Training Material for the ODOT Safety Investigations Manual

September 21, 2010

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Agenda

- 8:30 Welcome and Introductions
- 8:45 SIM Part # 1
- 10:00 Break
- 10:15 SIM Part # 2
- 11:45 Lunch
- 1:00 Case Study # 1
- 2:00 Case Study # 2
- 3:00 Wrap Up
- 3:15 Adjourn

Icebreaker

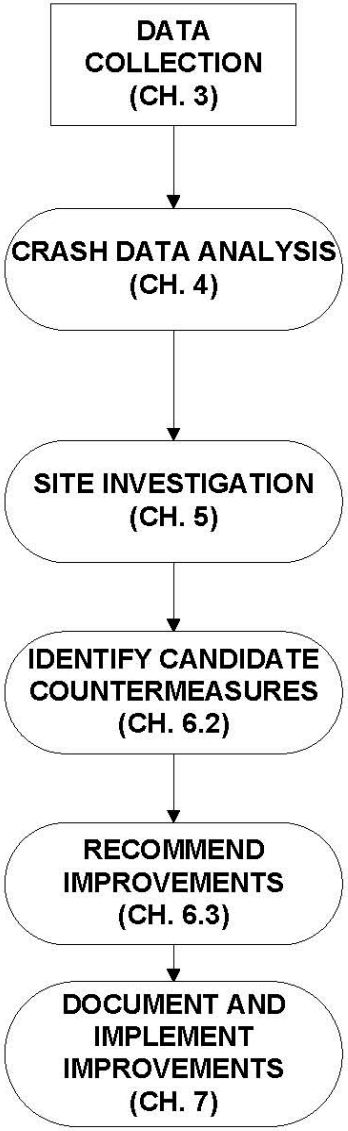
Outline of the Manual

1. Manual Overview
2. Safety Investigation Basics
3. Overview of Data Sources
4. Diagnosing Crash Patterns
5. Site Investigations
6. Countermeasure Selection and Recommend Improvement Analysis
7. Document Implementation

- Appendix
  - Worksheets, Instructions, Example Problems, Case Studies

Purpose

- Resource for traffic investigators
  - Both experienced & new
- Training material
- Standardized approach
- Documentation
- Useable by local agencies



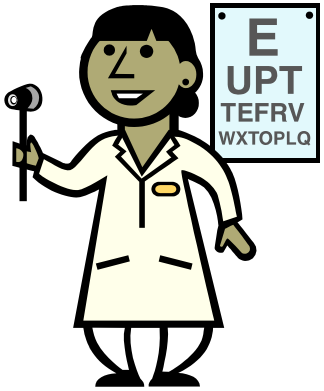
What This Manual Does Not Do

- Tell you how to do your job
- Cover all circumstances or crash patterns likely to be observed

Limitations

- Access to local crash data is still a challenge but will be improving.
  - Online access to Excel crash reports (not just summary) for non-state highways
  - Automated collision diagramming
  - GIS SPIS

Principles of Investigation



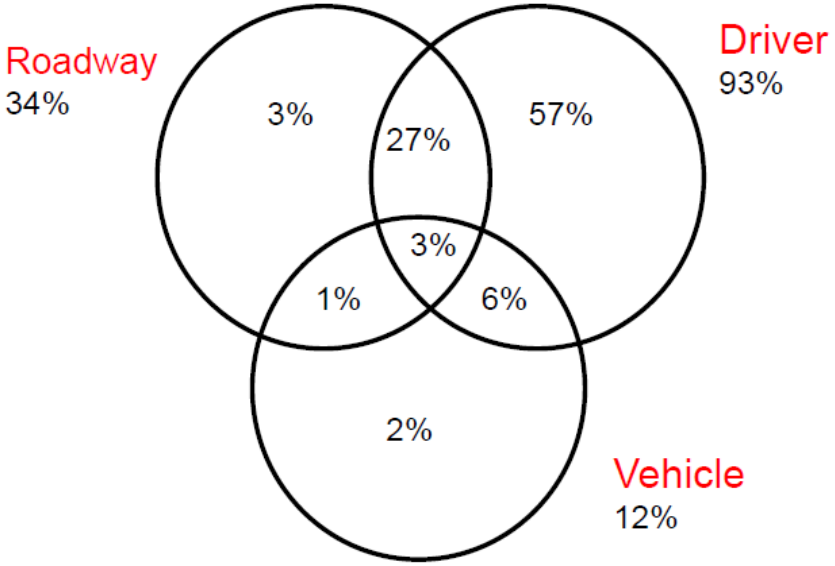
- The doctor is in!

- Crashes are rare events
- Most users prefer to avoid a crash

- Trying to detect a pattern of crashes that are “out of the ordinary”

Basic Concepts

- Factors that “cause” crashes
- Rates
- Duration
- Severity



Sample: OR99E & Checkerboard Road

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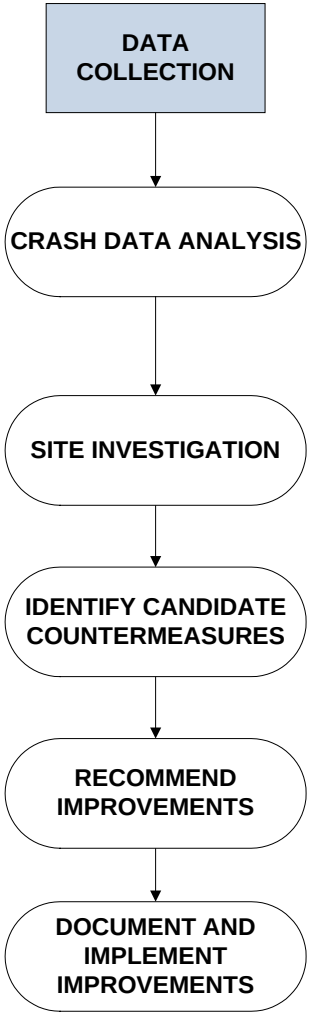
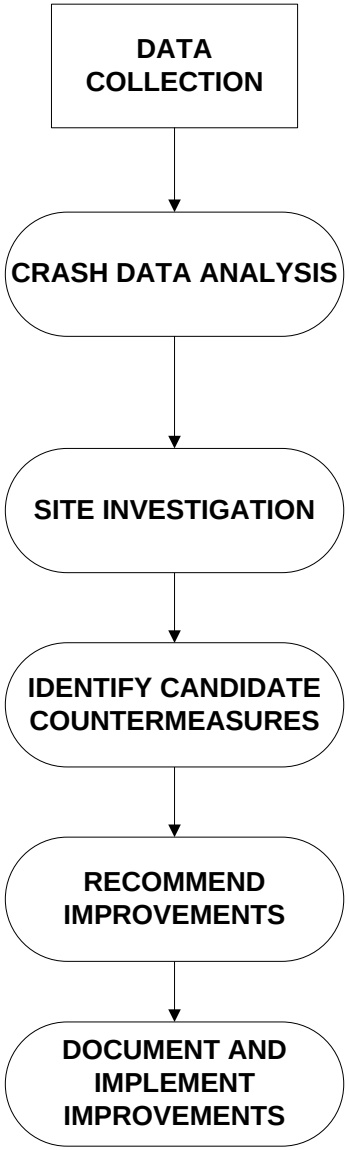
In Office Data

