

Using the New Roadside Safety Analysis Program (RSAPv3)



Malcolm H. Ray, P.E., Ph.D.
Christine Carrigan, P.E., Ph.D.
Chuck Plaxico, Ph.D.

Let's introduce ourselves...



Malcolm Ray
Presenter



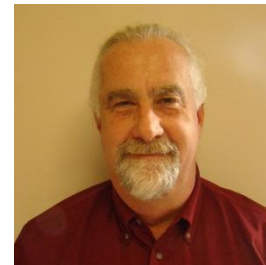
Christine Carrigan
Presenter



Chuck Plaxico
Moderator

Introduction

What does RSAPv3 do and how does it do it?



Malcolm H. Ray, P.E., Ph.D.

How do we decide what the best roadside safety treatment at a particular site?

- ▶ Example – let's say we have a divided highway.
 - What is the best median barrier to use?
 - What does *best* mean?

The roadside treatment that gives the largest crash cost reduction for the money invested to construct and maintain the treatment.

How do we decide what the best roadside safety treatment is at a particular site?

► Options:

- No median barrier.
- Cable median barrier.
- W-beam median barrier.
- TL4 concrete median barrier.
- TL5 concrete median barrier.



How do we decide what the best roadside safety treatment is at a particular site?

► Options:

- No median barrier.
- Cable median barrier.
- W-beam median barrier.
- TL4 concrete median barrier.
- TL5 concrete median barrier.

More Effective

BENEFIT COST RATIO

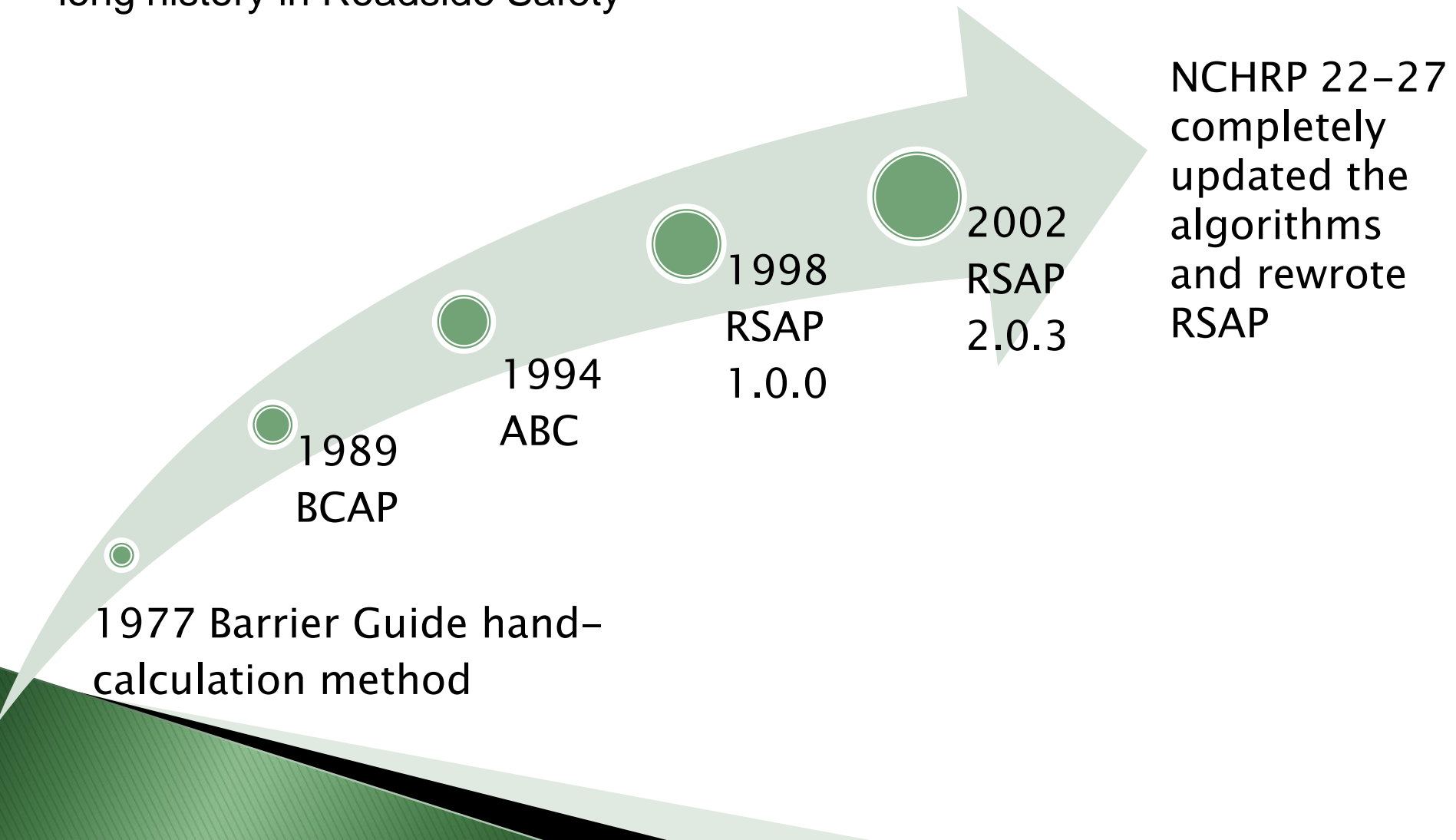
$$\text{BCR} = \frac{\text{Reduction in crash costs}}{\text{Cost of the Improvement}}$$

Costs Less

RSAPv3 calculates and ranks the BCR of alternatives to find the “best” roadside treatment option.

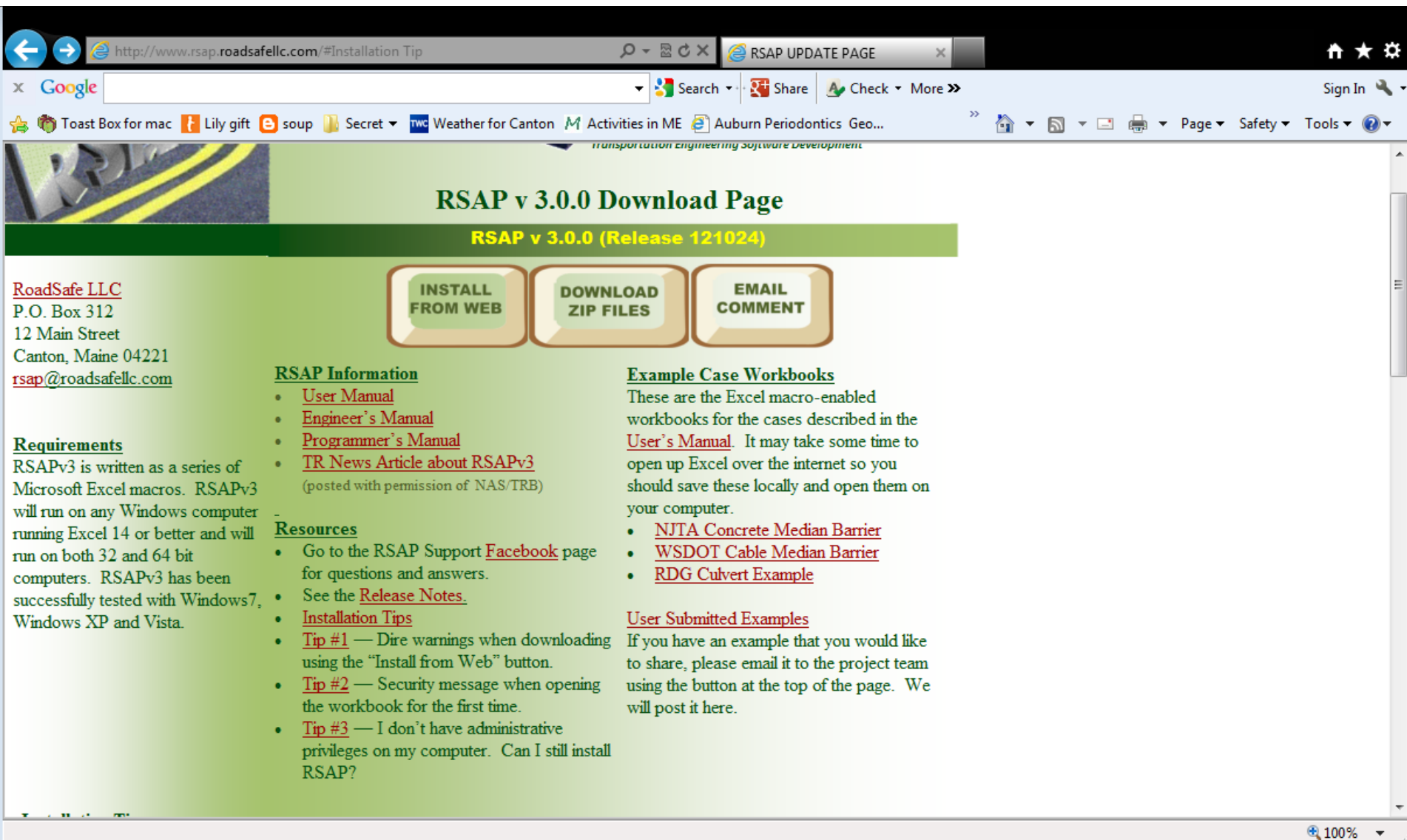
History

Encroachment-Based Benefit-Cost Methods have a long history in Roadside Safety



Where can I get RSAPv3?

<http://www.rsap.roadsafellc.com/>



The screenshot shows a web browser window displaying the 'RSAP v 3.0.0 Download Page'. The browser's address bar shows the URL 'http://www.rsap.roadsafellc.com/#Installation Tip'. The page has a green header with the title 'RSAP v 3.0.0 Download Page' and a sub-header 'RSAP v 3.0.0 (Release 121024)'. Below the header are three buttons: 'INSTALL FROM WEB', 'DOWNLOAD ZIP FILES', and 'EMAIL COMMENT'. The page is divided into three main sections: 'Requirements', 'Resources', and 'Example Case Workbooks'. The 'Requirements' section states that RSAPv3 is written as a series of Microsoft Excel macros and will run on any Windows computer running Excel 14 or better. The 'Resources' section lists links to the User Manual, Engineer's Manual, Programmer's Manual, and a TR News Article about RSAPv3. The 'Example Case Workbooks' section lists links to NJTA Concrete Median Barrier, WSDOT Cable Median Barrier, and RDG Culvert Example. The 'User Submitted Examples' section invites users to share examples with the project team.

RSAP v 3.0.0 Download Page
RSAP v 3.0.0 (Release 121024)

[RoadSafe LLC](#)
P.O. Box 312
12 Main Street
Canton, Maine 04221
rsap@roadsafellc.com

INSTALL FROM WEB **DOWNLOAD ZIP FILES** **EMAIL COMMENT**

Requirements

RSAPv3 is written as a series of Microsoft Excel macros. RSAPv3 will run on any Windows computer running Excel 14 or better and will run on both 32 and 64 bit computers. RSAPv3 has been successfully tested with Windows7, Windows XP and Vista.

Resources

- Go to the RSAP Support [Facebook](#) page for questions and answers.
- See the [Release Notes](#).
- [Installation Tips](#)
- [Tip #1](#) — Dire warnings when downloading using the "Install from Web" button.
- [Tip #2](#) — Security message when opening the workbook for the first time.
- [Tip #3](#) — I don't have administrative privileges on my computer. Can I still install RSAP?

RSAP Information

- [User Manual](#)
- [Engineer's Manual](#)
- [Programmer's Manual](#)
- [TR News Article about RSAPv3](#) (posted with permission of NAS/TRB)

Example Case Workbooks

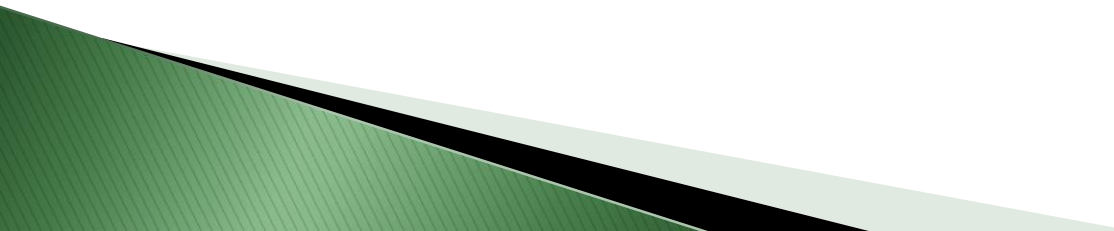
These are the Excel macro-enabled workbooks for the cases described in the [User's Manual](#). It may take some time to open up Excel over the internet so you should save these locally and open them on your computer.

