CRASH

User's Guide
April 2005

Crash Reduction Analysis System Hub

Florida Department of Transportation

Prepared for
State Safety Office
Florida Department of Transportation

Prepared by
Lehman Center for Transportation Research
Florida International University

User's Guide

Crash Reduction Analysis System Hub (CRASH)

Version 1.0

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Mr. Patrick Brady of the Safety Office at the Florida Department of Transportation served as the project manager for this project.

Crash reduction factors (CRFs) are used to estimate the expected reduction in crashes that will occur during a given period as a result of implementing a proposed safety improvement project. Development of CRFs based on the before-and-after method requires the use of historical safety improvement projects. While the Florida Department of Transportation (FDOT) maintains a comprehensive crash database for the state roadway system, it does not have a central database for safety improvement projects. Consequently, historical data for safety improvement projects are maintained separately at various district offices in various formats and are not easily accessible for both CRF development and safety program evaluation. This user's guide provides instructions on the use of a user-friendly web application designed to systematically maintain statewide safety improvement project data to facilitate the continual process of updating CRFs. The system, called Crash Reduction Analysis System Hub (CRASH), also provides capabilities to perform benefit-cost analysis using up-to-date CRFs as well as perform before-after analyses to evaluate the effectiveness of safety programs.

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DISCLAIMER

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INTRODUCTION

While the Florida Department of Transportation (FDOT) maintains a comprehensive crash database for the state roadway system, it does not have a central database for safety improvement projects. Consequently, historical data for safety improvement projects are maintained separately at various district offices in various formats and are not easily accessible for developing CRFs and for other purposes. This user's guide provides instructions on a web-based database application that was developed to systematically maintain statewide safety improvement project data to facilitate the continual process of updating CRFs. The system, called the Crash Reduction Analysis System Hub (CRASH), can perform the following tasks in an automated manner:

1. Record and maintain improvement projects,
2. Update CRFs using the latest available improvement project and crash data,
3. Apply the latest CRFs in the benefit-cost analyses of specific projects, and
4. Perform before-and-after analyses to evaluate the effectiveness of safety programs.

In addition, the system provides various functions for data retrieval and exportation for various analysis and reporting purposes.

SYSTEM COMPONENTS

The CRASH program was designed as a Microsoft ASP.NET web application that works with Microsoft ACCESS databases. The system in its initial version consists of the following four major database components:

1. Safety improvement projects since 1992
2. Historical crash records from 1984 through 2003
3. Crash reduction factors and associated statistics
4. User management information.

Figure 1 shows the initial screen of the system, which includes the following six functional components (front-end) that work with the above databases (back-end):

1. **Project Analysis**: This component allows one to perform the following functions:
   - Start New Project: To perform a new benefit-cost analysis for a project.
   - Edit Projects: To make changes to one or more previously saved analysis projects.
   - View Projects: To view one or more previously saved analysis projects.
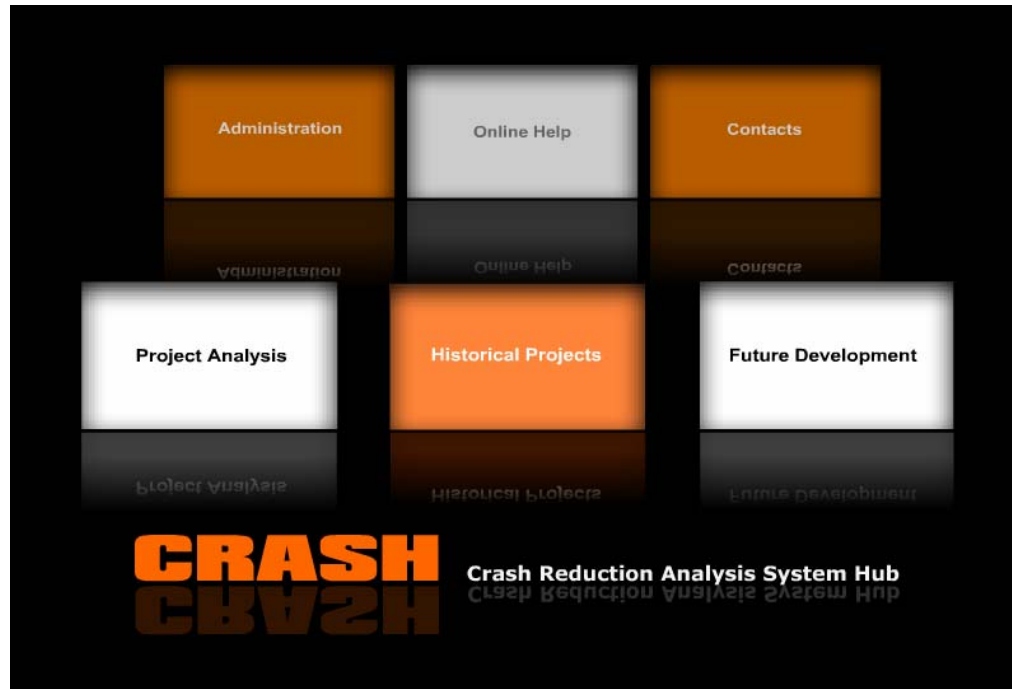
1

Figure 1. CRASH Main Menu

2. **Historical Projects**: This component allows one to perform the following functions:
   - Add Project: To enter information for an existing project of which analysis has been performed.
   - Edit Projects: To add post-construction information for projects that have been completed or are under construction.
   - View Projects: To view projects that have been completed or are under construction.
   - Generate HSIP Report: To generate the standard Highway Safety Improvement Program (HSIP) report.
   - Before-After Analysis: To generate before-and-after statistics for selected projects to evaluate their effectiveness.

3. **Future Development**: This component is reserved for future development in support of FDOT application of SafetyAnalyst, a new system currently under development by the Federal Highway Administration. For more information about the project, please visit the SystemAnalyst homepage at http://www.safetyanalyst.org/.

4. **Administration**: This component is mainly used by the system administrator or a designated person in the FDOT Central Office to perform the following functions:
   - User Management: To manage usernames and passwords for access to various system components (for system administrator only).
   - View CRFs: To generate the list of current Florida CRFs and to view detailed summary statistics associated with the calculation of each CRF.

- Update CRFs: To update the crash reduction factors after the new project and data are added (for system administration only).
- Maintain Types: To add and edit safety improvement project types (for system administrator only).
- Assign Types: To review projects and assign improvement types to projects (for system administrator only).
- Append New Records: To append crash records from a new data year (for system administrator only).

5. **Online Help**: This component provides access to the CRASH online help, tabulated CRFs from other states, state-by-state CRFs, and the final report for the project that develops this web application.

6. **Contact**: This component lists contact information for technical support and general information on the system.

To access any of these functional components, click the corresponding over-sized button shown in either orange or white color.

