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DRAFT TECHNICAL MEMORANDUM

Bend Arterial and Collector Safety Project Program Development

Diagnosis and Project Ranking

Date: September 24, 2012 Project #: 11645.0
To: Robin Lewis, PE, City of Bend
From: Casey Bergh, PE and Brian Ray, PE

The City of Bend and Kittelson & Associates, Inc. (KAI) are developing and implementing a data-driven transportation safety management program. The framework for the program was documented by KAI in our July 9, 2012 memorandum (draft prepared in June 2012) and is generally illustrated in Figure 1. The Diagnosis and Project Ranking components are described in this memorandum. Diagnosis involves identifying factors potentially contributing crashes at each site identified in the Network Screening phase and selecting countermeasures to reduce those crashes. The effectiveness of the countermeasures is used to rank projects for implementation.

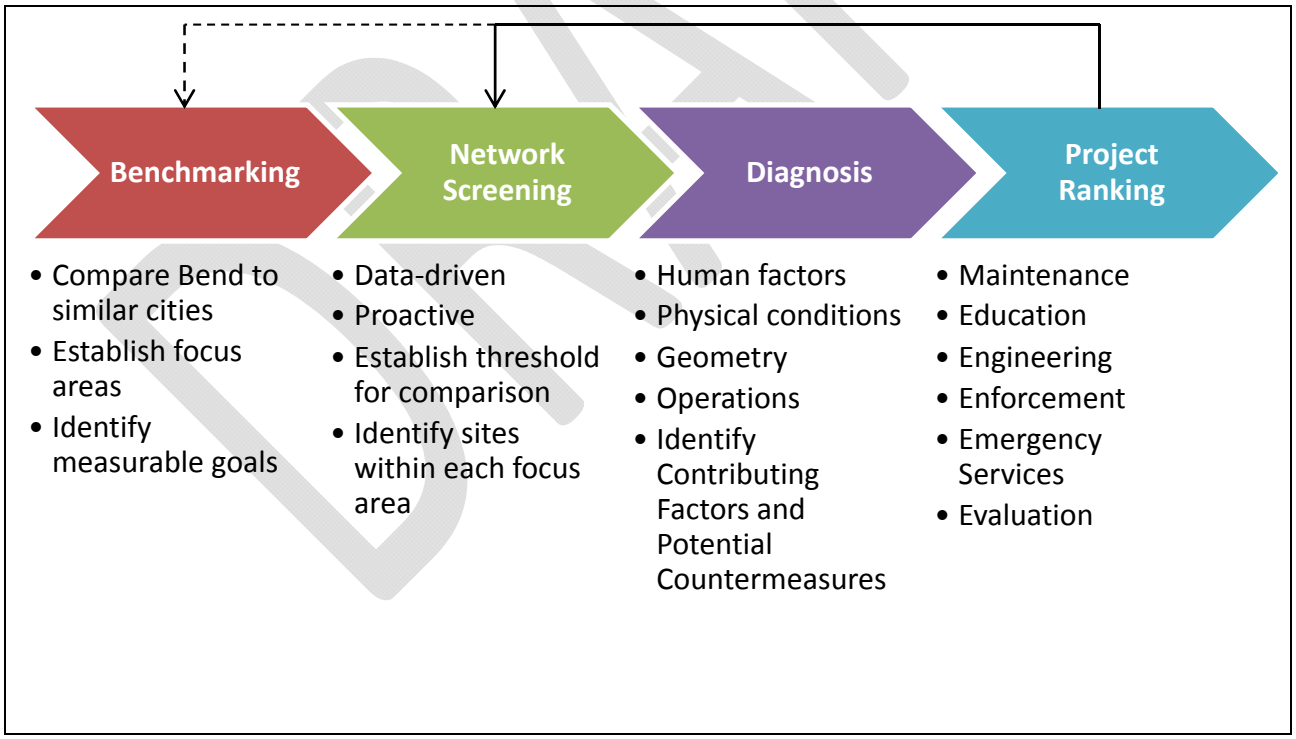


Figure 1 City of Bend Arterial and Collector Safety Program Framework

OVERVIEW

KAI and the City of Bend established a process for conducting diagnosis and summarizing the findings to allow projects (including one or more countermeasures) to be ranked for implementation. The key elements recommended to be conducted at each site as part of Diagnosis are described in detail in Chapters 5 and 6 of the Highway Safety Manual (HSM) and generally include the following:

1) Office review of data and background information,
2) Field review,
3) Identify contributing factors, and
4) Identify countermeasures.

The four general steps of diagnosis precede Project Ranking that generally includes the following:

1) Quantify the benefit of each countermeasure identified through Diagnosis,
2) Group countermeasures into projects and estimate the cost of each project,
3) Calculate a benefit-cost ratio for a 20-year design life, and
4) Rank projects based on benefit-cost ratios.

The resources and data used to conduct each step are described in further detail below.

KAI and the City diagnosed 5 of 20 sites identified through Network Screening. The sites were selected to represent sites from different focus areas (e.g., fatal and injury, bicycle and pedestrian, etc.) and with various cross-section and traffic control. The diagnosis and project benefit-cost ratios for the five projects are summarized in Attachment A. The City of Bend independently diagnosed the remaining sites and has compiled the project benefit-cost ratios for all sites.

SUMMARY OF DIAGNOSIS AND PROJECT RANKING AT SELECTED SITES

The following provides more details regarding the steps taken to diagnose, select countermeasures, and establish a measure for ranking projects. The process was applied to five sites by KAI as a means to refine the process and to provide examples for the City as they apply it to additional sites in 2012 and future years.

1) Office Review of Data and Background Information

Detailed crash summaries based on Oregon Department of Transportation crash reports from January 2006 through December 2010 (same data used in the network screening phase) were used to develop crash diagrams for each site. The crash diagrams showed direction of travel, crash type, and other details on a single map and were helpful for understanding and identifying crash patterns. Additional data, including traffic volumes, signal timing data, and some local police crash reports were reviewed, where appropriate, to learn more about why these trends may be occurring. An example crash diagram for the Greenwood Avenue/Hill Street intersection is shown

in Figure 2. Additional elements to consider during the Office Review step are outlined in Appendix 5B (Chapter 5) of the HSM.

2) Field Review

Observations of traffic flow, driver behavior, and existing geometry were recorded at each site during two days in July 2012. On the second day of field reviews, local City of Bend Police officers accompanied KAI and the City of Bend. Mini-audits of each site were conducted using field prompt lists provided in Appendix 5C and 5D of the HSM. The prompt lists help field reviewers observe and document a range of geometric, traffic control, and driver behavioral elements.

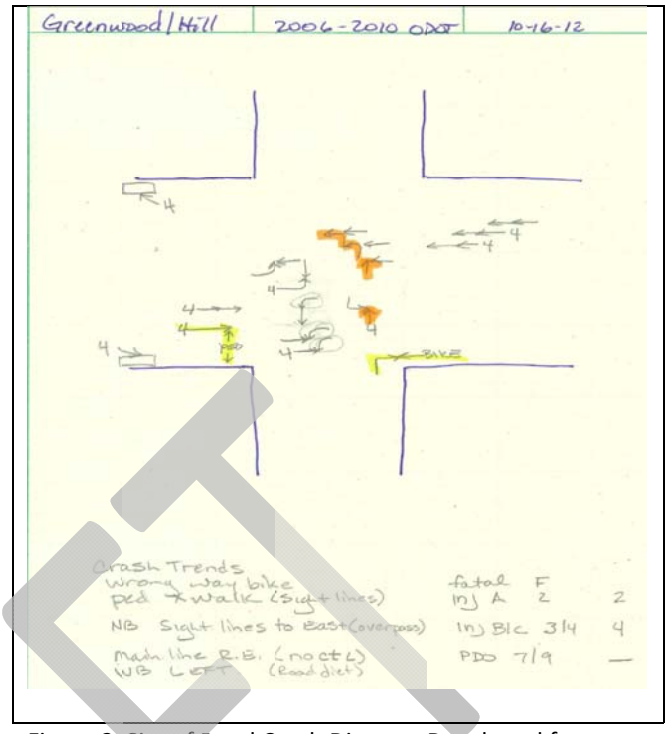


Figure 2 City of Bend Crash Diagram Developed for Office Review

3) Identify Contributing Factors

The crash patterns identified in the office review were considered and potential contributing factors were discussed based on the observations made during the field review.

4) Identify Countermeasures

For each contributing factor identified, a range of countermeasures were considered to address the potential for crashes. Several reference documents are available identifying a range of countermeasures to address particular contributing factors. Those reference documents include: NCHRP Report 500 series documents, NCHRP Report 705: *Evaluation of Safety Strategies at Signalized Intersections*, and other documents available through FHWA's Office of Safety (i.e., *Desktop Reference for Crash Modification Factors and Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures* – see http://safety.fhwa.dot.gov/tools/).

Countermeasures with crash modification factors (CMFs) indicating a crash reduction based on empirical studies were preferred over those not having quantitative estimates of their effectiveness.

5) Quantify the benefit of each countermeasure

When available, CMFs in Part D of the HSM or those with a star rating of three or more in FHWA's CMF Clearinghouse (www.cmfclearinghouse.org) were applied to estimate the benefit of a countermeasure. Some countermeasures do not have reliable CMFs and others have no quantifiable measure of effectiveness because they are a relatively new countermeasure or have not been applied widely and studied. Some treatments do not have CMFs, but there are documented trends indicating an increase or decrease is expected. If a trend was documented, engineering judgement was applied to estimate a conservative CMF in some cases. If a treatment did not have a quantifiable estimate of effectiveness or documented trend, engineering judgment was applied to identify a CMF based on the documented effectiveness of similar proven countermeasures. In many cases, there are no similar treatments with reliable CMFs so the treatment benefit was not included in the project benefit-cost ratios.

6) Estimate the cost of each countermeasure

Cost estimates were developed by the City of Bend based on standard unit costs of materials and are provided for the five sample sites in Appendix C.

7) Identify one or more effective countermeasures and combine into a project

Countermeasures that were found to have a reliable CMF indicating a reduction in crash frequency or severity were combined into groups as "projects." At some sites multiple projects were identified that range in cost or that made sense to provide as phases.

8) Calculate a cost-benefit ratio for a 20-year design life

ODOT's cost-benefit spreadsheet computed the estimated cost-benefit ratio of each project. This spreadsheet estimates benefits in terms of crash reduction based on CMFs. The CMFs were applied only to crash types expected to be impacted by each countermeasure.

The spreadsheet provides a method for estimating the economic benefit based on the Comprehensive Economic Costs associated with the number of crashes reduced. The comprehensive economic costs of crashes were estimated by severity using monetary values provided in FHWA's Technical Advisory "Motor Vehicle Accident Costs"[1] [2]. Unless the values are

[1] Economic costs per crash are calculated using 2004-2006 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2007 dollars with GDP implicit price deflator.

[2] PDO crash values of $7,500 per crash were adjusted by a factor of 2.0 to account for under-reporting. Reference: National Safety Council, 2005 estimates of value per crash.

updated to current year values, the project benefit-cost ratios are only valid for relative comparison purposes.

CONCLUSION

Once benefit-cost ratios are developed for all projects, the projects can be ranked and those projects with the highest benefit-cost ratios indicate the most cost-effective projects. The City may choose to implement those projects having the highest benefit-cost ratio first, or implement them in another order if total project costs exceed available funding, or if an opportunity arises to fund a safety project concurrently with other City projects.

Appendix A Site Diagnosis Summary Worksheets

Table A-1 Site Diagnosis Summary at Greenwood Avenue/Hill Street

GREENWOOD AVENUE/ HILL STREET	**Diagnosed by: Casey Bergh (KAI), Julia Wellner and Robin Lewis**
Traffic Control: Two-way stop	**Focus Area: Fatal & Injury**

OFFICE REVIEW FINDINGS

The City receives a high volume of calls requesting a striped cross-walk across Greenwood Avenue. However, pedestrian must cross 4 lanes of traffic and two lanes of parking. Zegeer, et. al. found there is a negative safety benefit associated with marking crosswalks on a 4-lane roadway with volumes greater than 12,000 vehicles/day. Greenwood carries about 12,000 vehicles per day.

There is a requirement for an easement from two properties, and ideally a conversion from 4 to 3 lanes. On the bright side: a 3 lane diet mitigates all operational issues at this intersection.

One pedestrian crash occurred in the marked crosswalk on the west leg of the intersection. One bike crash occurred when a bicyclist crossed the south leg in the wrong way direction and was hit by a northbound right turning vehicle. This is a classic wrong way crash. Greenwood does not have any bike facilities so wrong way riding through the sidewalk tunnels are frequent and common.

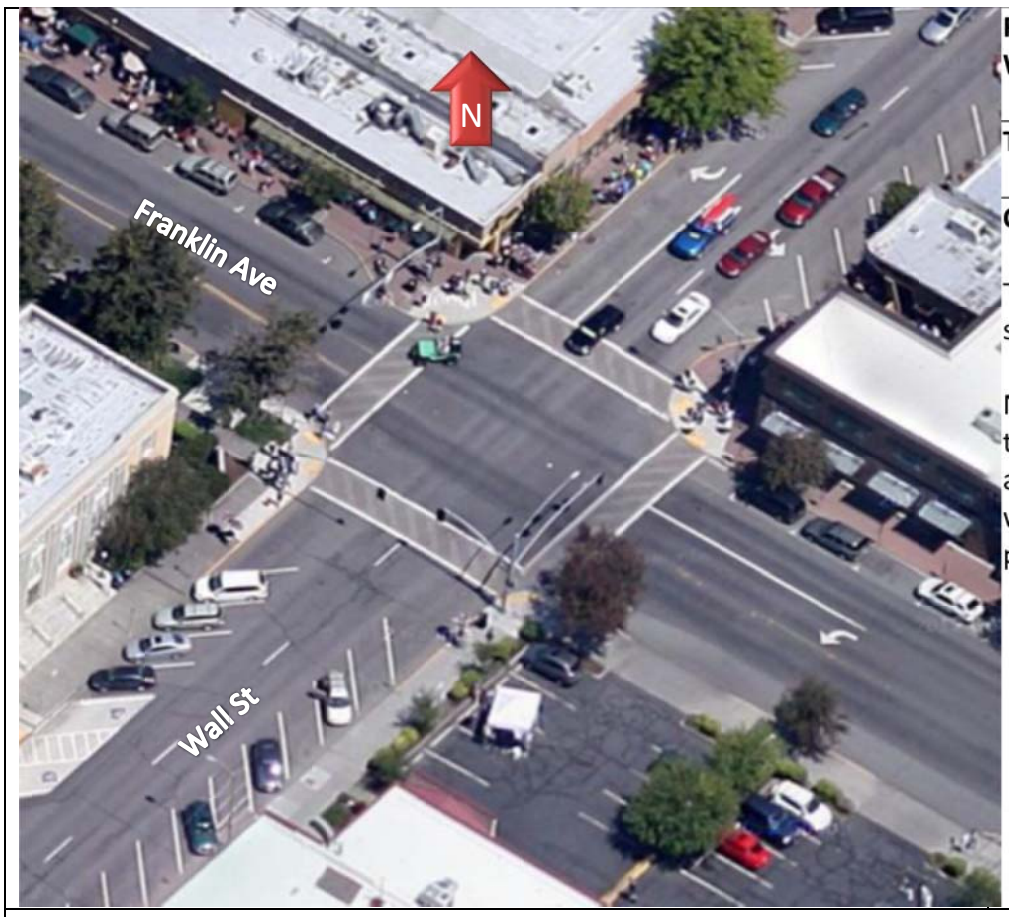
FIELD REVIEW OBSERVATIONS AND FINDINGS

Contributing Factors	**Potential Countermeasures**	**Crash Modification Factor (CMF)**	**Source of CMF**
1) Multi-lane pedestrian crossing (north-south)	• Road diet (reduce cross-section to three lanes with center left-turn lane and bike lanes) • Provide striped crossing and advanced warning signage • Provide intersection illumination	• 0.71 • 0.58-0.62 • 0.58 (nighttime crashes), 0.62 (nighttime pedestrian crashes)	• HSM 13.4.2.3 • HSM 14A.4.2.2 • HSM Table 14-18
2) On-street parking reduces pedestrian sight distance	• Extend on-street parking restriction 10-15 feet upstream of crosswalks • Provide bulb-outs to improve pedestrian sight distance at intersection	• 0.80* • 0.80*	• N/A
3) No major-street left-turn lanes	Road diet (reduce cross-section to three lanes with center left-turn lane and bike lanes)	• 0.71	• HSM 13.4.2.3
4) No bike lanes provided	Remove on-street parking, provide bike lanes	Unknown	

PROJECT RANKING CALCULATIONS

Projects	**Estimated Benefit ($/Year)**	**Estimated Construction Cost**	**B/C (20-year life)**
1) Curb extensions only	$18,000	$167,000	1.34
2) Road Diet with bike lanes and intersection illumination	$52,000	$273,868	2.37

Table A-2 Site Diagnosis Summary at Franklin Avenue/Wall Street



FRANKLIN AVENUE/ WALL STREET	**Diagnosed by: Casey Bergh (KAI) and Robin Lewis**
Traffic Control: Signal	**Focus Area(s): Pedestrian & Bicycle Crashes**

OFFICE REVIEW FINDINGS

Two crashes involved westbound bicyclists hit by southbound right-turning vehicles turning on red.

