

User Manual CORRECT

Cost-benefit Optimization for the Reduction of Roadway Environment Caused Tragedies

This document is in draft form and is intended for information purposes only. It should not be used for system operation.

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Introduction

CORRECT is designed to ease the cost and benefit evaluations for determining optimal alternative safety treatments to be applied to the highway system. CORRECT has been built as an Excel Workbook into which multiple locations can be added and summarized.

CORRECT opens a control panel sheet from which a number of commands can be initiated. These are divided into two broad classes: 1) editing of parameters and pick lists, and 2) creation new analysis (CASE) sheet, and creating the summary.

The benefit computations are dependent upon the road classification (e.g. Federal, State, County or Municipal) and whether the location under consideration is determined to be Urban or Rural. For each combination of these classifications, a set of annual crash frequencies is used to derive the overall Benefit/Cost values and ratios. Each workbook can contain multiple Candidate Analysis Site Evaluation (CASE) sheets that all utilize the same basic parameters that are set up in a single *Parameters sheet*. CASE sheets essentially define the costs and benefits of alternative improvement scenarios at a given location. The Parameters sheet is used to set up the primary parameters that will be used for all CASE sheets in the workbook.

Create a new file

It is generally necessary to create a new file of CASE sheets when making a new COR-RECT application. To do this, copy the delivered file:

CORRECT Template <version>.xls

to a suitable location, and give it a meaningful name. Do NOT called it Template – give it a name that is representative of the project funds you are allocating (e.g., "2011-HES-Allocation"). Be sure to copy it as an *Excel Macro Enabled Spreadsheet*; if not, functionality will be lost.

Terminology. Each file (in Excel jargon, a *workbook*) can hold multiple CASE sheets. Each CASE sheet will be in a separate *worksheet* within the workbook. Again, "work-sheet" is the Excel name for a separate subdivision within their workbook. In this manual these will generally be referenced as "CASE sheets" or just "sheets."

The number of CASE sheets will be dependent on the number of locations under consideration. It is recommended that the total number of potential locations to be improved be subdivided so that, for example, very large and very small projects are not considered simultaneously within the same workbook. This assists in creating a better situation for optimization, and it will also facilitate processing, since the more sheets in a single workbook, the slower the response time may become. A suggested target would be 20 to 30 CASE sheets per workbook. Further instructions are given in the next section.

Control Panel (Instructions sheet)

Note: "Instructions" is the name of the sheet containing the Control Panel.

Once the template is copied, open the new file (workbook). The initial display will be the Control Panel with the worksheet named "Instructions" (bottom tab). The Control Panel has only 1 editable field (called "Analysis Basis"); otherwise its function is to gain access to basic parameter sheets. Insert (for reference purposes only) the basis and source for the entries made in the Parameters section. This could include the name of the particular program being addressed, the years for which crash counts were extracted, and the date for the current crash costs.

The Control Panel is shown below for a copy of the template into the file named: CORRECT_Template-v-0-1-0.xls



Different versions of Excel behave differently – it might be necessary to unlock the copy of the spreadsheet; if this is the case use help and adjust the settings appropriately. The most recent versions will give warnings and directions when a protected field is selected.

Note the color codes and their definitions. They are used in the analysis sheets to help make them easier to read and to avoid erroneously keying into fields that contain formulas.

Before embarking on the first Benefit/Cost estimate, it is necessary to set up and/or check all the parameter sheets that will be used in all the estimates in this workbook. If any

such estimate requires a different set of parameters, these should be set up in a new Workbook. (e.g. if the years used to create base crash statistics (see Parameters sheet) change, then they should be created in a new workbook. If not, the new values will be applied to ALL estimates in this workbook.

The buttons on the Control Panel will now be discussed in order.

Edit Crash Parameters Button

Clicking this button will open the Parameters sheet, an example of which is given below.