SYSTEM ACCESS REQUIREMENTS

CRASH runs as a web application on the FDOT intranet system. To access the CRASH website, you must first be given authorization via the assignment of a User Name and a Password. This authorization is in addition to the authorization you need for access to FDOT's Intranet. The current contact for access authorization is:

> Patrick A. Brady, P.E.
> FDOT Safety Office
> 605 Suwannee Street, M.S. 53
> Tallahassee FL 32399-0450
> Phone: (850) 245-1502 or (850) 245-1500
> Fax: (850) 245-1554 SC 205-1554
> Email: patrick.brady@dot.state.fl.us

Depending on your need, you may be assigned access to certain pages and functionalities. The **User Management** section details such assignment by the System Administrator, which is a person in the Central Office who is in charge of CRASH system maintenance. Figure 2 shows the login screen that prompts you for a User Name and a Password. When the system is idled for more than half hour, you will be prompted this screen when trying to resume the session.
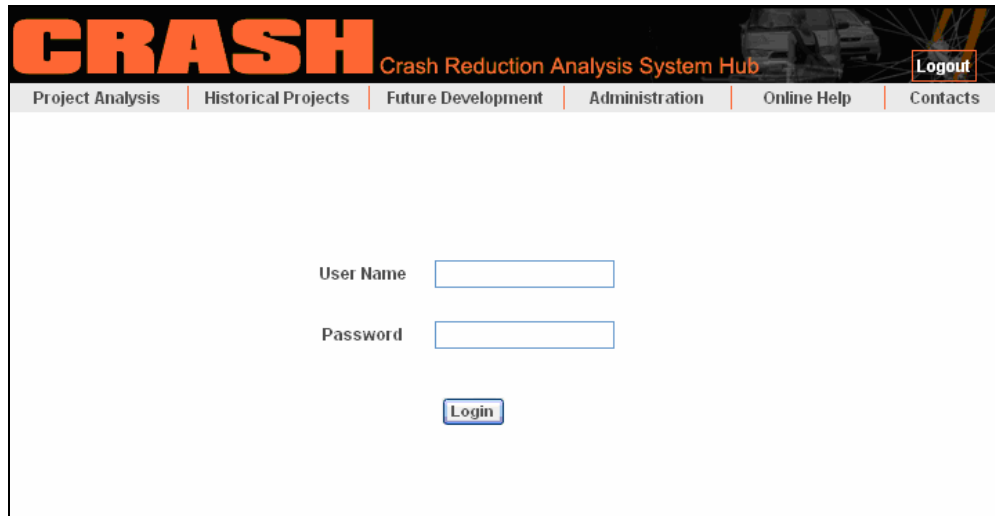
Figure 2. CRASH Login Screen

BROWSER REQUIREMENTS

CRASH can be accessed through a regular web browser. While it has not been tested on other browsers, the system has been well-tested on Internet Explorer (IE). The minimum display resolution is 1024x768. This is also the recommended resolution.

PROJECT ANALYSIS

This component allows you to quickly and conveniently perform a benefit-cost analysis for a potential improvement project, add a new improvement project to the project database, and view or edit an existing project. Analysis projects selected for implementation can be saved to the FDOT database and contribute directly to the continued update of CRFs.

Data Variables

Variables for improvement projects can be pre-construction and post-construction. Data for pre-construction variables are entered during a benefit-cost analysis. Data for post-construction variables are entered only after a project is selected and the construction is completed. Pre-construction variables include those in the standard benefit-cost analysis form, plus several variables required for Highway Safety Improvement Program (HSIP) reporting. Figure 3 shows, as a CRASH report, the standard benefit-cost analysis form used by FDOT. Post-construction variables include those that are known only after a project is selected and approved for construction, including the beginning and ending of construction period.

SAFETY OFFICE BENEFIT-COST ANALYSIS

1. Submitted by   CO-MRM   5. ___X___ Safety Priority

2. Date Submitted   1/13/2005   _____ Environmental Study

3. Project No. _____   WPA No. _____   Skid (I.D.) _____

4. Alternative No. _____   FM No. _2133232_   SN _NB 325838_   Speed _50_

6. District _2_   County/Section _72290_   SubSection _000_   State Road _933_   U.S. Road _0023_

7.

	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	
Beginning Milepost	1.9						
Ending Milepost	2.611						Total Length
Length	0.711						0.711
Node							

8. Description of Location/Facility Type   I-95 AT I-295 NORTH END OF TOWN

9. Cause of Crash Problems (list and discuss) _____

10. Proposed Improvements (list and discuss)   ROADWAY LIGHTING

	1999	2000	2001	2002		AVG
11. No. of Crashes	10	9	9	13		10
12. No. of Crashes Reduced	8	1	4	3		4

14. Crash Information for Facility

Cost/Crash	$50,000
Crash Cleanup	$200
Interest Rate	7.00%

13.

Type of Crash	CRF(%)	Number of Crashes	Crashes to be prevented
Angle	90.46	2	2
Fixed-Object	16.58	11	3
Right-Turn	75.70	0	0
Left-Turn	70.11	0	0
Rear-End	-14.45	10	-2
Head-On	100.00	1	1
Sideswipe	50.86	1	1
Pedestrian	-55.48	0	0
Ran-Off-Rd	73.12	8	6
Others	55.20	8	5
Total		41	16

15. Annual Cost of Improvements

Type	Cost	Life	CF	Annual Cost
A. R-O-W				
B. P.E.C.E.I.	$10,740	20	0.0944	$1,014
C. Structure				
D. Roadway	$29,150	20	0.0944	$2,752
E. Contingency				
F. Signals/Signing	$20,550	10	0.1424	$2,926
G. Subtotal				$6,692
H. Change in Maintenance				
I. Crash Cleanup				($800)
J. Other				
K. Total				$5,892

16. Benefits

A. Crash Reduction:	No. _4_	at	$50,000	$200,000
B. Other				
C. Other				
Total Annual Benefit				$200,000

17. Benefit-Cost Ratio   33.94

Prepared by	Approved by	Date

Comments/Crash Reduction Method:

High Crash Listings:

Figure 3. Standard Benefit-Cost Analysis Form as Displayed in CRASH

Start a New Benefit-Cost Analysis

To perform a new benefit-cost analysis, select the **Project Analysis|Start New Project** menu item. This will bring up the screen shown in Figure 4, which shows the top portion of the benefit-cost analysis form. In this form, you can press the Tab key to move from one field to another. Some of the fields are self-calculated, which are obviously not accessible by either the Tab key or the mouse pointer.

Figure 4. Standard Benefit-Cost Analysis Form in CRASH

The first item on the form is for specifying whether an improvement project is crash based or non-crash based. The default is crash based, which is for projects that are being considered in response to specific crash problems. Unlike crash based projects, which are reactive in nature, non-crash based projects would include proactive projects such as school zone signing, pavement markings, sidewalks, elder driver programs, etc. When the non-crash based option is selected, item 9 of the form will change from "Cause of Crash Problems" to "Non-crash Based Project Justification".

The location fields, including County and Section, Subsection, Beginning Milepost, and Ending Milepost, are required for a project to be saved. Up to six different locations of a project may be entered. This is used when a project involves multiple disjointed locations, for example, improve lighting at several interchanges.

An important capability of the benefit-cost analysis form is that it allows you to automatically retrieve crash statistics and CRFs into the form for calculation. This replaces the previously time-consuming, non-repeatable, and potentially error-prone manual data entry process.

Important: *To help the State improve the accuracy of crash reduction factors, it is important that a project is described in as much detail as possible.*

Retrieve Crash Records into Analysis

Once the data have been entered in the location fields, you can simply select a data year from the dropdown menu, as shown on the bottom left corner of Figure 5, to automatically retrieve crash statistics. As soon as a specific data year is selected, the crash records that are specific to the project location will be automatically retrieved, summarized, and displayed. Up to five years of crash records may be included in the analysis.