N-S pedestrian on west leg crosswalk hit by westbound through. Pedestrians can see the eastbound signal heads are red, may assume westbound signal heads are red as well. Westbound has a lagging through and left-turn phase.

FIELD REVIEW OBSERVATIONS AND FINDINGS

Contributing Factors	**Potential Countermeasures**	**Crash Modification Factor (CMF)**	**Source of CMF**
1) Southbound vehicles turning right on red not yielding to westbound bicyclists in travel lane	• Restrict southbound right-turn on red	• 0.61 (bike crashes)*	• Average of 3 and 4-start CMFs from Clearinghouse (Preusser 1982)
2) No southbound bike lane. Recreational cyclists use outside of right-turn lane at red light.	• Provide sharrows in southbound through lane and green bike box for bike storage in front of vehicle queue	• Unknown	
3) Pedestrians disregard pedestrian signal	• Signage to obey pedestrian signal • Modify westbound left-turn phasing to eliminate lagging left phase	• Unknown	

PROJECT RANKING CALCULATIONS

Projects	**Estimated Benefit ($/Year)**	**Estimated Construction Cost**	**B/C (20-year life)**
1) Bike box and sharrows on southbound approach	$3,000	$33,000	1.1
2) Remove southbound right turn lane	$10,000	$80,663	1.5

* CMF estimated as opposite of CMF provided in HSM (1.43 to 1.82).

Table A-3 Site Diagnosis Summary at Franklin Avenue/1st Street

FRANKLIN AVENUE/ 1st STREET	**Diagnosed by: Casey Bergh (KAI) and Robin Lewis**
Traffic Control: Unsignalized	**Focus Area(s): Pedestrian and Bicycle**

OFFICE REVIEW FINDINGS

Intersection is just east of an underpass that provides two travel lanes and no bike lanes. Pedestrian tunnels provide off-street undercrossing and are accessed via the sidewalk. East of 1st Street Franklin widens to a five-lane section. Similar to discussions on 3rd/Burnside - this area has a diverge within the intersection and poorly defined merge areas on the westbound approach.

The previous solution at 2nd Street, to eliminate lefts out, reduces the grid and connectivity, forcing lefts onto 1st/Les Schwab, where sight lines are worse. The main issue was probably the five lane cross-section; is this turn restriction still warranted?

Two reported crashes involved a bicyclist and one involved a pedestrian during the study period.

FIELD REVIEW OBSERVATIONS AND FINDINGS

Contributing Factors	**Potential Countermeasures**	**Crash Modification Factor (CMF)**	**Source of CMF**
1) Eastbound diverge in intersection encourages acceleration through intersection	• Road diet to reduce Franklin to 3-lane section east to 3rd Street and beyond. • Maintain a single lane with constant lane width eastbound through intersection. Define point of diverge east of intersection.	• 0.71 • Unknown	• HSM 13.4.2.3
2) Bicyclists move from bike lane to crosswalk to get on sidewalk into pedestrian tunnel, and vice versa.	• Install "walk bike" signs on sidewalks through tunnel and install ramps for bicyclists to rejoin traffic east of 1st Street. • Transition westbound bike lane to outside of the through lane (between right-turn lane and through lane). Define a clear decision point where bicyclists choose to ride with traffic or dismount and use sidewalk. • Add sharrows in travel lanes through underpass.	• 0.98* • 0.95* • Unknown	
3) No pedestrian facilities for crossing Franklin limit driver expectation	• Stripe crosswalk • RRFB or other pedestrian-activated device • Intersection illumination	• Unknown • Unknown • 0.58 (nighttime crashes), 0.62 (nighttime pedestrian crashes)	• HSM Table 14-18

PROJECT RANKING CALCULATIONS

Projects	**Estimated Benefit ($/Year)**	**Estimated Construction Cost**	**B/C (20-year life)**
1) Road diet, define diverge, add sharrows, illuminate intersection	$9,000	$208,000	0.5

Table A-4 Site Diagnosis Summary at Franklin Avenue/3rd Street

FRANKLIN AVENUE/ 3rd STREET	**Diagnosed by: Casey Bergh (KAI) and Robin Lewis**
Traffic Control: Signalized	**Focus Area(s): Fatal and Injury**

OFFICE REVIEW FINDINGS

On Franklin Ave the roadway is limited to two lanes at the RR undercrossing to west of 3rd Street, and east of 4th Street. Need counts to confirm need for five-lane section east-west; need video of outside lane usage. South of Franklin at railroad undercrossing 3rd street narrows to two lanes.

Six bike and pedestrian crashes reported in study period (2006-2010). Westbound right-turn with bike accounted for two of six. Two westbound bicycle crashes reported in south leg approach crosswalk - struck by southbound through vehicles. One crash involved a southbound pedestrian and an eastbound vehicle. One crash involved a southbound bicyclist and an eastbound right-turn.

Two other crashes involved a pedestrian and a bicyclist at the 7-11 driveway on southbound approach.

FIELD REVIEW OBSERVATIONS AND FINDINGS

Contributing Factors	**Potential Countermeasures**	**Crash Modification Factor (CMF)**	**Source of CMF**
1) Signal clearance interval	• Review clearance interval timing on 3rd Street and compare to Franklin Avenue/3rd Street signal timing. Adjust clearance interval timing, as necessary.	• 0.91*	• Referenced to adjustment for ITE standards
2) Drivers not yielding to pedestrians or bicyclists	• Install green bike lanes, bike boxes, install signs or dutch style cycle crossing	• Unknown	
3) Drivers disregard red signal	• Evaluate signal timing, adjust clearance intervals per ITE standards • Add 3-inch retro-reflective yellow sheeting on signal backplates • Road Diet on Franklin from 1st to 4th Street	• 0.91 • 0.85 • 0.71	• 3-star CMF from Clearinghouse • 4-star CMF from Clearinghouse • HSM - 13.4.2.3

PROJECT RANKING CALCULATIONS

Projects	**Estimated Benefit ($/Year)**	**Estimated Construction Cost**	**B/C (20-year life)**
1) Signal timing, signage, striping	$50,000	$50,000	12.46
2) Road Diet (5-lane to 3-lane section) & signal timing, dutch bike**	$161,000	$259,256	7.74

* CMF estimated based on engineering judgment with reference to CMFs for similar treatments

** Project includes larger area than single intersection. Project limits included curb work within the intersection and within 100' of Franklin approaches with paint to 4th Street and to RR Undercrossing.

Table A-5 Site Diagnosis Summary at Neff Road/Purcell Boulevard

NEFF ROAD/ PURCELL BOULEVARD	**Diagnosed by: Casey Bergh (KAI) and Robin Lewis**
Traffic Control: Signalized	**Focus Area(s): Fatal and Injury, Speed-involved**

OFFICE REVIEW FINDINGS

Nine rear-end crashes reported on the EB approach, which has a downgrade to signal.

Seven crashes of types that can be associated with red-light-running, primarily NB with EB.

Two NB right-turn on red crashes with EB bicycles.

Six EB/WB left-turn crashes may be associated with permissive phase.

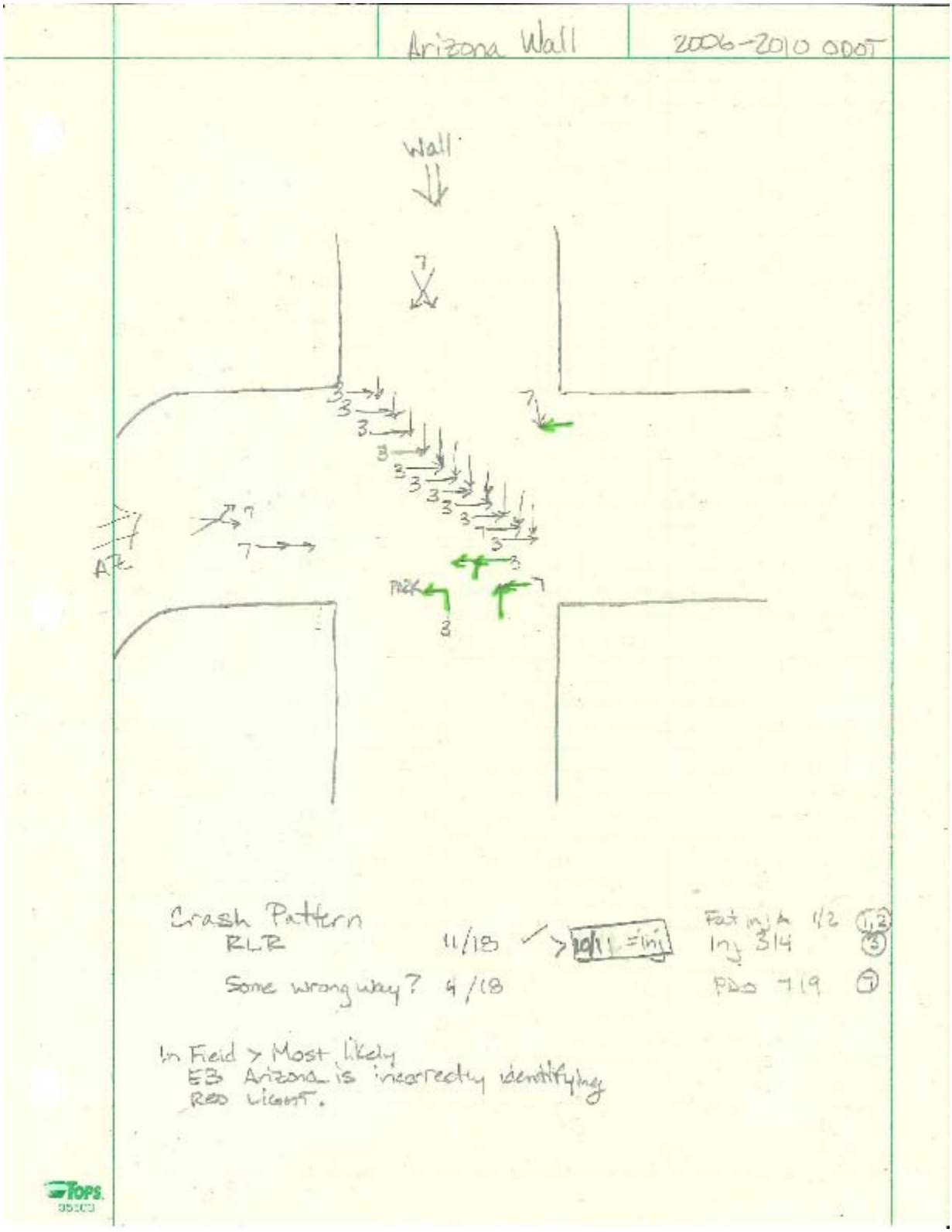
FIELD REVIEW OBSERVATIONS AND FINDINGS

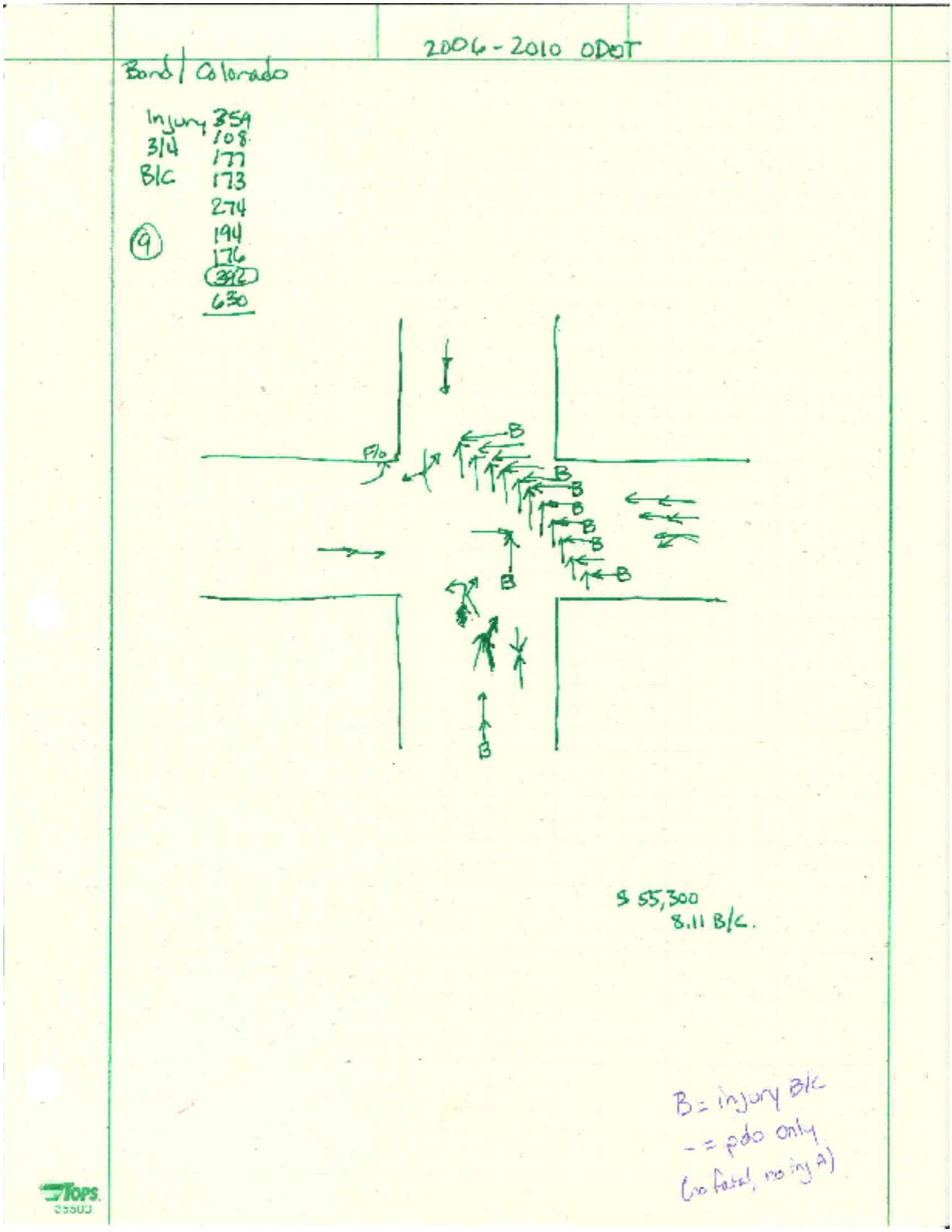
Contributing Factors	**Potential Countermeasures**	**Crash Modification Factor (CMF)**	**Source of CMF**
1) EB/WB permitted left-turn phase	• Convert left-turn phase to protected-only or PPLT with flashing yellow arrow.	• 0.01 (left-turn crashes only)	• HSM 14.7.2.4
2) Northbound right-turn vehicles use bike lane as second approach lane	• Restrict right-turn on red. • Restripe bike lanes, reinforce single-lane approach.	• 0.61 (bike crashes)* • Unknown	• Average of 3 and 4-start CMFs from Clearinghouse (Preusser 1982)
3) Drivers form two lanes on north and south approaches, although only one exists. Drivers see two signal heads and assume two lanes.	• Restripe approach lanes, define approach configuration. • Realign one signal head in the center of the lane and place one on far side pole	• Unknown	• N/A