Crash	Geometry	Exposure	Other
Crash Data	Highway Inventory	Functional Class	Web TransGIS
SPIS	Digital Video Log	Traffic Volumes	Traffic Signal Timing
SIP	Google Maps		As Built Plans

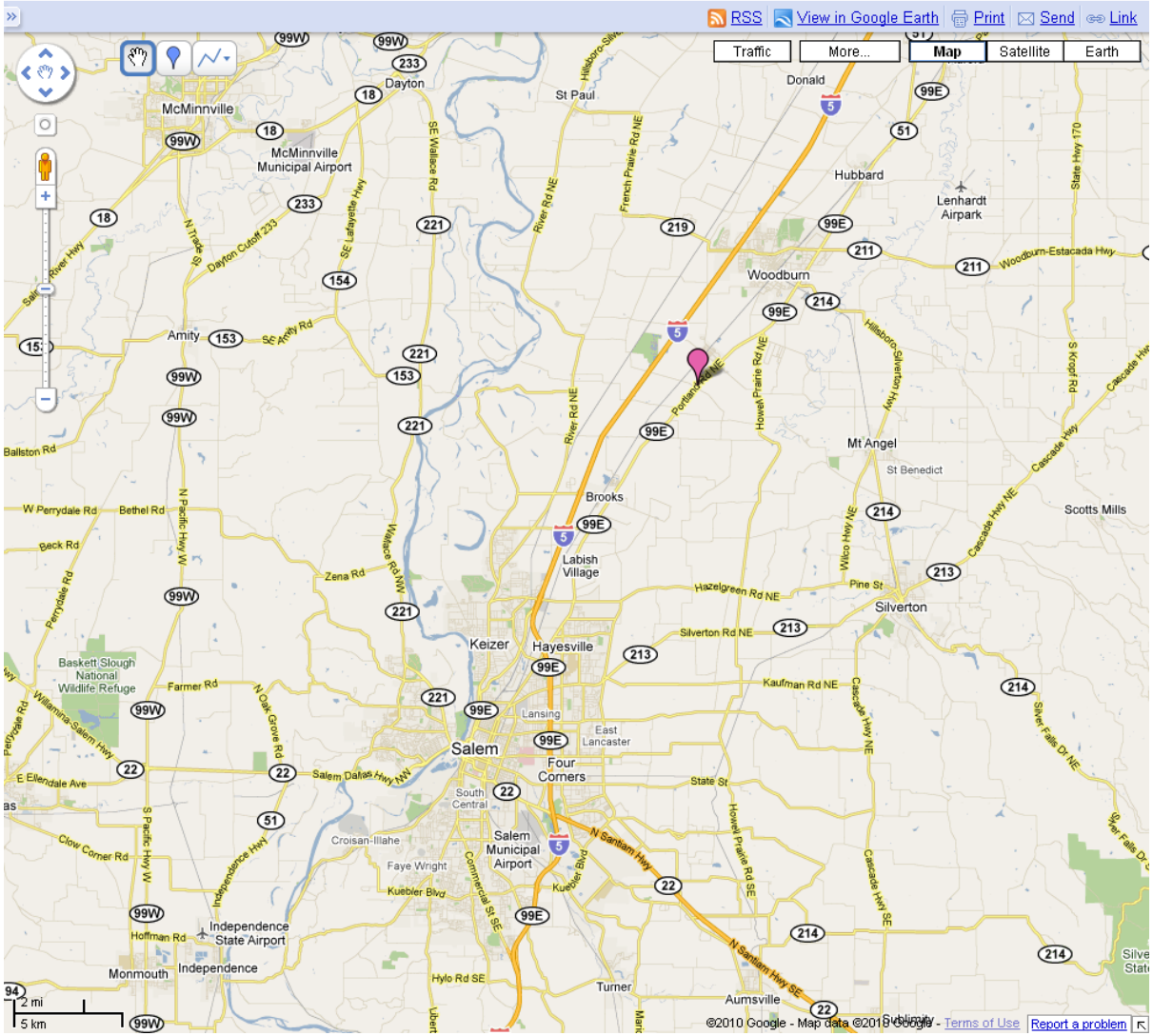


Data Collection

- Need:
  - Crash data
  - Photos or DVL
  - Site maps
  - Functional class
  - Traffic volumes