Figure 5. Automated Crash Record Retrieval

Apply Crash Reduction Factors

To obtain an estimate of the number of crashes to be prevented as a result of an improvement project(s), the CRFs associated with the particular type of project(s) must be specified. To do this:

1. Click the **Get CRF** button on the form shown in Figure 6. The screen shown in Figure 7 will pop up.

Figure 6. Automated CRF Retrieval

2. Select to apply either a single CRF based on the total crashes (default) or detailed CRFs for different crash types.

3. Select whether to apply standard or user-defined CRFs. Choose up to four different improvement types if a project involves multiple improvements. The aggregated CRFs, shown on the last column of Figure 7, will be automatically calculated based on the following formula and:

$$CRF_t = CRF_1 + (1 - CRF_1)CRF_2 + (1 - CRF_1)(1 - CRF_2)CRF_3 + ...$$

where
CRF_t = Aggregated CRF,

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$$CRF_1 = \text{CRF for the first improvement project,}$$
$$CRF_2 = \text{CRF for the second improvement project, and}$$
$$CRF_3 = \text{CRF for the third improvement project.}$$

CRF Level: ○ By Total Only ● By Crash Type

	Type 1	Type 2	Type 3	Type 4	
Type	● Standard [Find] ○ User-Defined	● Standard [Find] ○ User-Defined	● Standard [Find] ○ User-Defined	● Standard [Find] ○ User-Defined	
Type Code	1	12			
Type Description	New signal at channelized intersection	New LT channelization w/o LT phase			Aggregated CFR (%)
Total CFR	44.00	20.00			55.20
Angle CRF	82.00	47.00			90.46
Fixed-Obj. CRF	3.00	14.00			16.58
Right-Turn CRF	70.00	19.00			75.70
Left-Turn CRF	39.00	51.00			70.11
Rear-End CRF	-9.00	-5.00			-14.45
Head-On CRF	100.00	37.00			100.00
Sideswipe CRF	22.00	37.00			50.86
Pedestrian CRF	-69.00	8.00			-55.48
Ran-Off-Rd CRF	16.00	68.00			73.12
Others CRF	44.00	20.00			55.20
Wet	53.00	38.00			70.86

[Reset]   [Accept]   [Cancel]

Figure 7. Screen for Selecting Crash Reduction Factors

To use standard CRFs, click the **Find** button in Figure 7 to bring up the screen shown in Figure 8, which shows a list of available improvement types. Note that on this list, the number of projects (N) available to develop the CRFs is given at the end of each improvement type in parentheses. It is advisable to use only those with a project sample size of at least five. You will be prompted an advisory message when an improvement type with a sample size less than five is selected. You can select an improvement type from the list by clicking the appropriate item. The corresponding CRFs will be listed on the right. Click **Accept** to retrieve the CRFs and exit from the screen.

If the CRFs for a specific improvement type are not available, they must be obtained from another source and entered manually as user-defined CRFs. To use CRFs from other sources (i.e., user-defined), simply enter the factors in the appropriate fields manually. When CRFs are user-defined, a "**" note will appear on top of the selected CRFs to indicate that the CRFs being used are non-standard. Tables 3-6 to 3-13 and Appendix B of the final report for this project provide some CRFs developed by other states.

Once the CRFs are selected, you can click the **Accept** button to retrieve the CRFs into the benefit-cost analysis form. By default, all CRFs for different crash types are included. You may uncheck any crash types that are not applicable to the specific improvement project (see Figure 6). Unchecked crash types are excluded from the analysis.

Figure 8. Screen for Selecting CRFs

The list of improvement type selected will be listed under the **Selected CRF Safety Improvement Type(s)** box, as shown on Figure 9 as part of the pre-construction additional information for HSIP report. If only one improvement type has been selected, it will be listed as the Assigned Safety Improvement Type in the last box on the form. If more than one improvement type has been selected, this box will show "0-Improvement Type Not Assigned". You can click the dropdown button to show the list of improvement type and select one that is the primary improvement type. Note that the assignment of improvement type can also be performed through **Administration|Assign Types** menu option, which allows a group of projects to be assigned by a specific person. See the **Assign Types** subsection for additional information on this option.

After an analysis form is completed, it may be saved to the database by clicking the **Save** button at the bottom of the benefit-cost analysis form. A saved project may be edited or viewed using the **Project Analysis|Edit Projects** and **Project Analysis|View Projects**,

respectively. To print the form, simply click the **Print** button. This will bring up a print preview screen. Clicking on the **Print** button again on this screen will send the screen to the printer. You may also click the **Send to Historical** button to transfer the entered data into the historical project form, where information on project construction can be entered. See the **Historical Projects** section for more information on historical projects.

Figure 9. Pre-Construction Information for HSIP Report

Edit and View Projects

Saved projects can be either edited or viewed. In general, district users are allowed to view all projects from all districts, but can only edit projects from their own districts. Editing projects can also include deletion of a project record(s) from the database.

To edit or view projects, you select **Project Analysis|Edit Projects** and **Project Analysis|View Projects**, respectively. You will be presented a set of filters as shown in Figure 10. The filters allow you to retrieve only a subset of the projects that meet the filter conditions. Any combinations of the filters can be used. All filters are independent, except for the District and County. In this case, you are allowed to select only a county that is under a selected district. When a filter is left unspecified, it is not used and no constraints will be imposed based on that filter.

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Figure 10. Project Filters to Select Projects for Editing and Viewing

Once the filters are specified, you can click the **Submit** button to retrieve all projects that satisfy the filter conditions. All retrieved projects will be listed. Figures 11 and 12 each shows an example of a list of retrieved projects. The list includes several major location variables, plus the FM Number and the project status. You can click the column header to sort the list. Clicking once will sort the list in the ascending order and clicking it again will sort it in the descending order.

For the **Status** column, a project can be assigned one of the following status:

1. Analysis: The project is still in the analysis stage and may or may not be implemented.
2. Construction: The project is being constructed, but the construction has not been completed.
3. Completed: The project has been completed and the construction periods have been entered.

To view the details of a specific project, you can click the one of the **Action** columns. Two actions, **Edit** and **Delete**, are available for the **Edit** project list and one action, **View**, is available for the **View** project list. Clicking in the **Edit** or **View** button will retrieve the project information for the selected record onto the benefit-cost analysis form. Clicking the **Delete** button will delete the record after user confirmation.

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Figure 11. List of Projects for Editing

Figure 12. List of Projects for Viewing

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HISTORICAL PROJECTS

Historical projects are projects that have been adopted for implementation. Unlike projects under Project Analysis, historical projects are those that are either under construction or have been constructed.

Add Historical Projects

To add a historical project of which benefit-cost analysis has been performed, select the **Historical Projects|Add Project** menu item. This will bring up a form similar to the one for benefit-cost project analysis. Unlike for a new project, this form does not allow you to define CRFs or calculate crashes reduced (see Figure 13), like in project analysis. Another difference is that this form contains input for F.M. number and construction date (see Figure 14), while the other does not.

13. Type of Crash	CRF(%)	Number of Crashes	Crashes to be Prevented
Angle	90.42	22	19
Fixed-Object	62.11	1	1
Right-Turn	90.99	1	1
Left-Turn	59.79	16	10
Rear-End	-8.65	17	0
Head-On	100.00	0	0
Sideswipe	36.83	5	2
Pedestrian	100.00	0	0
Ran-Off-Rd	55.87	0	0
Others	60.22	4	3
Total		66	36

☐ Wet Only   ○ Night-Time Only
⦿ Day & Night   ○ Day-Time Only

15. Annual Cost of Improvements

Type	Cost	Life	CF	Annual Cost
A. R-O-W				
B. P.E.C.E.I.	17000	10	0.1424	2421
C. Structure				
D. Roadway	20000	10	0.1424	2848
E. Contingency				
F. Signals/Signing				
G. Subtotal				5269
H. Change in Maintenance				
I. Crash Cleanup				-4500
J. Other				
K. Total				769

16. Benefits

A. Crash Reduction: No. 9	at 1000		9000
B. Other			
C. Other			
Total Annual Benefit			9000

17. Benefit-Cost Ratio — 11.70

Figure 13. Pre-calculated Number of Crashes Prevented

Figure 14. Construction Period Information for Historical Projects

Edit and View Historical Projects

These two functions are similar to the ones described for project analysis. The only difference is that the form for historical projects contains construction date but the project analysis form does not. See the previous section on project analysis for related details.

Generate HSIP Report

This function is to generate the Highway Safety Improvement Programs (HSIP) annual report for selected projects. The function is accessed through the **Historical Projects|Generate HSIP Report** menu item. Figure 15 shows the screen for applying a set of filters to identify desirable projects. Once the filters are specified, you can click the **Submit** button to start generating statistics for the report. Figure 16 shows a sample HSIP report. Click the **Print** button at the bottom of the screen to print the report.