- [NJTA Concrete Median Barrier](#)
- [WSDOT Cable Median Barrier](#)
- [RDG Culvert Example](#)

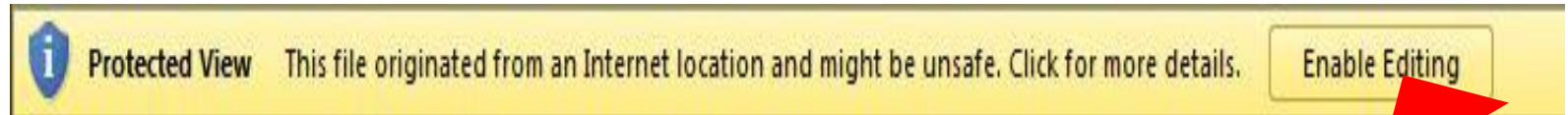
User Submitted Examples

If you have an example that you would like to share, please email it to the project team using the button at the top of the page. We will post it here.

Current Version

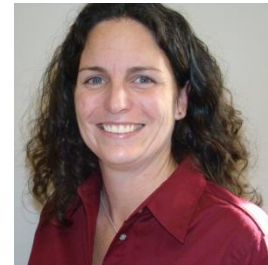
- ▶ RSAPv3 is actually a group of Excel Macros → Excel must be installed on your computer.
 - ▶ Current release is RSAP 3.0.1 release 130304.
 - ▶ Release 121024 and later run on either 32 or 64 bit computers.
 - ▶ Same code runs on both architectures regardless of whether you have the 32 or 64 bit version of excel installed.
 - ▶ If you have Excel 12 (i.e., Windows 2007) you need a slightly different version → contact the development team.
 - ▶ Register your copy so you are notified about updates, changes and training opportunities.
- 

Remember: Enable editing after download



Example Problem

Median Barrier Alternatives on a High-Speed,
High-Volume Divided Highway



Christine E. Carrigan, P.E., Ph.D.

RSAP 3.0.1 (release 130304)

RSAP Controls

Concrete Barrier Example Problem

- PROJECT
- TRAFFIC
- HIGHWAY
- ALTERNATIVES
- X-SECTION
- ANALYZE
- RESULTS
- SETTINGS
- HAZARDS

Start a New Project

Open Existing Project

Clear User Information

Restore RSAP Defaults

RSAPv3_130304_concrete.xlsm

RSAP PROJECT INFORMATION

BASIC INFORMATION

Today's date (i.e., run date)

3/5/2013

Title

Concrete Barrier Example Problem

Units

USCU

(only USCU units at this time)

Design Life

25

YRS

Construction Year

2003

Rate of Return

4

%

Notes

See User's Manual Page 85 for a description of this example problem.

Microsoft Excel



The cell or chart that you are trying to change is protected and therefore read-only.

To modify a protected cell or chart, first remove protection using the Unprotect Sheet command (Review tab, Changes group). You may be prompted for a password.

OK

Change the default values in the yellow or rose cells or proceed to the next step by selecting 'Traffic Info.'

Help

Save

SaveAs

Exit

Departmental Analyses -- 2009 Annual Revision," U.S. DOT, March 18,2009.

see <http://regs.dot.gov>

RSAP Root Directory:

C:\Program Files\RSAPv3

YELLOW:

User entered information.

ROSE:

Default data, can be edited.

WHITE:

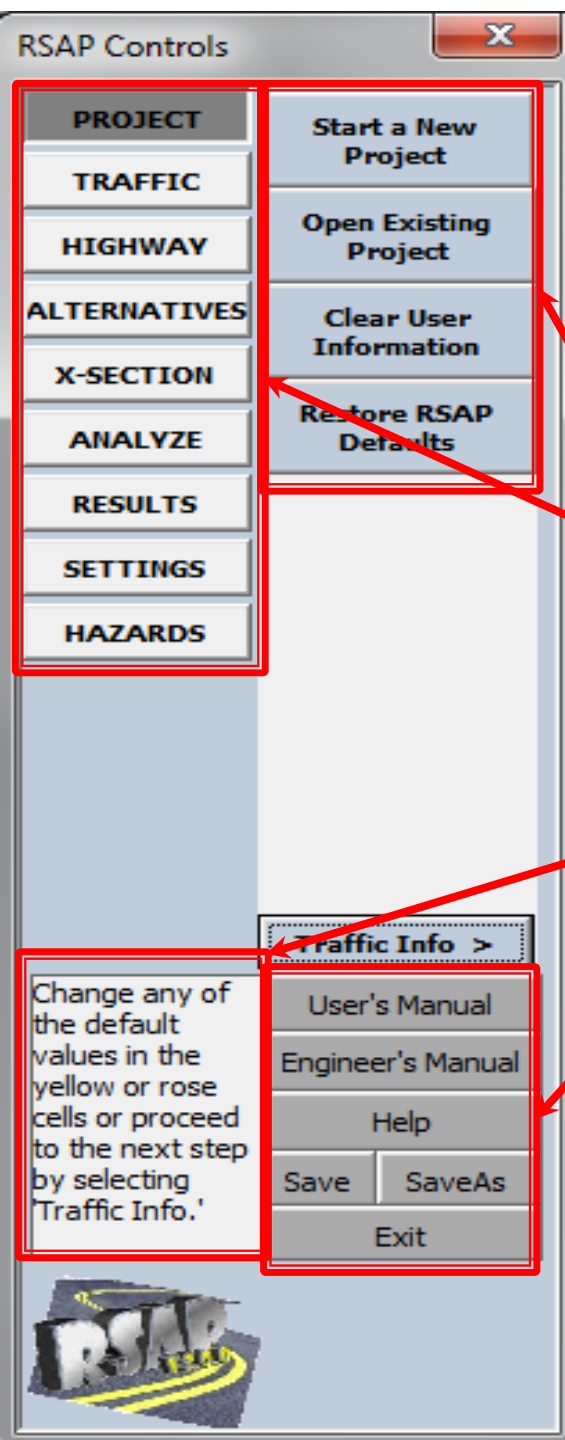
Calculated values.

Note:

Each term and input cell is defined in the User's Manual.



8:23 AM
3/5/2013



► RSAP Controls

- Always on the left side of screen.
- Work flows from:
 - Top to bottom
 - Left to right
- Correspond to each worksheet.
- Button options change with the context of the worksheet.
- Hints about what to do next.
- General purpose buttons – available all the time.

Our Focus: Example Problem

- ▶ Entry of Project Data
 - Traffic characteristics
 - Highway types
 - Highway characteristics
 - Properly locating data
 - Roadside cross-section
- ▶ Analysis Settings
- ▶ Results

PROJECT

TRAFFIC

HIGHWAY

ALTERNATIVES

X-SECTION

ANALYZE

RESULTS

SETTINGS

HAZARDS

Clear User Information

Restore RSAP Defaults

< Project Info

Highway Info >

User's Manual


Engineer's Manual

Help

Save SaveAs

Exit

Change any of the values in the yellow or rose cells. If they are ok proceed to 'Highway Info'



RSAPv3_130304_concrete.xlsm

Concrete Barrier Example ProblemTRAFFIC INFORMATION

CONSTRUCTION YEAR ADT: 47,700 vehicles/day

TRAFFIC GROWTH 1.7 % growth/yr

WHICH ADT TO USE? Mid-Life

MID-LIFE ADT: 58,888 vehicles/day

END OF LIFE ADT: 72,701 vehicles/day

ADT USED BY RSAP 58,888 vehicles/day

Enter the average annual daily traffic as a whole number.

VEHICLE MIXTYPICAL CHARACTERISTICS

RSAP VEHICLES	FHWA CLASS	PERCENT	RSAP TYPE	WEIGHT	LENGTH	WIDTH	C.G. Long.	C.G. Hgt	Crash Cost Adj.	Encr Multiplier	Mix Multiplier
		%		lbs	ft	ft	ft	ft			
Motorcycles	1	0.0	M	600	7.00	1.50	3.00	2.60	0.56	1.00	0.00
Passenger Vehicles	2	63.8	C	3,300	15.00	5.40	6.00	5.00	1.00	1.00	-0.75
Pickup Truck	3	21.3	PU	5,000	19.75	6.50	8.50	2.90	1.00	1.00	-0.25
Light Tractor Trailer	8-9	0.0	LTT	16,000	48.00	8.50	12.00	4.8	3.52	0.30	0.00
Average Tractor Trailer	8-13	9.0	ATT	22,250	48.00	8.50	20.00	4.8	3.52	0.30	0.60
Heavy Tractor Trailer	8-13	0.0	HTT	37,500	48.00	8.50	20.00	6	3.52	0.30	0.00
Light Single Unit Truck	5	0.0	LSUT	6,800	35.00	7.77	12.50	3.4	3.52	0.30	0.00
Average Single Unit Truck	6	6.0	ASUT	12,000	35.00	7.77	12.50	3.4	3.52	0.30	0.40
Heavy Single Unit Truck	7	0.0	HSUT	22,000	35.00	7.77	12.50	4.2	3.52	0.30	0.00

Concrete Barrier Example ProblemTRAFFIC INFORMATION

CONSTRUCTION YEAR ADT: 47,700 vehicles/day

TRAFFIC GROWTH 1.7 % growth/yr

WHICH ADT TO USE? Mid-Life

MID-LIFE ADT: 58,888 vehicles/day

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ADT USED BY RSAP 58,888 vehicles/day

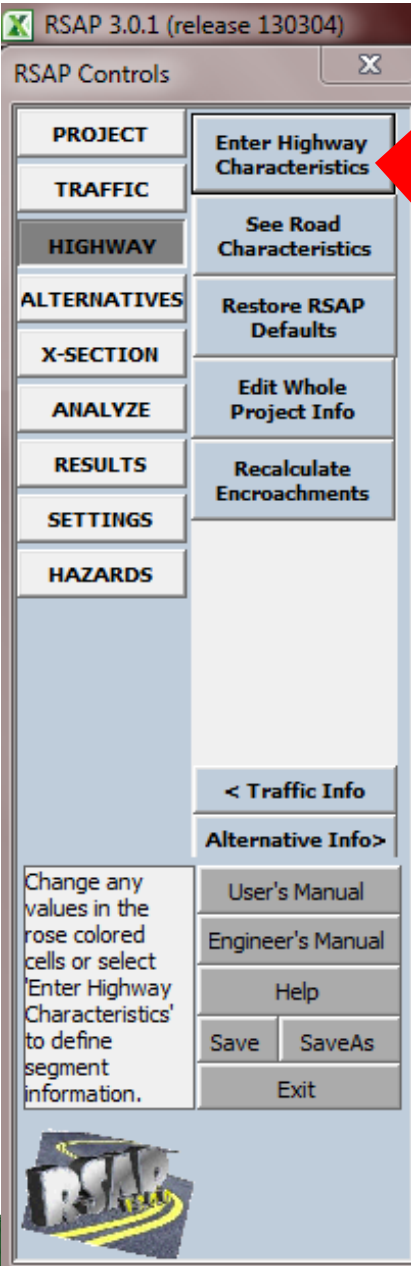
Enter the average annual daily traffic as a whole number.

50	%
50	%
D	
F	
65	m
1	

Highway Types

- ▶ Undivided
- ▶ Divided
- ▶ One way





RSAP Controls

PROJECT

Segment Project

TRAFFIC

See Road Characteristics

HIGHWAY

Clear User Information

ALTERNATIVES

X-SECTION

ANALYZE

RESULTS

SETTINGS

HAZARDS

< Traffic Info

Alternative Info>

User's Manual

Engineer's Manual

Help

Save

SaveAs

Exit

Enter the road characteristics in the yellow cells. When finished select 'Segment Project.'