RURAL 2006	FatAcc	Inj Acc	Fatalities	Injuries	URBAN 2006	Fat Acc	Inj Acc	Fatalities	Injuries
Federal	227	3563	270	5387	Federal	142	5240	169	8076
State	167	2832	199	4776	State	93	5163	99	7935
County	281	6264	302	9378	County	29	939	28	1342
Municipal	0	13	0	20	Municipal	111	9185	124	12792
	· · · · ·		•				•		
RURAL 2007	Fat Acc	Inj Acc	Fatalities	Injuries	URBAN 2007	Fat Acc	Inj Acc	Fatalities	Injuries
Federal	202	3447	232	5880	Federal	100	5437	117	8189
State	166	2722	188	4465	State	91	4910	102	7493
County	270	6004	296	9050	County	21	935	21	1339
Municipal	0	8	0	79	Municipal	108	8932	115	12266
	Est Ass	lei Ass	E at alitia a	la invia a	UDBAN 2009	EstAss	lai Ann	Establish	la invia a
RURAL 2000	Fat Acc	IN ACC 2265	Fatalities	injuries	URBAN 2000	F at Acc	IN ACC	Fatalities	Injuries
Pederal	220	3305	203	0103	Pederal	123	2003	142	7040
State	202	2014	226	4020	State	27	4/4/	22	4019
County Municipal	302	47	330	3057	County Municipal	21	005	97	1220
Municipal	0	11	U	20	wiunicipal	05	0/05	07	12145
RURAL Total	Fat Acc	Inj Acc	Fatalities	Injuries	URBAN Total	Fat Acc	Inj Acc	Fatalities	Injuries
Federal	657	10375	785	17050	Federal	365	16266	428	24691
State	494	8228	569	13766	State	256	14820	281	22447
County	853	18298	934	27485	County	77	2739	81	3909
Municipal	0	38	0	119	Municipal	302	26906	326	37201
Statewide	2004	36939	2288	58420	Statewide	1000	60731	1116	88248
	Rural Injury	and Fatal	ity Costs			Urban Inju	ry and Fat	tality Costs	1
RURAL	I:F Ratios	-	I/F COST		URBAN	I:F Ratios	-	I/F COST	
Federal	15.79		\$213,153		Federal	44.56		\$141,699	
State	16.66		\$207,613		State	57.89		\$132,263	
County	21.45		\$184,627		County	35.57		\$151,953	
Municipal	Inteasible		nteasible		Municipal	89.09		\$121,089	
Statewide	18.43	L	\$197,774		Statewide	60.73		\$130,779	
Number of Years =	3		575000						
	PDO	INJURY	FATAL		•				
Per Crash \$ Costs	\$3,000	\$100,000	\$2,000,000	<-Please e	enter CURRENT c	osts here			Done
H A P H In	structions λ F	Parameters				•			

The left portion of the page is for RURAL data, and the right portion is for URBAN data. Because the ratio of injury to fatality crashes is different for rural and urban crashes (mainly due to speeds and also the availability of EMS), they are calculated independently in this spreadsheet. As is evident, the number of crashes by severity, injuries and fatalities for each of the roadway classes over the last three years will be contained in this worksheet. If (and *only* if) this worksheet needs to be updated, the following procedure should be used:

1. Key in the lowest year for the 3-year set of base parameters in cell A1. Generally this data will be for the most recent three years for which data area available (either in CARE or other sources).

- 2. For each of the Federal, State, County, Municipal classifications enter the values for :
 - Number of Fatal Crashes/Accidents from all causes (yellow field)
 - Number of Injury Crashes/Accidents from all causes (yellow field)
 - Number of Fatalities (individuals) (white field)
 - Number of Injuries (individuals) (white field)
- 3. Repeat this step for the Urban classification on the right.
- 4. Key in the current PDO (Property damage only) cost per crash
- 5. Key in the current cost of an injury used by the state
- 6. Key in the current cost estimate for a fatality used by the state.

All other fields are calculated and are used in the CASE sheets that will be created. When complete, click [Done] button in lower left corner.

Edit Treatment Costs

This button is not activated. It is a place holder in anticipation that a standard set of treatment costs might be available sometime in the future.

Edit Cities and Counties Lists

This command opens a worksheet used to define city and county pick lists for the CASE sheets. The following are the first 20 entries for Alabama.

Counties	Cities
Autauga	Abbeville
Baldwin	Adamsville
Barbour	Addison
Bibb	Akron
Blount	Alabaster
Bullock	Albertville
Butler	Alexander City
Calhoun	Aliceville
Chambers	Allgood
Cherokee	Altoona
Chilton	Andalusia
Choctaw	Anderson
Clarke	Anniston
Clay	Arab
Cleburne	Ardmore
Coffee	Argo
Colbert	Ariton
Conecuh	Arley

If these lists need to be updated, counties should be entered in the panel shown to the left. New cities with their associated county should be entered in the panel on the right. All entries should be in alphabetical order, with the cities being listed alphabetically within their county. When inserting new entries, make certain that the following rules are followed:

- Insert a row within the heavy blue lines.
- Make certain to insert in alphabetic order.
- Make certain that in the left panel, all cities for one county (County column) are kept together and are in alphabetic order .
- Make certain that the spelling of county names in the right-hand panel are exactly the same as those in the left panel (list of counties). Each cell in the County column of the left panel is a pick list, and this method of entry is advised.