Figure 15. Filters for Project Selection for HSIP Report

STATE ___Florida___ F ___ L ___

FIPS CODE

(Alpha)

**THE ANNUAL REPORT ON
HIGHWAY SAFETY IMPROVEMENT PROGRAMS
THE ANNUAL REPORT ON
EVALUATION DATA FOR COMPLETED SAFETY IMPROVEMENTS**

Page 1 of 1

FM NUMBER	PRIMARY FUNDING SOURCE	SAFETY IMPROVEMENT TYPE	COST OF EVALUATED IMPROVEMENTS	CRASH BASED	NUMBER OF CRASHES										EVALUATION STATUS	VOLUME		RURAL or URBAN	NUMBER of LANES	DIVIDED or UNDIVIDED
					BEFORE					AFTER						Before AADT	After AADT			
					Mks	Fat	Inj.	PDO	TOTAL	Mks	Fat	Inj.	PDO	TOTAL						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
4066271	SS	40	$250,000	Y	36	0	44	42	86	24	0	0	0	0	P	21331	0	U	4	D
4066061	SS	108	$629,000	Y	36	0	13	1	14	24	0	10	6	16	P	23393	23500	R	4	D
4064121	SS	114	$33,000	Y	36	0	0	0	0	24	0	0	0	0	P	0	0	R	2	U
406705	SS	11	$463,000	Y	36	1	6	2	9	24	0	0	0	0	P	7722	0			
406662	SS	108	$563,000	Y	36	0	65	27	92	24	1	19	15	35	P	24799	27571			
406411	SS	40	$259,000	Y	36	0	18	14	32	12	0	3	4	7	P	29094	34429			
404312	SS	14	$1,055,000	Y											P					
404024	SS	40	$302,000	Y	36	0	20	9	29	12	0	5	0	5	P	25431	25000			
409049	SH	12	$391,000	Y	36	1	5	2	8	12	0	3	1	4	P	8912	7650			
406641	SH	12	$476,000	Y	36	1	53	29	83	24	0	19	11	30	P	40837	39367	R	4	D
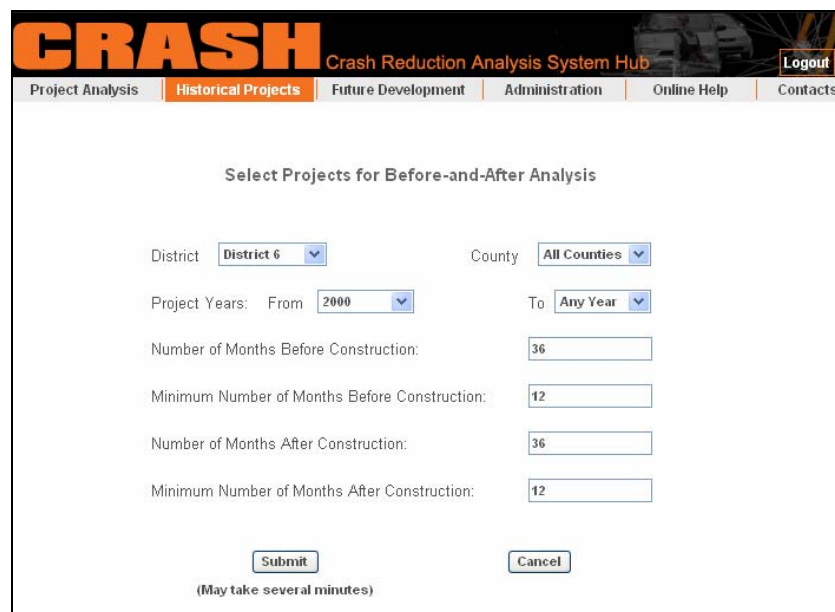
Figure 16. HSIP Annual Report

Perform Before-and-After Analysis

CRASH can perform a before-and-after analysis for any selected projects. For example, one can select improvement projects from a particular district for a certain period of time to quickly evaluate if the crash rates have significantly improved due to the projects. Figure 17 includes a number of filters to allow you to select the desired projects for analysis. Once the filters are specified, you can click the **Submit** button to start the automated analysis process. Because of the intensive data retrieval and calculations involved, the process may take up to several minutes, depending on the size of projects selected. By default, all projects in the database will be included. The output summary statistics are presented in the following four tables:

1. The **Project Summary** table lists all the projects used in the calculation (see Figure 18) of CRFs for a specific improvement type.

2. The **Before Construction Period** table shows the crash statistics associated with the "before-construction" period of each project, including crashes, mean ADT, study period, and total exposure associated with each improvement project (see Figure 19).

3. The **After Construction Period** table is similar to the **Before Construction Period** table, but includes data for projects after the construction periods (see Figure 20).

4. The **Crash Summary** table shows the crash summary statistics for all projects, including crashes, crash rates, crash reduction factors, Poisson test statistics, and whether the Poisson test is significant (see Figure 21). The Poisson test is based on a 95% level of confidence.

Figure 17. Filters for Project Selection for Before-and-After Analysis

Figure 18. Project List for a Before-and-After Analysis

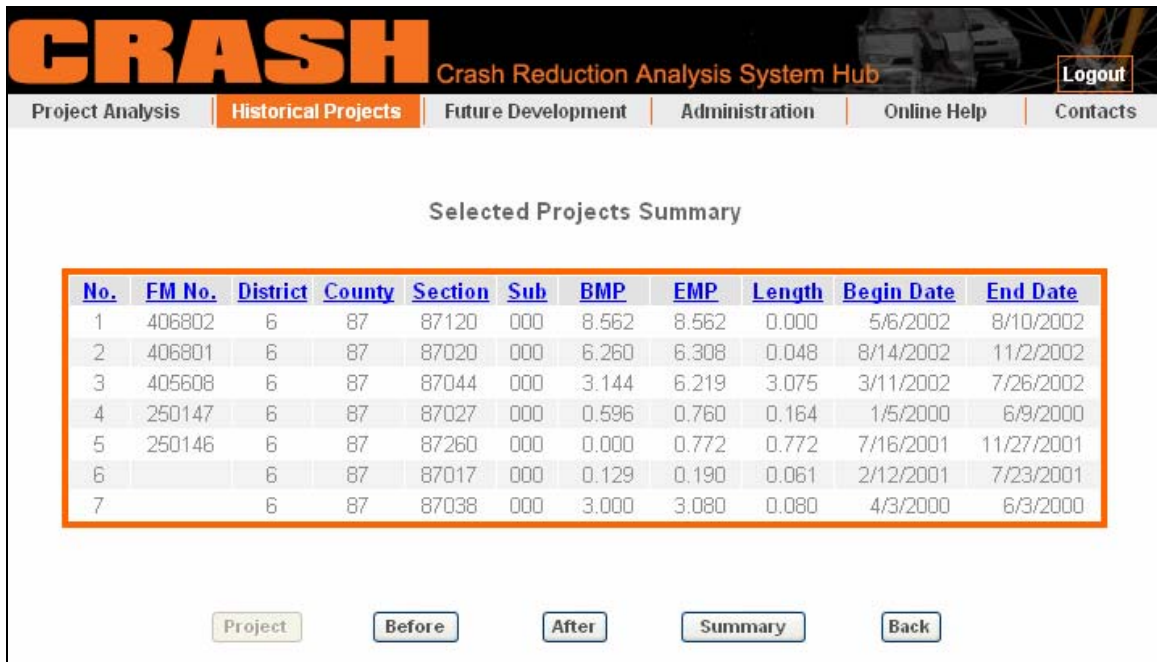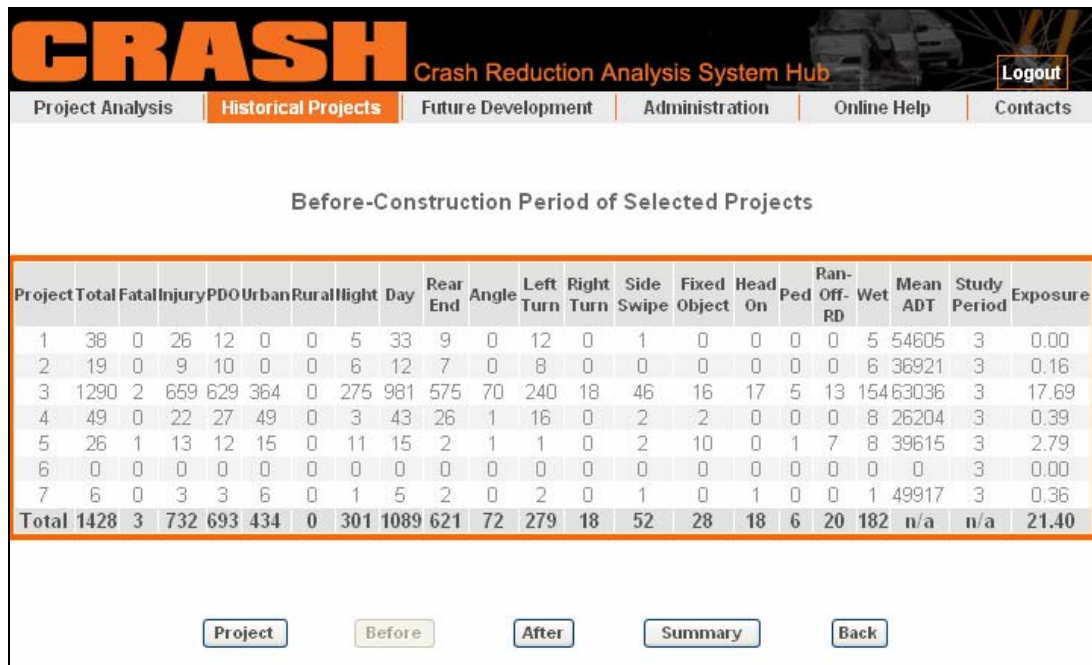**Figure 19. Before Statistics for a Before-and-After Analysis**