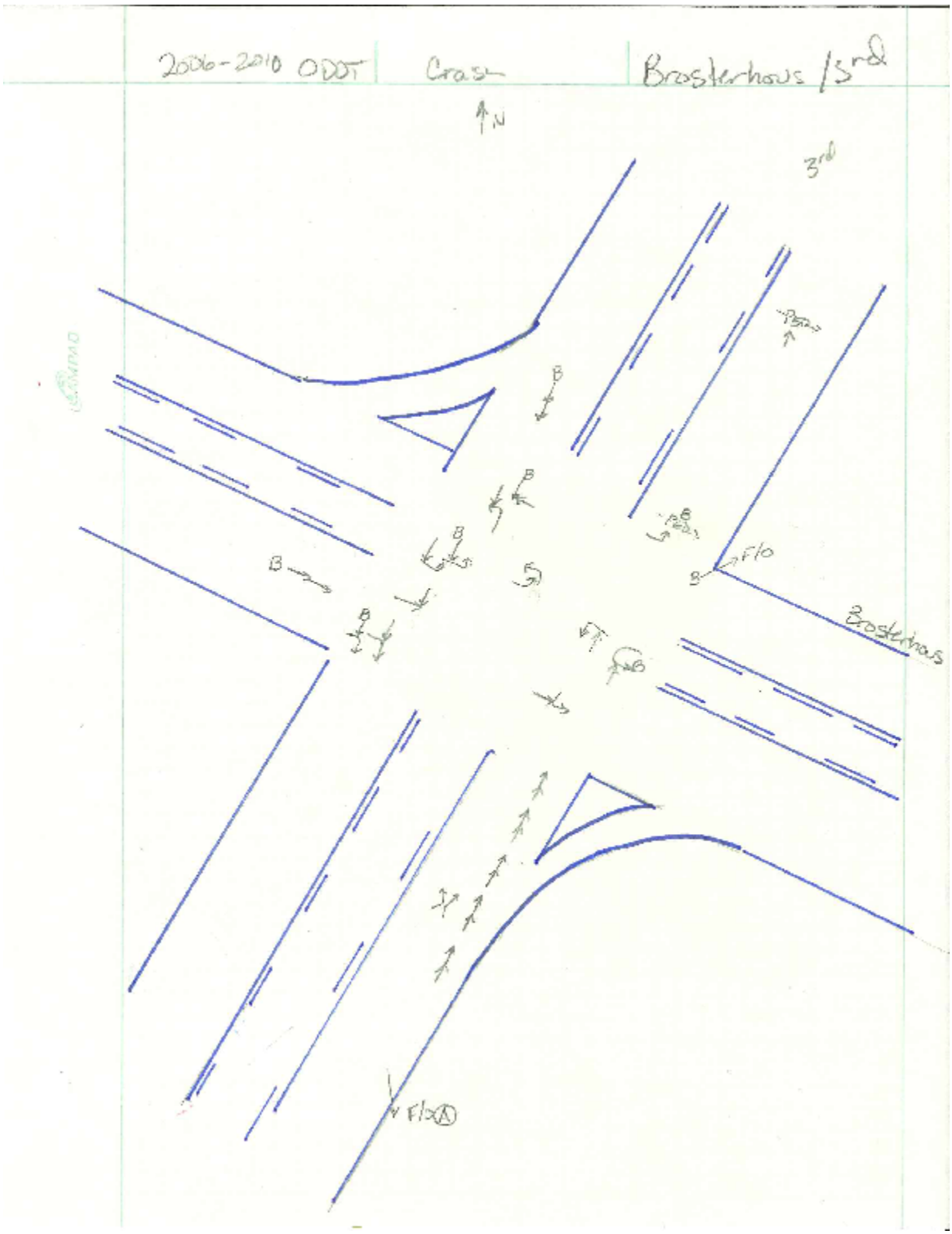
PROJECT RANKING CALCULATIONS

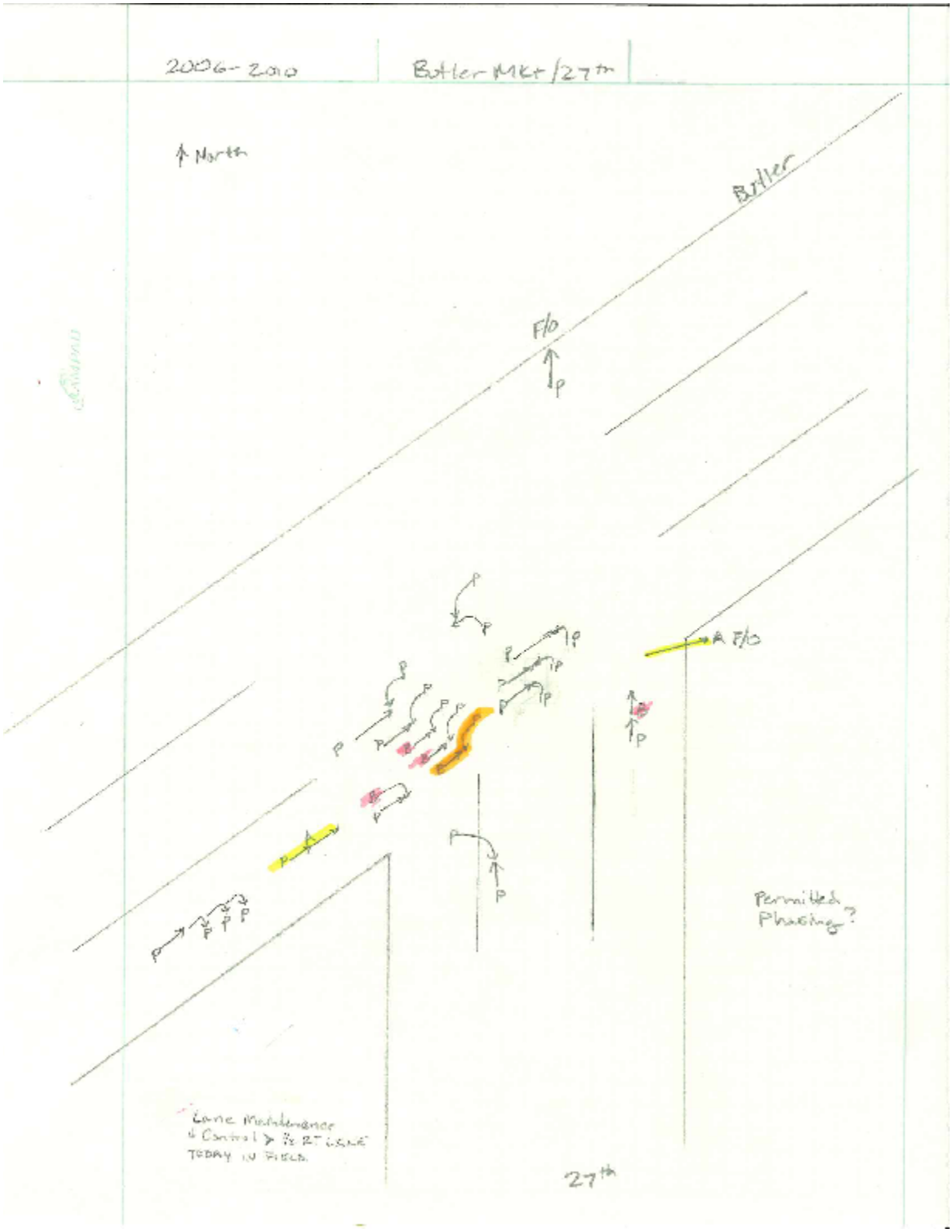
Projects	**Estimated Benefit ($/Year)**	**Estimated Construction Cost**	**B/C (20-year life)**
1) Restrict northbound right-turn on red, convert to protected only left-turn phasing east and west approaches, restripe approach lanes	$60,000	$100,390	7.5

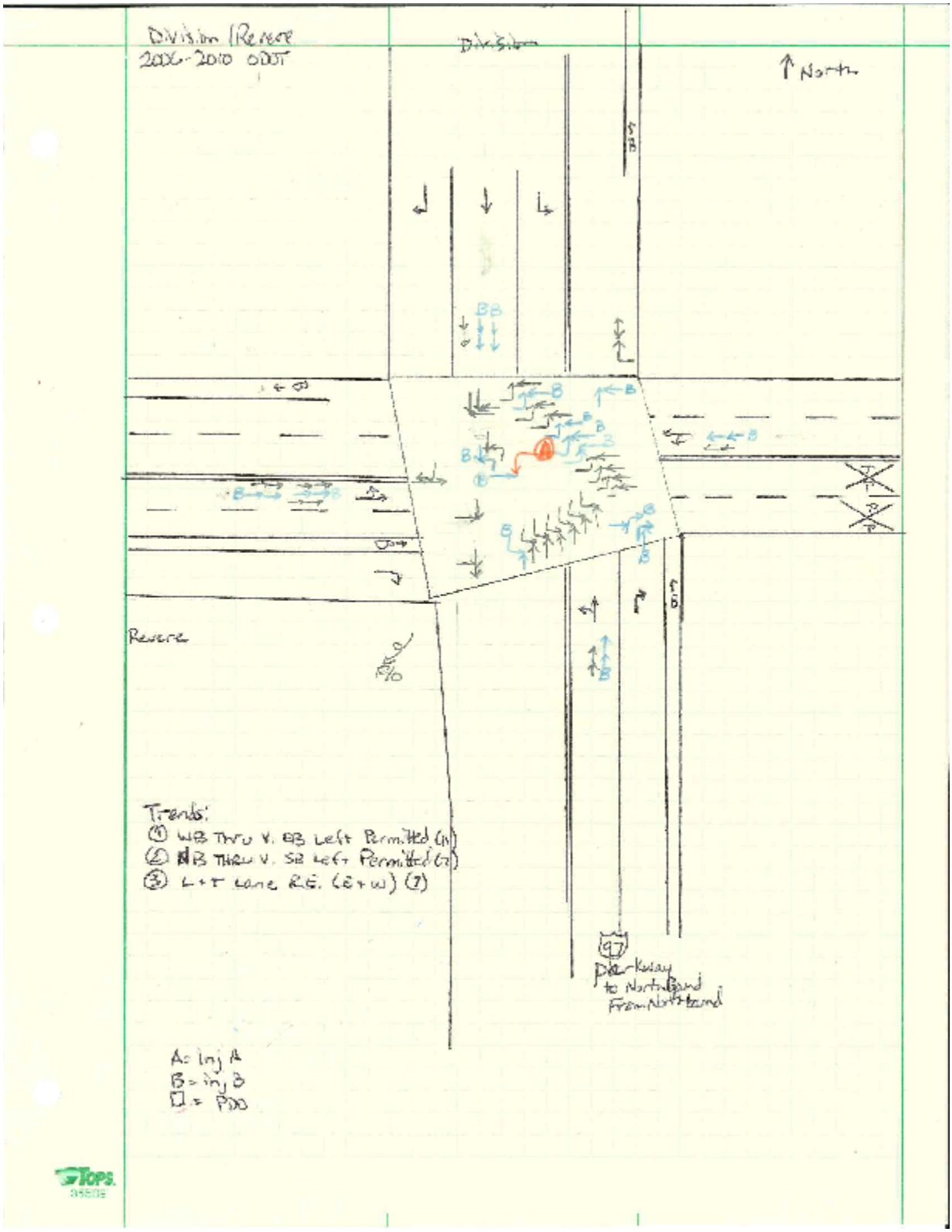
Appendix B Crash Diagrams

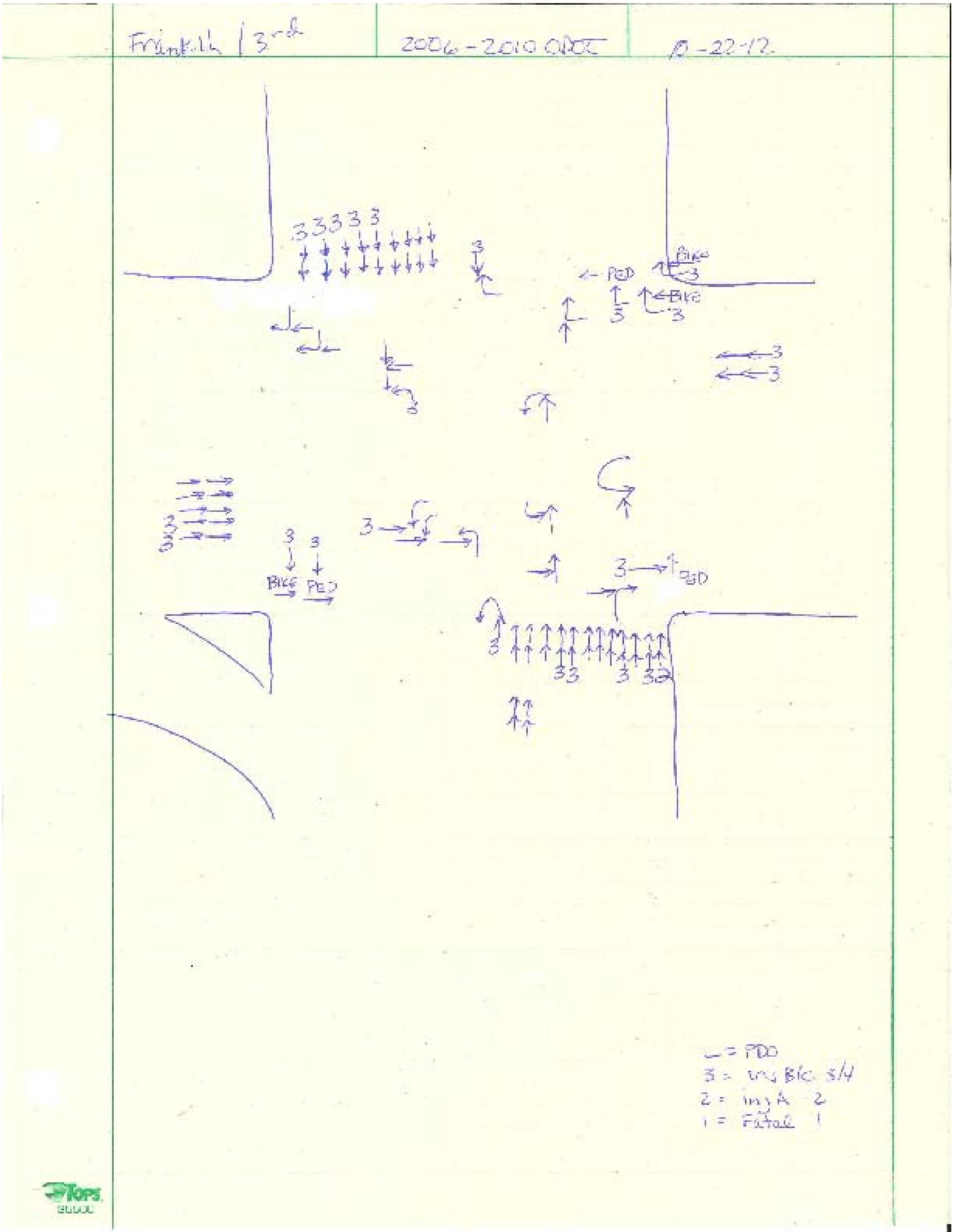

Arizona Wall
2006-2010 ODOT
Wall
Crash Pattern
RLR
11/18
Some wrong way? 4/18
Fat inj A 1/2
Inj 3/4
PDO 7/9
In Field > Most likely
EB Arizona is incorrectly identifying
Red Light.