Location


RSS
View in Google Earth
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Traffic
More...
Map
Satellite
Earth
McMinnville
McMinnville Municipal Airport
Dayton
St Paul
Donald
Hubbard
Lenhardt Airpark
Woodburn
Amity
Mt Angel
St Benedict
Scotts Mills
Brooks
Labish Village
Silverton
Keizer
Hayesville
Baskett Slough National Wildlife Refuge
Lansing
East Lancaster
Salem
Four Corners
South Central
Croisan-Illahe
Faye Wright
Salem Municipal Airport
Independence State Airport
Independence
Monmouth
Turner
Aumsville
2 mi
5 km
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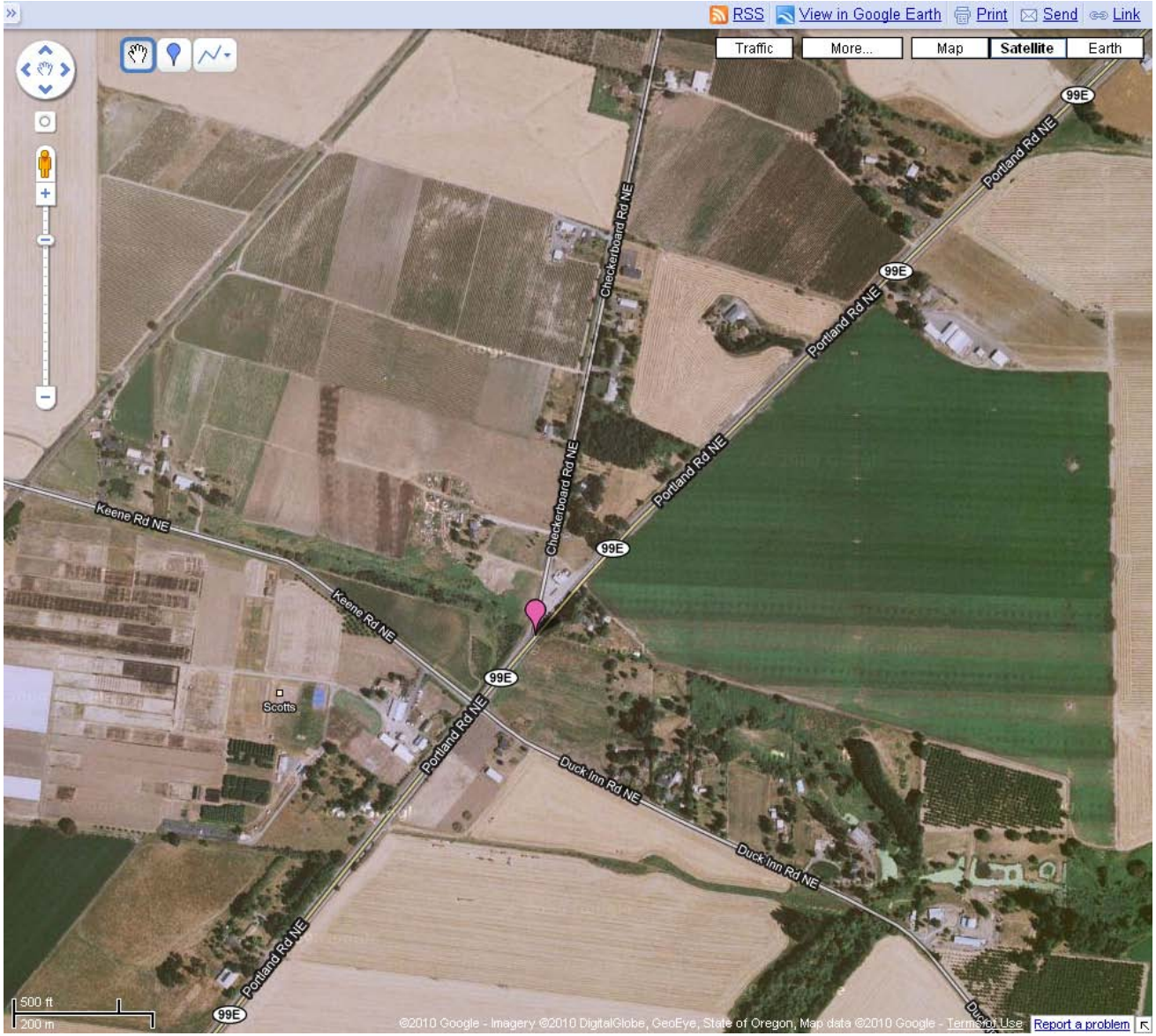
Report a problem


RSS
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Link
Traffic
More...
Map
Satellite
Earth
99E
Portland Rd NE
Checkerboard Rd NE
Keene Rd NE
Scotts
Duck Inn Rd NE
500 ft
200 m
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Report a problem

Hwy 081 MP 37.055

Hwy 081 MP 37.020

Browse the DVL (Digital Video Log)

- The ODOTDVL can be accessed internally at http://rssa.odot.state.or.us/cf/dvl/
- The external link to the ODOT DVL is included at:

http://www.oregon.gov/ODOT/TD/TDATA/rics/PublicRoadsInventory.shtml

Make some notes about what you see

Use Google Maps Streetview

- http://maps.google.com/maps?tab=wl

- Type OR 99E and Checkerboard Road in the search dialog window

Get the Functional Class

http://www.oregon.gov/ODOT/TD/TDATA/rics/FunctionalClassification.shtml

RURAL

- Rural interstate
- Rural other principal arterial
- Rural minor arterial
- Rural major collector
- Rural minor collector
- Rural local

URBAN

- Urban interstate
- Urban other freeways and expressway
- Urban other principal arterial
- Urban minor arterial
- Urban collector
- Urban local

Functional Class

Functional Classification and National Highway System Status on Oregon State Highways

Hwy	MIge Type	Beg MP	MIge Type	End MP	NHS	FC	Notes	HPMS Area	Urban Area
72		3.34		5.19	No	14-Urban Principal Arterial-Other		4	Salem
72		5.19		7.92	Yes	14-Urban Principal Arterial-Other		4	Salem
72		7.92		8.48	Yes	12-Urban Principal Arterial-Other Fwy or		4	Salem
81		-6.09		-3.75	Yes	14-Urban Principal Arterial-Other		4	Portland
81		1.00		5.46	Yes	14-Urban Principal Arterial-Other		4	Portland
81		5.46		15.01	No	14-Urban Principal Arterial-Other		4	Portland
81		15.01		19.26	No	06-Rural Minor Arterial		1	
81		19.26		22.05	No	14-Urban Principal Arterial-Other		2	Canby
81		22.05		30.87	No	06-Rural Minor Arterial		1	
81		30.87		33.62	No	14-Urban Principal Arterial-Other		2	Woodburn
81		33.62		42.21	No	06-Rural Minor Arterial		1	
81		42.21		46.49	No	14-Urban Principal Arterial-Other		4	Salem
91		-5.76		-4.75	No	16-Urban Minor Arterial		4	Portland