When completed, click the Done button.

Edit List of Crash Causes

Note: During prototyping and beta testing the Wyoming codes have been left in the prototype. This can be replaced with Alabama data once its potential use is verified. To potentially save keying in long descriptions of crash causes, these are established as pick lists. This button allows editing of those listed, and allows new ones to be entered. Typically, these lists will be the same as entries stored in CARE variables for:

- Roadway Contributing Circumstances codes
- Environmental Contributing Circumstances codes
- Most Harmful Event for Causal (at-fault) Vehicle

Since CORRECT is primarily aimed at finding benefits for roadway projects, Driver and Non-Motorist causation is omitted from this list.

Clicking the [Edit List of Crash Causes] button opens the following sheet.

		Causes of Accidents	Done
Group	Number	Group	Cause
Animal	1	Animal	Antelope
Animals	2	Animal	Buffalo
Driver Event	3	Animal	Cow
NonMot Event non-fixed	4	Animal	Deer
Road Access	5	Animal	Elk
Roadbed	6	Animal	Horse
Roadway Accessories	7	Animal	Moose
Signage	8	Animal	Other Domestic (Dog, Llama)
Signal/Utility Accessories	9	Animal	Other Wild
Terrain/Fixed Objects	10	Animal	Pig
TrafficControl	11	Animal	Sheep
Veh.Event	12	Animals	Animals in Roadway
Visibility	13	Driver Event	Avoiding an Animal on Road
Visual Obstruction	14	Driver Event	Carbon Monoxide (CO) Poisoning
Weather	15	Driver Event	Injuries by being thrown again part of vehicle
WorkZone	16	Driver Event	Other Non-Collision (MC Loss of Control)
	17	NonMot Event non-fixed	Motor Vehicle in Transport on OTHER Roadway
	18	NonMot Event non-fixed	Motor Vehicle in Transport on Roadway
	19	NonMot Event non-fixed	Other NON-Fixed Object
	20	NonMot Event non-fixed	Parked Motor Vehicle
	21	NonMot Event non-fixed	Pedacycle
	22	NonMot Event non-fixed	Pedestrian
	23	NonMot Event non-fixed	Railway Vehicle
	24	NonMot Event non-fixed	Struck by object set in Motion by Motor Vehicle
	25	Road Access	Lane Markings Missing or Faded
	26	Road Access	Obstructed by a Previous Crash

The Groups in the left column are used simply to make it easier for a user to select the Cause when the list of possible causes is very long. Although the column names are different, the same rules for entering new values as shown for Editing Cities and Counties apply.

When finished, click the [Done] button.

Note: The Number column shown is not used and is for reference only.

Editing Treatments List

In a similar fashion to the table of causes of crashes, this table presents a table of roadway treatments that could be deployed. The default list of treatments is taken from the *NCHRP Research Results Digest #299* published in November 2005.

This report includes recommendations for Crash Modification Factors for many of these Treatments under various conditions. However, because of the levels of uncertainty and the variability in crash causes, this sheet makes no attempt to provide that data for inclusion in the analyses. It is left up to the analyst to estimate those numbers based either on the published recommendations modified by best judgment in specific situations, or based on best practice established with the analysts organization.

Clicking the [Edit Treatments] button opens the following tables.

