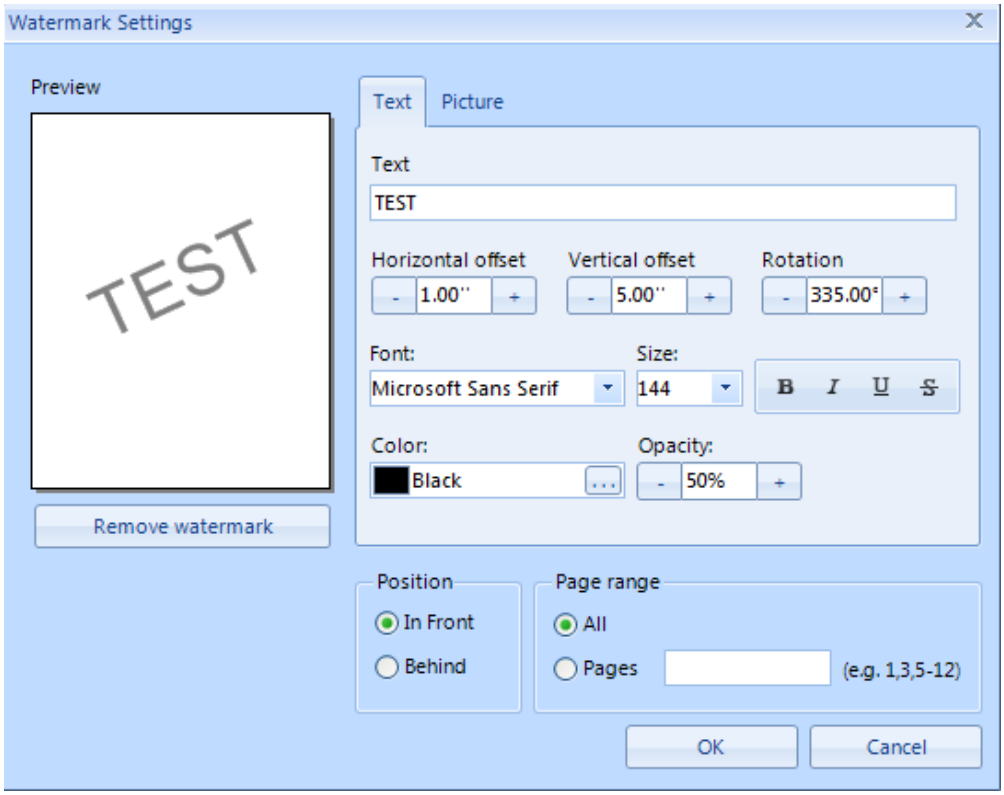


Page fit mode: Change it to “No Fit” so it does not try to fit all of the columns on one page.

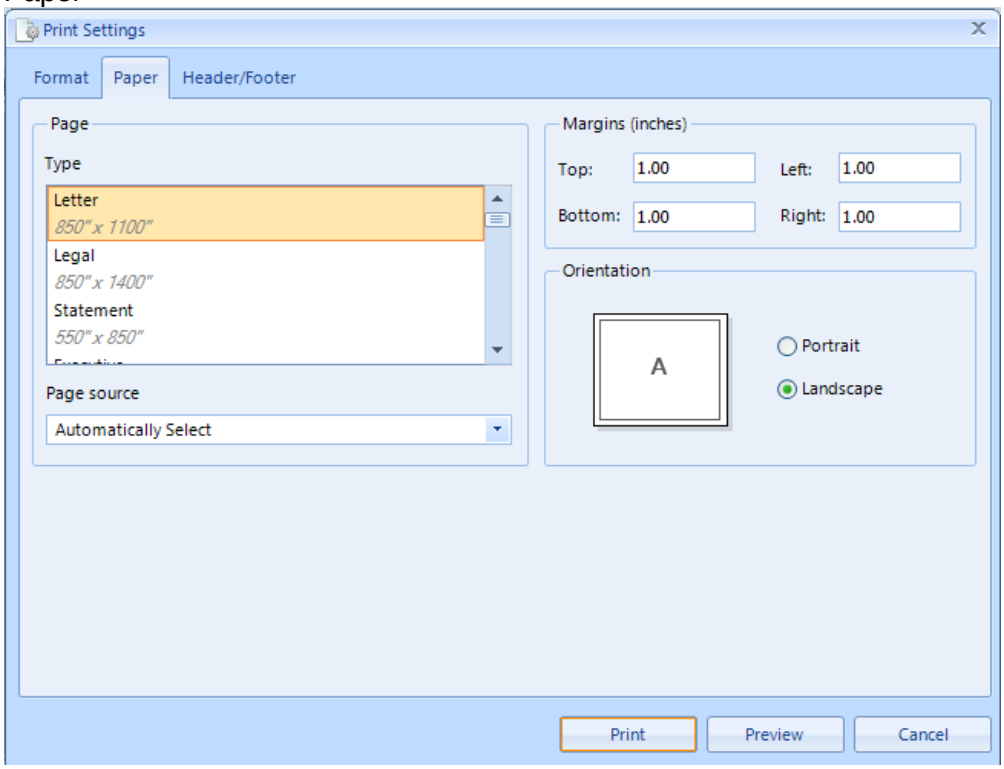
The default is also to print the data and the way you have the grid layout set when you click the print preview button. For example, if you have filtered the data down to Highway 077, it will only print out the Highway 077 sections. It will also print out the columns in the order that you put them. You can change some of these options using the check boxes in the Print section.

Following are screen shots of the Watermark Settings (where you can create your own custom watermark) and the other tabs in the Print Settings dialog box.