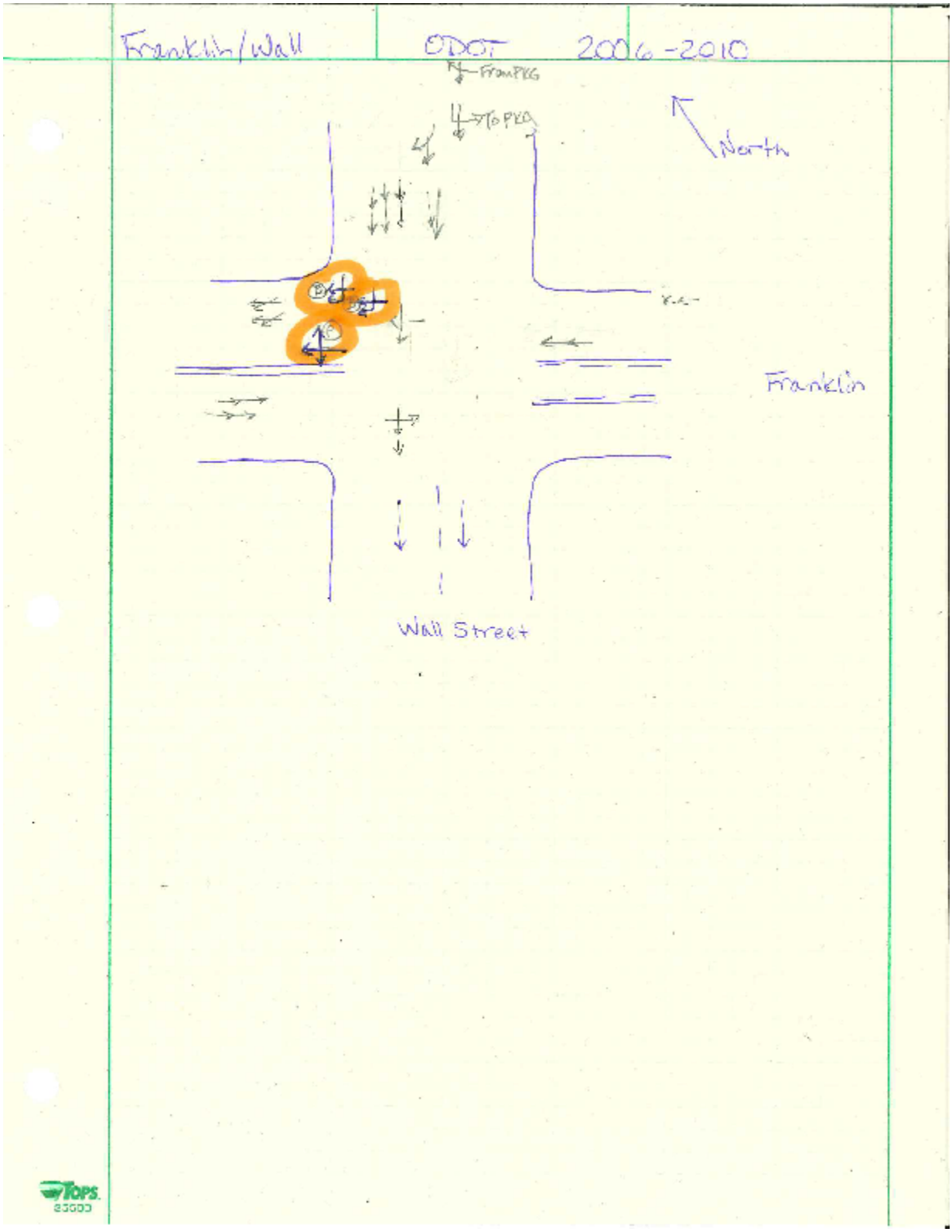

2006 - 2010 ODOT
Bond / Colorado
Injury 359
3/4 108
B/C 177
173
274
194
176
382
630
F/O
B
$ 55,300
8.11 B/C.
B = injury B/C
- = pdo only
(no fatal, no inj A)

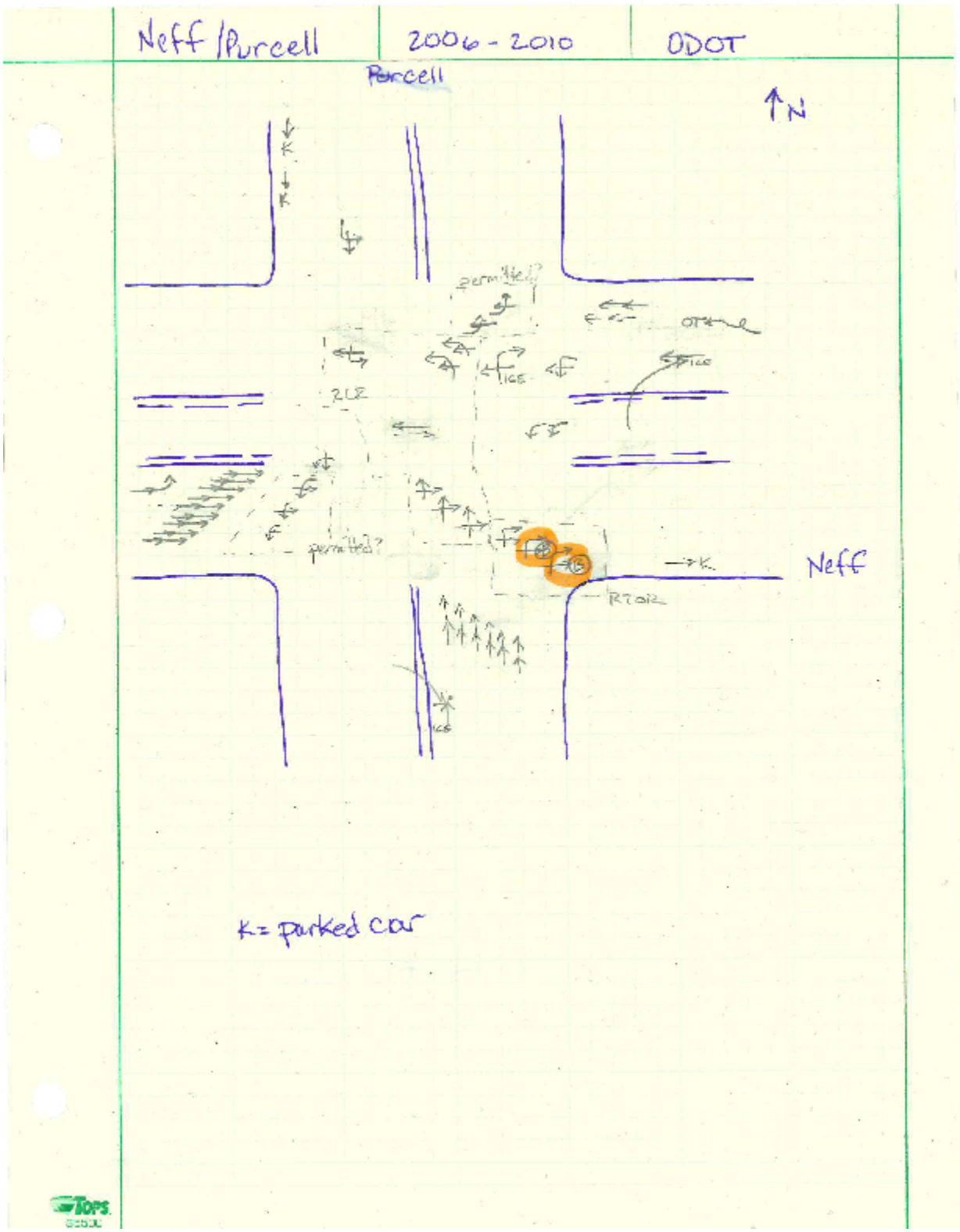

2006-2010 ODOT
Crash
Brosterhous / 3rd
N
3rd
B
F10
Brosterhous
F/A

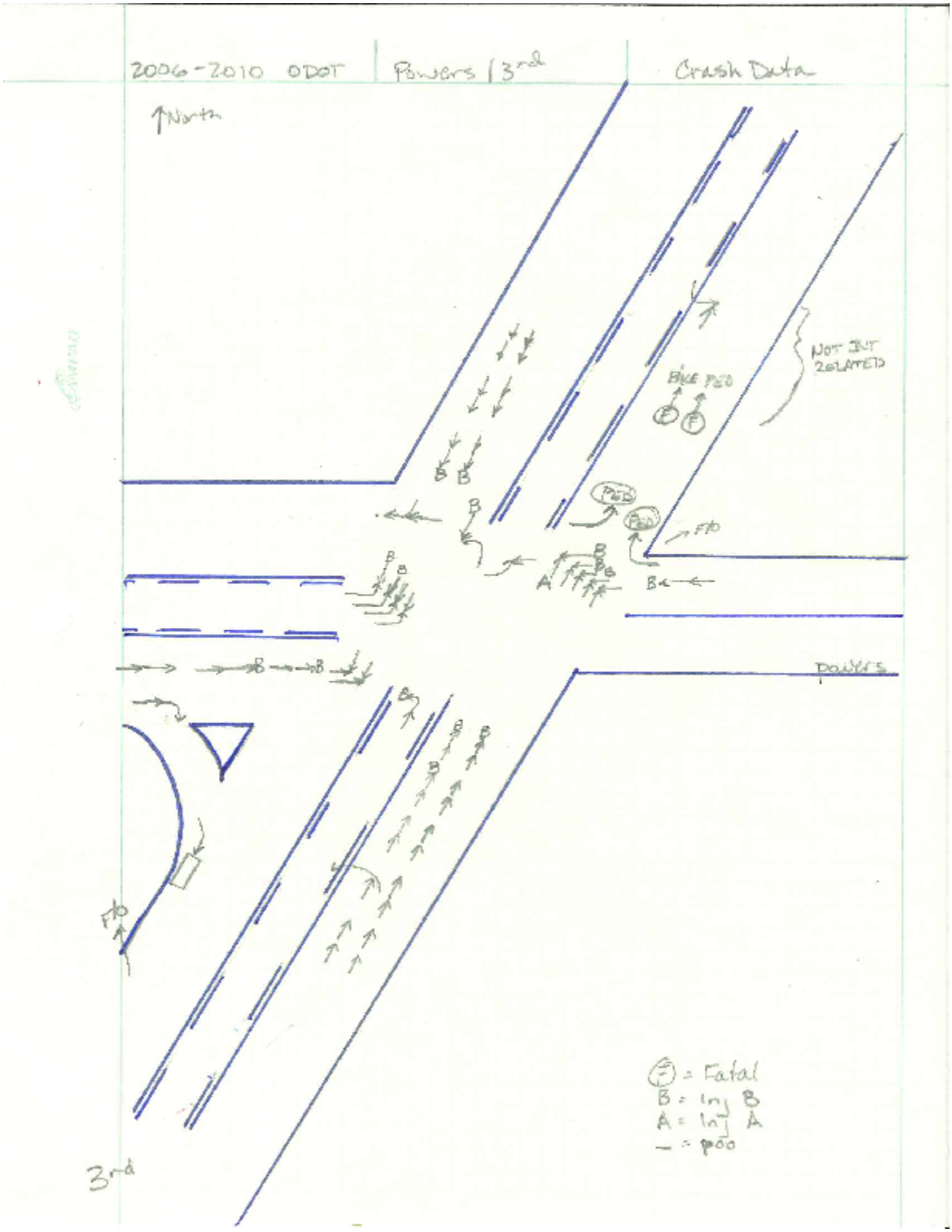

2006-2010
Butler Mkt/27th
North
Butler
F/O
P
A F/O
Permitted Phasing?
Lane Maintenance
& Control > 1/2 RT LANE
TODAY IN FIELD
27th

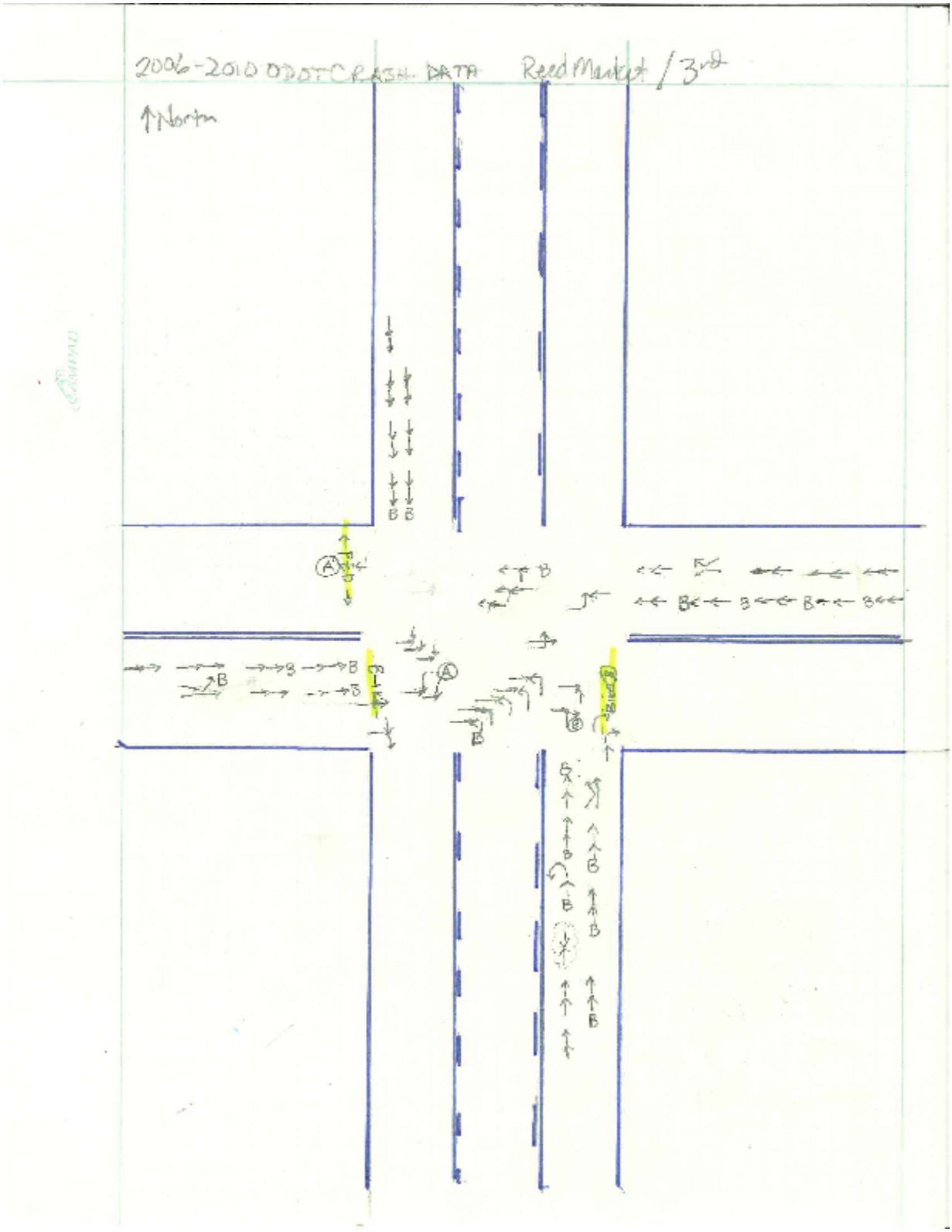

Division (Revere
2006-2010 ODOT
Division
North
Revere
Trends:
① WB Thru v. EB Left Permitted (1)
② NB Thru v. SB Left Permitted (2)
③ L+T Lane RE. (2+1) (7)
Parkway
to Northbound
From Northbound
A= Inj A
B= Inj B
□ = PDO