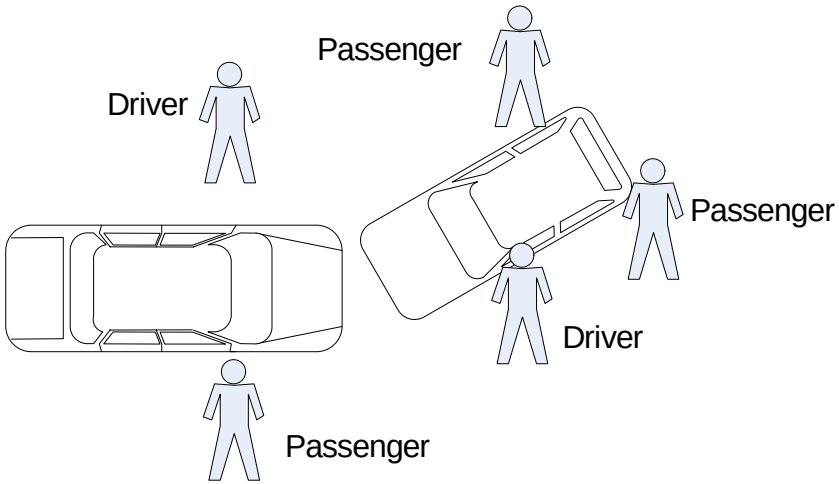
Get Traffic Volumes

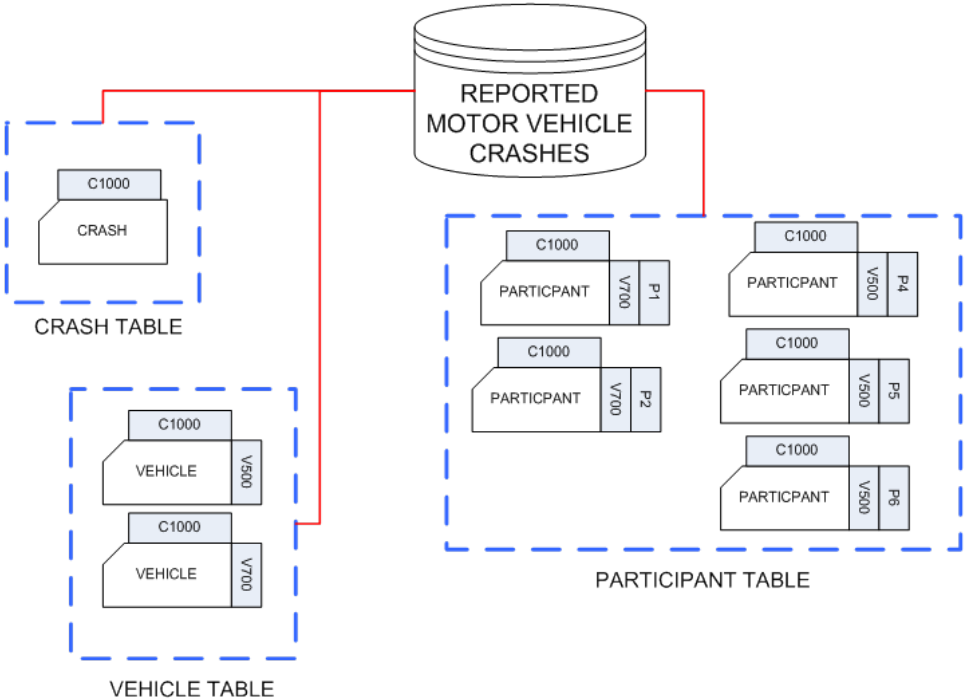
- See ODOT traffic volume tables
- http://www.oregon.gov/ODOT/TD/TDATA/tsm/tvt.shtml

- Minor street volume may require some digging.