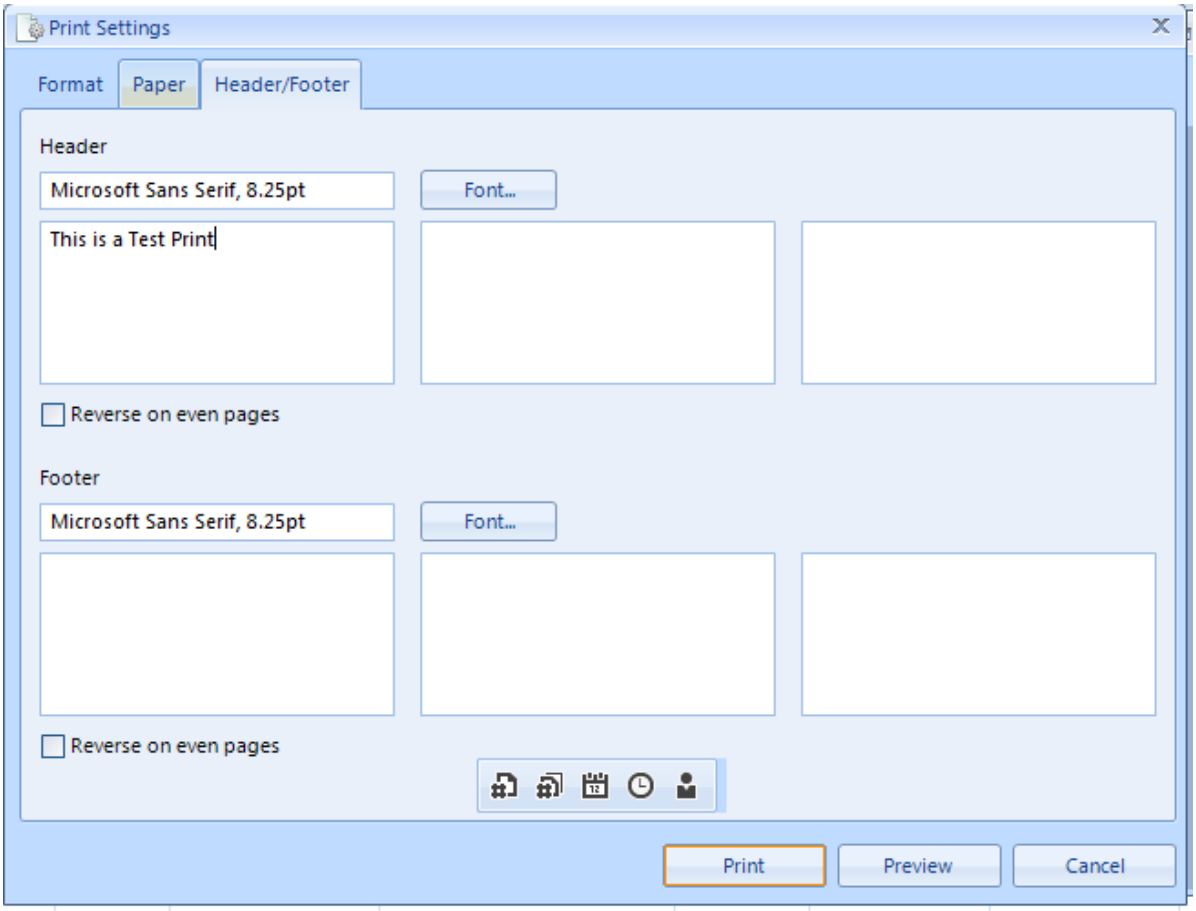
Watermark Button:



Paper

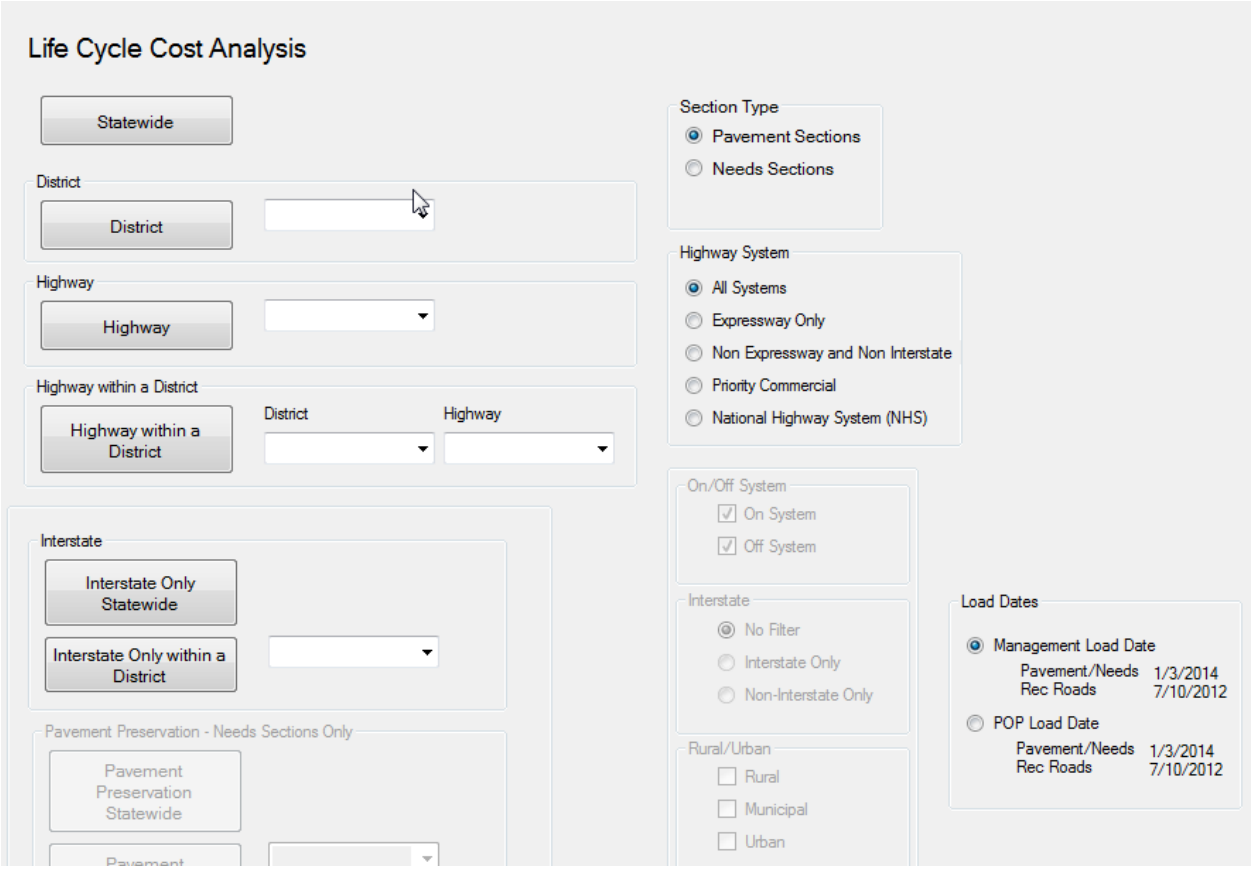


Header/Footer



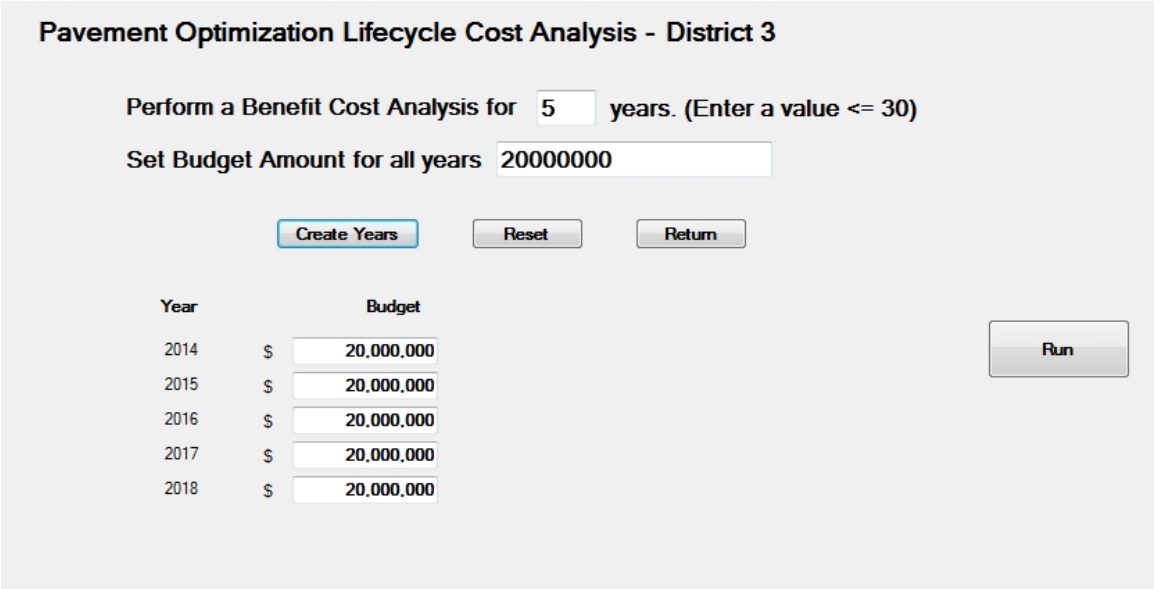
Another option for printing is using the Print Screen key on your keyboard.

LIFE CYCLE COST ANALYSIS:

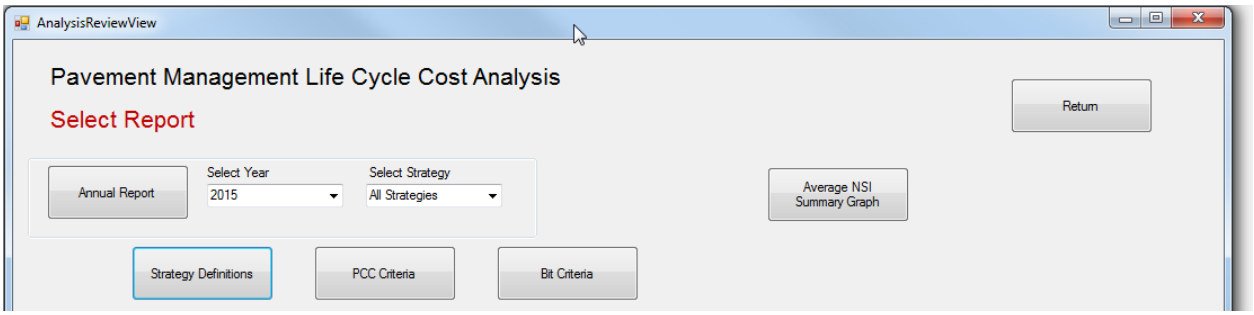


The Life Cycle Cost Analysis applies a specified annual budget to determine the best strategy for improvement based on benefit/cost ratios at the network level.

This screen allows you to select sections by Statewide, District, Highway or Highway within a District. You also have the section type to choose from. There is an option to include the interstate system within a District or the Interstate Only.



This first screen of the life cycle cost analysis is where you enter the number of years that you want to run the analysis from 1 to 30. Next set the budget amount for all years and select Create Years. This will set the budget amount for each year in the cost analysis period. You can adjust the budgets as needed to reach the desired NSI. Select RUN to create the reports.



This is the Report Selection screen. It allows you to view the annual reports and select the strategies that were selected for improvements for the budgets inputted. On the top right you can select a summary graph for the NSI rating. Also, on the bottom you can select the Strategy Definitions, PCC Criteria or Bit Criteria.

REPORTS:

The report for each year shows which sections were selected for improvement within the budget constraints. The lists are sorted by the largest benefit/cost ratio. Costs are shown for strategies and totaled at the end of the time period.