		Done
Category	Category	Treatment
Add/Reduce Lanes	Add/Reduce Lanes	Add a travel lane
Change Access	Add/Reduce Lanes	Add channelization for right-turns
Change Curbs	Add/Reduce Lanes	Add exclusive left-turn lane
Change Enforcement	Add/Reduce Lanes	Add exclusive right-turn lane
Change Instrumentation	Add/Reduce Lanes	Add passing lanes (two-lane roads)
Change Lighting	Add/Reduce Lanes	Add two-way left-turn lane (TWLTL)
Change Median	Add/Reduce Lanes	Convert two-lane road to multilane road
Change Rails/Barriers	Add/Reduce Lanes	Create positive offset for opposing left-turn lanes
Change Restrictions	Add/Reduce Lanes	Increase lane width
Change Roadway Markings	Add/Reduce Lanes	Install double left-turn lane (change from single)
Change Shoulders	Add/Reduce Lanes	Install median acceleration lane
Change Signage	Add/Reduce Lanes	Install turn lane or bypass lane at T-intersection
Realingment	Add/Reduce Lanes	Narrow lane widths to add lanes\
Surface Treatment	Add/Reduce Lanes	Narrow urban lanes to install turn lane
Traffic Control Signals	Add/Reduce Lanes	Reduce number of lanes (road diet)
Miscellaneous	Add/Reduce Lanes	Replace a TWLTL with median/left-turn bays
	Add/Reduce Lanes	Use shoulder on freeways/expressways for bus lane
	Change Rails/Barriers	Install median barriers
	Change Rails/Barriers	Install/upgrade guardrail
	Change Access	Close driveways near intersections
	Change Access	Consolidate driveways
	Change Access	Eliminate left-turns at driveways
	Change Curbs	Add sidewalk/walkway *
	Change Curbs	Install curb extensions (bulbouts)
	Change Curbs	Install raised crosswalks

Once again, the Categories are defined to help to navigate the Treatments in the pick lists. Despite the different column headings, the rules for editing these tables are the same as for Cities and Counties

Edit Treatment Costs

[Future enhancement]

Create Sheet for New Location (CASE Form)

A new sheet is required for each location, which usually corresponds to a CASE form to be added to the project resource allocation workbook. To create a sheet from the Control Panel, click on the [Create Sheet for New Location] button.

Issues that could arise at this point:

- If the spreadsheet is not set up for macros it could require the user to indicate the allowance of macros by clicking the yellow bar at the top of the page; and
- Some macros for which no data pages yet exist might generate a message; e.g., some of the future enhancements. Click the appropriate button to ignore these issues in order to proceed.

Reference Number	×
Enter Reference Number	OK Cancel
BR0563	

This will then prompt you for a Reference Number as shown. The number may be free form alphanumeric. We recommend it be kept short since it will become the sheet number as well (on the bottom tab). Some alpha prefix for a given project might serve to attach the site to a given project.

The following is an example of the Candidate Analysis Site Evaluation (CASE) form sheet that will be opened:

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8				0	1	0 1	1]		
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Notice that the Reference number is inserted into the sheet, and is used as the sheet name as shown below.

Reference Number: BR0563

H + H Instructions BR0563

(1) Time period for accident history

Time Period of (1) Accident History:

The cursor will initially be positioned in the cell marked "Time period for accident history". This is an important number and should be the first item entered. It is the number

of years of accident history that will be used to generate the statistics used in the four entries of Causes of Crashes (see below). Enter the number and press "Enter'.

(2) Date Range

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(2) Date:
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Key in the date range (e.g., 2007-2009) for the crash history estimates for reference only (e.g., for potential CARE reruns).

(3) Select the Roadway System

In order to set up the calculations correctly, and to utilize the proper parameters, it is necessary to select the right system from the area of the screen shown below.

(3)	System - Urban:	Federal	State	County	Municipal	
	System - Rural:	Federal	State	County		< Please Click one of the buttons at the left

Choose either the Urban or the Rural row and click the appropriate button for Federal, State, County or Municipal road system. Click the button that has the label – not the blue box. If, for example, Rural–State is selected, the resulting screen appears as follows:

(3)	System - Urban:	Federal	Stat	9		County	ļ	Municipal			
	System - Rural:	Federal	Stat	e	Х	County					

By selecting this button, not only has the "X" been set, but all the calculation formulas have been adjusted in the benefit calculations. It also makes available the area of the screen used to enter the causes of crashes and associated statistics available for entry. These are hidden until items (1) and (3) are entered. In addition, clicking one of these seven buttons enters the description of the system in the field marked "System" (see 6 below).

(4) Funding Information

These funding fields are for record purposes only. Insert the names of the On-System and/or Off-system funding sources.

(4) Funding: ON-System: OFF-System:

(5) Location Information

The following information is mandatory, although not used by the application.

Description: This field is free form and should be used to describe the highway or street name an other relevant information.