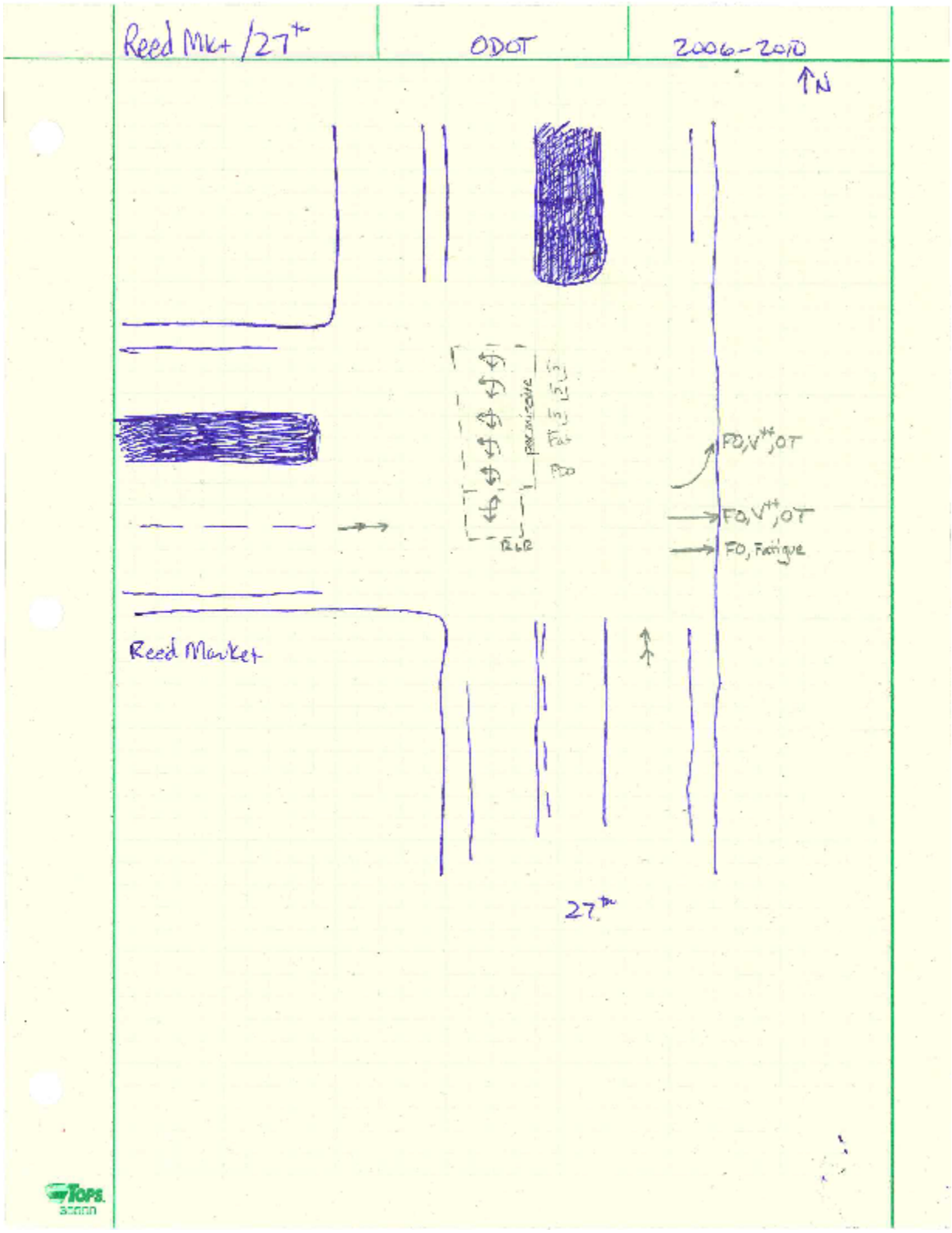

2006 - 2010 ODOT
PED
BIKE
= PDO
3 = inj B/C 3/4
2 = inj A 2
1 = Fatal 1

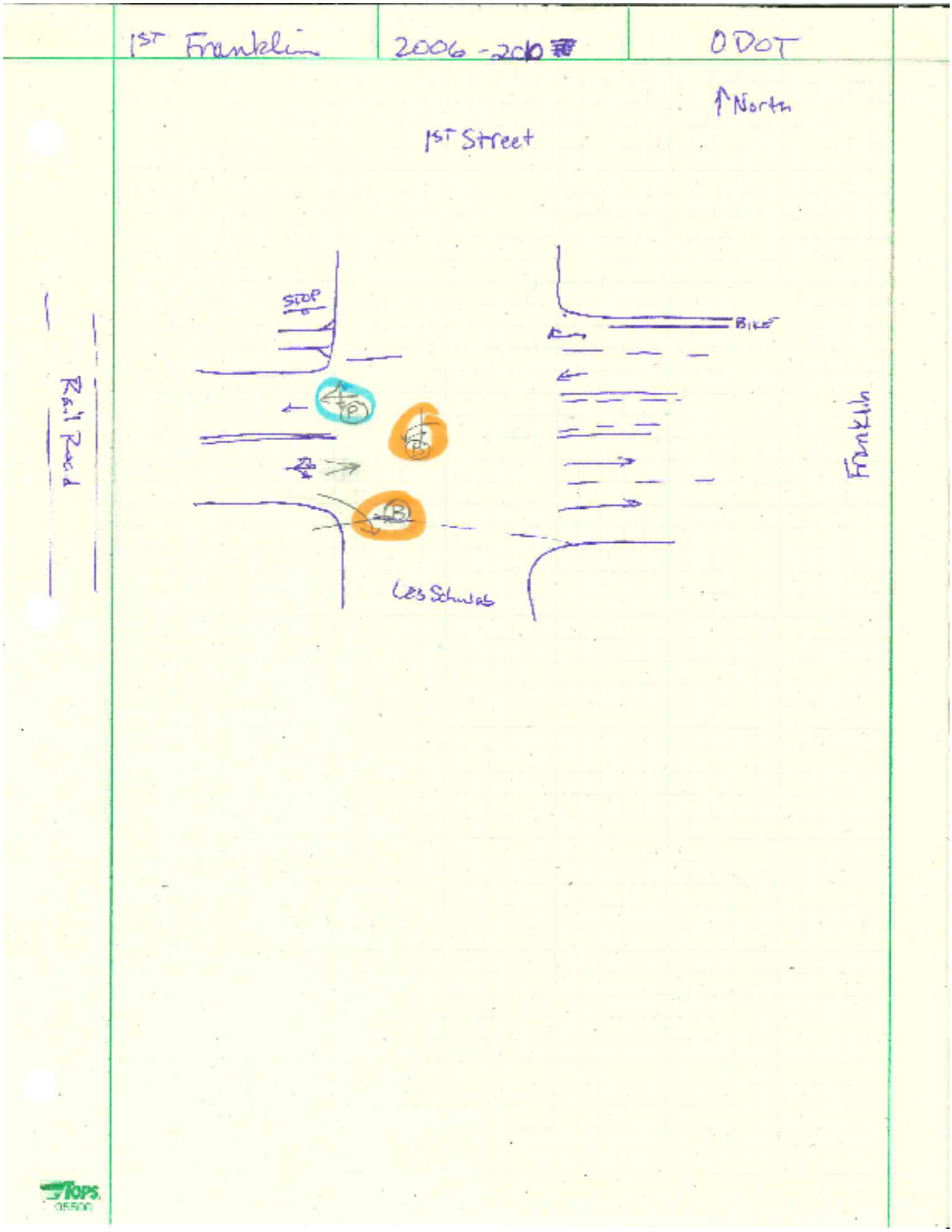

Franklin/Wall
ODOT
2006-2010
From PED
To PED
North
Franklin
Wall Street

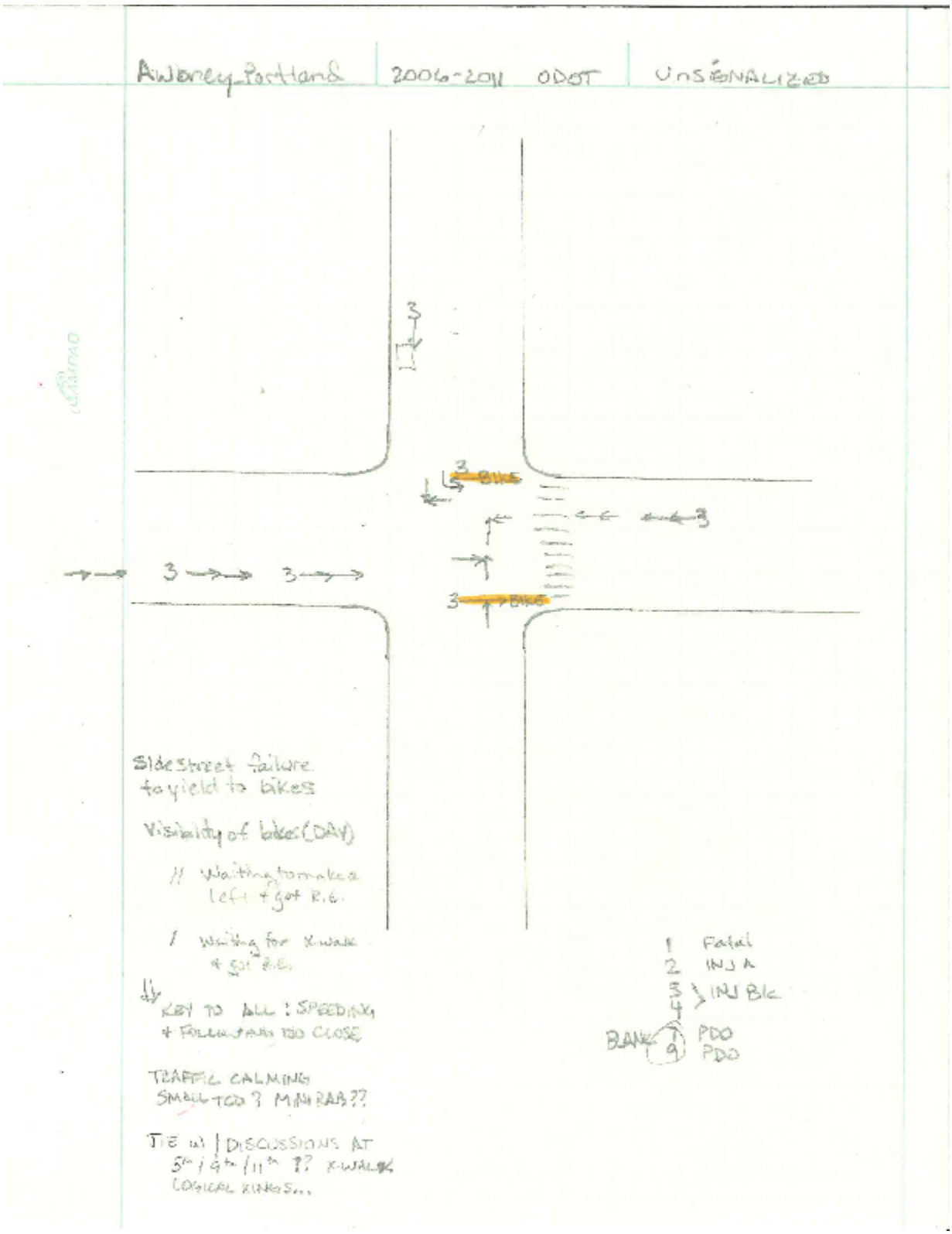

Neff / Purcell
2006 - 2010
ODOT
Purcell
N
permitted?
2LE
permitted?
Neff
K = parked car

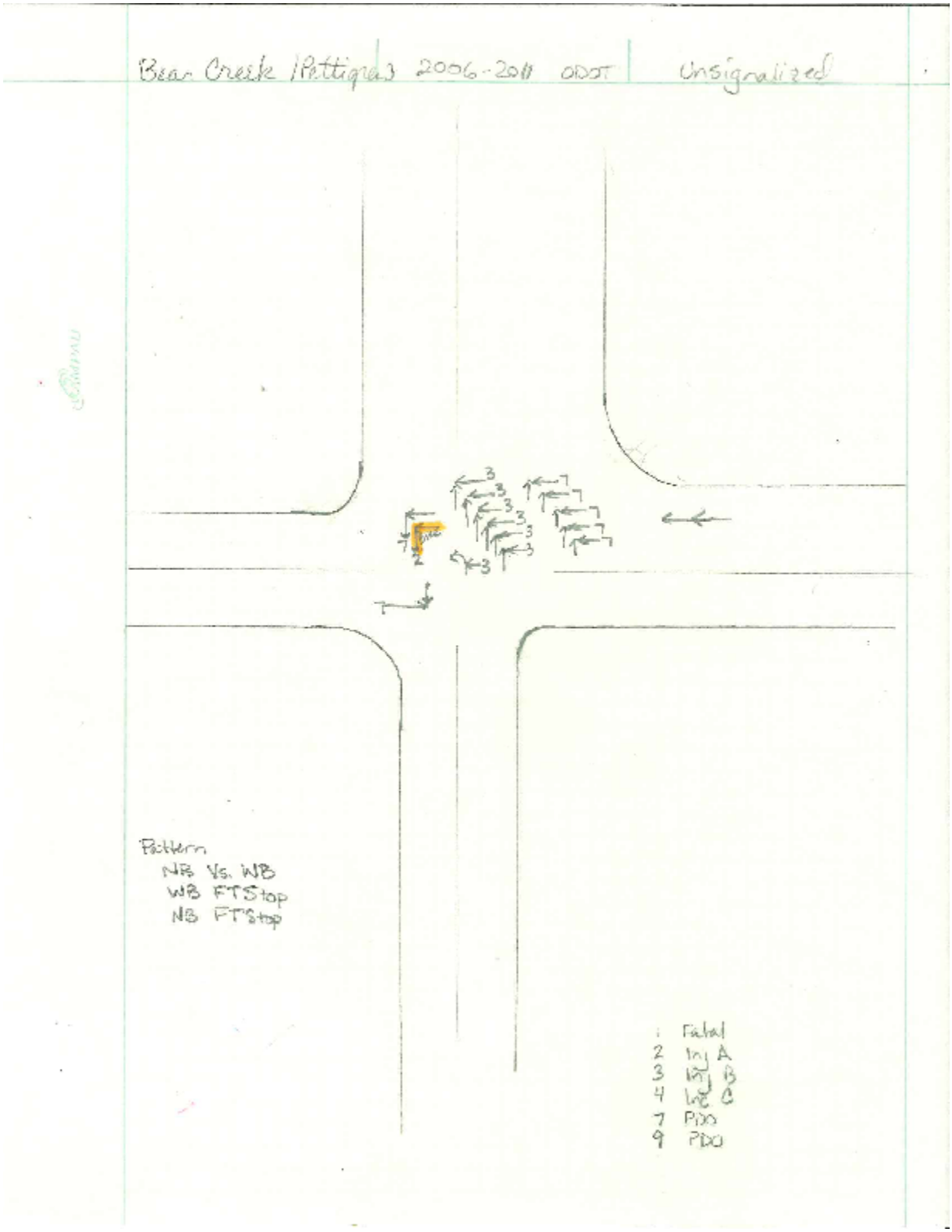

2006-2010 ODOT
Powers / 3rd
Crash Data
North
NOT INT RELATED
BIKE PED
PED
FTO
POWERS
3rd
= Fatal
B = Inj B
A = Inj A
– = PDO