District 4 2015

Selected Projects Based on 12 Year Benefit Cost Analysis
Sorted by Risk Assessment

Pavement Sections - All Strategies

Budget of $45,000,000
Remaining Budget $1,500

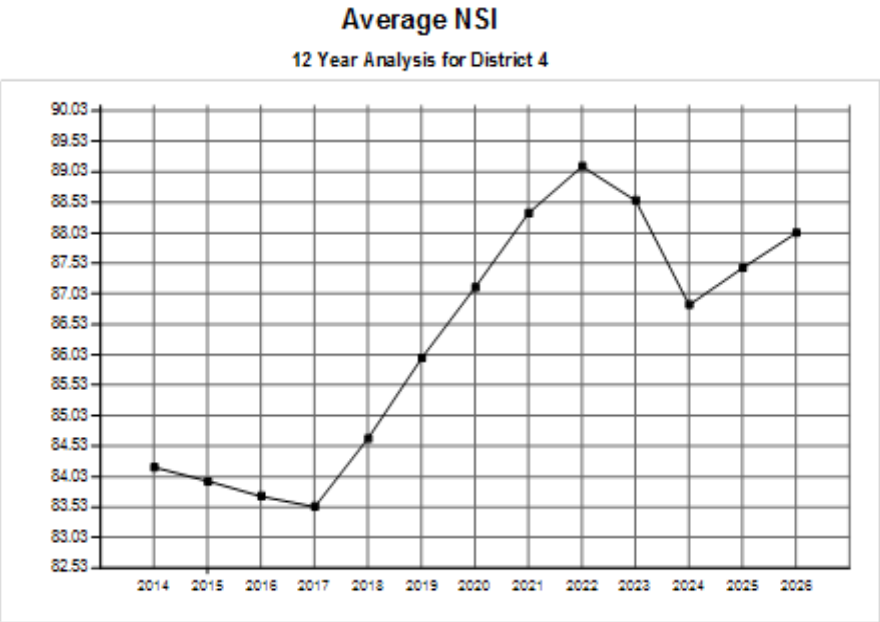
Average NSI of Analysis Area Before Imprevement 80.517
After Improvement 83.950

RANK	HWY NUM	BEGIN REF POST	LANE DIR	DIST	LOCATION	LENGTH	STRATEGY	EST. COST	NSI BEFORE STRATEGY	NSI AFTER STRATEGY	PROGRAM YEAR
9.145	006	212.71	B	04	HASTINGS-HARVARD SP	15.27	RS-AC	$5,039,100	53.80	100.00	2014
9.003	136	85.37	B	04	JCT N78-S JCT N14	13.85	RS-AC	$4,570,500	57.50	100.00	2013
8.948	008	0.52	B	04	SUPERIOR EAST	6.78	RS-AC	$2,237,400	57.50	100.00	
8.935	014	82.70	B	04	CENTRAL CITY-W JCT N92	4.01	RS-AC	$1,323,300	55.00	100.00	2014
8.817	030	293.05	B	04	SHELTON-WOOD RIVER	7.22	RS-AC	$2,382,600	60.00	100.00	
8.771	070	108.27	B	04	ORD SOUTH / N11 INTERSECTION	13.91	RS-AC	$4,590,300	57.90	100.00	2017
8.707	008	7.28	B	04	HARDY EAST	5.72	RS-AC	$1,887,600	57.50	100.00	2020
8.678	030	300.28	B	04	WOOD RIVER-GRAND ISLAND	12.26	RS-AC	$4,045,800	60.00	100.00	2012
8.622	092	334.00	B	04	JCT N11 WEST	9.84	RS-AC	$3,247,200	60.00	100.00	
8.432	004	63.50	B	04	E JCT US281-LAWRENCE	9.66	RS-AC	$3,187,800	56.66	100.00	2011
8.416	014	44.69	B	04	E JCT US6-ELDORADO	8.18	RS-AC	$2,699,400	47.04	100.00	2016
8.406	074	52.03	B	04	S JCT N14-ONG	10.80	RS-AC	$3,564,000	60.00	100.00	2019
8.404	014	52.88	B	04	ELDORADO-JCT I80	7.72	RS-AC	$2,547,600	61.62	100.00	2016
8.293	014	26.50	B	04	DEWEESE SP NORTH	5.17	RS-AC	$1,706,100	64.73	100.00	2016
8.275	281	0.00	B	04	NEBR/KN LN-RED CLOUD	5.95	RS-AC	$1,963,500	55.31	100.00	2014
1.234	L61D	0.00	B	04	JCT US30-N92 CLARKS	0.18	ML2AC	$6,300	88.00	93.00	2020

Use the toolbars with arrows on the top of the screen to navigate through the report.
To print this report, select the printer icon at the top of the screen. Close this screen to return to the previous screen.

NSI GRAPH:

The Graph shows you the Average NSI rating for each year after the improvement strategies have been performed.



ANALYSIS YEAR	BUDGET	REMAINING BUDGET	AVE NSI	TOTAL IMPROVED MILES
2014	$0	$0	84.18	0.00
2015	$45,000,000	$1,500	83.95	136.52
2016	$45,000,000	$460	83.70	137.33
2017	$45,000,000	$850	83.53	136.47
2018	$45,000,000	$710	84.65	135.08
2019	$45,000,000	$2,300	85.97	131.09
2020	$45,000,000	$1,020	87.13	283.87
2021	$45,000,000	$2,370	88.35	580.17
2022	$45,000,000	$5,880	89.11	546.83
2023	$45,000,000	$3,409,480	88.55	272.35
2024	$45,000,000	$30,293,640	86.84	230.17
2025	$45,000,000	$103,340	87.45	458.09
2026	$45,000,000	$17,130	88.02	515.22

STRATEGIES:

Pavement Optimization Strategy Definitions

ML1AC Maintenance Level 1	This is a maintenance action that would cost approximately $7,000 per mile. Example: Crack Sealing, Fog Sealing, Skin Patching or Throw and Roll Patch.
ML2AC Maintenance Level 2	This is a maintenance action that would cost approximately $35,000 per mile. Example: Armor Coats, Chip Seal, Machine Patch or Mill and Armor Coat.
ML3AC Maintenance Level 3	This is a maintenance action that would cost approximately $150,000 per mile. Example: Mill and Overlay or Thin Overlays.
RS-AC Resurface	This is a resurfacing action with asphalt. The cost would be approximately $330,000 per mile.
ML1PCC Maintenance Level 1	This is a maintenance action that would cost approximately $32,000 per mile. Example: Joint Sealing and Crack Sealing
ML2PCC Maintenance Level 2	This is a maintenance action that would cost approximately $75,000 per mile. Example: Joint and Panel Repair with Joint Sealing
ML3PCC Maintenance Level 3	This is a maintenance action that would cost approximately $127,000 per mile. Example: Diamond Grinding and Panel and Joint Repair.
RH-PCC Rehabilitation	This is a rehabilitation action that would cost approximately $355,000 per mile. Example: Resurfacing. This section's future analysis will change to the asphalt/composite decision tree.