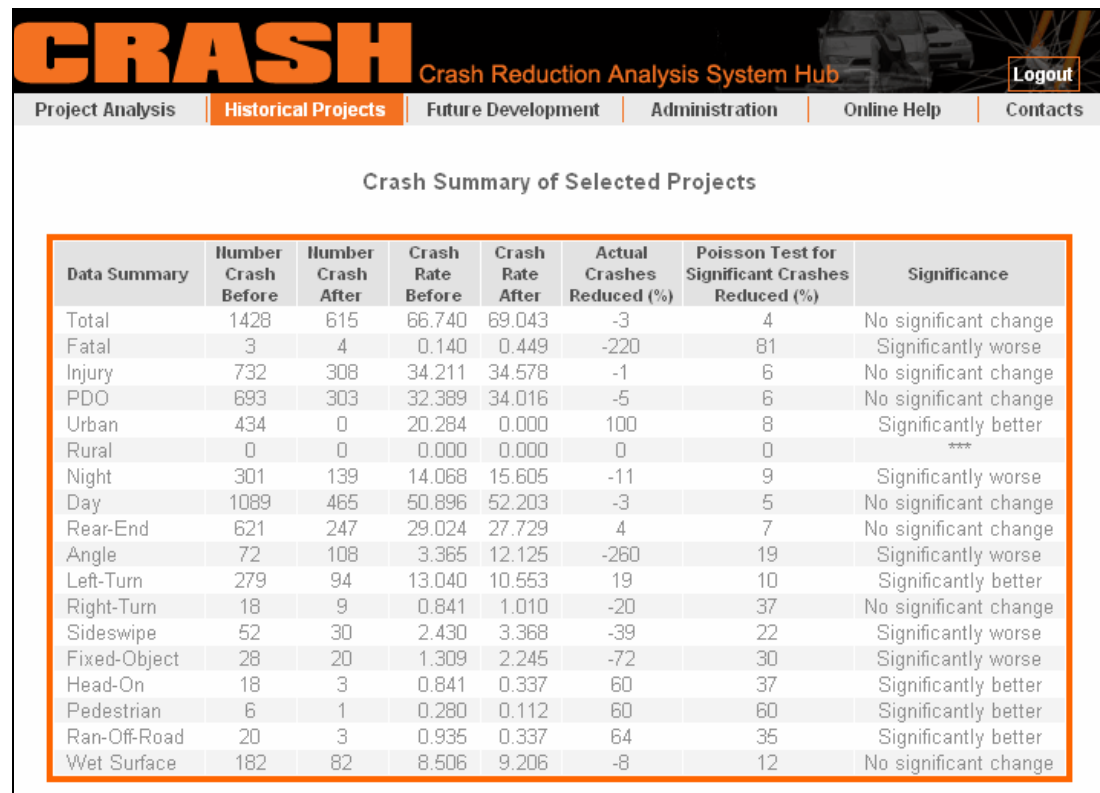**Figure 20. After Statistics for a Before-and-After Analysis**

Project	Total	Fatal	Injury	PDO	Urban	Rural	Night	Day	Rear End	Angle	Left Turn	Right Turn	Side Swipe	Fixed Object	Head On	Ped	Ran-Off-RD	Wet	Mean ADT	Study Period	Exposure
1	15	0	12	3	0	0	4	11	3	1	5	0	0	1	0	0	0	3	65767	1	0.00
2	3	0	3	0	0	0	1	2	2	1	0	0	0	0	0	0	0	1	38833	1	0.06
3	533	3	268	262	0	0	106	419	230	99	83	7	26	9	3	1	0	58	61670	1	5.77
4	20	0	7	13	0	0	5	15	5	2	2	1	1	1	0	0	0	4	29850	3	0.45
5	27	0	12	15	0	0	15	10	6	2	1	0	3	9	0	0	3	16	40704	2	1.91
6	16	1	6	9	0	0	8	7	0	3	3	1	0	0	0	0	0	0	95875	2	0.36
7	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	50500	3	0.37
Total	615	4	308	303	0	0	139	465	247	108	94	9	30	20	3	1	3	82	n/a	n/a	8.91

Figure 21. Summary for a Before-and-After Analysis

Data Summary	Number Crash Before	Number Crash After	Crash Rate Before	Crash Rate After	Actual Crashes Reduced (%)	Poisson Test for Significant Crashes Reduced (%)	Significance
Total	1428	615	66.740	69.043	-3	4	No significant change
Fatal	3	4	0.140	0.449	-220	81	Significantly worse
Injury	732	308	34.211	34.578	-1	6	No significant change
PDO	693	303	32.389	34.016	-5	6	No significant change
Urban	434	0	20.284	0.000	100	8	Significantly better
Rural	0	0	0.000	0.000	0	0	***
Night	301	139	14.068	15.605	-11	9	Significantly worse
Day	1089	465	50.896	52.203	-3	5	No significant change
Rear-End	621	247	29.024	27.729	4	7	No significant change
Angle	72	108	3.365	12.125	-260	19	Significantly worse
Left-Turn	279	94	13.040	10.553	19	10	Significantly better
Right-Turn	18	9	0.841	1.010	-20	37	No significant change
Sideswipe	52	30	2.430	3.368	-39	22	Significantly worse
Fixed-Object	28	20	1.309	2.245	-72	30	Significantly worse
Head-On	18	3	0.841	0.337	60	37	Significantly better
Pedestrian	6	1	0.280	0.112	60	60	Significantly better
Ran-Off-Road	20	3	0.935	0.337	64	35	Significantly better
Wet Surface	182	82	8.506	9.206	-8	12	No significant change

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ADMINISTRATION

This limited-access component allows the system administrator or a designated person to perform the following tasks:

1. Manage user accounts and assign access privileges.
2. View CRF summary statistics for specific improvement types (access not limited)
3. Update CRFs
4. Maintain safety improvement types
5. Assign new safety improvement types to projects
6. Append new crash records

User Management

The **User Management** page is accessed from the **Administration|User Management** menu item. It allows the System Administrator to assign set up accounts for new users, edit existing accounts, including deletion of accounts, and grant user privileges in terms of permission to view or edit projects for specific jurisdictions. Figure 22 shows the main screen of the function, which lists all the existing accounts. To add a new user, click the **Add New User** button at the bottom. This will bring up the screen in Figure 23, which allows a new user name and password to be specified. Both the user name and the password are not case sensitive and up to 20 alphanumeric characters may be specified for each. A new user can be either from the Central Office or from a specific district. He or she can be given privilege to edit and/or view projects from either their own district or all districts. Figures 24 and 25 show the screens with similar fields, but for editing and deleting an existing user account, respectively.