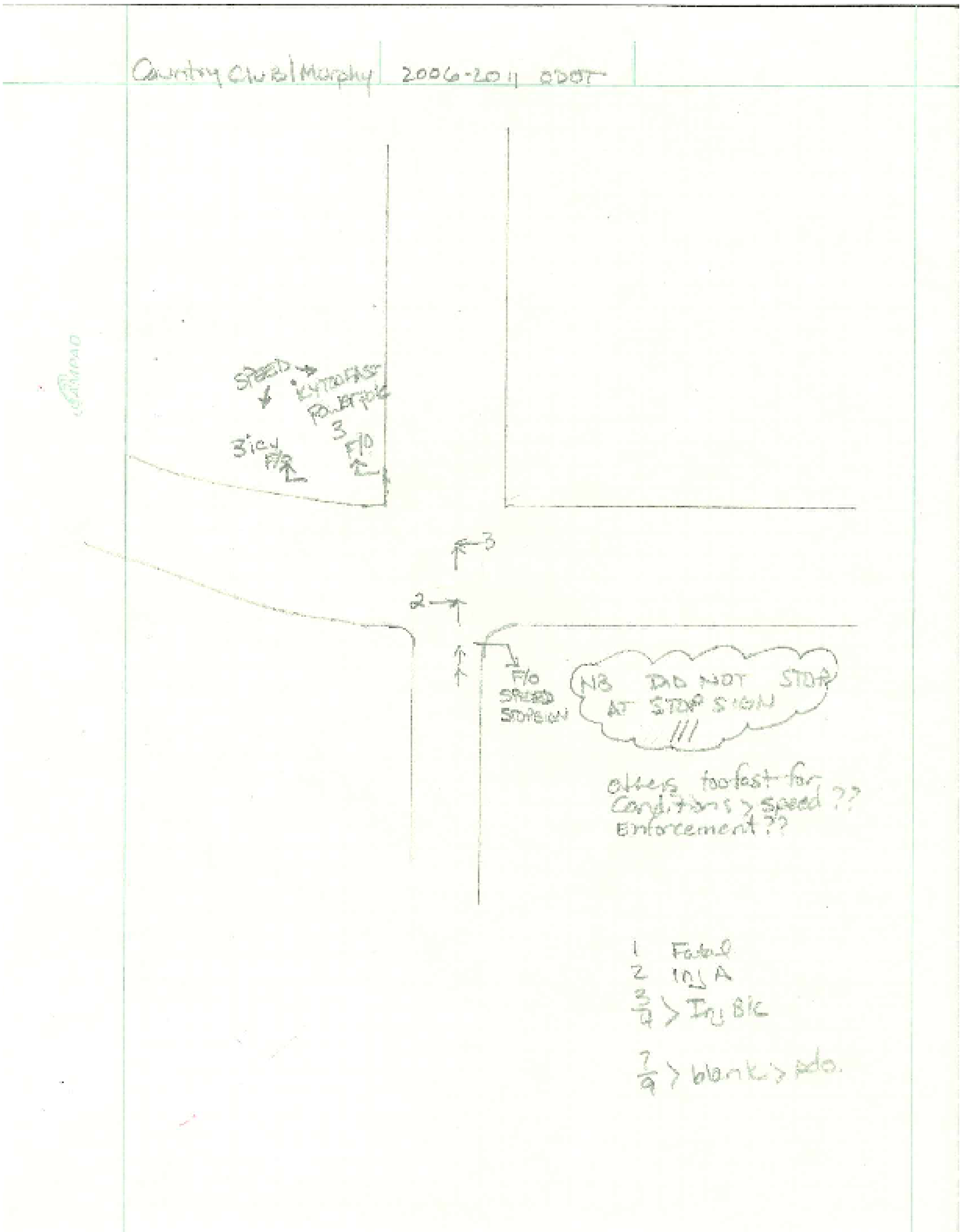

2006-2010 ODOT CRASH DATA Reed Market / 3rd
↑North

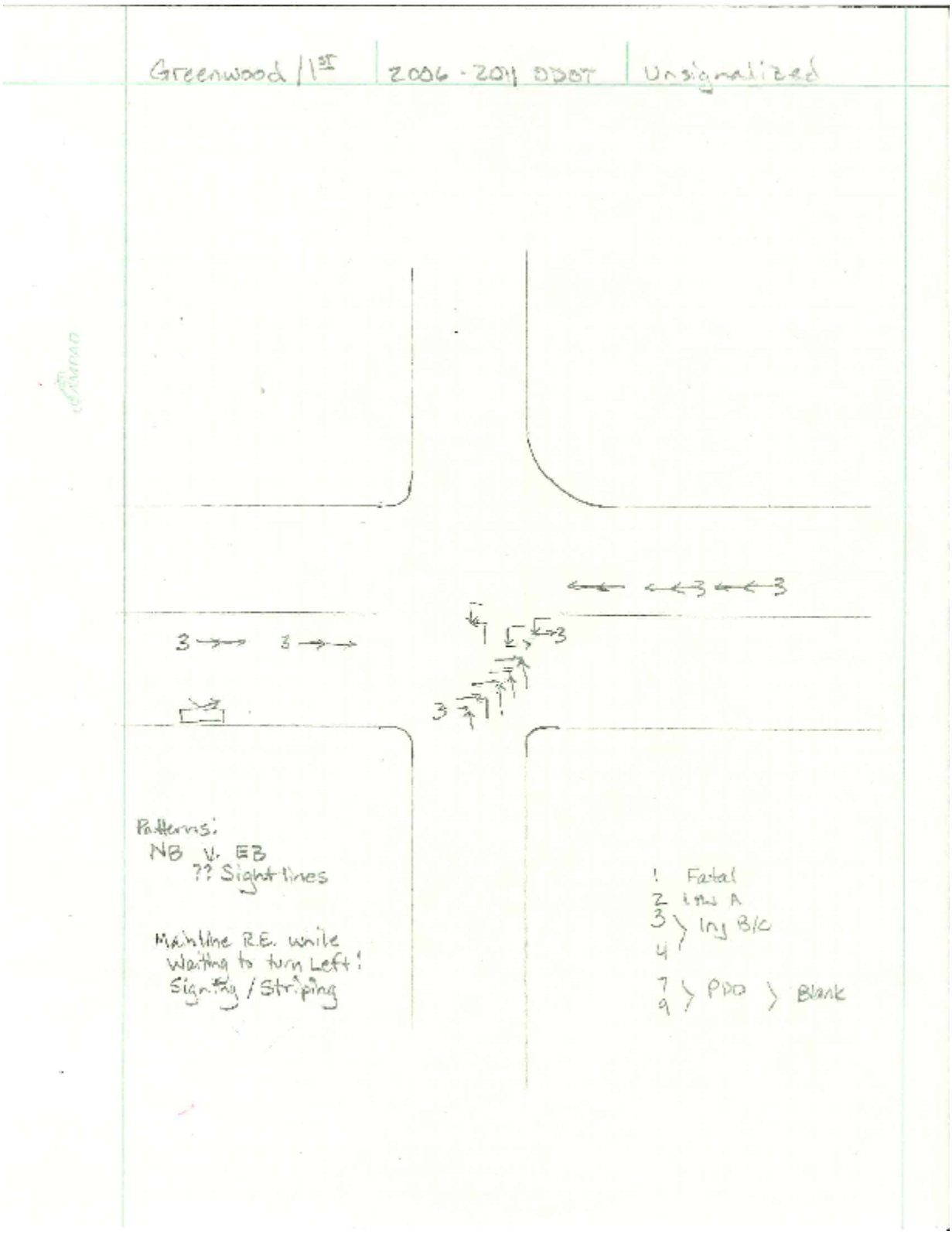

Reed Mkt / 27th
ODOT
2006-2010
N
FO, V85, OT
FO, V85, OT
FO, Fatigue
Reed Market
27th


1ST Franklin
2006 - 2010
ODOT
North
1ST Street
STOP
Bike
Franklin
Les Schwab

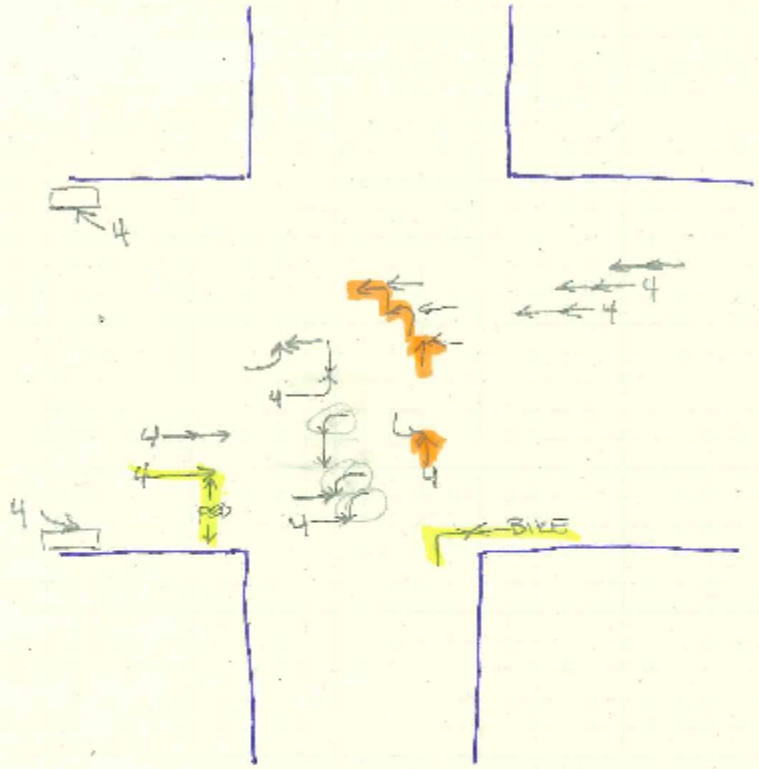

Awbrey_Portland
2006-2011
ODOT
UNSIGNALIZED
3
3 BIKE
3
3
3
3 BIKE
Sidestreet failure to yield to bikes
Visibility of bikes (DAY)
// Waiting to make a left + got R.E.
/ Waiting for X-walk + got R.E.
KEY TO ALL: SPEEDING + FOLLOWING TOO CLOSE
TRAFFIC CALMING
SMALL TCD? MINI RAB??
TIE in | DISCUSSIONS AT 5th / 9th / 11th ?? X-WALK LOGICAL KINKS..
1 Fatal
2 INJ A
3 INJ Bk
4
BANK 1
9
PDO
PDO


Bear Creek / Pettigrew 2006-2010 ODOT Unsignalized
Pattern
NB Vs. WB
WB FTStop
NB FTStop
1 Fatal
2 Inj A
3 Inj B
4 Inj C
7 PDO
9 PDO


Country Club/Murphy
2006-2011 ODOT
SPEED
3
F/O
2
F/O
SPEED
NB DID NOT STOP AT STOP SIGN
///
others too fast for conditions > speed ??
Enforcement ??
1 Fatal
2 Inj A
Inj B

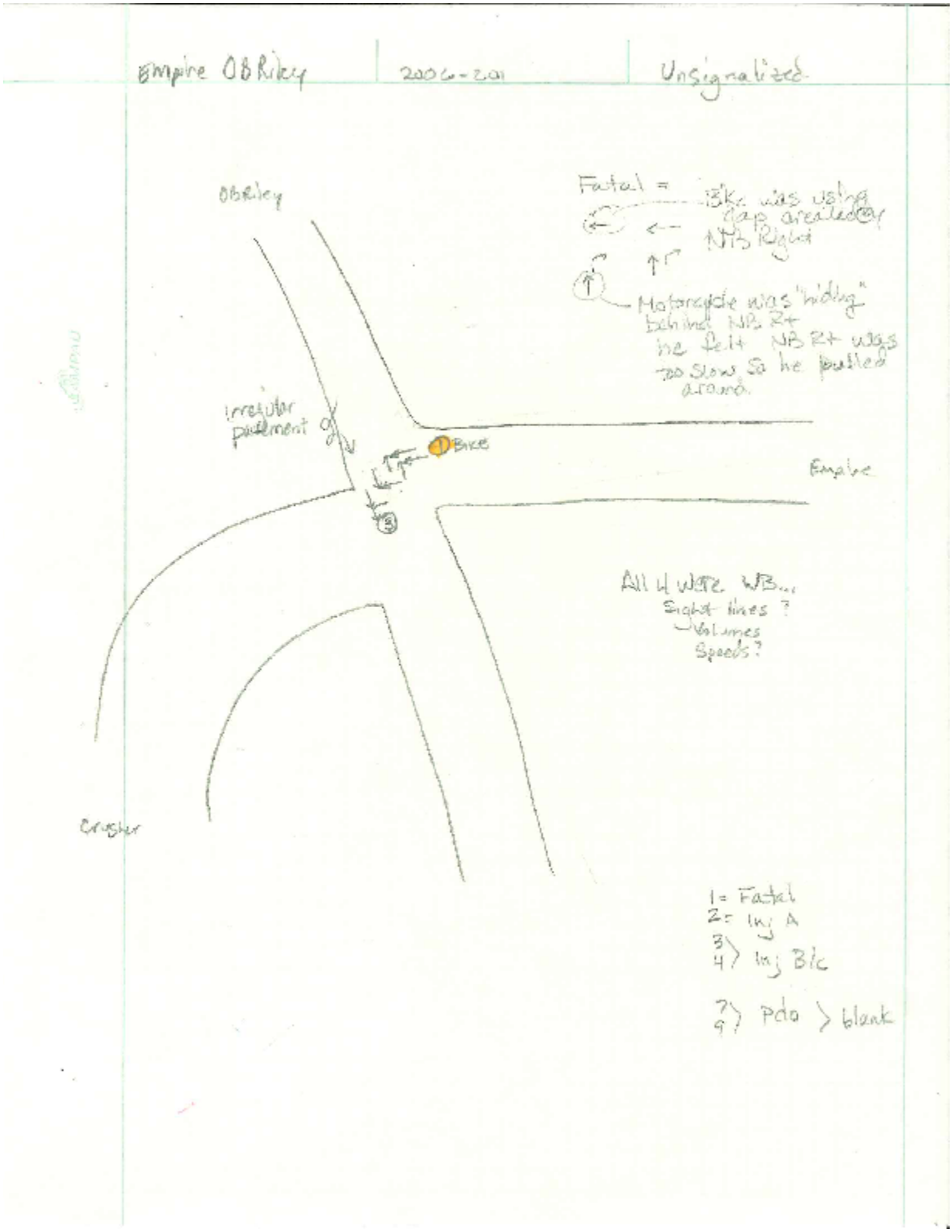

Greenwood / 1st
2006 - 2011 ODOT
Unsignalized
3
3
3
3
3
Patterns:
NB v. EB
?? Sight lines
Mainline R.E. while
Waiting to turn Left!
Signing / Striping
! Fatal
2 thru A
3 > Inj B/C
4
7
9 > PDO > Blank

Greenwood/Hill | 2006-2010 ODOT | 10-16-12

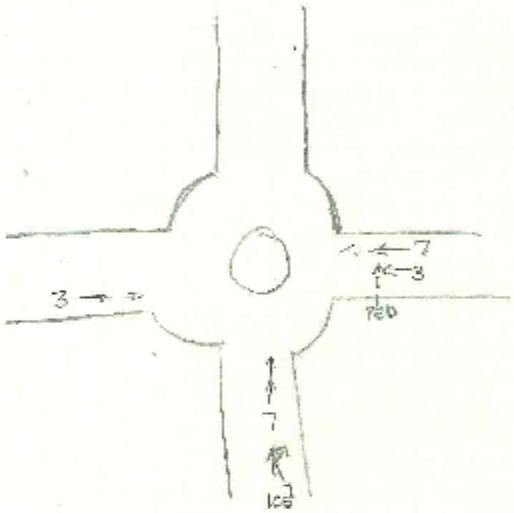


Crash Trends

Wrong way bike	fatal	F	
ped walk (sight lines)	inj A	2	2
NB Sight lines to east (overpass)	inj B/C	3/4	4
Main line R.E. (noctl)	PDO	7/9	—
WB LEFT (Road diet)			


Empire OB Riley
2006-2011
Unsignalized
OB Riley
Fatal =
Bike was using dog area/sidewalk
NB Right
Motorcycle was "hiding" behind NB RT he felt NB RT was too slow so he pulled around.
irregular pavement
Bike
Empire
All 4 were WB...
Sight lines?
Volumes
Speeds?
Crosby
1 = Fatal
2 = Inj A
3
4 > Inj B/C
7
9 > PDO > blank

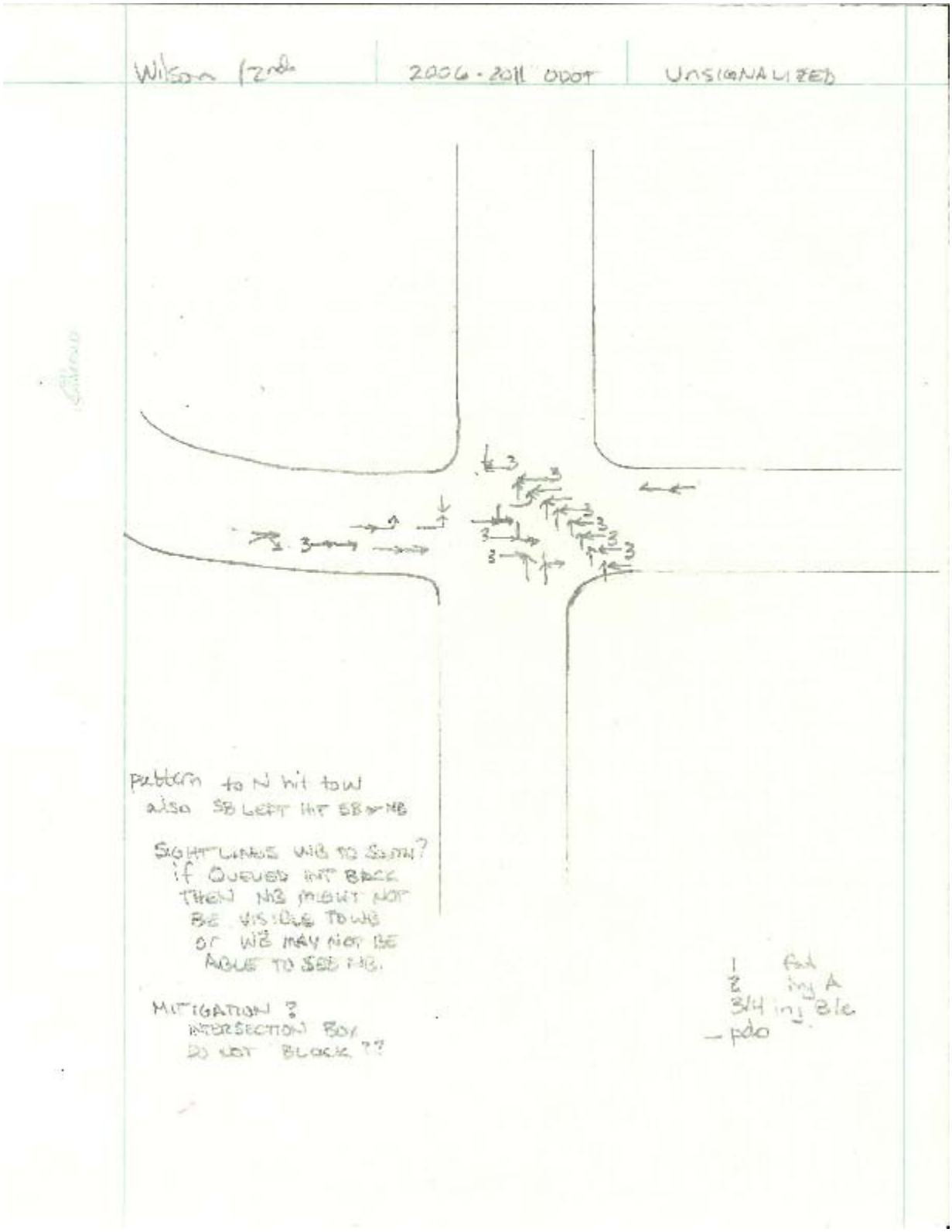
Reed Mkt / Bond	2006-2011 ODOT	Unsignalized