RSAPv3_130304_concrete.xlsm

Concrete Barrier Example Problem

WHOLE ROADWAY CHARACTERISTICS

PERCENT OF TRAFFIC IN PRIMARY DIRECTION:

50

%

PERCENT OF TRAFFIC ENCROACHING RIGHT:

50

%

HIGHWAY TYPE:

D

TERRAIN:

F

POSTED SPEED LIMIT:

65

mi/hr

USER ENROACHMENT ADJUSTMENT:

1

PROJECT	
Min Sta	
Max Sta	5
Max Offset	

USER-ENTERED CHARACTERISTICS

Total segments =

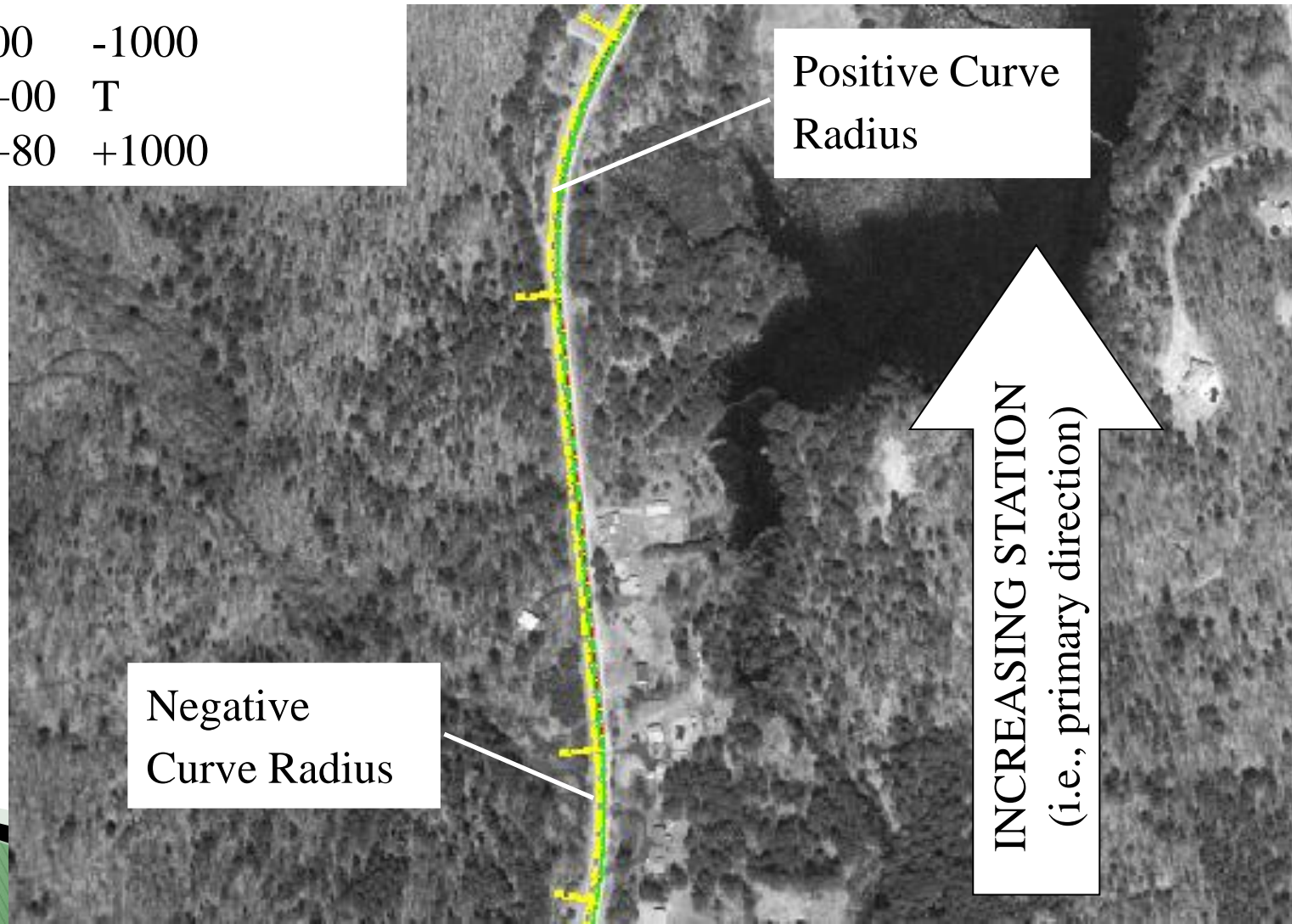
RSAP DEFAULT HIGHWAY CHARACTERISTICS

START STATION	END STATION	KEYWORD	VALUE	SEG.	DIVIDED HIGHWAYS		
0+00.	52+80.	LANES TOTAL	4		ACCESS DENSITY	0	point
0+00.	52+80.	LANES TOTAL	2		LANES TOTAL	4	
0+00.	52+80.	LNWIDTH	27		LNWIDTH	12	
		MED_SHLR_WIDTH			MED_SHLR_WIDTH	10	
		MED_WIDTH			MED_WIDTH	30	
		PRM_CURV_RAD			PRM_CURV_RAD	T	
		PRM_GRADE			PRM_GRADE	0	
		PRM_NUM_LNS			PRM_NUM_LNS	2	
		RMBLSTRIP			RMBLSTRIP	FALSE	TRUE
					RT_SHLR_WIDTH	6	

RSAPv3 includes many dropdown menus that provide the appropriate input options.

Highway Characteristics: prm_curv_rad (feet)

0+00 to 30+00	-1000
30+00 to 45+00	T
45+00 to 52+80	+1000

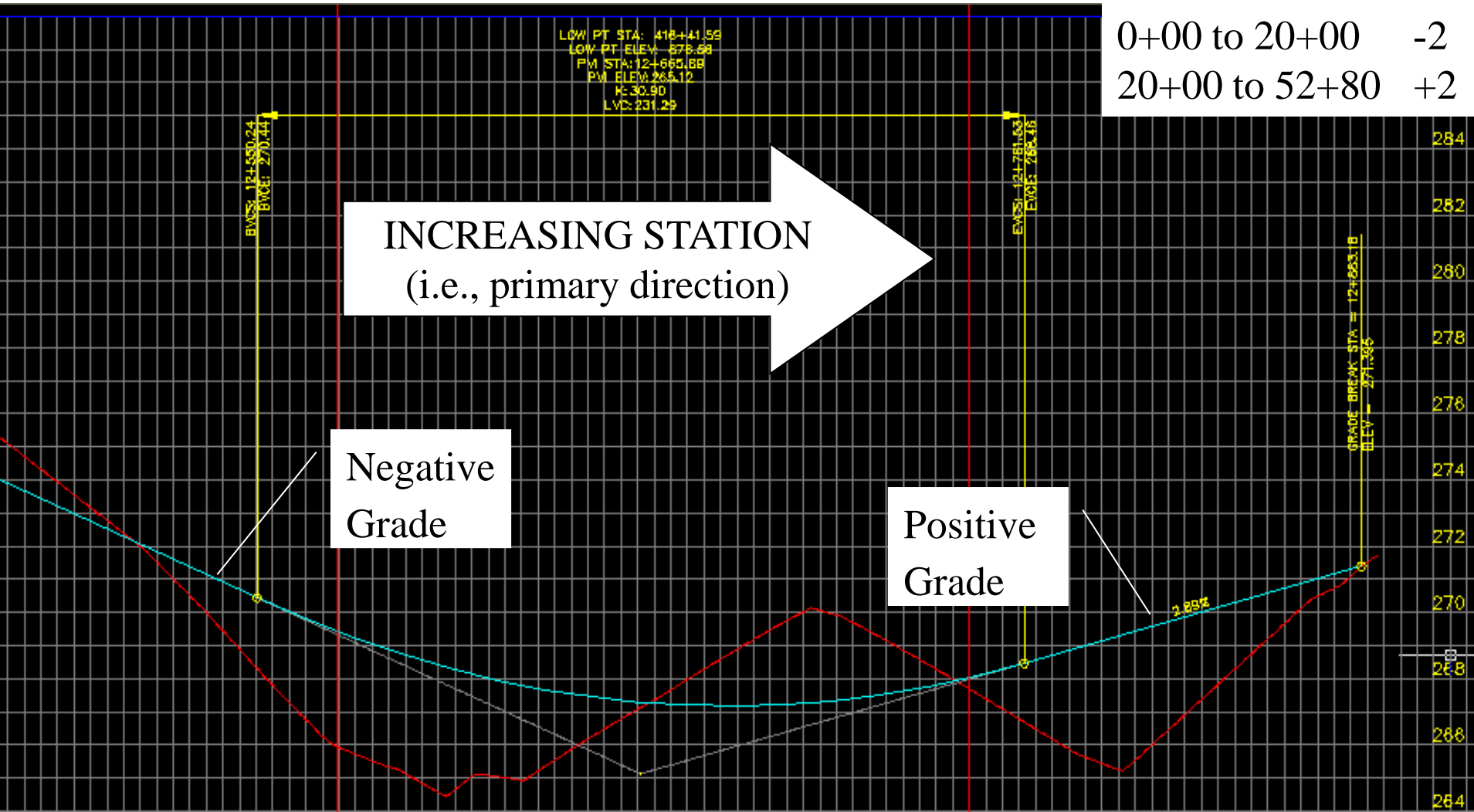


Positive Curve
Radius

Negative
Curve Radius

INCREASING STATION
(i.e., primary direction)

Highway Characteristics: prm_grade (percent)



RSAP Controls

PROJECT

TRAFFIC

HIGHWAY

ALTERNATIVES

X-SECTION

ANALYZE

RESULTS

SETTINGS

HAZARDS

Segment Project

See Road Characteristics

Clear User Information

< Traffic Info

Alternative Info>

User's Manual

Engineer's Manual


Help

Save

SaveAs

Exit

Enter the road characteristics in the yellow cells. When finished select 'Segment Project.'



0

RSAPv3_130304_concrete.xlsm

Concrete Barrier Example Problem

WHOLE ROADWAY CHARACTERISTICS

PERCENT OF TRAFFIC IN PRIMARY DIRECTION:

PERCENT OF TRAFFIC ENCROACHING RIGHT:

HIGHWAY TYPE:

TERRAIN:

POSTED SPEED LIMIT:

USER ENROACHMENT ADJUSTMENT:

50

50

D

F

65

1

%

%

mi/hr

PROJECT

Min Sta

Max Sta

Max Offset

USER-ENTERED CHARACTERISTICS

Total segments =

RSAP DEFAULT HIGHWAY CHARACTERISTICS

DIVIDED HIGHWAYS

START STATION	END STATION	KEYWORD	VALUE	SEG.			
0+00.	52+80.	LANES TOTAL	4		ACCESS DENSITY	0	point
0+00.	52+80.	PRM_NUM_LNS	2		LANES TOTAL	4	
0+00.	52+80.	MED_WIDTH	27		LNWIDTH	12	
					MED_SHLR_WIDTH	10	
					MED_WIDTH	30	
					PRM_CURV_RAD	T	
					PRM_GRADE	0	
					PRM_NUM_LNS	2	
					RMBLSTRIP	FALSE	TRUE
					RT_SHLR_WIDTH	6	