Figure 22. User Management Main Screen

Figure 23. Assign New User

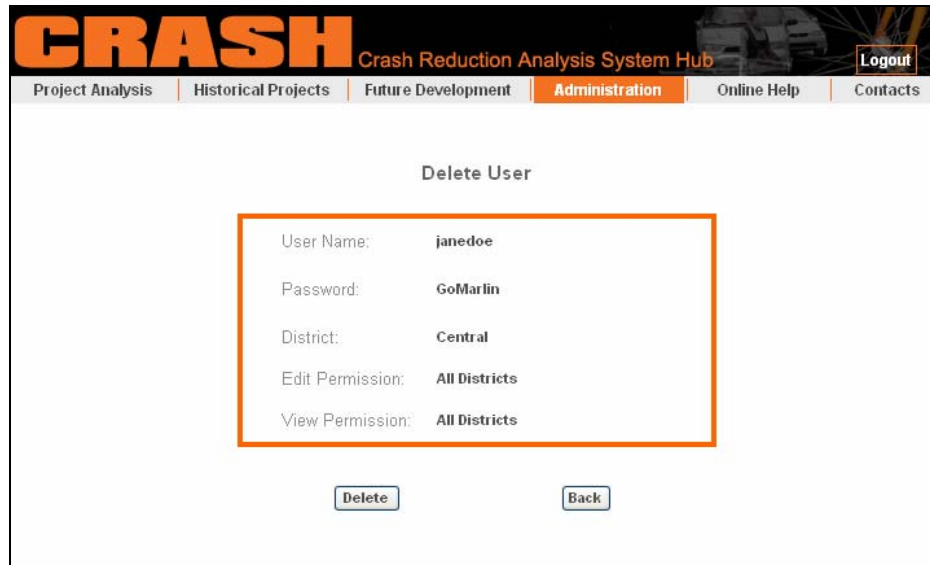**Figure 24. Edit User Account Information**

Figure 25. Delete a User

View CRF Summary Statistics

This function can be accessed from the **Administration|View CRFs** menu item. Selecting this menu item will bring up the screen shown in Figure 26, which allows you to select either to view an Excel summary table listing all up-to-date CRFs from Florida by clicking the link, or to view the detailed calculations of a specific improvement type by selecting from a list of available improvement types and then clicking **View**. In the Excel summary table, the table title will show the date the last time the CRFs were updated (see next section). The output for a specific improvement type includes summary statistics presented in the following four tables:

1. The **Project Summary** table lists all the projects used in the calculation (see Figure 27) of CRFs for a specific improvement type.

2. The **Before Construction Period** table shows the crash statistics associated with the "before-construction" period of each project, including crashes, mean ADT, study period, and total exposure associated with each improvement project (see Figure 28).

3. The **After Construction Period** table is similar to the **Before Construction Period** table, but includes data for projects after the construction periods (see Figure 29).

4. The **Crash Summary** table shows the crash summary statistics for all projects, including crashes, crash rates, crash reduction factors, Poisson test statistics, and whether the Poisson test is significant (see Figure 30). The Poisson test is based on a 95% level of confidence.
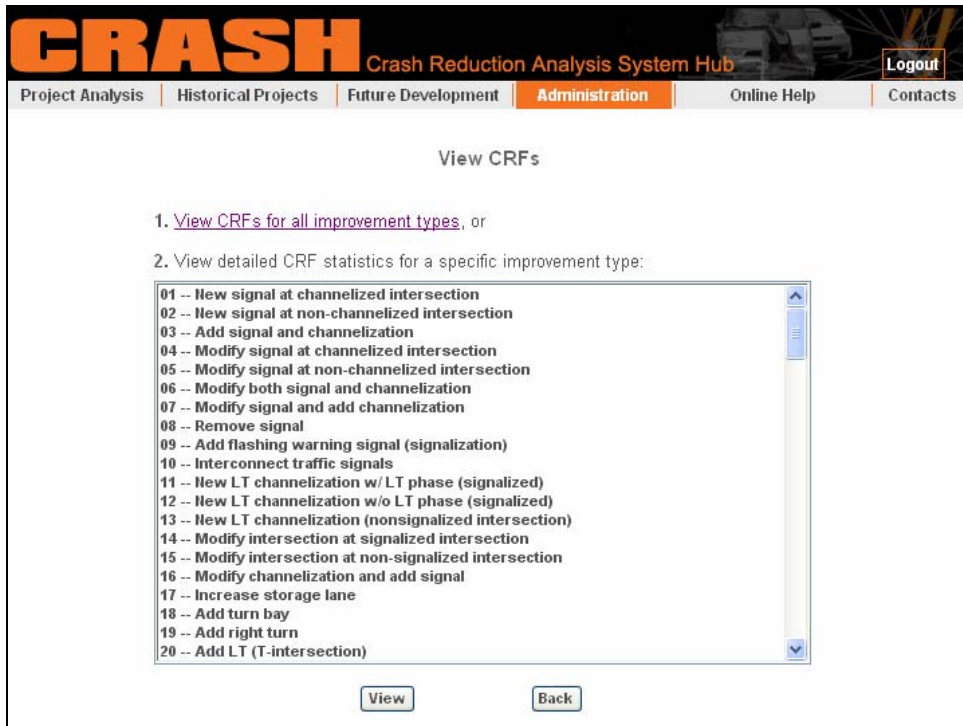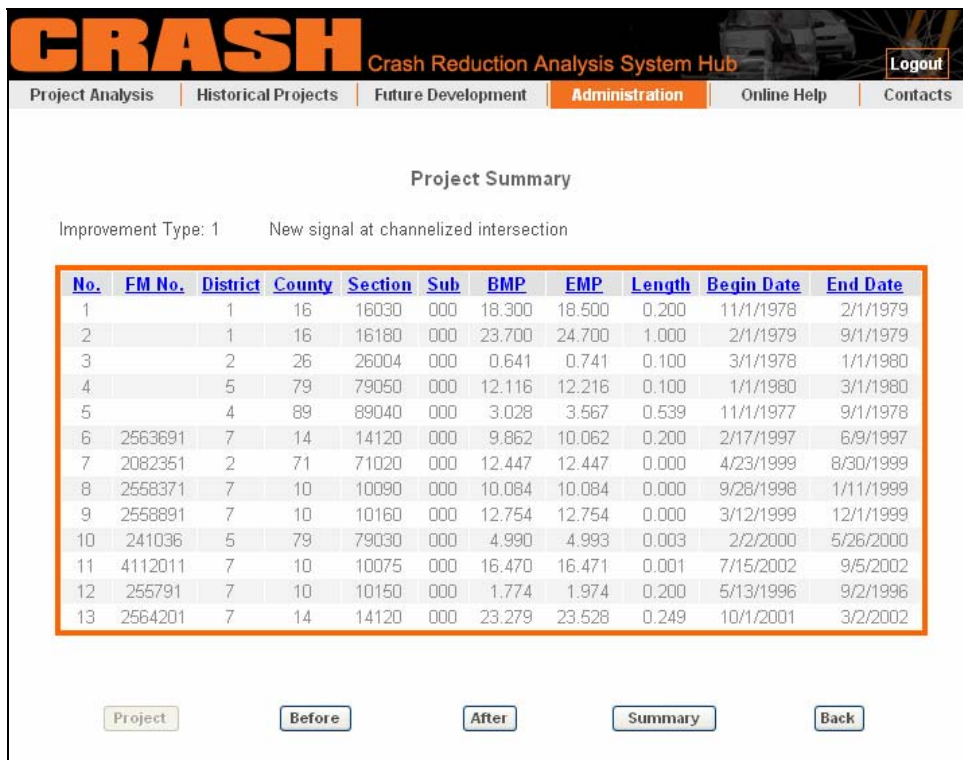
Figure 26. Select to View CRF Summary Statistics