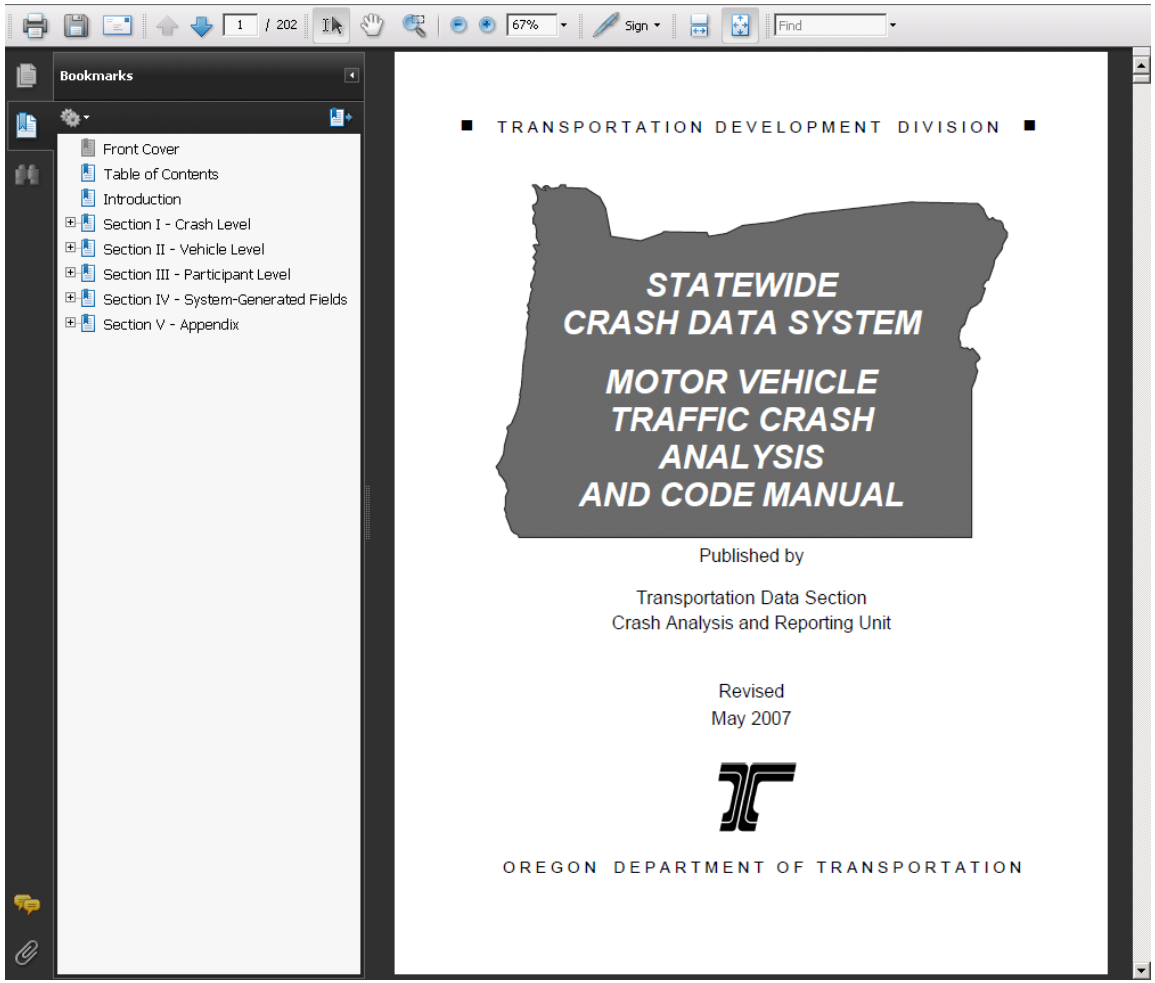
Crash Data

- Relational database
  - Crash
    - 1 record
  - Vehicle
    - 1 record for every vehicle
  - Participant
    - 1 record for every person





Let’s browse the code manual

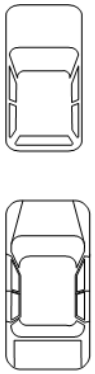


06/28/2010

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINOUS SYSTEM CRASH LISTING
Highway 081 MP 36.95 to 37.11, Both Add and Non-Add mileage 01/01/1999 to 12/31/2003
1 - 17 of 17 rows shown.

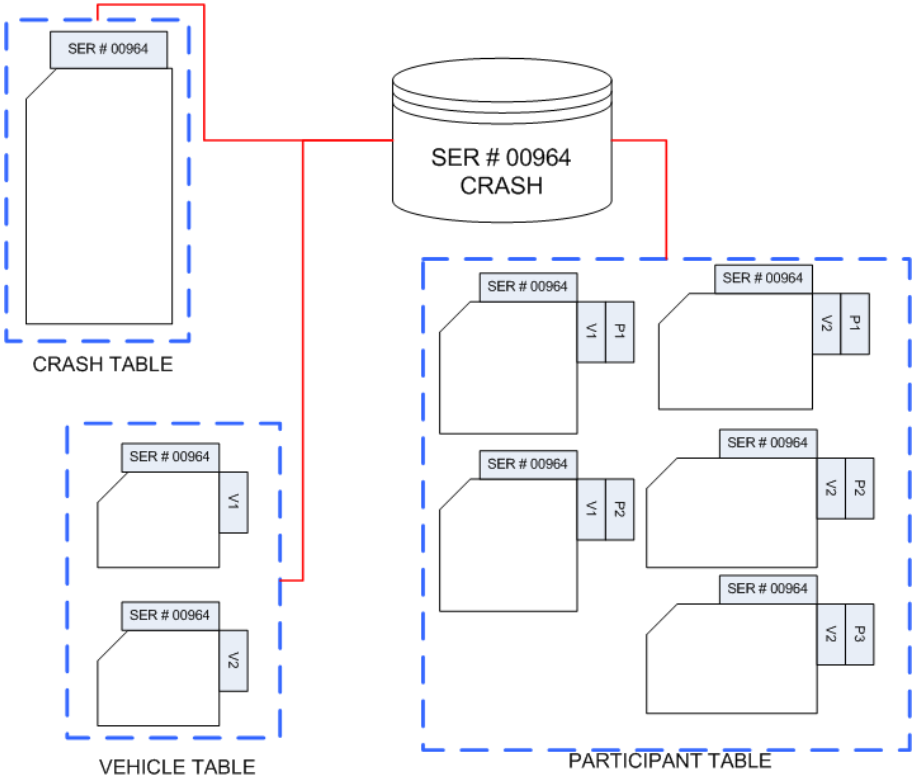
SER# INVEST	SPEED	ALC	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN# FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
03579	Y	N	N	N	N	06/20/1999	Marion	1 06		STRGHT		N	N	CLD	O-STRGHT	01	NONE 0	STRGHT	1	DRVR	NONE	00	Unk	UNK					01
COUNTY						SU		MN		UN	(NONE)	NONE	N	DRY	SS-M		PRVTE	N -S						UNK			000		01
						2A		0 37.00		04	0		N	DARK	INJ		PSNGR CAR									044			01
											(2)																		
																02	NONE 0	STRGHT	1	DRVR	INJB	69	M	OR-Y					
																	PRVTE	S -N						OR>25			000		
																	PSNGR CAR									000			
																			2	PSNG	INJB	62	F						
07016	N	N	N	N	N	12/06/2001	Marion	1 06		STRGHT		N	N	RAIN	S-1STOP	01	NONE 0	STRGHT	01	DRVR	INJC	18	F	OR-Y					07
CITY						TH		MN		UN	(NONE)	NONE	N	WET	REAR		PRVTE	S -N						OR<25			000		
						12P		0 37.02		04	0		N	DAY	INJ		PSNGR CAR									043			07
											(2)																		
																02	NONE 0	STOP	01	DRVR	INJC	29	F	OR-Y					
																	PRVTE	S -N						OR<25			012		
																	PSNGR CAR									000			
02101	Y	N	N			04/25/2003	Marion	1 06		STRGHT		N	N	CLD	S-1STOP	01	NONE	STRGHT	01	DRVR	INJB	29	M	OR-Y					01
STATE						FR		MN		UN	(NONE)	BUS	N	WET	REAR		PRVTE	S -N						OR<25			000		00
						2P		0 37.02		04		STPSGN	N	DAY	INJ		PSNGR CAR									026,047	000		01
											(2)																		
																02	NONE	STOP	01	DRVR	NONE	58	M	OR-Y					
																	PUBLC	S -N						OR<25			011		00
																	SCHL BUS									000	000		00
06887	N	N	N	N	N	12/02/2001	Marion	1 06		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT	01	DRVR	NONE	32	M	OR-Y					07
NONE						SU		MN		UN	(NONE)	UNKNOWN	N	DRY	REAR		PRVTE	S -N						OR<25			000		