NO ISSUES TO MITIGATE
EDUCATION: WALK IN X-WALKS (HE WAS RIDING SKATEBOARD)
? YIELD TO PEDS IN X-WALK

RESEARCH YIELD TO PED SIGNS R1-6

1 fatal
2 inj A
3 inj B
4 inj C
7 PDO
9 PDO


Wilson (2nd)
2006 - 2011 ODOT
UNSIGNALIZED
pattern to N hit tow
also SB LEFT HIT EB or NB
SIGHT LINES WB TO SBTH?
if QUEUED INT BACK
THEN NB MIGHT NOT
BE VISIBLE TO WB
OR WB MAY NOT BE
ABLE TO SEE NB.
MITIGATION ?
INTERSECTION BOX
DO NOT BLOCK ??
1 fat
2 inj A
3/4 inj Ble
- pdo

Appendix C Cost Estimates

City of Bend CIP
Arizona Wall and Colorado Bond
Cost Estimate

MARK-UPS	Percent	
ELEC/I&C	0%	
MECHANICAL	0%	
ALLOWANCE	30%	
MOB/BOND/INS	8%	
CONTINGENCY	20%	
ENGINEERING	25%	
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED
COB INTERNAL CHARGES	5%	COB PROVIDED
OTHER COB COSTS	0%	COB PROVIDED
ADMIN/LEGAL	3%	COB PROVIDED

Prepared By: Robin Lewis
Proj. Manager: Robin Lewis
Project No: ST0614
Date: September 17, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	1	LS	$2,000.00	$2,000	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	Install mountable islands	0	LF	$2.00	$0	
H	Add one Near Left Signal Head	1	EA	$15,000.00	$15,000	1 Near Left Signal Head
I	Improved Detection and Interconnect	1	LS	$20,000.00	$20,000	Signal Coordination and Timing as a group of signals.
J	Add Signal Backplates	3	EA	$500.00	$1,500	Hi Vis Yellow
K	ADA Ramp (incl. truncated dome)	0	EA	$3,000.00	$0	
L		0	SF	$1.00	$0	
M		0	SF	$10.00	$0	
N	Signing	4	EA	$300.00	$1,200	Improved One-way signing and Signal Ahead Signing
O	Pavement Green Bike Box Markings	0	SF	$20.00	$0	
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Pavement marking - thermoplastic	0	LF	$3.00	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$52,700**	
R	Allowance	30%			$15,810	
S	Mob/Bond/Ins	8%			$4,216	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	20%			$10,540	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$30,566**	
V	Engineering	25%			$18,000	Includes signal audit for phasing and timing, turning movement counts
W	COB Internal Charges	5%			$2,635	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$1,581	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$22,216	
	TOTAL ESTIMATED PROJECT COST				**$83,266**	

City of Bend CIP
Colorado Bond
Cost Estimate

MARK-UPS	Percent	
ELEC/I&C	0%	
MECHANICAL	0%	
ALLOWANCE	30%	
MOB/BOND/INS	8%	
CONTINGENCY	20%	
ENGINEERING	30%	
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED
COB INTERNAL CHARGES	5%	COB PROVIDED
OTHER COB COSTS	0%	COB PROVIDED
ADMIN/LEGAL	3%	COB PROVIDED

Prepared By:	Robin Lewis
Proj. Manager:	Robin Lewis
Project No:	ST0614
Date:	September 17, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	1	LS	$2,000.00	$2,000	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	Install mountable islands	0	LF	$2.00	$0	
H	New signal heads, to improve conspicuity	0	EA	$5,000.00	$0	
I	New signal backplates (hi vis yellow)	2	EA	$500.00	$1,000	
J	Improved detection and interconnect between all 4 signals	1	LS	$20,000.00	$20,000	unknown improvements - this is a baseline guess
K	ADA Ramp (incl. truncated dome)	0	EA	$3,000.00	$0	
L		0	SF	$1.00	$0	
M		0	SF	$10.00	$0	
N	Signing	4	EA	$300.00	$1,200	Improved One-way and Signal Ahead Signing; next signal signing
O	Pavement Green Bike Box Markings	0	SF	$20.00	$0	
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Pavement marking - thermoplastic	0	LF	$3.00	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$37,200**	
R	Allowance	30%			$11,160	
S	Mob/Bond/Ins	8%			$2,976	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	20%			$7,440	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$21,576**	
V	Engineering	30%			$18,000	Includes signal audit for phasing and timing, turning movement counts
W	COB Internal Charges	5%			$1,860	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$1,116	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$20,976	
	TOTAL ESTIMATED PROJECT COST				**$58,776**	

City of Bend CIP
Brosterhous 3rd
Cost Estimate

MARK-UPS	Percent				
ELEC/I&C	0%			Prepared By:	Robin Lewis
MECHANICAL	0%			Proj. Manager:	Robin Lewis
ALLOWANCE	0%			Project No:	ST0614
MOB/BOND/INS	8%			Date:	September 11, 2012
CONTINGENCY	30%				
ENGINEERING	25%				
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED			
COB INTERNAL CHARGES	5%	COB PROVIDED			
OTHER COB COSTS	0%	COB PROVIDED			
ADMIN/LEGAL	3%	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	0	LS	$1,000.00	$0	
D	Survey Staking	0	LS	$2,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	Install mountable islands		LF	$2.00	$0	
H	New ped push button poles and buttons		EA	$2,500.00	$0	
I		0	LF	$20.00	$0	
J		0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$3,000.00	$0	
L	Convert to Protected Only E-W turns (Brost)	4	EA	$3,000.00	$12,000	Operate as Exclusive Walk Phase; operate as flashing yellow arrow lefts when permitted phasing is run.
M	Signal timing, dilema zone audit and change implementation	1	EA	$10,000.00	$10,000	Red Light running is an issue as is EB to SB rights - NOT ADEQUATE ISD to north due to roadway curvature and parked cars back of sidewalk. NO RTOR EB to SB.
N	Add Video Detection EB, SB	2	EA	$8,000.00	$16,000	already has 2070 and NB, WB video
O	Pavement Green Bike Box Markings	0	SF	$20.00	$0	
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Pavement marking - thermoplastic	0	LF	$3.00	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$50,000**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$4,000	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$15,000	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$19,000**	
V	Engineering	25%			$20,000	Includes signal audit for phasing and timing, turning movement counts
W	COB Internal Charges	5%			$2,500	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$1,500	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$24,000	
	TOTAL ESTIMATED PROJECT COST				**$69,000**	

City of Bend CIP						
Butler Market at 27th Street		**Convert to protected Wb left; add NB double headed black on yellow warning sign; add EB bike lane; change timing/ph**				
Cost Estimate	**Add turn arrow sections rather than green balls for NB**					
	MARK-UPS	**Percent**			**Prepared By:**	**Robin Lewis**
	ELEC/I&C	**0%**			**Proj. Manager:**	**Robin Lewis**
	MECHANICAL	**0%**			**Project No:**	**ST0614**
	ALLOWANCE	**0%**			**Date:**	**September 11, 2012**
	MOB/BOND/INS	**10%**				Convert to Protected, turn arrows, change phasing
	CONTINGENCY	**30%**				
	ENGINEERING	**25%**				
	CAPITALIZED INTEREST (BOND)	**0%**	COB PROVIDED			
	COB INTERNAL CHARGES	**8%**	COB PROVIDED			
	OTHER COB COSTS	**0%**	COB PROVIDED			
	ADMIN/LEGAL	**5%**	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$5,000.00	$5,000	
B	Work Zone TC	1	LS	$15,000.00	$15,000	
C	Erosion Control	0	LS	$3,000.00	$0	
D	Survey Staking	0	LS	$5,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Parkstrip construction (curb tight becomes buffered)	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	
L	Concrete Sidewalk	0	SF	$4.00	$0	
M	Concrete Driveway Apron	0	SF	$10.00	$0	
N	Signing	4	EA	$600.00	$2,400	Add double headed arrow up to span wire for NB; add ground mounted double headed arrow, add 2 type 3 barricades, one left lane one right lane projection
O	Striping	300	LF	$3.00	$900	Add bike lane stripe back in EB; add bike lane stripe westbound through intersection (thermo)
P	Pavement Legends (thermoplastic)	6	EA	$350.00	$2,100	Add bike lane legends two places EB to help remove Right turners from using bike lane to double stack for signal.; add two sets of elongated left and right arrows on NB approach
Q	Carbon Slurry Seal	0	SY	$2.60	$0	
R	Pedestrian poles + push buttons	0	EA	$2,500.00	$0	
S	Changes to WB heads	1	EA	$2,000.00	$2,000	Add left turn signal head
T		0	LF	$50.00	$0	
U		0	LS	$2,000.00	$0	
V	Change to video detection	0	EA	$24,000.00	$0	Already has Video Detection
W		0	EA	$10,000.00	$0	left turn head already in place (new this week)
X	Changes to NB Heads	3	EA	$2,000.00	$6,000	Change out green ball signal indication for 4 section FYA heads; two mounted on Mast Arm, 1 mounted on far left post of existing NW corner pole.
Y	Change signal phasing and timing	1	LS	$2,000.00	$2,000	execute signal timing and phasing changes incl. clearance and All Red adjustments
Z	Change controller to a 2070	1	EA	$5,000.00	$5,000	This includes the 2070 and a modem/switch
	SUBTOTAL CONSTRUCTION QUANTITIES				**$40,400**	
T	Allowance	0%			$0	
U	Mob/Bond/Ins	10%			$4,040	
V	Capitalized Interest (Bond)	0%			$0	
W	Contingency	30%			$12,120	
2	SUBTOTAL SOFT CONSTRUCTION COSTS				**$16,160**	
X	Engineering	25%			$30,000	
Y	COB Internal Charges	8%			$3,232	
Z	Other COB Charges	0%			$0	
AA	Admin/Legal	5%			$2,020	
AB	Property Costs (ROW/Easements)	$0			$0	
AC	Utilities Costs	$0			$0	
AD	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$35,252	
	TOTAL ESTIMATED PROJECT COST				**$56,560**	

City of Bend CIP
Revere at Division
Cost Estimate

MARK-UPS	Percent		
ELEC/I&C	0%		
MECHANICAL	0%		
ALLOWANCE	0%		
MOB/BOND/INS	10%		
CONTINGENCY	30%		
ENGINEERING	35%		
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED	
COB INTERNAL CHARGES	8%	COB PROVIDED	
OTHER COB COSTS	0%	COB PROVIDED	
ADMIN/LEGAL	5%	COB PROVIDED	

Prepared By: Robin Lewis
Proj. Manager: Robin Lewis
Project No: ST0614
Date: September 11, 2012

Road Diet with new signal equipment/head alignment/paint/carbon seal

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$10,000.00	$10,000	
B	Work Zone TC	1	LS	$15,000.00	$15,000	
C	Erosion Control	1	LS	$3,000.00	$3,000	
D	Survey Staking	0	LS	$5,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	2nd to 3rd new curb north and south sides
F	Removal of surfacings	0	SY	$5.00	$0	2nd to 3rd new curb north and south sides
G	removal of curbs	0	LF	$2.00	$0	2nd to 3rd new curb north and south sides
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	There are no cb 2nd to 3rd where new curb goes
I	Concrete Curb 16"	0	LF	$20.00	$0	2nd to 3rd new curb north and south sides
J	Parkstrip construction (curb tight becomes buffered)	0	LF	$60.00	$0	2nd to 3rd new curb north and south sides
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	Division to 3rd: division, lytle, 2nd, 3rd (will require new ped pushbuttons)
L	Concrete Sidewalk	0	SF	$4.00	$0	no sidewalk replacement
M	Concrete Driveway Apron	0	SF	$10.00	$0	Division to 3rd 5 driveway aprons to replace at new curb line
N	Signing	4	EA	$200.00	$800	Division to 3rd new stop signs/street name signs
O	Striping	5600	LF	$0.75	$4,200	Division to 3rd restripe 4 lines (bike, lft edge twltl, rt edge twltl, bike)
P	Pavement Legends (thermoplastic)	24	EA	$350.00	$8,400	Wall to 3rd Restripe
Q	Carbon Slurry Seal	7466.66667	SY	$2.60	$19,413	Wall to 3rd Carbon Seal Prep for Restripe
R	Pedestrian poles + push buttons	0	EA	$2,500.00	$0	3rd Street signal changes - west leg ped
S	Signal Poles, Mast Arms, Heads	4	EA	$10,000.00	$40,000	3rd Street signal changes - westbound receive
T	Install median Wall to Division to create lane reduction	0	LF	$50.00	$0	Wall to Division - keep curbs, add median
U	Sawcut for median install Wall to Division	0	LF	$1.00	$0	Wall to Division - keep curbs, add median
V	Removal of surfacings Wall to Division	0	SY	$5.00	$0	Wall to Division - keep curbs, add median
W	Striping	0	LF	$0.75	$0	Wall to Division - keep curbs, add median
X	Changes to NB Off Ramp - signal head	1	EA	$2,000.00	$2,000	NB Off Ramp convert to L + TR (signal head change)
Y	Changes to NB Off Ramp - striping changes	305	LF	$0.75	$229	NB Off Ramp convert to L + TR (striping change)
Z	Signal Detection, Timing and Phasing Audit	1	EA	$10,000.00	$10,000	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$113,042**	
T	Allowance	0%			$0	
U	Mob/Bond/Ins	10%			$11,304	
V	Capitalized Interest (Bond)	0%			$0	
W	Contingency	30%			$33,913	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$45,217**	
X	Engineering	35%			$39,565	
Y	COB Internal Charges	8%			$9,043	
Z	Other COB Charges	0%			$0	
AA	Admin/Legal	5%			$5,652	
AB	Property Costs (ROW/Easements)	$0			$0	
AC	Utilities Costs	$0			$0	
AD	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$54,260	
	TOTAL ESTIMATED PROJECT COST				**$158,259**	

City of Bend CIP

Franklin at 3rd Street **Long Term - Road Diet East-West**

Cost Estimate

MARK-UPS	Percent			
ELEC/I&C	0%		Prepared By:	Robin Lewis
MECHANICAL	0%		Proj. Manager:	Robin Lewis
ALLOWANCE	0%		Project No:	ST0614
MOB/BOND/INS	8%		Date:	July 17, 2012
CONTINGENCY	30%			
ENGINEERING	25%			
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED		
COB INTERNAL CHARGES	15%	COB PROVIDED		
OTHER COB COSTS	0%	COB PROVIDED		
ADMIN/LEGAL	10%	COB PROVIDED		

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$20,000.00	$20,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	New ped push button poles	4	LS	$3,000.00	$12,000	
D	Signal timing, dilemma zone audit and change implementation	1	EA	$10,000.00	$10,000	
D	Add 2070 Controller	1	EA	$8,000.00	$8,000	
D	Survey Staking	1	LS	$15,000.00	$15,000	
E	Asphalt Pavement Saw Cutting	3000	LF	$1.00	$3,000	
F	Removal of surfacings	533	SY	$5.00	$2,667	
G	removal of curbs	400	LF	$2.00	$800	
H	Concrete inlet catchbasin with Sump	2	LS	$2,500.00	$5,000	
I	Concrete Curb 16"	400	LF	$20.00	$8,000	Curbing within 100' of intersection only; rest done with paint (and future redevelopment or grant funding)
J	Vegetated Swale	0	LF	$60.00	$0	Reconnect to the catchbasins.
K	ADA Ramp (incl. truncated dome)	8	EA	$2,500.00	$20,000	Just at the intersection for now.
L	Concrete Sidewalk	0	SF	$1.00	$0	no new sidewalk
M	Concrete Driveway Apron	3240	SF	$10.00	$32,400	no new driveway aprons
N	Signing	10	EA	$200.00	$2,000	
O	Striping (thermoplastic)	12000	LF	$3.00	$36,000	Highlight any remaining conflict areas (3rd Street).
P	Pavement Legends (thermoplastic)	10	EA	$300.00	$3,000	bike lane symbol, turn lane arrows, stop bars, crosswalks
	SUBTOTAL CONSTRUCTION QUANTITIES				**$187,867**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$15,029	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$56,360	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$71,389**	
V	Engineering	25%			$46,967	
W	COB Internal Charges	15%			$28,180	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	10%			$18,787	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$93,933	
	TOTAL ESTIMATED PROJECT COST				**$259,256**	