Figure 27. Project Summary Table

Before-Construction Period

Improvement Type: 1   New signal at channelized intersection

Project	Total	Fatal	Injury	PDO	Urban	Rural	Night	Day	Rear End	Angle	Left Turn	Right Turn	Side Swipe	Fixed Object	Head On	Ped	Ran-Off-RD	Wet	Mean ADT	Study Period	Exposure
1	76	2	35	39	76	0	11	61	15	40	9	3	2	1	1	0	1	9	13207	3	4.34
2	137	1	63	73	0	137	12	97	18	48	31	8	18	4	0	0	3	31	11759	3	14.16
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11737	3	2.57
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
5	23	0	10	13	0	23	3	16	12	0	4	1	2	2	0	1	0	3	5075	3	3.55
6	15	0	12	3	0	15	1	12	3	8	4	0	0	0	0	0	0	3	15007	3	0.27
7	7	0	2	5	7	0	0	7	1	3	1	2	0	0	0	0	0	1	40571	3	0.00
8	21	1	11	9	0	21	7	13	0	18	2	0	1	0	0	0	0	1	9157	3	0.00
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
12	56	2	34	20	56	0	18	35	10	25	14	0	2	5	0	0	0	2	32214	3	0.59
13	37	0	27	10	0	18	3	30	15	2	7	0	0	1	0	0	2	7	10935	3	0.25
Total	372	6	194	172	139	214	55	271	74	144	72	14	25	13	1	1	6	57	n/a	n/a	25.73

| Project | | Before | | After | | Summary | | Back |

Figure 28. Crash Summary Table for Before-Construction Period

After-Construction Period

Improvement Type: 1   New signal at channelized intersection

Project	Total	Fatal	Injury	PDO	Urban	Rural	Night	Day	Rear End	Angle	Left Turn	Right Turn	Side Swipe	Fixed Object	Head On	Ped	Ran-Off-RD	Wet	Mean ADT	Study Period	Exposure
1	45	0	19	26	45	0	8	33	20	3	11	1	5	1	0	0	3	8	13101	3	4.30
2	74	1	37	36	0	74	16	53	29	10	10	4	14	2	0	0	2	11	14429	3	17.38
3	4	0	2	2	4	0	1	2	0	0	3	0	0	1	0	0	0	0	13540	3	2.97
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
5	40	0	17	22	0	40	8	28	22	0	5	0	3	4	0	1	0	1	6868	3	4.81
6	8	0	6	2	0	7	3	5	6	0	2	0	0	0	0	0	0	2	16488	3	0.30
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
8	4	0	1	3	0	4	2	2	1	1	0	0	0	1	0	0	0	0	9200	3	0.00
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.00
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00
12	40	1	26	13	40	0	15	21	14	10	9	0	0	4	0	1	1	7	32088	3	0.59
13	31	0	22	9	0	0	4	27	4	6	12	0	1	2	0	0	0	3	11052	2	0.17
Total	246	3	130	113	89	125	57	171	96	30	52	5	23	15	0	2	6	32	n/a	n/a	30.51

| Project | | Before | | After | | Summary | | Back |

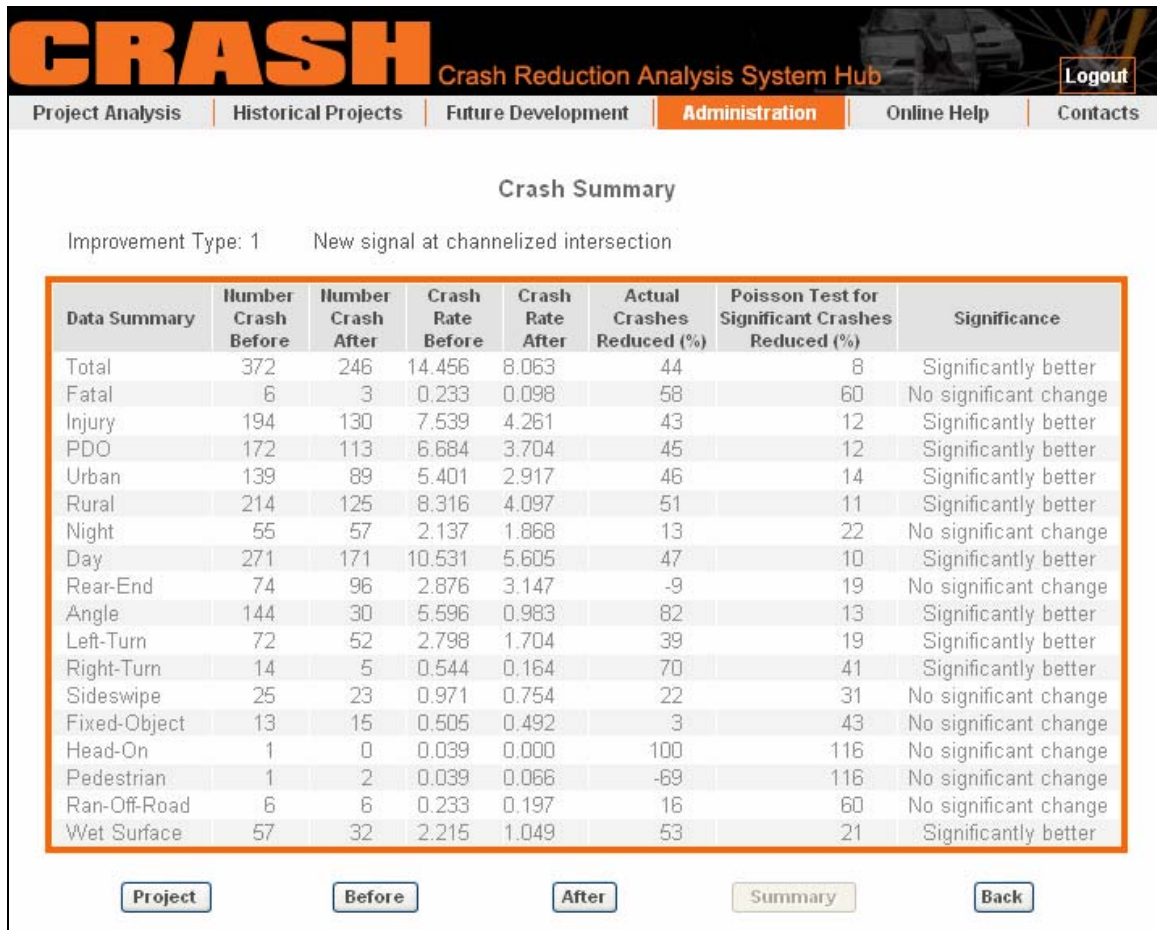**Figure 29. Crash Summary Table for After-Construction Period**

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Figure 30. Crash Summary Table

Update CRFs

This function, accessible from the **Administration|Update CRFs** menu item, is to update the existing CRFs with data from new projects. It is performed by either the system administrator or a designated person. **The method implemented in this version of CRASH is based strictly on the simple before-and-after study method (refer to chapter 2 for more details on this method)**. Figure 31 shows the screen for specifying the number of months you wish to include for the before and after construction period. You can also specify the desired minimum number of months before and after project construction to be included in the calculation. Thus, projects that have not yet met the minimum number of months will not be included in the calculation. You must specify the years for which the improvement projects are to be included. This allows you to exclude projects from a certain period. For example, if you want to include only projects that have been completed since 1990, you would enter 1990 in the **From** year field.