Project Information

Traffic Information

Road Segments

Alternatives

Severity

Cross-Section

Encr

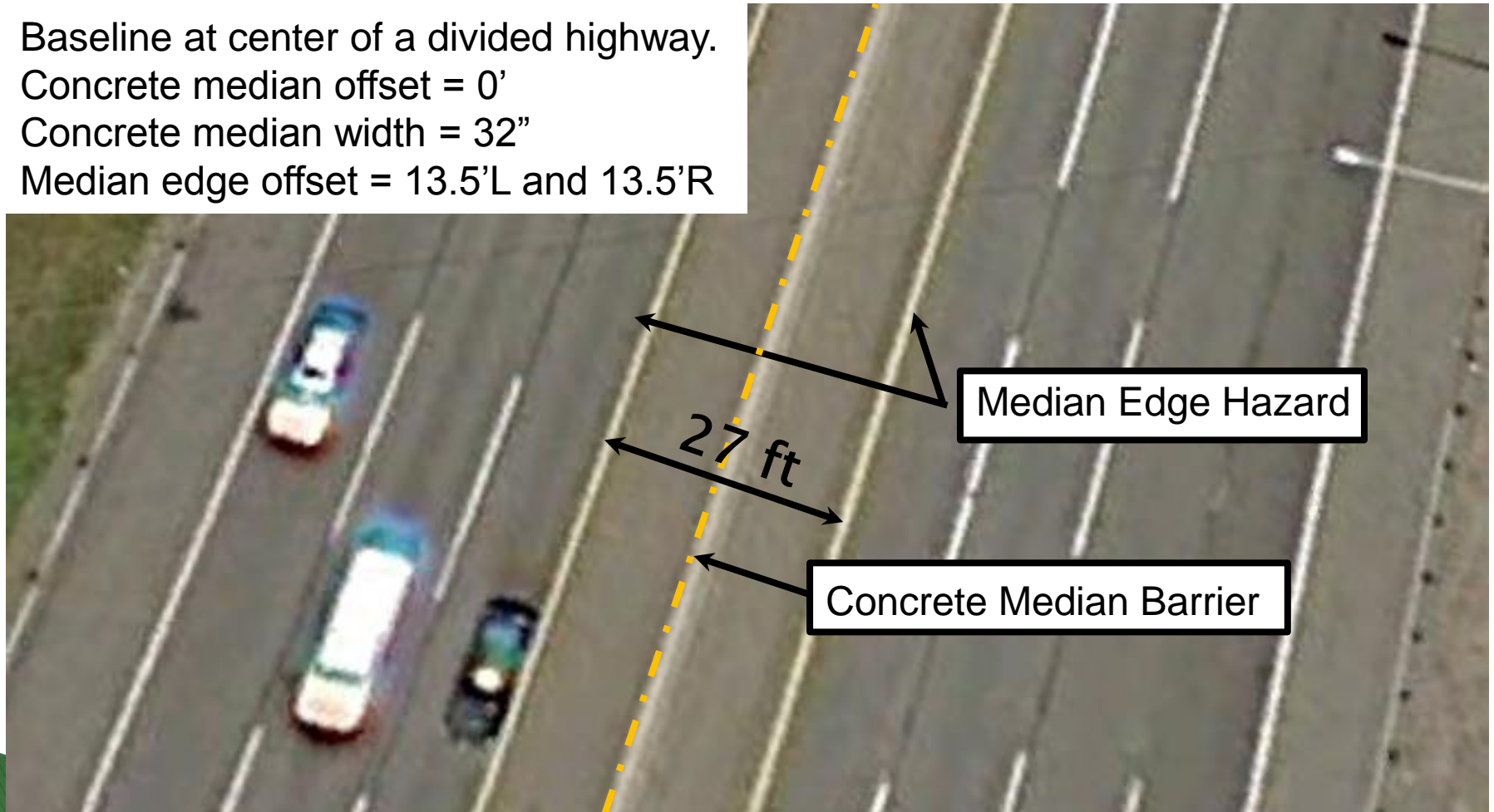


Roadside Alternatives

- ▶ RSAPv3 will evaluate up to five alternatives with up to 25 segments at one time.
- ▶ Enter from lowest to highest construction cost.
 - Alternative 1: Unprotected median
 - Alternative 2: W-beam median
 - Alternative 3: TL-3+ concrete median
 - Alternative 4: TL5 NJ Shape median

Locating Hazards

Baseline at center of a divided highway.
Concrete median offset = 0'
Concrete median width = 32"
Median edge offset = 13.5'L and 13.5'R



RSAP Controls

PROJECT

4 ALTS DEFINED

TRAFFIC

Clear All Alternative Data

HIGHWAY

Copy Alt 1

ALTERNATIVES

Delete Alt 2

X-SECTION

Sort Alternatives in Station Order

ANALYZE

View/Edit

RESULTS

Alternative 1

SETTINGS

Alternative 2

HAZARDS

Alternative 3

Alternative 4

Alternative 5

Hazard Info >

< Highway Info

X-Section Info >

Complete the information in the yellow cells. Use buttons to add, edit or delete alternatives.

User's Manual

Engineer's Manual

Help

Save

SaveAs

Exit

RSAPv3_130304_concrete.xlsm

ROADSIDE FEATURES FOR ALTERNATIVE NUMBER: 1

ALTERNATIVE NAME

Unprotected Median

DEFAULT X-SECTION

All Flat

CONSTRUCTION COST

\$ -

ANNUAL MAINTENANCE COST

\$ -

GENERAL HAZARD TYPE	SPECIFIC HAZARD TYPE	START STATION	START SIDE	START OFFSET	END STATION	END SIDE	END OFFSET	PARAMETER	VALUE
		STATIONS		ft	STATIONS		ft		
SpecialEdge	EdgeOfMedian	0+00.	R	R	52+80.00	R	13.5		
SpecialEdge		0+00.	L	13.5	52+80.00	L	13.5		
Guardrails_Rigid	BridgeEdge_HighHaz								
Guardrails_SemiRigid	BridgeEdge_LowHaz								
MedianBarriers_Flexible	BridgeEdge_MedHaz								
MedianBarriers_Rigid	ClearZoneFence								
MedianBarriers_SemiRigid	EdgeOfMedian								
PoleTreeSign	GenericRigidWall								
SpecialEdge	Rock Ledge								
TerminalEnds									

Menu options are context sensitive.

Station Format Error

Enter the offset as a decimal number from 0 to 200.

Retry

Cancel

Help

Was this information helpful?

Most input cells include error checking and will notify you if you enter invalid information

Project Information

Traffic Information

Road Segments

Alternatives

Severity

Cross-Section

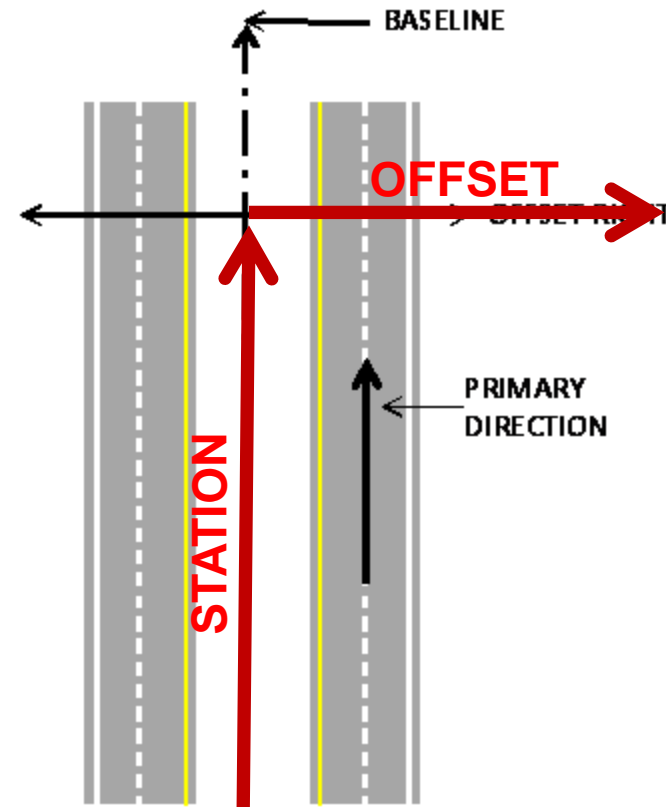
Encr Fre

Ready

[illegible]

Locating Data

- ▶ **Station** → Measured longitudinally in Stations in the Primary Direction.
- ▶ **Offset** → Measured as a distance left or right from the BASELINE.
- ▶ The baseline is different for different highway types.

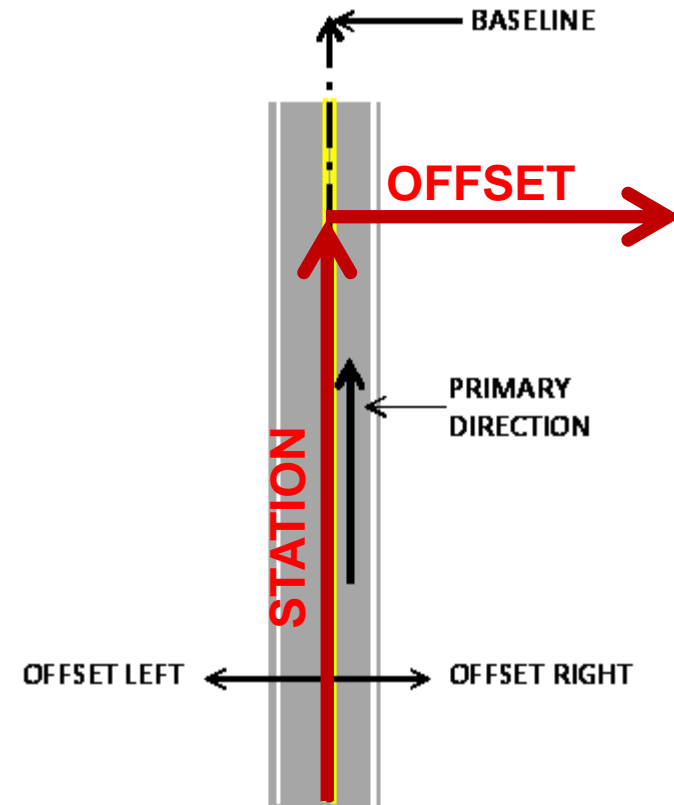


4 LANE DIVIDED

The baseline runs along the center-line of the median in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line.

Locating Data

- ▶ **Station** → Measured longitudinally in Stations in the Primary Direction.
- ▶ **Offset** → Measured as a distance left or right from the BASELINE.

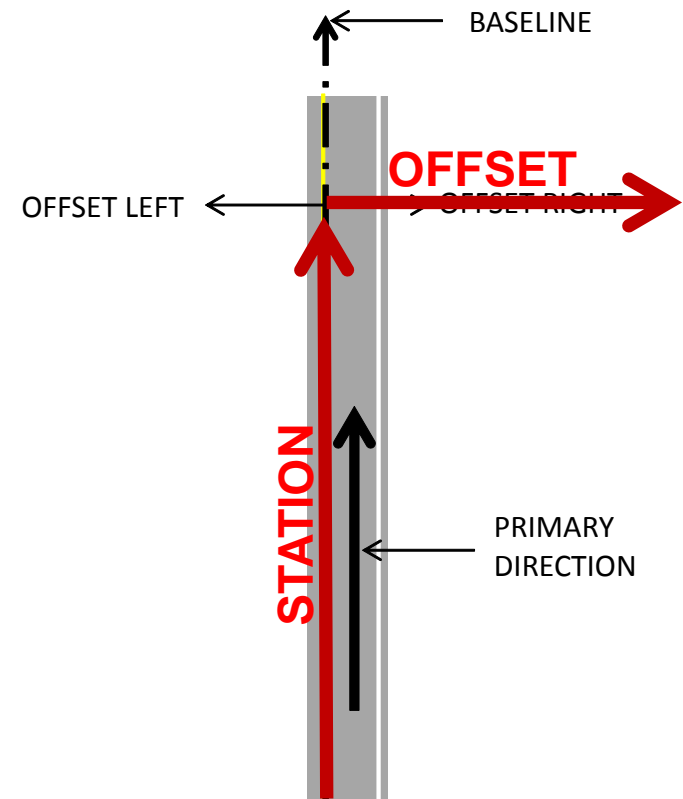


2 LANE UNDIVIDED

The baseline runs along the center-line of the undivided highway in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line.