County: This value must be entered from the picklist. (see *Control Panel* above) **City:** This value must be entered from the picklist. (see *Control Panel* above)

(6) Milepost Information

In order to record the precise location for which accident statistics are being recorded (e.g. from a Hot Spot identified in CARE), the milepost information is recorded here.

Notice that the System information was filled automatically when it was selected.

(7) Investigators Information

It is often very important to record the names of the investigators who prepared this estimate. This is a free form field in which to record the information.

(7) Investigators:

(8) Causes of Accidents

In any Hot Spot being analyzed, there may be more than one significant cause of the accidents there. The following entries allow the description of, and statistics related to those causes. At least one cause MUST be inserted and designated by the mandatory colors of the cells.

Select Cause Group

First, scroll to the right of the screen to find the Select

Select Cause Group

Cause Group fields and select the appropriate group.



By selecting a group, the appropriate list of Causes will be made available for selecting in the main Causes panel.

(8)	Roadway Environment Causes of Accidents	(9) Total Number of Accidents	(10) Number of Fatal Accidents	(11) Number of Injury Accidents	(12) Number of P.D.O Accidents
(8a)		0			
(8b)		0			
(8c)		0			
(8d)		0			

Total Number of Roadway Environment Causes

Enter Cause Details

Select the required Cause in (8a):

(8)	Roadway Environment Causes of Accidents	(9) Acc	T
(8a)	Lane Markings Missing or Faded	-	
(8b)	Struck by object set in Motion by Motor Vehicle		
(8c)	Lane Markings Missing or Faded		-
(8d)	Obstructed by a Previous Crash 6		

For the specific cause listed for the roadway location being considered for improvement, key in the Numbers of:

(10) Fatal Accidents/Crashes

(11) Injury Accidents/Crashes

(12) PDO Accidents/Crashes

(9) Total Number of Accidents	(10) Number of Fatal Accidents	(11) Number of Injury Accidents	(12) Number of P.D.O Accidents
26	1	5	20
0			5
0			, ,
0			

Note: These numbers are for the "Time Period of Accident History" discussed earlier (Item 1).

Repeat the previous two steps for up to three more causes. *IMPORTANT: any historically determined crash must only be assigned to ONE roadway environment cause, or else this "double counting" will result in an exaggerated benefit estimate. Assign each crash to its most likely cause only. If any historically determined crashes cannot be assigned to any roadway environment cause, then they should be excluded from consideration since the countermeasures proposed will not have any effect on them.*

Note that total accidents are automatically accumulated, and the number of causes is counted automatically.

(13) Treatments

Up to three treatments for the segment of road specified are allowed. Enter all treatments that are being considered. If more than three have to be considered, create an additional (virtual) location to handle it.

Select a Treatment

To enter a Treatment, scroll to the right



and select a treatment category as shown.



Having selected a Treatment Category, scroll back to the left and select a treatment (up to three treatments may be specified in this way.



Insert Initial Cost

For each treatment, an initial capital cost needs to be estimated. This is usually fairly easy to estimate from past project of similar type. The results will be entered here:

(13)	Description of Alternative Safety Treatments	(14) Initial Cost	1
(13a)	Consolidate driveways	\$ 155,000	
(13b)		<u> </u>	
(13c)		Ŷ	

Life expectancy and Maintenance costs

For each treatment, the life of that treatment and the cost per annum to maintain it must be estimated and entered.

1	(15) Life in	(16) Maint. Cost
	Years	Per Year
	15	\$ 1,000
		5
1		

Accident/Crash Rate Reduction Factors

For each Treatment, the investigator should estimate a Crash rate reduction factor associated with each Cause specified. If three Causes have been listed, then the first row under 8a, 8b, and 8c in the illustration shown above will be shown as mandatory. Note these are to be speci-

Aaint. Cost	(17) % Ac Environm	cident Rate	e Reduction	For Roadway
er Year	8a	8b	8c	8d
1,00	0			
Maint. Cost	(17) % Acci Environme	dent Rate R nt Causes	Reduction Fo	or Roadway
Per Year	8a	8b	8c	8d
1,000	2.00%	2.70%	1.50%	

fied as **reduction factors** and not **modification factors** as reflected in the NCHRP report. Further, these are not applied to all crashes at the location, but ONLY to the crashes that are listed for the corresponding causes.

Benefit/Cost Analysis

Once all of the above information has been entered, the Benefit/Cost fields are automatically calculated.