Return

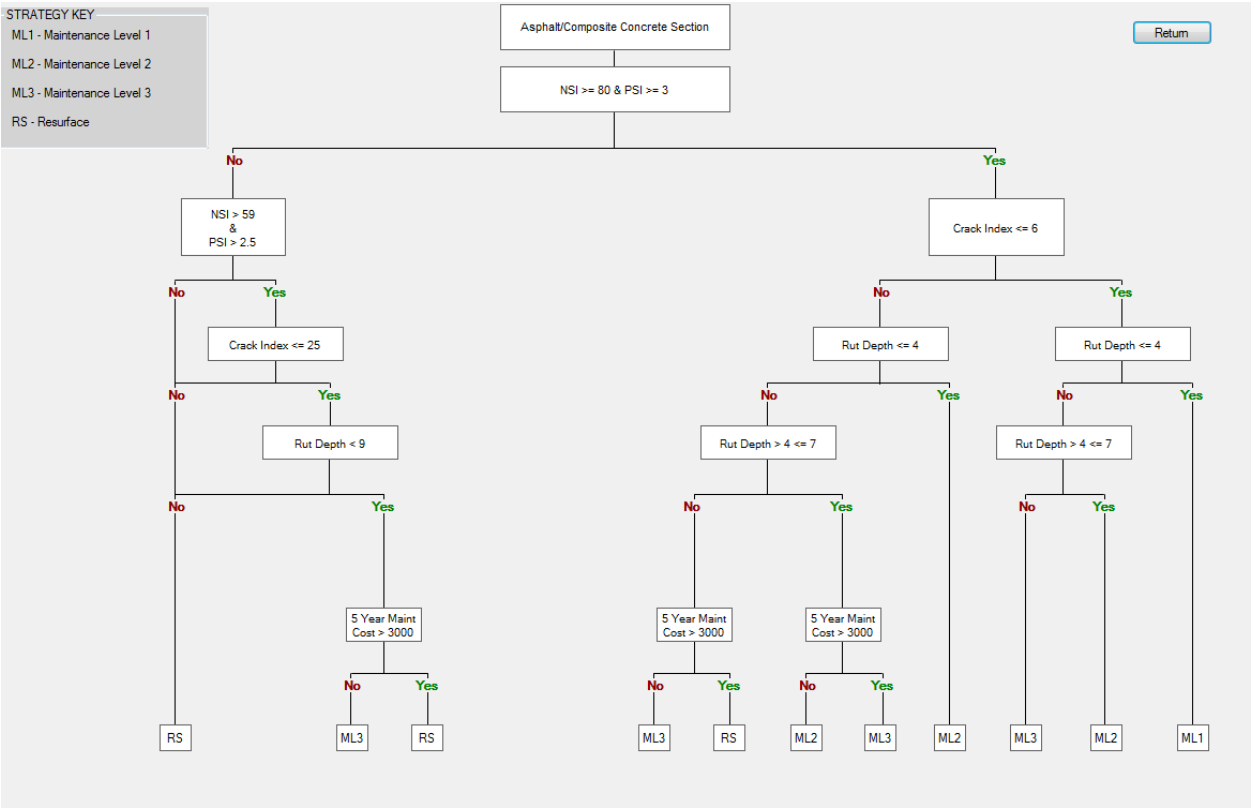
These are the predicted strategies that come from the decision trees and related costs. All costs shown include overhead costs of 35% for Engineering and Contingencies.

NOTE: Current costs as of September, 2013.

DECISION CRITIERIA:

The strategies selected during the optimization and analysis are based on these decision flowcharts. The values used on the chart come from data analysis and engineering judgment since 1984. There is a flowchart for Asphaltic Concrete(AC) and one for Portland Cement Concrete(PCC).

AC DECISION CRITERIA:

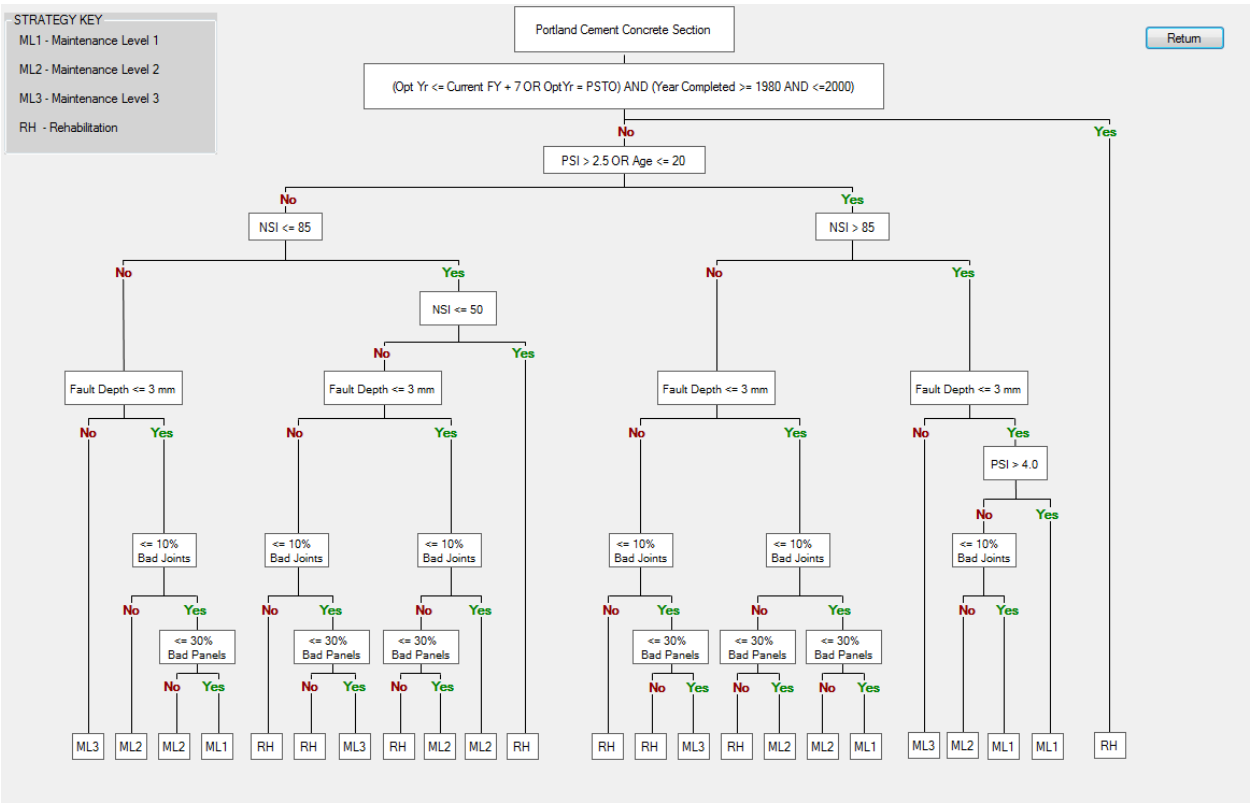


A pavement section must have had at least 3 years since the last improvement before it goes into the decision tree. Also, if the section has a NSI > 85 and the PSI > 3.0 and the crack index < 4 and the rut depth < 4mm then no action is required so it doesn't go through the decision tree.

Each qualifying pavement section falls through this tree and lands on only one strategy. Actions can be ML1, ML2, ML3 and RS as conditions worsen. The first thing it checks is the NSI and PSI. Then it checks the cracking, rutting and 5 year maintenance cost to determine the most appropriate strategy.

The "Strategy Key" at the upper left corner defines the strategies and approximate costs.

PCC DECISION CRITERIA:



A pavement section must have had at least 7 years since the last improvement before it goes into the decision tree. Also, if the section has faulting < 2.5mm and the bad joints < 10% and the bad panels < 30% and joint seal < 50% then no action is required so it doesn't go through the decision tree.

Each qualifying pavement section falls through this tree and lands on only one strategy. Actions can be ML1, ML2, ML3 or RH as conditions worsen. The PSI and Age are the first indices checked followed by NSI, Faulting, Bad Joints and Bad Panels to determine the appropriate strategy. There is a check at the beginning of the flowchart to determine if the optimum year is less than or equal to the current year plus 7 years or "PSTO" and the age is from 1980 through 2000. If the criteria is met the pavement section falls to the RHPCC strategy. All of the RHPCC strategies move over to the bituminous decision tree due to the top layer now being bituminous in a composite design. RCPCC(Reconstruct PCC) is no longer cost effective and has been replaced with the RHPCC strategy. Select Return to go to the previous screen.

GLOSSARY:

Cracking Index-This is a measure of the amount of cracking observed on the pavement. The index is a function of the extent and severity of these distresses.

Faulting-The average faulting at joints in mm.

IRI-International Roughness Index is measured in mm/m.

Joint Distress-This indicates the percentage of PCC joints observed to be spalled for the sample section.

NSI-Nebraska Serviceablity Index is a pavement condition index used to gauge the overall health of a pavement section. It is a calculated numerical value based on pavement distresses such as transverse, wheel path and longitudinal cracking. Its value ranges on a scale of 0 to 100. Zero being "Very Poor" and 100 being "Very Good" condition.

PSI-Present Serviceability Index. This is a numerical value indication the ride quality of the pavements. PSI is a function of roughness IRI, cracking and rutting. It is a on a scale of 0 to 5 with 0 being the worst condition and 5 being the best.

Rutting-The average rut depth measured with Nebraska's profilometer in mm.

Slab Cracking-The percentage of slabs observed to be cracked for the sample section.

Thermal Cracking-This index reflects the severity and extent of transverse and random block cracking. The index is expressed as an index on a scale of 0 to 100 with 0 being the best and 100 being the worst.

Transverse Cracking-This is a condition observed for cracks that are predominately perpendicular to the pavement centerline.

TADT-Truck Average Daily Traffic.

Joint Seal-A PCC factor denoting if the nominal joint seal at a sample site is OK or deficient.

Program Year-The year in which a resurfacing or reconstruction is going to be performed.

Optimum Year-The best year for resurfacing a pavement based on the historical and current pavement condition. It is the year when the benefit to cost ratio of resurfacing a pavement is at a maximum.

Critical Year-The year at which most of the traveling public, and engineers would find the pavement in unacceptable condition. Pavement distress is of such magnitude that complete reconstruction is often needed.

Profile Date-This is the date that the pavement was profiled. Collecting both sensor data and photos.

NSI Date-This is the date that the visual condition ratings were collected.

APPENDIX "A" (POP PARAMETERS)

Bituminous/Composite Sections:

OPTIMUM VALUES(Criteria for "No Action Required", All must occur)

	RDCP0108 field name
NSI > 85	NSI_M
And PSI > 3.0	MPSI
And Crack Index < 4	CRKNG_IDX_AMT
And Rut Depth < 4 mm	CLC_RUT_DPH_Q

YEARLY DETERIORATION RATES

NSI (- 2.5 points), If NSI <= 75.5 then the rate = -3.25 points. OR
Age > 12 & 20 Year ADT > 200 then the rate = -5.0 points OR
ML3 Flag is True then the rate = -5.0 points.
PSI (- 0.1 points)
Crack Index (+ 1.5 points)
Pred Age (+1)
Rut Depth (+ 2.0 default) (+ 1.0 for ML3) and (+ 0.5 for RSAC and RHAC and DT_CMPLTD > JAN, 2000)

Once an strategy selection causes a slower rate of deterioration, then keep using that rate until another strategy causes an even slower rate.