Locating Data

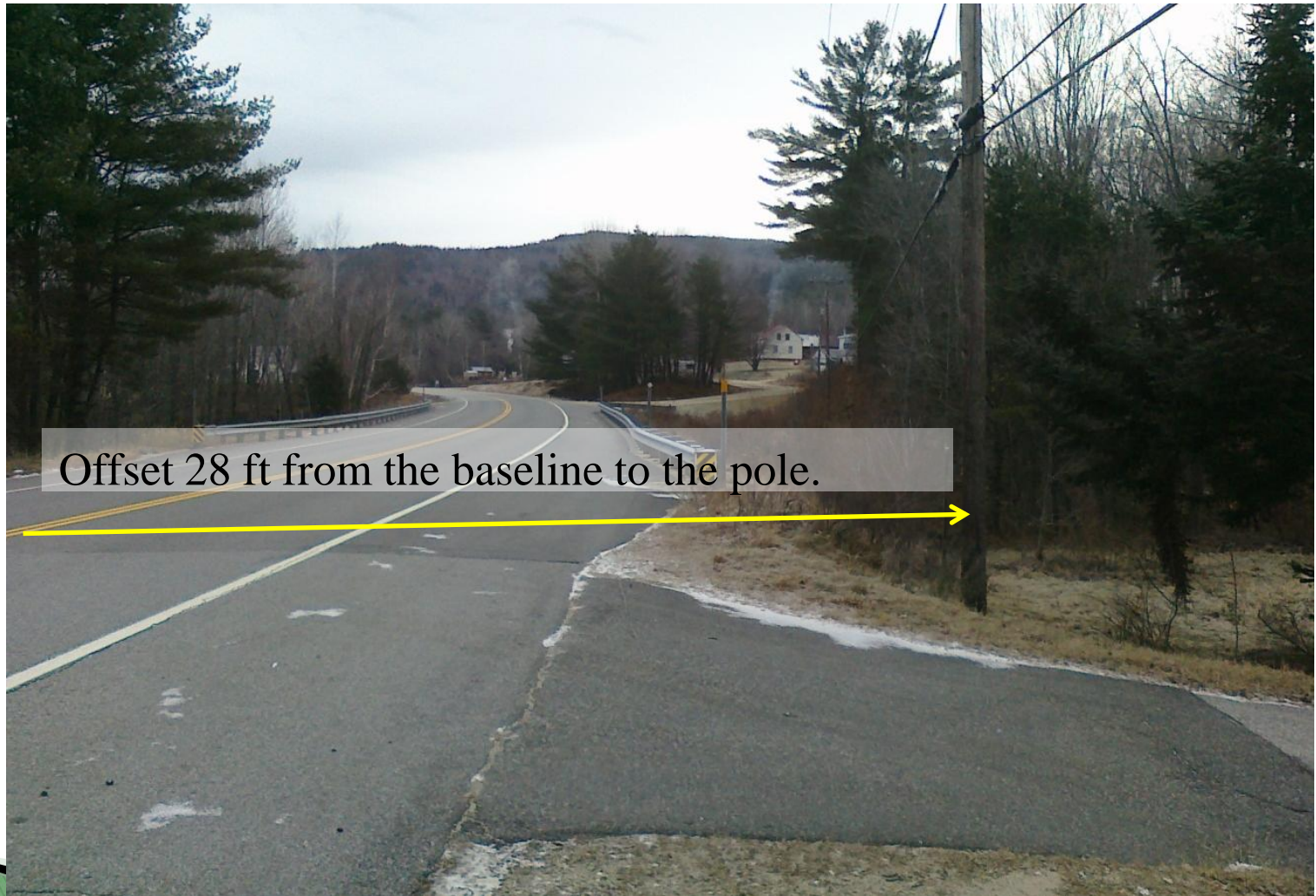
- ▶ **Station** → Measured longitudinally in Stations in the Primary Direction.
- ▶ **Offset** → Measured as a distance left or right from the BASELINE.



ONE WAY

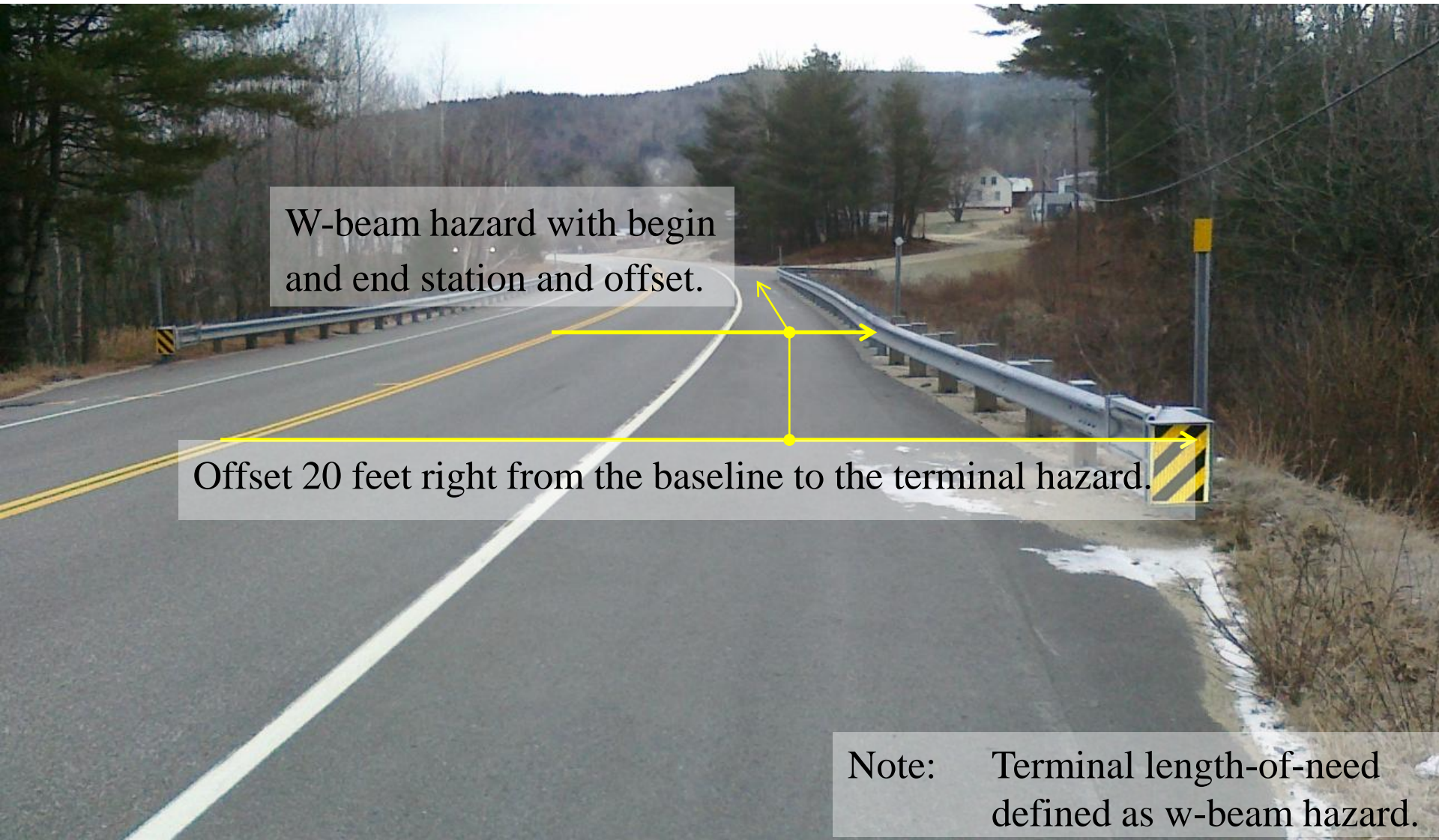
The baseline runs along the left lane edge of the one-way road in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line. Use one-way roads for ramps or divided highways with independent alignments.

Locating Hazards



Offset 28 ft from the baseline to the pole.

Locating hazards



W-beam hazard with begin and end station and offset.

Offset 20 feet right from the baseline to the terminal hazard.

Note: Terminal length-of-need defined as w-beam hazard.

Locating Hazards

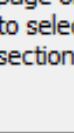
Baseline is always in middle of road



Roadside X-Sections

[illegible]

RSAP Controls		X
PROJECT	Copy Defaults to all Segments	
TRAFFIC		
HIGHWAY	Assign X-Sections to Segs and Alts	
ALTERNATIVES		
X-SECTION	To edit a x-section, double click on one of the x-sections listed below.	<div> <div>All 10:1</div> <div>All 2:1</div> <div>All 3:1</div> <div>All 4:1</div> <div>All 6:1</div> <div>All 8:1</div> <div>All Flat</div> </div>
ANALYZE		
RESULTS		
SETTINGS		
HAZARDS		
<p>Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.</p>		<div> <div><Alternative Info</div> <div>Analysis ></div> <div>User's Manual</div> <div>Engineer's Manual</div> <div>Help</div> <div>Save</div> <div>SaveAs</div> <div>Exit</div> </div>



PROJECT

Copy Defaults to all Segments

TRAFFIC

HIGHWAY

Save X-Section

ALTERNATIVES

Delete X-Section

X-SECTION

To edit a x-section, double click on one of the x-sections listed below.

ANALYZE

RESULTS

All 10:1

All 2:1

All 3:1

All 4:1

All 6:1

All 8:1

All Flat

SETTINGS

HAZARDS

<Alternative Info

Analysis >

Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.

User's Manual

Engineer's Manual

Help

Save

SaveAs

Exit

RSAPv3_130304_concrete.xlsm

DEFAULT X-SECTION			
SEG	START STA	END STA	
1	0+00.	52+80.00	All Flat

SEGMENT CHARACTERISTICS			
Total Lanes			
Number Lanes Prim			
Lane Width (ft)			12.

Project Information

Traffic Info

PROJECT

Copy Defaults to all Segments

TRAFFIC

HIGHWAY

Save X-Section

ALTERNATIVES

Delete X-Section

X-SECTION

To edit a x-section, double click on one of the x-sections listed below.

ANALYZE

RESULTS

All 10:1

All 2:1

All 3:1

All 4:1

All 6:1

All 8:1

All Flat

SETTINGS

HAZARDS

<Alternative Info

Analysis >

Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.

User's Manual

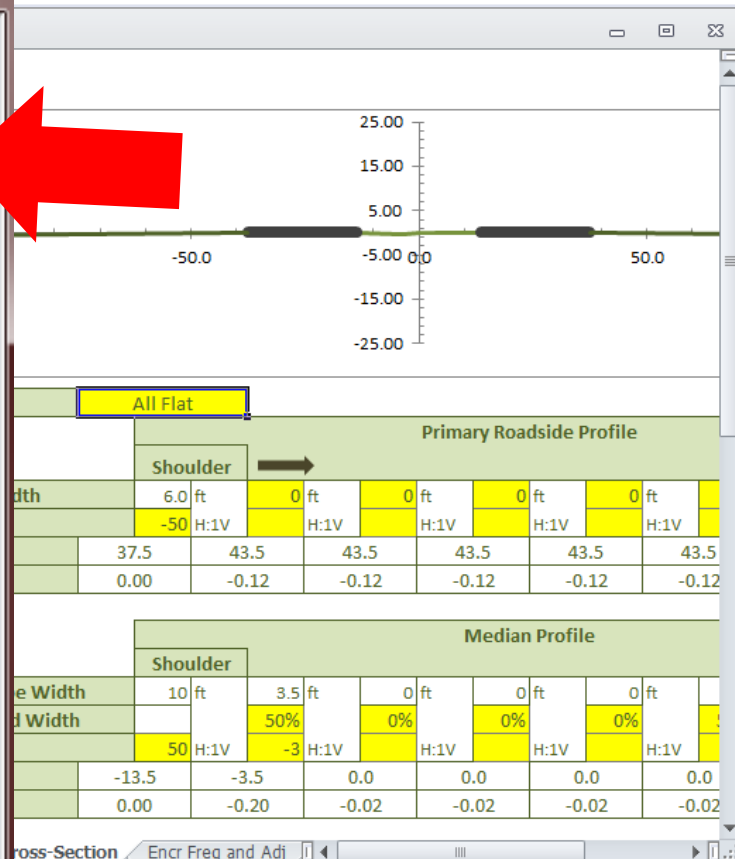
Engineer's Manual

Help

Save

SaveAs

Exit



Roadside X-Sections

[illegible]

RSAP Controls

PROJECT

Copy Defaults to all Segments

TRAFFIC

HIGHWAY

Assign X-Sections to Segs and Alts

ALTERNATIVES

X-SECTION

To edit a x-section, double click on one of the x-sections listed below.