In class exercise



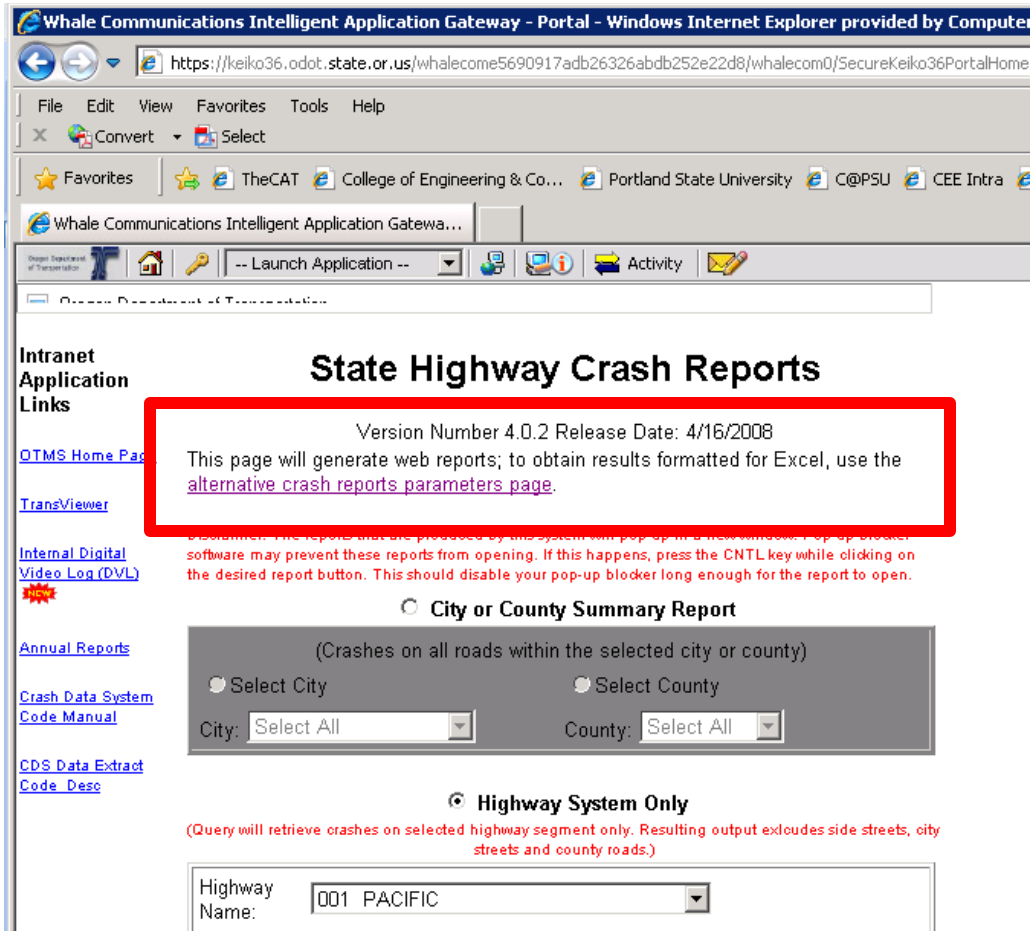
Using the PRC report, add the following to the diagram below for crash serial # 00964. Be sure to place in the appropriate box:

1) The milepost of the crash
2) Day of the week of crash
3) Severity of crash
4) Weather and lighting of the crash
5) Type and direction of travel for each vehicle
6) Type, age, sex, injury severity and liscense status of each particpant
7) Label the vehicles to the left (with number)



Download Crash Data

- Download
  - PRC Report in Excel Format
  - Must use Internet Explorer
  - Link



PRC: Program Research Corporation

SIM Worksheets

- Download the worksheet
- Notice tabs:
  - Cover sheet
  - Data entry
  - PRC Rawdata
  - …

Cover Sheet

- Fill in all yellow highlighted cells
- This information will appear on most other forms
- Be sure to select whether it is a
  - SEGMENT
  - INTERSECTION
  - then the appropriate class or type

Data Entry

- Select all rows/columns in the PRC report you downloaded.
- Copy and paste into SIM worksheet, PRC_RAWDATA tab in cell A1
- Go to DATAENTRY tab
- Fill in

Crash Patterns Worksheet

- Collision type (all)
- Collision type (fatal & severe injury)
- Number of vehicle
- Residence of driver
- Sex of driver
- Time of day
- Light condition
- Weather
- Surface
- Day of the week
- Driver age
- Location
  - On roadway
  - Off roadway
- Cause codes