IMPROVEMENT VALUES FOR STRATEGIES

Maintenance Level 1(ML1AC)

NSI	+2.5
PSI	NA
Crack Index	NA
Rut Depth	NA

Maintenance Level 2(ML2AC)

NSI	+3.0
PSI	+0.1
Crack Index	(crack/2)
Rut Depth	(rut/2)

Maintenance Level 3(ML3AC)

NSI	96
PSI	3.5
Crack Index	0.0
Rut Depth	0

Resurface(RS-AC, RS-ACN, RSACN1)

NSI	100
PSI	4.5
Crack Index	0.0
Rut Depth	0
Pred Age	0

Reconstruction(RCAC)

NSI	100
PSI	4.5
Crack Index	0.0
Rut Depth	0
Pred Age	0

If a bituminous/composite section is selected for an improvement strategy, then it is locked out of the decision making for 3 years. On the 4th year it is available for a strategy.

Portland Cement Concrete Sections:

OPTIMUM VALUES(Criteria for "No Action Required", All must occur)

	RDCP0108 field name
Fault Depth < 2.5mm	FAULT_AMT
And Bad Joints < 10%	JNT_DSTRSS_AMT
And Bad Panels < 30%	SLAB_CRKNG
And Crack Seal < 50%	CNC_PAV_JS_P

YEARLY DETERIORATION RATES

NSI (- 1.5 points), If NSI <= 75.5 then the rate = 2.0 points.
If identified as an ASR section(built between 1980 and 2000 and optium year is"PSTO" or within 7 years) then the rate = 6.0.

PSI (- 0.1 points)
Crack Seal (+10%)
Bad Joints (+1)
Bad Panels (+2)
Pred Age (+1)
Fault Depth (+0.375 default) (+0.15 for RCPCC and RHPCC and DT_CMPLTD > JAN, 2000)

Once an strategy selection causes a slower rate of deterioration, then keep using that rate until another strategy causes an even slower rate.

IMPROVEMENT VALUES FOR STRATEGIES

Maintenance Level 1(ML1PCC)

NSI	+ 5.0
PSI	+ 0.1
Fault Depth	NA
% Bad Joints	NA
% Bad Panels	NA
Crack Seal	0%

Maintenance Level 2(ML2PCC)

NSI	+ 8.0
PSI	+ 0.3
Fault Depth	NA
% Bad Joints	0%
% Bad Panels	0%
Crack Seal	0%

Maintenance Level 3(ML3PCC)

NSI	+ 12.0
PSI	+ 0.6
Fault Depth	0.0mm
% Bad Joints	0%
% Bad Panels	0%
Crack Seal	0%

Rehabilitation(RHPCC, RHPCCA, RHPCC1)

NSI	100
PSI	4.5
Fault Depth	0.0mm
% Bad Joints	0%
% Bad Panels	0%
Crack Seal	0%
Pred Age	0

Reconstruction(RCPCC)

NSI	100
PSI	4.5
Fault Depth	0.0mm
% Bad Joints	0%
% Bad Panels	0%
Crack Seal	0%
Pred Age	0

If a Portland cement concrete section is selected for an improvement strategy, then it is locked out of the decision making for 7 years. On the 8th year it falls through the decision making again.

Some of our section data is not always up to date when there is a construction project in progress. We would like to include these sections in the future scenarios but we need to have like-new conditions in the data to start with. If the section is less than or equal to 2 years old and the under construction switch is "Y" or a "P"(Partial means from 0.05 miles to 50% of the section under construction) then we need to check the NSI, rutting or faulting to see if they are in the correct range(shown below), if not then set the appropriate distresses to the improvement values based on the strategy. The strategy code is entered based on the one year program. These are designated by an asterisk(*) in the first space of the Location information column on the Life Cycle Cost Analysis Report.

BITUMINOUS

IF UNDER CONSTRUCTION = "Y" OR "P"
AND PRED AGE = 1 OR 2
AND NSI < 90
OR RUTD AMT > 3
THEN SET CONDITION VALUES BASED ON THE IMPROVEMENT STRATEGY.

PCC

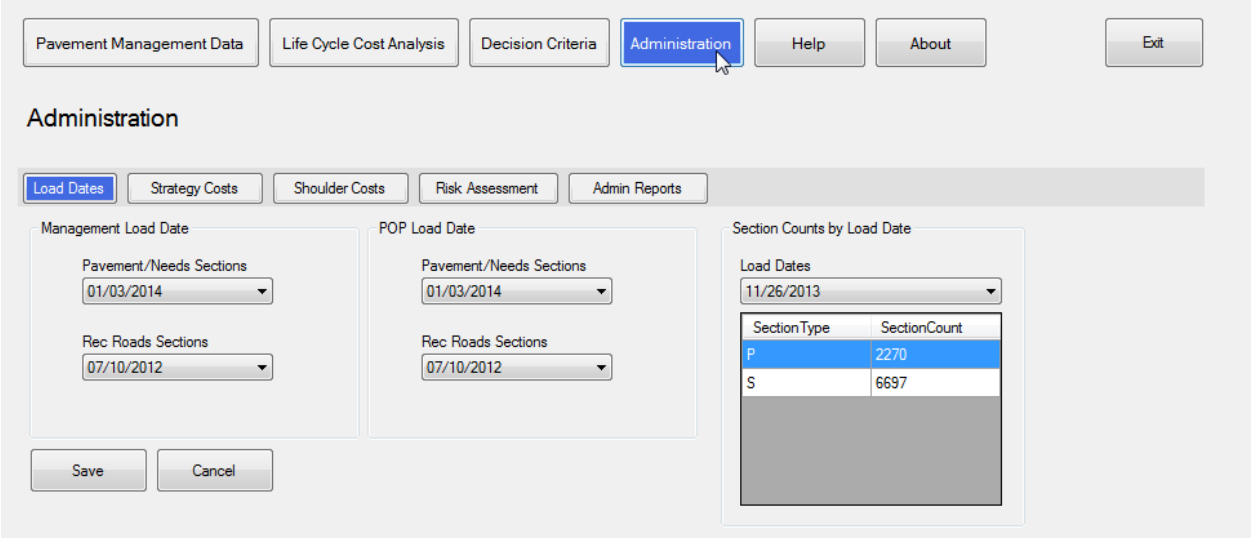
IF UNDER CONSTRUCTION = "Y" OR "P"
AND PRED AGE = 1 OR 2
AND NSI < 90
OR FAULT AMT > 2
THEN SET CONDITION VALUES BASED ON THE IMPROVEMENT STRATEGY.