All 10:1

All 2:1

All 3:1

All 4:1

All 6:1

All 8:1

All Flat

<Alternative Info

Analysis >

User's Manual

Engineer's Manual

Help

Save

SaveAs

Exit

Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.

RESULTS

SETTINGS

HAZARDS

RSAPv3_130304_concrete.xlsm

DEFAULT X-SECTION			X-SECTION FOR ALTERNATIVE				
SEG	START STA	END STA	All Flat	All Flat	All Flat	All Flat	
			1	2	3	4	5
1	0+00.	52+80.00	All Flat	All Flat	All Flat	All Flat	
			All 4:1				
			All 6:1				
			All 8:1				
			All Flat				
			MedMndinCu				
			MedMndinFill				
			MedMndonFi				
			Vertical Fill				

SEGMENT CHARACTERISTICS

Total Lanes

Number Lanes Prim

Lane Width (ft)

4

2

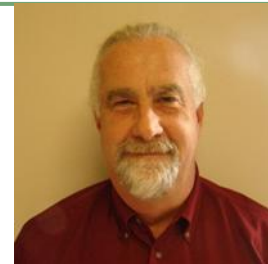
12.0

You can choose a different cross-section for each segment in each alternative.

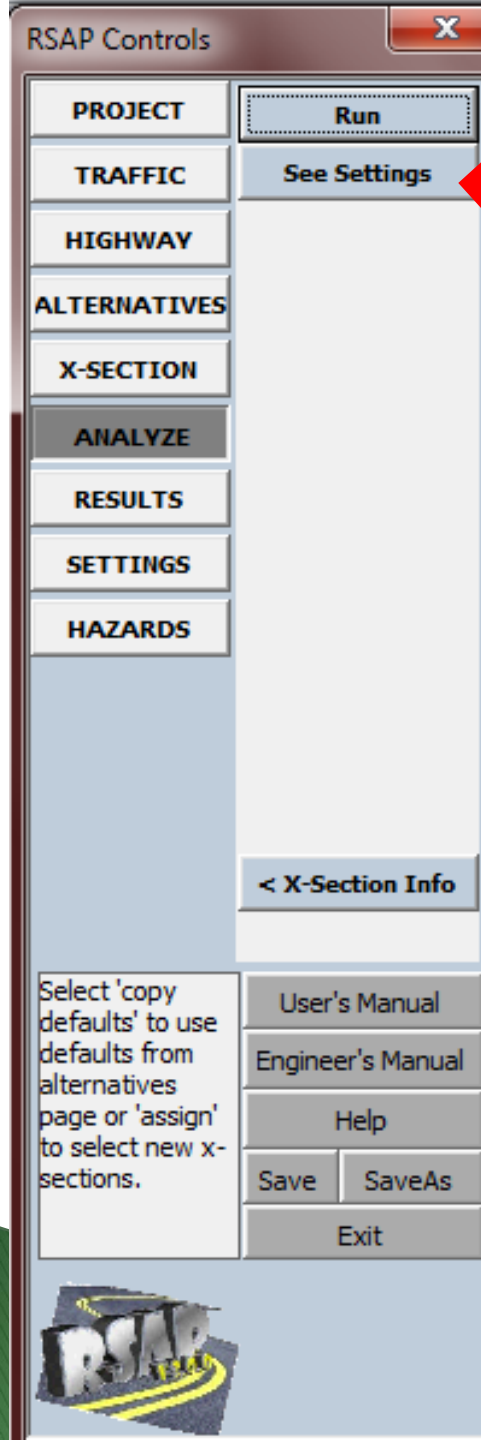
You can also create you own new custom cross-sections and save them in the database.

Analysis and Results

Median Barrier Alternatives




Malcolm H. Ray, PE, PhD



ANALYZE:
How do I pick the best
analysis settings?

RSAP Controls

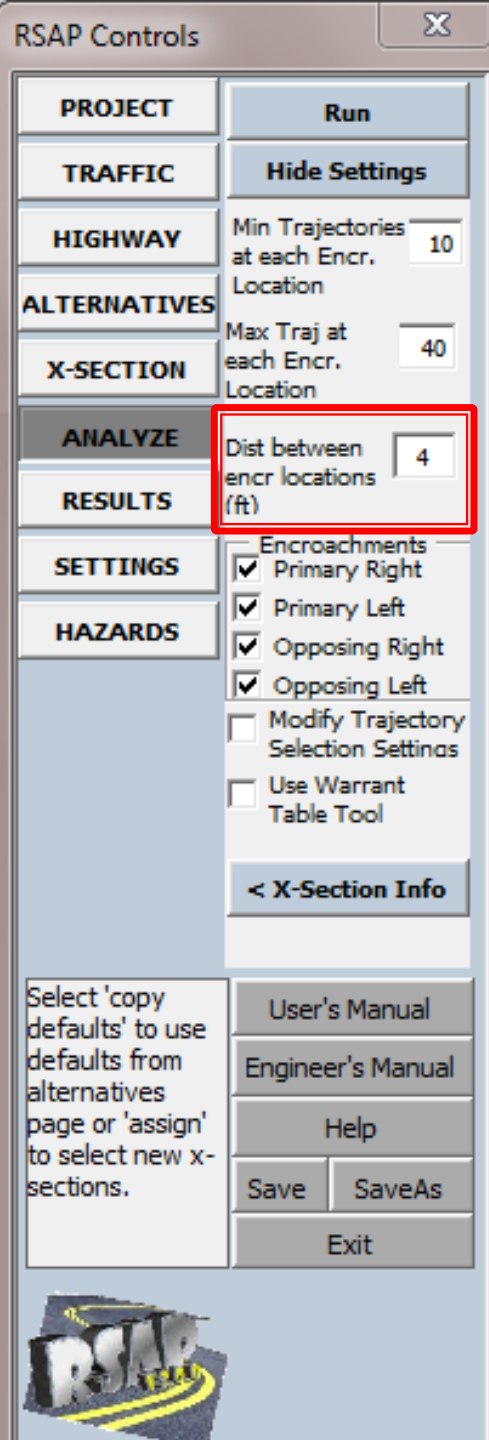
PROJECT	Run
TRAFFIC	Hide Settings
HIGHWAY	Min Trajectories at each Encr. Location 10
ALTERNATIVES	Max Traj at each Encr. Location 40
X-SECTION	
ANALYZE	Dist between encr locations (ft) 4
RESULTS	
SETTINGS	<input type="checkbox"/> Encroachments
HAZARDS	<input checked="" type="checkbox"/> Primary Right
	<input checked="" type="checkbox"/> Primary Left
	<input checked="" type="checkbox"/> Opposing Right
	<input checked="" type="checkbox"/> Opposing Left
	<input type="checkbox"/> Modify Trajectory Selection Settings
	<input type="checkbox"/> Use Warrant Table Tool
	< X-Section Info
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.	User's Manual
	Engineer's Manual
	Help
	Save SaveAs
	Exit



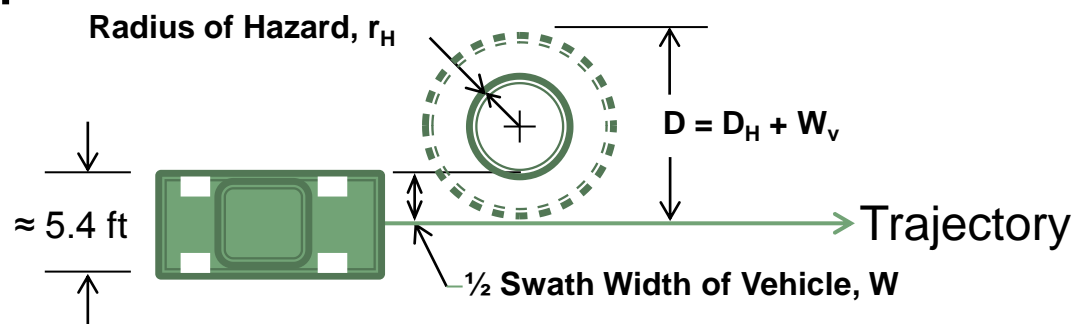
Minimum and Maximum number of trajectories to select.

Select which encroachments you want to include in the analysis.

Outside scope of this course.



- ▶ Distance between encroachment locations.
- ▶ Default value is 4 ft.
- ▶ If you have point hazards you need a small number like 4 ft to make sure you don't miss any hazards.
- ▶ 1000 ft works well when considering longitudinal hazards like our example problem.




RSAP Controls

PROJECT	Run
TRAFFIC	Hide Settings
HIGHWAY	Min Trajectories at each Enchr. Location <input type="text" value="10"/>
ALTERNATIVES	Max Traj at each Enchr. Location <input type="text" value="40"/>
X-SECTION	Dist between enchr locations (ft) <input type="text" value="4"/>
ANALYZE	
RESULTS	
SETTINGS	<div><div>Encroachments</div><div><input checked="" type="checkbox"/> Primary Right</div><div><input checked="" type="checkbox"/> Primary Left</div><div><input checked="" type="checkbox"/> Opposing Right</div><div><input checked="" type="checkbox"/> Opposing Left</div><div><input type="checkbox"/> Modify Trajectory Selection Settings</div><div><input type="checkbox"/> Use Warrant Table Tool</div></div> <div>< X-Section Info</div>
HAZARDS	

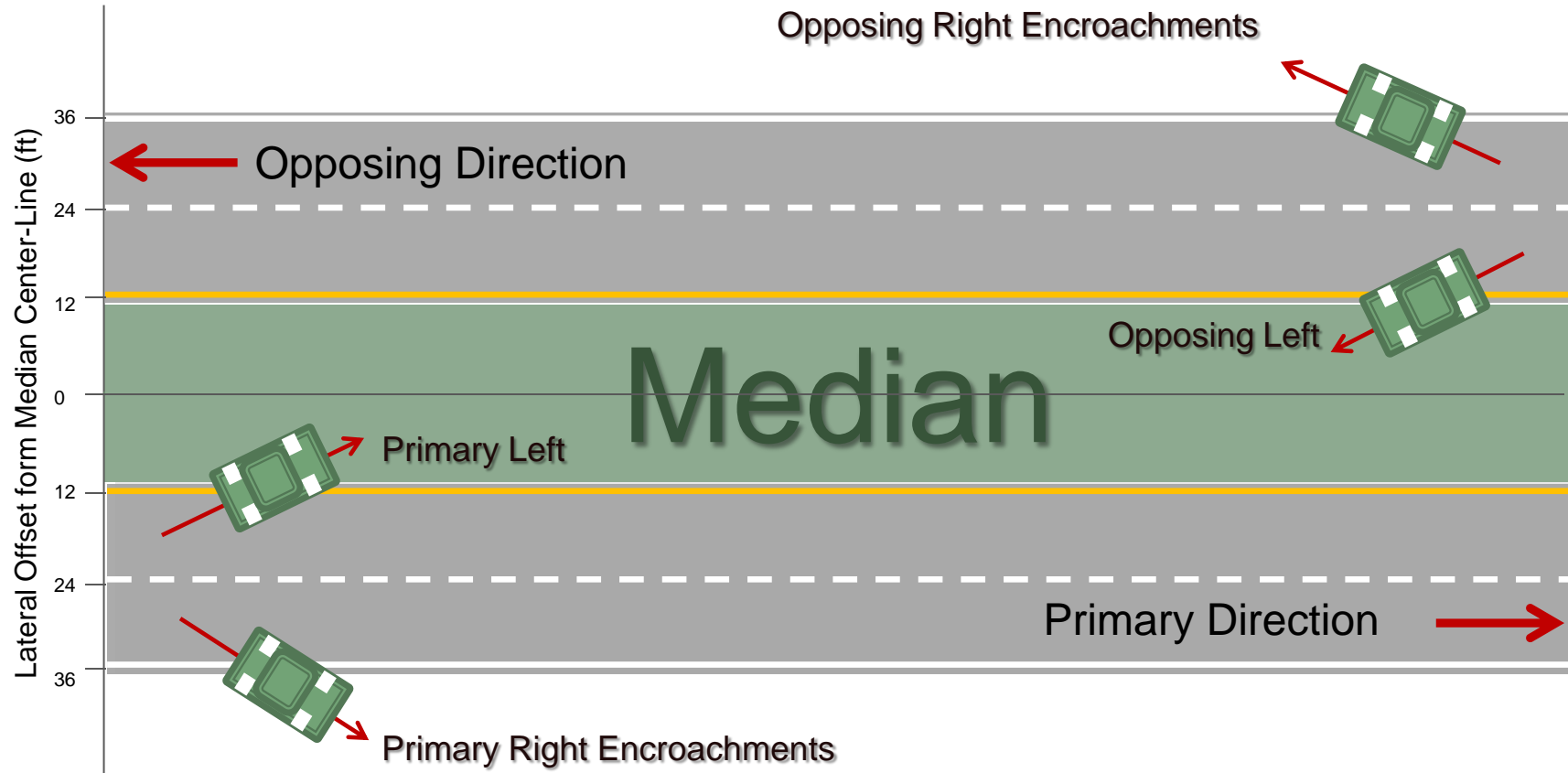
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.