Red variables require use of PRC report

Decoding the Patterns

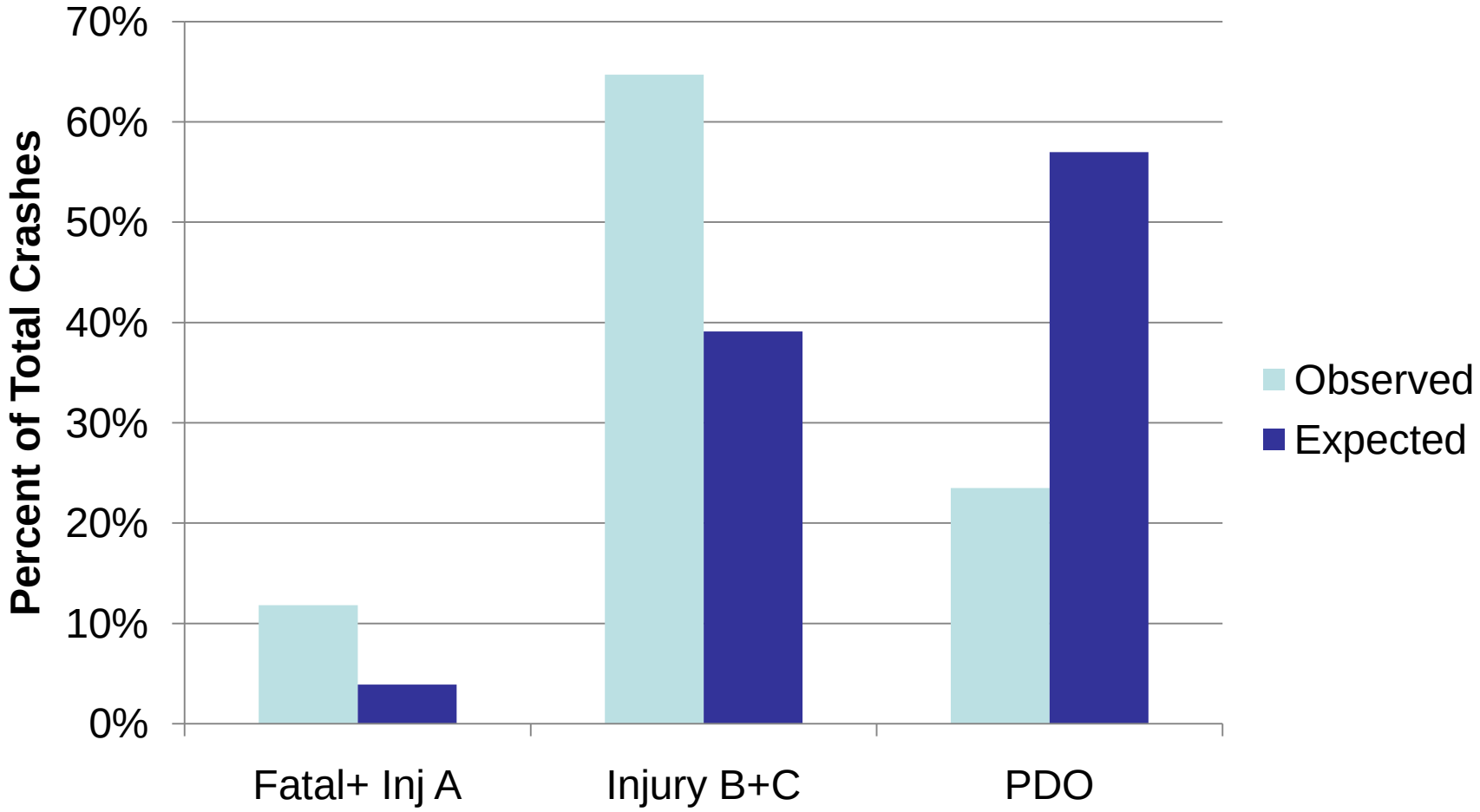
Crashes at study site
2 / 17 = 11.8%

P(Norm) - How likely is the proportion (2/17) observed by chance? Values less than 5% flagged but you can look at value as another clue.

Severity	*Crash*	*Obs %*	*Ex %*	*P(Norm)*
Fatal+ Inj A	2	11.8%	3.9%	14.1%
Injury B+C	11	64.7%	39.1%	**2.9%**
PDO	4	23.5%	57.0%	99.9%
	17	100.0%	100.0%	

"Expected" %
(Its looked based on facility type)

Decoding the Patterns Worksheets



Patterns

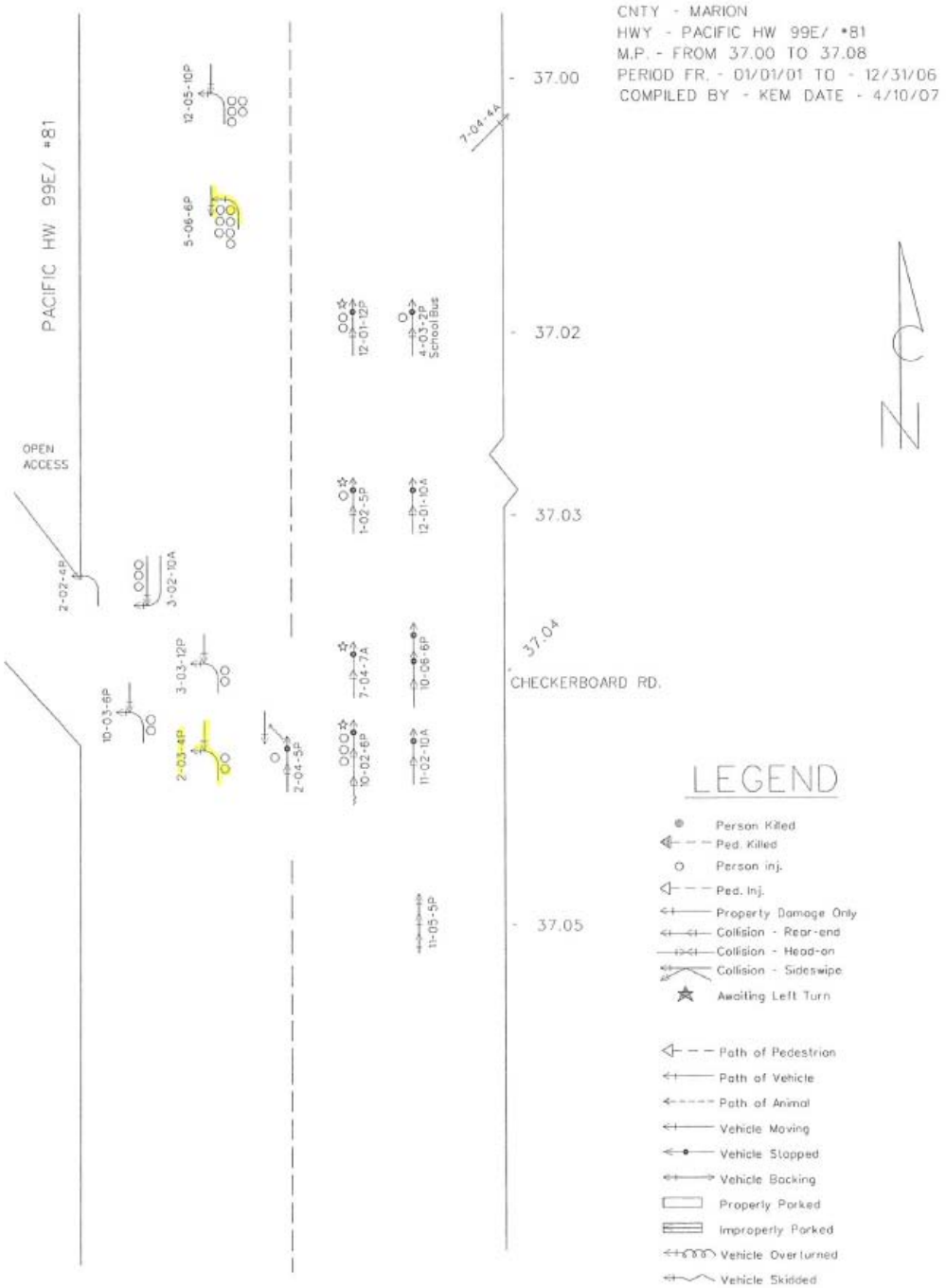
- Look at case study sheet
- Highlight or note “flagged patterns”