Figure 31. Screen for Selecting Project Time Periods for CRF Calculation

Maintain Improvement Types

The maintenance of improvement types involves the following three tasks:

1. Add a new improvement type
2. Edit an existing improvement type
3. Delete an existing improvement type

To perform these tasks, select the **Administration|Maintain Types** menu item. This will bring up the screen shown in Figure 32, which lists all existing improvement types defined in the database.

To create a new improvement type, click the **Add New Type** button at the bottom of the screen (see Figure 32) to bring up the screen shown in Figure 33. By default the screen will list the next available improvement type number. You may overwrite this with another number that is not already used. Once the name for a new improvement type is specified, click the **Submit** button and the new improvement type will be added to the existing list.

To edit an existing improvement type, click the corresponding **Edit** link to bring up the screen shown in Figure 34. Only the name of an improvement type can be changed. Make all the necessary changes and then click the **Submit** button to execute the change.

To delete an existing improvement type, click the **Delete** link of the corresponding improvement type on the list in Figure 32 to bring up the screen shown in Figure 35. When an existing type is deleted, all projects, if any, that have been assigned the improvement type will be reassigned the "0" improvement type, which means the projects have not been assigned an improvement type.

Figure 32. Main Screen for Maintenance of Improvement Types

Figure 33. Screen for Creating a New Improvement Type

Figure 34. Screen for Modifying an Existing Improvement Type

Figure 35. Screen for Deleting an Existing Improvement Type

Assign Improvement Types

Determining the appropriate improvement type is the task of a person who is experienced in safety improvement projects. The manager uses the project description for a project and then assigns an appropriate improvement type to it. For CRF development purposes, only one

improvement type may be assigned, even tough a project may involve multiple improvements.

To assign an improvement type:

1. Select the **Administration|Assign Types** menu item to bring up the screen in Figure 36

2. Use any combination of the filters shown in the screen to limit the desirable list of projects to be assigned a new improvement type of or changed to another improvement type. For convenience, you can select only projects that have not been assigned an improvement type by selecting the second radio button on the screen. Once the filters are specified, click the **Submit** button to retrieve the desired projects.

3. From the list of projects, identify the project that needs to be assigned an improvement type by clicking the **Assign** link that corresponds to the project. This will bring up the screen shown in Figure 37. Click an improvement type from the list box.

4. Click the **Assign** button to bring up the screen shown in Figure 38.

5. Click the **View** button to review the complete project information.

Figure 36. Screen for Selecting Project to Assign an Improvement Type

Figure 37. Identified List of Projects for Improvement Type Assignment

Figure 38. Screen for Selecting an Improvement Type to Assign

Append New Crash Records

CRASH includes a function to allow crash records to be appended to its crash record database. It assumes that the file being imported consists of the following 38 variables (in the same listed order) in the comma-delimited format:

1. Crash Report Number
2. Crash Date
3. Time of Crash
4. DOT County Number
5. Section Number
6. Subsection Number
7. Located Mile-point
8. Nearest Node Number
9. Located Route Id (lowest-numbered "SR" route)
10. DOT Site Location
11. Side of Road (for 1st harmful event)
12. Lane of Accident (for 1st harmful event)
13. Road Surface Condition (crash report form)
14. Lighting Condition (crash report form)
15. Weather Condition (crash report form)
16. Traffic Control (1st value from crash report form)
17. Road Conditions at Time of Crash (1st value from crash report form)
18. Crash Rate Class Category (CAR code)
19. Average Daily Traffic (RCI)
20. Crash-Level Alcohol Involved Code (crash report form)
21. 1st Harmful Event for At-Fault Vehicle (crash report form)
22. Vehicle Type for At-Fault Vehicle (crash report form)
23. Vehicle Use Code for At-Fault Vehicle (crash report form)
24. First Point of Impact for At-Fault Vehicle (crash report form)
25. Vehicle Movement Code for At-Fault Vehicle (crash report form)
26. Direction of Travel for At-Fault Vehicle (crash report form)
27. 1st Contributing Cause Driver/ Pedestrian for At-Fault Section (crash report form)
28. Driver/ Pedestrian Age for At-Fault Section (based on driver/ped birth date from crash report form)
29. Vehicle Type for Next Vehicle (crash report form)
30. Vehicle Use Code for Next Vehicle (crash report form)
31. 1st Point of Impact for Next Vehicle (crash report form)
32. Vehicle Movement Code for Next Vehicle (crash report form)
33. Direction of Travel for Next Vehicle (crash report form)
34. Contributing Cause Driver/ Pedestrian for Next Section (crash report form)
35. Driver/ Pedestrian Age for Next Section (based on driver/ped birth date from crash report form)
36. Total Number of Vehicles in Crash
37. Total Number of Traffic Fatalities in Crash (Traffic Fatality is person with Injury

Severity value of "5")

38. Total Number of Injuries in Crash (Injury is person with Injury Severity value of "2", "3" or "4")

Figure 39 shows the screen for importing new crash records. It can be accessed from the **Administration|Append New Records** menu item. The first column of the screen shows the list of variables in the database as listed above. The second column lists the crash data years and the corresponding number of crash records stored already stored in the system crash database for each year.

To import data for a new crash year, type in the file path and name as shown in Figure 38. Alternatively, one can click the **Browse** button to navigate to the file folder where the desired input file resides. After a file is specified, click the **Append** button to start appending crash records to the database. CRASH will first detect if the file is of the right format. CRASH will proceed with the data importation only if the format the specified file is of the correct format.

To avoid duplicated records, CRASH will check the Crash Report Number (first field), which is unique, of each record to determine if it is an existing record in the database. If so, the duplicated records will be listed altogether in a box and you will be asked whether to replace them with the existing records. As soon as the appending process is completed, the list of crash record statistics on the screen will be updated. You may select to append multiple years of records at once (not recommended, however), or appending the crash records for a single year in multiple appends (e.g., one for each district).
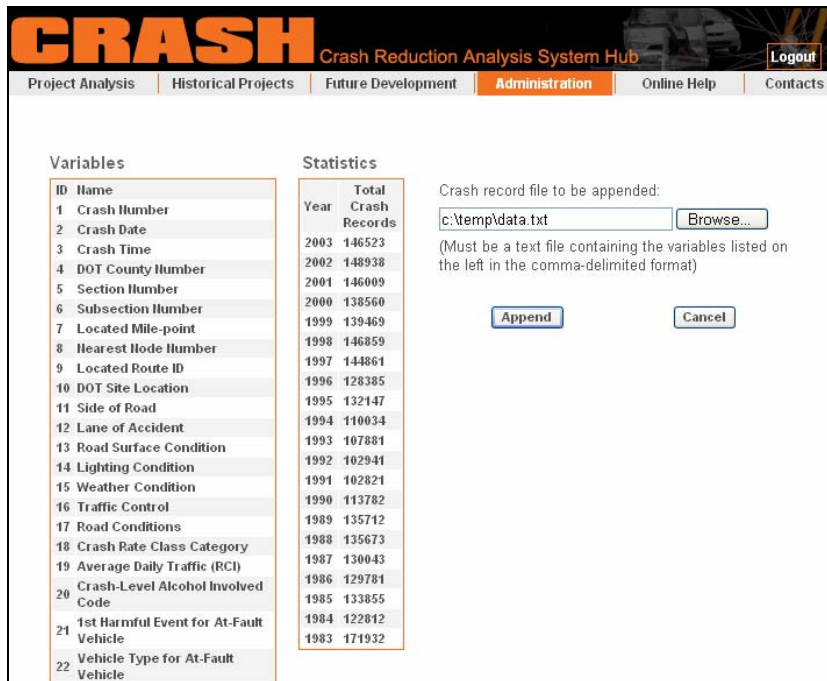

Figure 39. Screen for Appending New Crash Records