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Help
Save SaveAs
Exit



Encroachments to consider.

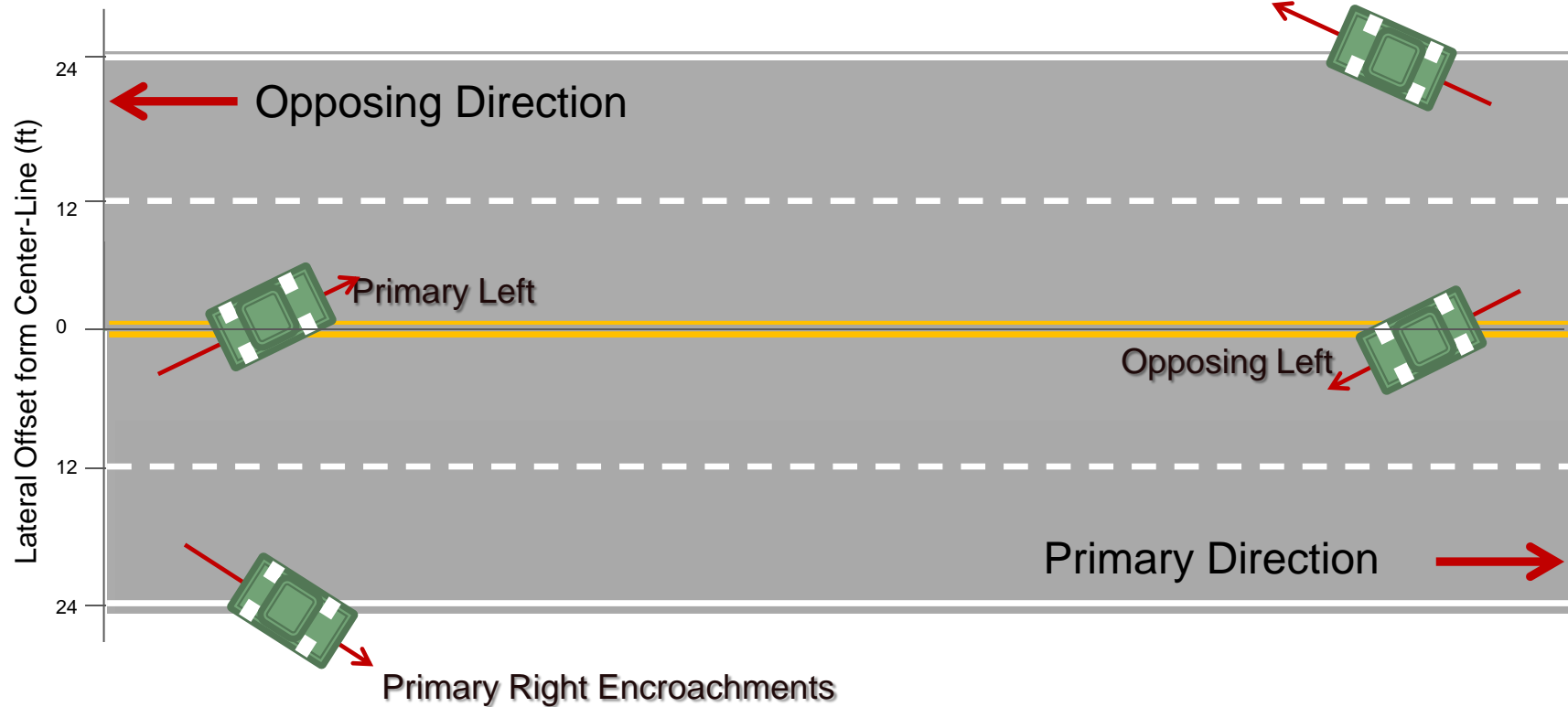
Encroachments Divided Highways



Encroachments

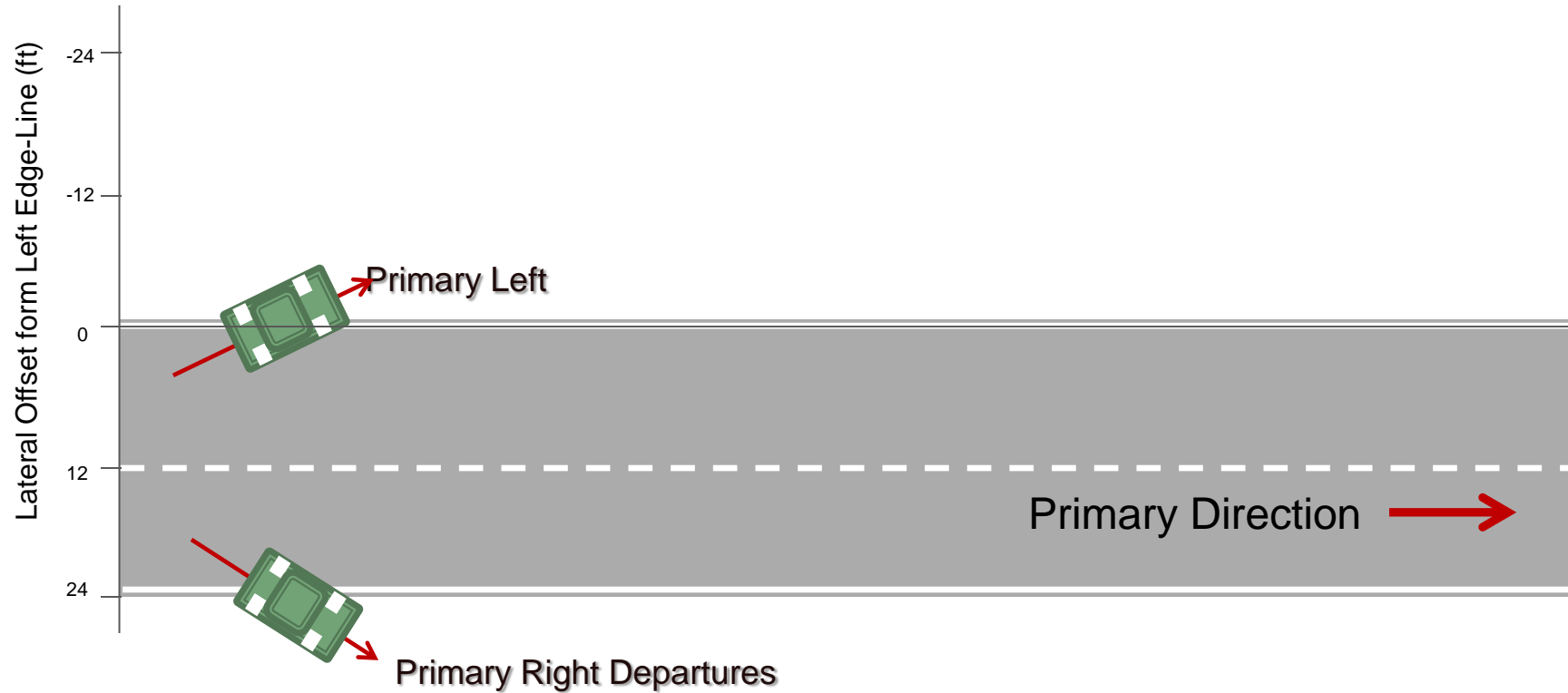
Undivided Highways

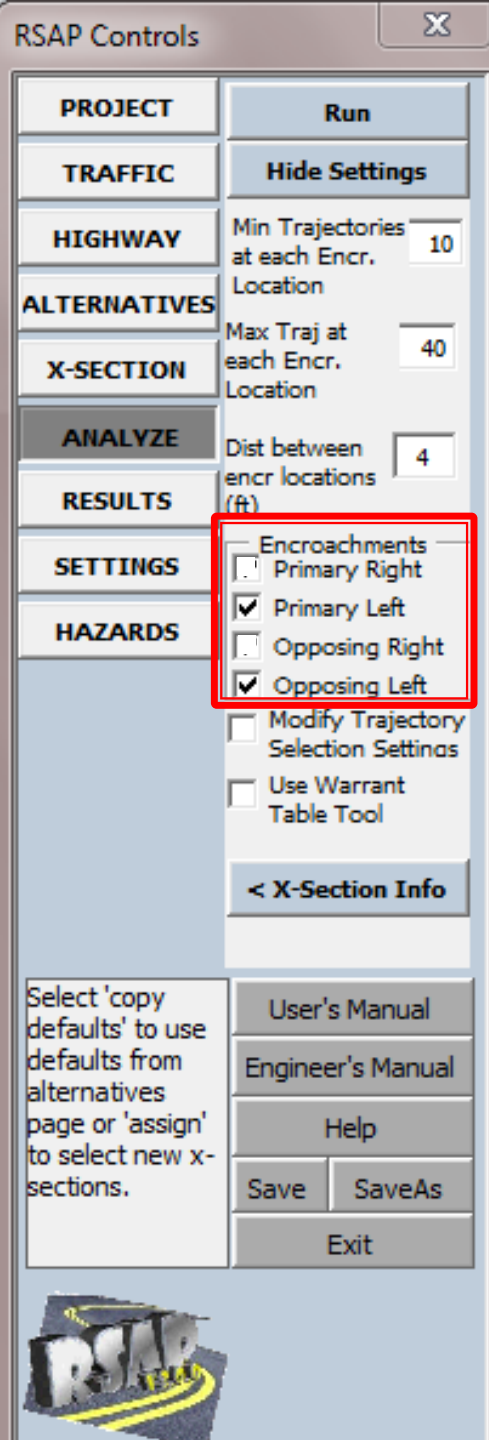
Opposing Right Encroachments



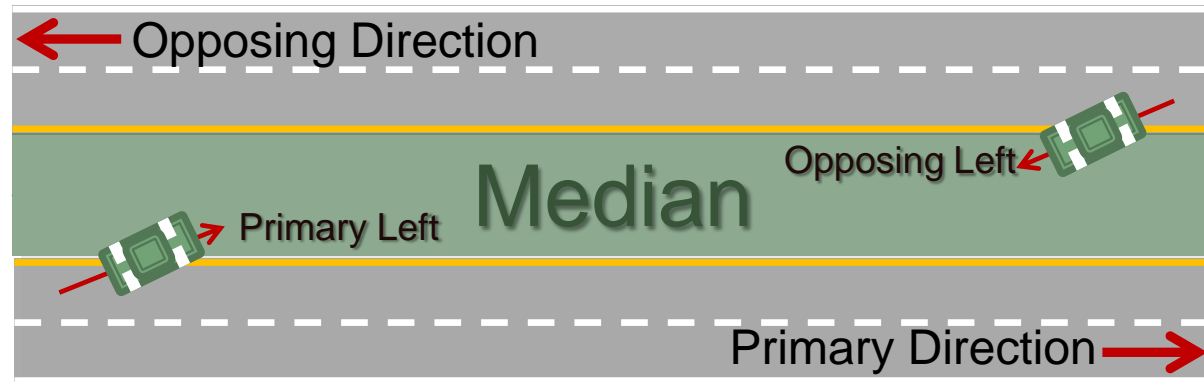
Encroachments

One-Way Highways






- Only check the boxes for encroachments that you want to consider.
- Our example is evaluating a median barrier so we will consider only:
 - primary left and
 - opposing left.