This check and update should be performed before the sections are deteriorated. They will then pass the optimal test and no action is required for year 1. After a few years of deterioration they will fail the optimal test and require action as suggested by the decision tree.

ADMINISTRATION FUNCTIONS:

This screen is available to administrators only.

Load Dates-This is where the section's databases are selected by load dates.



Strategy Costs

Strategy	Cost	Equation
ML1AC	$ 7000	Benefit Cost Rank = (4 * 2.5) / 7 + (CRKNG_IDX_AMT / 10)
ML2AC	$ 35000	Benefit Cost Rank = (5 * 6) / 35 + (CRKNG_IDX_AMT / 10)
ML3AC	$ 150000	Benefit Cost Rank = (8 * (96 - NSI_M) / 150) + (AVG_RUTD_AMT / 10)
RS-AC	$ 330000	Benefit Cost Rank = (15 * (100 - NSI_M) / 330) + (AVG_RUTD_AMT / 100) RS-ACN Benefit Cost Rank = 5 + (AVG_RUTD_AMT / 10) RSACN1 Benefit Cost Rank = 4.99 + (AVG_RUTD_AMT / 10)
ML1PCC	$ 32000	Benefit Cost Rank = (8 * 5 / 32) + (CNC_PAV_JS_P / 100)
ML2PCC	$ 75000	Benefit Cost Rank = (10 * 8) / 75 + ((SLAB_CRKNG + JNT_DSTRSS_AMT) / 100)
ML3PCC	$ 127000	Benefit Cost Rank = (12 * 12) / 127 + (FAULT_AMT / 10)

RH-PCC	$ 355000	Benefit Cost Rank = (15 * (100 - NSI_M) / 355) + (FAULT_AMT / 10)
		RHPCCA
		If NSI_M &= 30 Then
		Benefit Cost Rank = 9 + (FAULT_AMT / 10)
		Else
		Benefit Cost Rank = (15 * (100# - NSI_M) / 355) + (FAULT_AMT / 10)
		End If
		RHPCC1
		Benefit Cost Rank = 9 + (FAULT_AMT / 10)

Shoulder Costs

Strategy	Condition for SURF_SHLDR_WDTH_RI	Cost
RS-AC, RS-ACN, or RSACN1	<= 2 And > 0	24250
RS-AC, RS-ACN, or RSACN1	> 2 And < 8	72750
RS-AC, RS-ACN, or RSACN1	>= 8	97000
ML3AC	<= 2 And > 0	8000
ML3AC	> 2 And < 8	24000
ML3AC	>= 8	32000
RH-PCC, RHPCC1, or RHPCCA	<= 2 And > 0	32500
RH-PCC, RHPCC1, or RHPCCA	> 2 And < 8	97500
RH-PCC, RHPCC1, or RHPCCA	>= 8	130000

Risk Assessment Formulas

Risk Assessment Rank =

Benefit Cost Rank * (1 + System Factor + Population Density Factor + Length Factor + Strategy Factor)

System Factor

HPMS_NAT_FCN_C	Description	System Factor
1	Interstate	0.25
2	Other Freeway/Expressways	0.2
3	Other Principal Arterials	0.15
4	Minor Arterials	0.1
5	Major Collectors	0.05
6	Minor Collectors	0.01
7	Locals	0.01

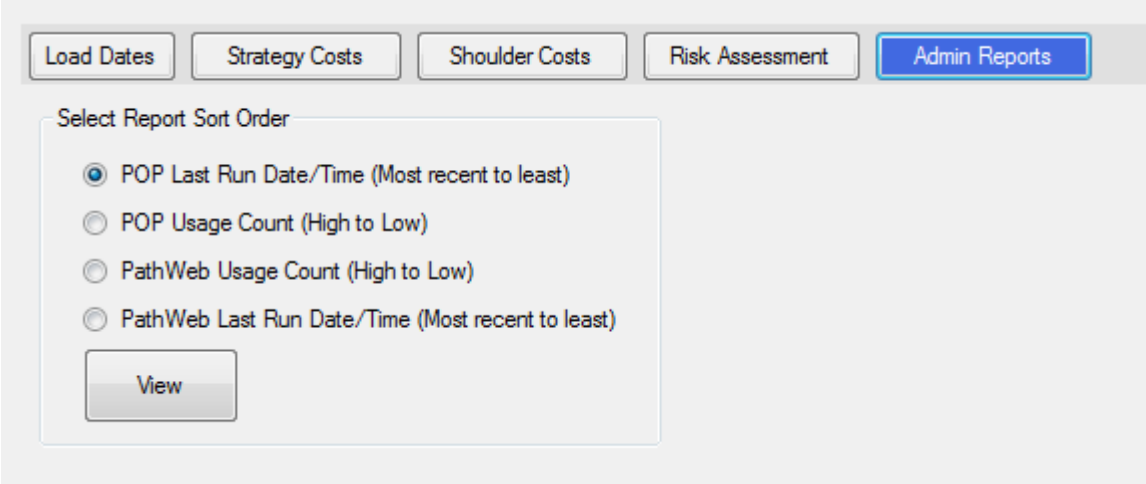
Population Factor

CNY_POP_DNS_C	Description	Population Density Factor
1	High	0.1
2	Moderate	0.05
3	Low	0.025

Length Factor

CNTRLN_MILE_AMT	Length Factor
> 3.0	0.1
> 1.0 and <= 3.0	0.05
<= 1.0	0.025

Strategy Factor

Strategy	Description
ML1AC	0.05
ML2AC	0.05
ML3AC	0.1
RS-AC, RS-ACN, or RSACN1	0.2
ML1PCC	0.05
ML2PCC	0.05
ML3PCC	0.1
RH-PCC, RHPCCA, or RHPCC1	0.2

Administrative Reports – Usage Reports for POP and PathWeb are available here.