	Benefit and	Cost An	alysis				Copy Al	Sheets	to Summa	ary			
	Reference Number:	BR0563		System:	RURAL S	STATE	Based on	3	years of a	ccident hist	ory		
	Location	US85 (ML85B) NO	RTHBOUN	ND LANE		LARA	MIE	County			City RU	RAL
					Cost	B	enefit	Mainten	ance Cost	B/C Ratio1		Total Cost	B/C Ratio2
Alt 1	Consolidate driveways			S	155,000	\$	174,000	S	15,000	1.1226	S	170,000	1.0235
Alt 2				S	-	\$	-	S	-	-	S	-	-
Alt 3				S	-	\$	-	S	-	-	S	-	-

B/C Ratio1 = Benefit / Cost

B/C Ratio2 = Benefit / (Cost + Maintenance Cost)

The following gives another possible completed example for a location.

Eile	2	↓ Home Insert	Page <u>La</u> yout Fo	r <u>mu</u> las <u>Dat</u> a	AL_CORRECT_	Example_Test	-01 - Microso 1 <u>d-I</u> ns	oft Excel	1.1	10	1		
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1	A	Candidate A	nalvsis Site	Evaluatio	n Form	(CASE Form	n)	1	J	n	L	IVI	
2	F	Reference Number:	BR0563			(reate New	Location SI	heet	Copy Th	nis Sheet	Clear T	his Sheet
4	(4)	Funding:	ON-Syst	tem: HES	5-403a	0	FF-System:]			
7	۲ (1) ۸	Time Period of Accident History:	3 Veste				(2) Date:	2007-2	009				
8	Γ			0		Country	1	M					
9	(3)	System - Urban:	Federal	State		County		wunicipal					
11		System - Rural:	Federal	State	X	County							
14	(5)		Des	cription			1	County		1	City		
15	(5)	Location:	S132 near S009 s	outh of Wetump	ka			Elmo	re		Rural	LImore	
17	(6)	Segment ID:	S132	From:	125	to	127	1	System:	RURAL	. STATE		
18					Node/Milepo:	st	Node/Milepo	st					
20	(7)	Investigators:	David Brown creat	ting tost case									
21			Dana Dronn oroat	ing test case									
21 22 23	(8)	Roadway Environm	ent Causes of Accid	lents		(9) Total Nun Accidents	nber of	(10) Number Accidents	of Fatal	(11) Numb Accidents	er of Injury	(12) Numbe Accidents	≡ er of P.D.O
21 22 23 24	(8) F (8a) L	Roadway Environm	ent Causes of Accid	lents		(9) Total Nun Accidents	nber of	(10) Number Accidents	of Fatal	(11) Numbo Accidents	er of Injury 5	(12) Numbe Accidents	er of P.D.O
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Transferring Data Sheet(s) to the Summary

Clicking the [Copy All Sheets to Summary] button transfers the Benefit and Cost Analysis results to a "Summary" sheet, and at the same time enters them into a sortable list in a sheet called "Listings." If a Summary sheet already exists, it will be recreated to avoid duplication entries. The same is true of the Listings sheet. The [Copy This Sheet to Summary] button will not work until a summary sheet is created, which will occur when the [Copy All Sheets to Summary] button is used to create the Summary sheet.

Repeat Process for All Locations

The process indicated above for the first location will be repeated for all locations – this might include dozens of replications of the above procedure to get all of the locations into the spreadsheet. All location CASE forms must be entered before going to the next step. To enter a new CASE form, go back to the Instructions page and click [Create Sheet for New Location].

Create Summary and Listing

Clicking the button [Create Summary and Listing] causes two sheets (Summary and Listing) to be created.

NOTE: These two sheets are not dynamically updated. The user must again click on one of the "Copy ..." buttons to regenerate the pages after a new page is created or any change is made to any of the analysis sheets.

Summary sheet

The summary sheet will contain a copy of the Benefit and Cost Analysis from each analysis sheet one below the other for easy reference.

Listing Sheet (Optimization)

This sheet presents the optimal allocation of resources according to the data input given for the various alternatives at all of the locations. *Optimal* here means that it is impossible to produce any greater benefit by changing any alternative specified. The specified alternatives produce the maximum possible safety benefit given the budget. In order to view how this works, it is recommended that users change the value of the budget specified and click the "Run Optimizer" button. The alternatives will change to fit the updated optimal set of alternatives within the new budget.