RSAP Controls

PROJECT	Run
TRAFFIC	Hide Settings
HIGHWAY	Min Trajectories at each Enchr. Location 10
ALTERNATIVES	Max Traj at each Enchr. Location 40
X-SECTION	Dist between enchr locations (ft) 4
ANALYZE	
RESULTS	
SETTINGS	<input checked="" type="checkbox"/> Encroachments <input checked="" type="checkbox"/> Primary Right <input checked="" type="checkbox"/> Primary Left <input checked="" type="checkbox"/> Opposing Right <input checked="" type="checkbox"/> Opposing Left <input type="checkbox"/> Modify Trajectory Selection Settings <input type="checkbox"/> Use Warrant Table Tool
HAZARDS	< X-Section Info
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.	User's Manual Engineer's Manual Help Save SaveAs Exit



Selecting RUN starts the analysis.

Progress

33 %

Cancel

Initializing segment and hazard data.
Priority set to High
Segment 1 - Alternative 1 - Primary Left
number of trajectories selected: 40

minimum trajectory score: 0.96423318275618
average trajectory score: 0.971787296521959
(score > 0.9 is considered a good score)
(0.9 > score > 0.8 is considered acceptable score)
(0.8 > score > 0.7 is of questionable quality)
(0.7 > score is unacceptable score. Consider reducing number of trajectories.)

A progress bar will appear during the run to let you know how the run is progressing.

RSAP Controls

PROJECT

TRAFFIC

HIGHWAY

ALTERNATIVES

X-SECTION

ANALYZE

RESULTS

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HAZARDS

Segment Report

B/C Report

Feature Report

Print Report

Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.

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SaveAs

Exit

RSAPv3_130304_concrete.xlsm

FEATURE COLLISION AND COST REPORT

Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

RSAP Settings: Min No. Traj=10; Max No. Traj=40; Traj Increment=1000 ft

Alternative	Segment	FEATURE		ANNUAL CRASHES			ANNUAL COST OF CRASHES			Feature Repair Cost
		Feature Number	Feature Type	Encroachment Type	Total Feature Crashes	Penetrated or Vaulted	Rolled Over after Redirection	Annual Feature Crash Cost	Feature Maintenance Cost	
1	Alternative 1									
1	1	1	EdgeOfMedian	PL	0.0000	0.0000	0.0000	\$ 0	\$ 0	\$ 0
1	1	1	EdgeOfMedian	OL	1.7223	1.7223	0.0000	\$ 221,825	\$ 0	\$ 0
1	1	2	EdgeOfMedian	PL	1.7769	1.7769	0.0000	\$ 224,314	\$ 0	\$ 0
1	1	2	EdgeOfMedian	OL	0.0000	0.0000	0.0000	\$ 0	\$ 0	\$ 0
1	1	3	Rollover	PL	0.0520	0.0000	0.0000	\$ 3,674	\$ 0	\$ 0
1	1	3	Rollover	OL	0.0526	0.0000	0.0000	\$ 3,580	\$ 0	\$ 0
2	Alternative 2									
2	1	1	EdgeOfMedian	PL	0.0000	0.0000	0.0000	\$ 0	\$ 0	\$ 0
2	1	1	EdgeOfMedian	OL	0.1610	0.1610	0.0000	\$ 43,262	\$ 0	\$ 0
2	1	2	EdgeOfMedian	PL	0.1427	0.1427	0.0000	\$ 43,287	\$ 0	\$ 0
2	1	2	EdgeOfMedian	OL	0.0000	0.0000	0.0000	\$ 0	\$ 0	\$ 0
2	1	3	TL3WbeamMB	PL	1.9136	0.1481	0.0324	\$ 45,443	\$ 0	\$ 2,296

RSAP Controls

PROJECT

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Segment Report

B/C Report

Feature Report

Print Report

Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.


User's Manual

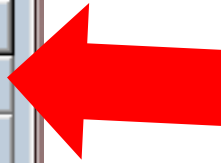
Engineer's Manual

Help

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Exit





What do all those numbers
in the incremental cost-
benefit table mean?

EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
With Respect to Alternative			1	2	3	4	
		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	1.91	
	4	TL5 NJ Shape Barrier				0.00	

Best Choice is:

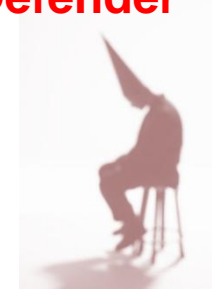
TL5 NJ Shape Barrier

The Challenger-Defender Game

		Decision Point Benefit-Cost Ratio: 1				
		Alternative Choice				
With Respect to Alternative		1	2	3	4	
	ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	1.00	11.80	11.49	8.18	
	2		0.00	10.58	4.70	
	3			0.00	1.91	
	4				0.00	

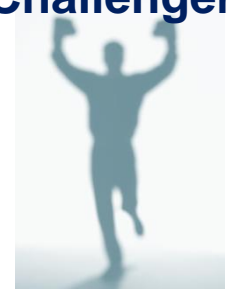
1.00

Defender



11.80 > 1

Challenger

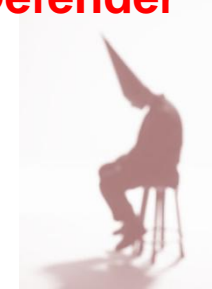


The Challenger-Defender Game

		Decision Point Benefit-Cost Ratio:				1	
		Alternative Choice					
With Respect to Alternative			1	2	3	4	
		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	1.91	
	4	TL5 NJ Shape Barrier				0.00	

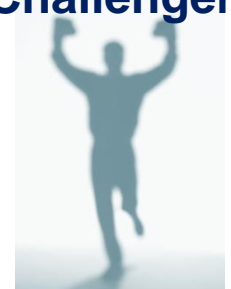
11.80

Defender



10.58 > 1

Challenger

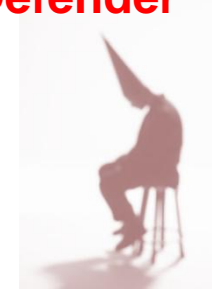


The Challenger-Defender Game

		Decision Point Benefit-Cost Ratio: 1				
		Alternative Choice				
With Respect to Alternative		1	2	3	4	
	ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18
	2	W-Beam Median Barrier		0.00	10.58	4.70
	3	TL3+ NJ Shape Barrier			0.00	1.91
	4	TL5 NJ Shape Barrier				0.00

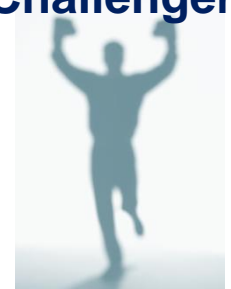
10.58

Defender



1.91 > 1

Challenger



EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
With Respect to Alternative			1	2	3	4	
		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	1.91	
	4	TL5 NJ Shape Barrier				0.00	

Best Choice is:

TL5 NJ Shape Barrier

PROJECT

TRAFFIC

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ALTERNATIVES

X-SECTION

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B/C Report

Feature Report

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Change any of the default values in the yellow or rose cells or proceed to the next step by selecting 'Traffic Info.'

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SEGMENT AND ALTERNATIVE COST SUMMARY

Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

ANNUAL SEGMENT SUMMARY				
Segment	Crashes	Crash Costs	Maintenance Cost	Repair Costs

<u>Alternative1</u>				
1	3.60	\$ 453,393		\$ 0
<u>Alternative2</u>				
1	4.14	\$ 181,294	\$ 4,524	
<u>Alternative3</u>				
1	3.97	\$ 100,035	\$ 377	
<u>Alternative4</u>				
1	3.84	\$ 69,057	\$ 377	

Rate of Return		4	%	
Design Life		25	yrs	
A/P		0.0640		
Alternative	Annualized Construction Cost	Annual Maintenance Cost	Annual Repair Cost	Annual Crash Cost
1	\$ 0	\$ 0	\$ 0	\$ 453,393
2	\$ 18,044	\$ 500	\$ 4,524	\$ 181,294
3	\$ 30,369	\$ 0	\$ 377	\$ 100,035
4	\$ 46,583	\$ 0	\$ 377	\$ 69,057

<http://www.rsap.roadsafellc.com/>

← → http://www.rsap.roadsafellc.com/#Installation Tip RSAP UPDATE PAGE

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transportation Engineering Software Development

RSAP v 3.0.0 Download Page

RSAP v 3.0.0 (Release 121024)

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RoadSafe LLC
P.O. Box 312
12 Main Street
Canton, Maine 04221
rsap@roadsafellc.com

Requirements

RSAPv3 is written as a series of Microsoft Excel macros. RSAPv3 will run on any Windows computer running Excel 14 or better and will run on both 32 and 64 bit computers. RSAPv3 has been successfully tested with Windows7, Windows XP and Vista.

RSAP Information

- [User Manual](#)
- [Engineer's Manual](#)
- [Programmer's Manual](#)
- [TR News Article about RSAPv3](#)
(posted with permission of NAS/TRB)

Resources

- Go to the RSAP Support [Facebook](#) page for questions and answers.
- See the [Release Notes](#).
- [Installation Tips](#)
- [Tip #1](#) — Dire warnings when downloading using the "Install from Web" button.
- [Tip #2](#) — Security message when opening the workbook for the first time.
- [Tip #3](#) — I don't have administrative privileges on my computer. Can I still install RSAP?

Example Case Workbooks

These are the Excel macro-enabled workbooks for the cases described in the [User's Manual](#). It may take some time to open up Excel over the internet so you should save these locally and open them on your computer.

- [NJTA Concrete Median Barrier](#)
- [WSDOT Cable Median Barrier](#)
- [RDG Culvert Example](#)

User Submitted Examples

If you have an example that you would like to share, please email it to the project team using the button at the top of the page. We will post it here.

100%

Finding the RSAP Facebook Page

- ▶ Go to <http://www.facebook.com/RSAPv3>
- ▶ Or ... search for the RSAPv3 Facebook Page by name within Facebook
- ▶ Or ... search for RSAPv3 in Google.
- ▶ Or ... If you see the RSAPv3 Page on a friend's profile, you can click on the RSAP logo.
- ▶ When on the RSAPv3 Page, click on the "Like" button in the upper right hand corner.





Wall

Hidden Posts

Info

Friend Activity (1+)

Insights

Photos

EDIT

About

Edit

Use this page to provide feedback, discuss tips with other users and share....

More

49

like this

37

talking about this

Remove from My Page's Favorites

Get Updates via SMS

Get Updates via RSS

Unlike

RSAPv3

Software · Edit Info



Wall

RSAPv3 · Everyone (Most Recent) ▾

Share: Status Photo Link Video Question

Write something...



RSAPv3

RSAPv3 Release 120116 has been posted on at <http://rsap.roadsafello.com/>.

Unlike · Comment · Share · January 16 at 5:02pm

You like this.

1 share

Write a comment...



RSAPv3

After downloading and using the Alpha version of RSAPv3, please take this survey to provide your feedback. Thank you!

Can you spare a few moments to take my survey?

www.surveymonkey.com

Please take the survey titled "RSAPv3 Software Evaluation". Your feedback is important!

Like · Comment · Share · January 15 at 11:30am

Admins (2) [?]



Use Facebook as

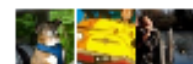
Notifications 2

Promote with an

View old Insights

Invite Friends

You and RSAPv3



16 friends like this

Sponsored

Free Electricity Ho
homemadeenergy.org



No Young Guys Wa
lps.seniorpeoplemeet

Chat (3)

I'm not a Facebook user.

Can I participate?

- ▶ The page is publicly *viewable*.
- ▶ Posting on the Page (i.e., full participation) does require joining Facebook.
- ▶ You can also go to the RSAPv3 download page (rsap.roadsafellc.com) and send a comment by email to rsap@roadsafellc.com.
- ▶ The development team will post responses on Facebook and also answer any emails.



Acknowledgments

- ▶ The work is funded by the National Cooperative Highway Research Program (NCHRP) Project 22–27, “Roadside Safety Analysis Program (RSAP) Update.”

Thank you!

- ▶ Visit rsap.roadsafellc.com
 - Download the newest release of RSAPv3
 - Link to Facebook page.
 - Manuals which accompany the software.
 - List of improvements.
 - Register your copy.
- ▶ Questions? Email: rsap@roadsafellc.com