Crash Rates

- What is the calculated rate?
- What is the critical rate?
- Is this intersection “flagged” as above average?

Collision Diagram

- The investigators other best friend!
- (New automated statewide tool available soon)

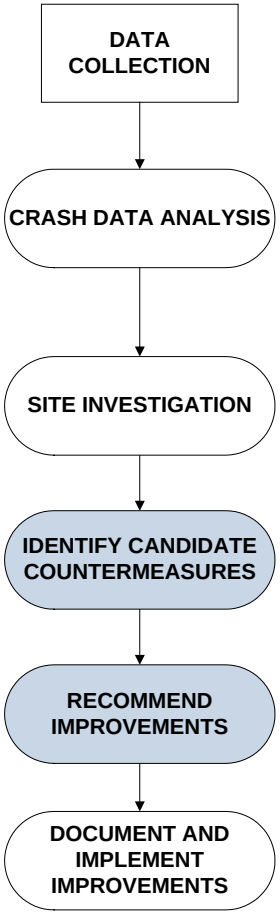


Site Investigations

- Based on the patterns:
  - What crash patterns should they look for?
  - What time should investigator go to the site?
  - What items should they try to document?
    - Table 1, pg 44
  - What types of field studies might be considered?
    - Table 2, pg 48
  - Are there any crash pattern specific elements to collect?
    - Table 3 and 4, pg 51

Countermeasure Selection

- Select the “cure” for the crash
- Good countermeasure should reduce either the frequency or severity of dominant crashes types.
- Tradeoffs between safety and other competing decision elements should be expected



Countermeasures

- Based on field data and collision data
  - What are some possible countermeasures?
  - Use Table 3, 4 to brainstorm

Traffic
More...
Map
Satellite
Apply access management to limit open access
Realign Checkerboard to remove skew
Add left-turn lane refuge (both directions)
A

Getting a CMF or CRF

http://www.cmfclearinghouse.org/

CRASH MODIFICATION FACTORS CLEARINGHOUSE

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Advanced Search

Please use the Advanced Search page to narrow your CMF search results. If you need more help structure your search, please visit our help page.

No pop from previous query. url.modify:

Search Terms: Match any of these words.

Search Areas [?]:
- [x] All
- [ ] Countermeasure Name
- [ ] Study Abstract
- [ ] Study Citation (includes authors' names)
- [ ] CMF Keywords

Countermeasure Category [?]:
- Highway lighting
- Interchange design
- Intersection geometry
- Intersection traffic control
- On-street parking

Star Quality Rating [?]: All CMF's (only cmfs rated at this level or higher)

CMF in Highway Safety Manual (HSM)? [?]:
- ( ) Only CMF's included in the Highway Safety Manual
- ( ) Only CMF's not included in the Highway Safety Manual
- (•) All CMF's

Crash Type [?]:
- Parking related
- Pedestrian
- Rear end
- Rear to rear

Crash Severity [?]:
- - please select -
- All
- Fatal
- Minor injury

Roadway Type [?]: - please select -

Intersection Type [?]: - please select -

Intersection Geometry [?]: - please select -

Traffic Control [?]: - please select -

Area Type [?]: Rural

Type of Methodology [?]: - please select -

CMF CRASH MODIFICATION FACTORS CLEARINGHOUSE

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Home » Advanced Search Results

Advanced Search Results

There were 56 results returned for this search. Modify Search

Category: Intersection geometry

Countermeasure: Add left-turn lanes to major road approaches at intersections

CMF	CRF(%)	Quality	Crash Type	Crash Severity	Roadway Type	Area Type	Reference
0.42 [B]	58	★★★★★	All	Fatal,Serious Injury,Minor Injury	Not specified	Rural	Harwood et al., 2002

Countermeasure: Addition of left- or right-turn by-pass lanes

CMF	CRF(%)	Quality	Crash Type	Crash Severity	Roadway Type	Area Type	Reference
0.95	5	★★★☆☆	All	All	Not specified	Rural	Preston and Schoenecker, 1999
0.81	19	★★★☆☆	All	Property damage only (PDO)	Not specified	Rural	Preston and Schoenecker, 1999
1.25	-25	★★☆☆☆	All	Fatal,Serious Injury,Minor Injury	Not specified	Rural	Preston and Schoenecker, 1999

Countermeasure: Closure or complete relocation of all driveways from functional area of intersection

CMF	CRF(%)	Quality	Crash Type	Crash Severity	Roadway Type	Area Type	Reference
1.17	-17	★☆☆☆☆	All	All	Principal Arterial Other	Rural	Lall et al., 1995
1.41	-41	★☆☆☆☆	All	Serious injury,Minor injury	Principal Arterial Other	Rural	Lall et al., 1995

B/C Form

- Calculate the B/C
- Note: new ODOT forms to replace form shown.

HSIR

- “Highway Safety Investigations Report” - HSIR
- Document the final results.

Documentation

- Preparing consistent documentation is a key ingredient in safety improvement process.
- Narrative description of problem
  - Try writing a statement that summarizes the investigation (be prepared to share)
- Recommendation
  - Try writing a statement (be prepared to share)

A