City of Bend CIP

Franklin at Wall Street — **Immediate - Install turning vehicles yield to bikes/peds; NO RTOR; FYA head, no lag left, WAIT message**

Cost Estimate

MARK-UPS	Percent	
ELEC/I&C	0%	
MECHANICAL	0%	
ALLOWANCE	0%	
MOB/BOND/INS	8%	
CONTINGENCY	30%	
ENGINEERING	10%	
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED
COB INTERNAL CHARGES	5%	COB PROVIDED
OTHER COB COSTS	0%	COB PROVIDED
ADMIN/LEGAL	3%	COB PROVIDED

Prepared By:	Robin Lewis
Proj. Manager:	Robin Lewis
Project No:	ST0614
Date:	June 28, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$5,000.00	$5,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	0	LS	$0.00	$0	
D	Survey Staking	1	LS	$2,000.00	$2,000	Remove SB right turn lane - create thru-right.
E	Asphalt Pavement Saw Cutting	100	LF	$1.00	$100	These are all for adding a curb extension for SB Wall
F	Removal of surfacings	89	SY	$10.00	$889	This eliminates the high conflicts from SB rights and ped/bike
G	removal of curbs	100	LF	$2.00	$200	activity. The area is downtown and pedestrian/bike has
H	Concrete inlet catchbasin with Sump	1	LS	$2,500.00	$2,500	greater priority than traffic flow
I	Concrete Curb 16"	100	LF	$20.00	$2,000	This adds 7 parking spaces into the downtown inventory
J	Add Curb Extension	89	SY	$60.00	$5,340	Pavers on top
K	ADA Ramp (incl. truncated dome)	2	EA	$2,500.00	$5,000	assume 2 ADA ramps (may only be 1)
L	Paver sidewalk	89	SY	$25.00	$2,222	this completes the curb extension
M	new signal pole NW corner	1	EA	$10,000.00	$10,000	
N	Signing	4	EA	$300.00	$1,200	turning vehicles yield to bikes/peds (modified R10-15)
O	Pavement Green Bike Box Markings	0	SF	$20.00	$0	
P	New Fully ADA Ped Signals (including message)	8	EA	$1,000.00	$8,000	This is only for west leg. - include audible WAIT message during DON"T WALK PHASE; animated eyes, leading ped phases
Q	Signal Phasing Changes	0	EA	$20,000.00	$0	
R	Convert to Flashing Yellow Arrow signal head	2	EA	$2,000.00	$4,000	remove dog house signal head
	SUBTOTAL CONSTRUCTION QUANTITIES				**$58,451**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$4,676	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$17,535	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$22,211**	
V	Engineering	10%			$20,000	
W	COB Internal Charges	5%			$2,923	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$1,754	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$24,676	
	TOTAL ESTIMATED PROJECT COST				**$80,663**	

City of Bend CIP		**Change signal phasing E-W to Protected ONLY and NO RTOR NB and SB.**				
Neff at Purcell		**Exclusive Walk Phase & No RTOR**				
Cost Estimate		**Stripe crosswalks on all approaches. Stripe bike lanes on Purcell to cross-walk.**				
	MARK-UPS	**Percent**			**Prepared By:**	**Robin Lewis**
	ELEC/I&C	**0%**			**Proj. Manager:**	**Robin Lewis**
	MECHANICAL	**0%**			**Project No:**	**ST0614**
	ALLOWANCE	**0%**			**Date:**	**July 6, 2012**
	MOB/BOND/INS	**8%**				
	CONTINGENCY	**30%**				
	ENGINEERING	**10%**				
	CAPITALIZED INTEREST (BOND)	**0%**	COB PROVIDED			
	COB INTERNAL CHARGES	**5%**	COB PROVIDED			
	OTHER COB COSTS	**0%**	COB PROVIDED			
	ADMIN/LEGAL	**3%**	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	0	LS	$0.00	$0	
D	Survey Staking	0	LS	$0.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Signal Timing, Detection, Phasing Audit	1	LS	$10,000.00	$10,000	
K	Changes to E-W signal heads	6	EA	$2,000.00	$12,000	Change out dog houses; lefts = 4 section FYA heads; thrus = 3 section standard heads
L	Changes to N-S signal heads	4	EA	$2,000.00	$8,000	Change out 4 section green arrow head for a xxx section FYA head ONE over the lane, the second req'd far left. Include red arrow for right turns (No RTOR). Just center one over the lane, and put another far left (assuming lefts are considered the more major move). The heads will be different. Red ball, green ball on both, but Red Arrow and FYA arrows for both left and right on one centered over the lane.
M	Add 2070 controller	0	SF	$10.00	$0	Already has a 2070
N	Signing	2	EA	$300.00	$600	No RTOR
O	Pavement Green Bike Box Markings	1176	SF	$20.00	$23,520	Modified Green Bike Lanes (to minimize wear) x 4 approaches
P	Pavement Legends (thermoplastic)	8	EA	$300.00	$2,400	bike lane symbol,
Q	Pavement stop bar marking - thermoplastic	128	LF	$2.60	$333	outline of the green bike lane
R	Crosswalk Striping 12" thermoplastic	336	LF	$2.60	$874	
S	Bike Lane Striping 8" thermoplastic	700	LF	$2.60	$1,820	50' on all approaches (in and out of approach) + 200' on north leg
T	Implement protected only phasing E-W lefts	1	LS	$1,200.00	$1,200	0.01 cmf
	SUBTOTAL CONSTRUCTION QUANTITIES				**$72,746**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$5,820	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$21,824	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$27,644**	
V	Engineering	10%			$20,000	
W	COB Internal Charges	5%			$3,637	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$2,182	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$25,820	
	TOTAL ESTIMATED PROJECT COST				**$100,390**	

City of Bend CIP
Powers at 3rd
Cost Estimate

MARK-UPS	Percent				
ELEC/I&C	0%			Prepared By:	Robin Lewis
MECHANICAL	0%			Proj. Manager:	Robin Lewis
ALLOWANCE	30%			Project No:	ST0614
MOB/BOND/INS	8%			Date:	September 11, 2012
CONTINGENCY	30%				
ENGINEERING	25%				
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED			
COB INTERNAL CHARGES	5%	COB PROVIDED			
OTHER COB COSTS	0%	COB PROVIDED			
ADMIN/LEGAL	3%	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	0	LS	$1,000.00	$0	
D	Survey Staking	0	LS	$2,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	Install mountable islands		LF	$2.00	$0	
H	New combined pole/mast arm with illumination NW Corner	1	EA	$4,000.00	$4,000	
I	Add 1 additional video detection	1	EA	$8,000.00	$8,000	
J	Add 2070 controller	0	EA	$5,000.00	$0	Already has a 2070 controller
K	ADA Ramp (incl. truncated dome)	0	EA	$3,000.00	$0	
L	East and West - change to 4 section heads	2	EA	$2,000.00	$4,000	Shall run exclusive Walk Phase (no permitted crossing lefts)
M	Signal timing, dillema zone audit and change implementation	1	EA	$10,000.00	$10,000	
N	Signing	4	EA	$300.00	$1,200	No Right Turn on Red for WB to NB rights
O	Pavement Green Bike Box Markings	0	SF	$20.00	$0	
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Pavement marking - thermoplastic	0	LF	$3.00	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$39,200**	
R	Allowance	30%			$11,760	
S	Mob/Bond/Ins	8%			$3,136	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$11,760	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$26,656**	
V	Engineering	25%			$20,000	Includes signal audit for phasing and timing, turning movement counts
W	COB Internal Charges	5%			$1,960	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$1,176	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$23,136	
	TOTAL ESTIMATED PROJECT COST				**$65,856**	

City of Bend CIP
Reed Market at 3rd
Cost Estimate

MARK-UPS	Percent				
ELEC/I&C	0%			Prepared By:	Robin Lewis
MECHANICAL	0%			Proj. Manager:	Robin Lewis
ALLOWANCE	0%			Project No:	ST0614
MOB/BOND/INS	8%			Date:	September 12, 2012
CONTINGENCY	30%				
ENGINEERING	25%				
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED			
COB INTERNAL CHARGES	5%	COB PROVIDED			
OTHER COB COSTS	0%	COB PROVIDED			
ADMIN/LEGAL	3%	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$2,000.00	$2,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	1	LS	$2,000.00	$2,000	
E	Asphalt Pavement Saw Cutting	400	LF	$1.00	$400	sawcut for mountable islands
F	Removal of surfacings	44	SY	$5.00	$222	remove for mountable islands
G	Install mountable islands	400	LF	$2.00	$800	mountable islands at corners for bike dutch intersection
H	New ped push button poles and buttons	8	EA	$2,500.00	$20,000	the ramps are separated now.
I		0	LF	$20.00	$0	
J		0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	8	EA	$3,000.00	$24,000	will need 8 new ADA ramps
L		0	SF	$1.00	$0	
M		0	SF	$10.00	$0	
N	Signing	4	EA	$300.00	$1,200	
O	Pavement Green Bike Box Markings	3120	SF	$20.00	$62,400	Modified Green Bike Lanes (to minimize wear) x 3 approaches
P	Pavement Legends (thermoplastic)	8	EA	$300.00	$2,400	bike lane symbol,
Q	Pavement marking - thermoplastic	2192	LF	$3.00	$6,576	Ladder cross-walk+transverse cross-walk+bike cross-walk ladder
	SUBTOTAL CONSTRUCTION QUANTITIES				**$132,998**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$10,640	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	30%			$39,899	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$50,539**	
V	Engineering	25%			$33,250	Includes signal audit for phasing and timing, turning movement counts
W	COB Internal Charges	5%			$6,650	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$3,990	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$43,889	
	TOTAL ESTIMATED PROJECT COST				**$183,538**	

City of Bend CIP						
Reed Market at 27th Street		**Convert to protected nb left; add turn arrow sections rather than green balls for EB L + R; change timing/phasing**				
Cost Estimate		**Add 2070 controller**				
	MARK-UPS	**Percent**			**Prepared By:**	**Robin Lewis**
	ELEC/I&C	**0%**			**Proj. Manager:**	**Robin Lewis**
	MECHANICAL	**0%**			**Project No:**	**ST0614**
	ALLOWANCE	**30%**			**Date:**	**September 10, 2012**
	MOB/BOND/INS	**10%**				Convert to Protected, turn arrows, change phasing
	CONTINGENCY	**0%**				
	ENGINEERING	**25%**				
	CAPITALIZED INTEREST (BOND)	**0%**	COB PROVIDED			
	COB INTERNAL CHARGES	**8%**	COB PROVIDED			
	OTHER COB COSTS	**0%**	COB PROVIDED			
	ADMIN/LEGAL	**5%**	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$5,000.00	$5,000	
B	Work Zone TC	1	LS	$15,000.00	$15,000	
C	Erosion Control	0	LS	$3,000.00	$0	
D	Survey Staking	0	LS	$5,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Parkstrip construction (curb tight becomes buffered)	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	
L	Concrete Sidewalk	0	SF	$4.00	$0	
M	Concrete Driveway Apron	0	SF	$10.00	$0	
N	Signing	4	EA	$600.00	$2,400	Add 1 double headed black on yellow arrow to mast arm; add 2 red/white type 3 barricades behind sidewalk; (one aligned with each lane); relocate existing ground mounted double headed black on yellow arrow to be directly below the mast arm mounted double yellow arrow. relocate the hospital sign to the far right signal post, towards the top, so the top of the Hospital Sign aligns with the top of the street name sign.
O	Striping	100	LF	$3.00	$300	Thermoplastic the bike lane across the top of the T.
P	Pavement Legends (thermoplastic)	4	EA	$350.00	$1,400	Install elongated left and right turn arrows - 2 sets EB
Q	Carbon Slurry Seal	0	SY	$2.60	$0	
R	New signal pole, mast arm, combination luminaire mast arm and luminaire	1	EA	$4,000.00	$4,000	This will be located at the NE 'corner' of the intersection and replace the mast arm that the existing dog house is on to extend the arm to allow a head to be centered over the NB left turn lane.
S	Changes to EB heads	3	EA	$2,000.00	$6,000	Change out green ball signal indication for 4 section FYA heads; two mounted on mast arm, 1 mounted on far left post of new pole.
T	Change controller to a 2070.	1	EA	$5,000.00	$5,000	This includes the 2070 and a modem/switch
U	Changes to NB head	1	EA	$2,000.00	$2,000	Change out doghouse for a 4 section FYA Head.
V		0	SY	$5.00	$0	
W	Add second NB thru head	1	EA	$2,000.00	$2,000	Now we need a second thru head.
X	Change to Video Detection	1	EA	$24,000.00	$24,000	Can coordinate with GO Bond overlay to remove loops with a grind
Y	Change signal phasing and timing	1	LS	$2,000.00	$2,000	execute signal phasing changes
Z						
	SUBTOTAL CONSTRUCTION QUANTITIES				**$69,100**	
T	Allowance	30%			$20,730	
U	Mob/Bond/Ins	10%			$6,910	
V	Capitalized Interest (Bond)	0%			$0	
W	Contingency	0%			$0	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$27,640**	
X	Engineering	25%			$20,000	
Y	COB Internal Charges	8%			$5,528	
Z	Other COB Charges	0%			$0	
AA	Admin/Legal	5%			$3,455	
AB	Property Costs (ROW/Easements)	$0			$0	
AC	Utilities Costs	$0			$0	
AD	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$28,983	
	TOTAL ESTIMATED PROJECT COST				**$96,740**	

City of Bend CIP						
Franklin Avenue Hill to 1st Safety Mitigation		**Near Term: Restripe, add crosswalks (stop approaches), bike lanes, sharrows thru tunnel, lane organization to**				
Cost Estimate		**eliminate lane slop**				
	MARK-UPS	**Percent**			**Prepared By:**	**Robin Lewis**
	ELEC/I&C	**0%**			**Proj. Manager:**	**Robin Lewis**
	MECHANICAL	**0%**			**Project No:**	**ST0614**
	ALLOWANCE	**0%**			**Date:**	**July 16, 2012**
	MOB/BOND/INS	**8%**				
	CONTINGENCY	**20%**				PAINTED ONLY ROAD DIET
	ENGINEERING	**25%**				
	CAPITALIZED INTEREST (BOND)	**0%**	COB PROVIDED			
	COB INTERNAL CHARGES	**10%**	COB PROVIDED			
	OTHER COB COSTS	**0%**	COB PROVIDED			
	ADMIN/LEGAL	**5%**	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$4,000.00	$4,000	
B	Work Zone TC	1	LS	$10,000.00	$10,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	0	LS	$1,000.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	4	LS	$2,500.00	$10,000	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Vegetated Swale	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	8	EA	$2,500.00	$20,000	
L	Concrete Sidewalk	0	SF	$4.00	$0	
M	Carbon Seal Overlay for striping prep	10478	SY	$2.60	$27,243	
N	Signing	2	EA	$200.00	$400	
O	Striping (thermoplastic)	16840	LF	$3.00	$50,520	
P	Pavement Legends (thermoplastic)	5	EA	$300.00	$1,500	Thermo xwalks - 2 ea per crossing assumed; + bike + sharrow
Q	Illumination	1	EA	$15,000.00	$15,000	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$139,663**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	8%			$11,173	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	20%			$27,933	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$39,106**	
V	Engineering	25%			$34,916	
W	COB Internal Charges	10%			$13,966	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	5%			$6,983	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$55,865	
	TOTAL ESTIMATED PROJECT COST				**$178,769**	

City of Bend CIP

Awbrey at Portland — **Convert 2-way stop to mini-roundabout**

Cost Estimate

MARK-UPS	Percent	
ELEC/I&C	0%	
MECHANICAL	0%	
ALLOWANCE	0%	
MOB/BOND/INS	0%	
CONTINGENCY	25%	
ENGINEERING	10%	
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED
COB INTERNAL CHARGES	5%	COB PROVIDED
OTHER COB COSTS	0%	COB PROVIDED
ADMIN/LEGAL	3%	COB PROVIDED

Prepared By: Robin Lewis
Proj. Manager: Robin Lewis
Project No: ST0614
Date: September 13, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$5,000.00	$5,000	
B	Work Zone TC	1	LS	$5,000.00	$5,000	
C	Clearing and Grubbing	0	LS	$3,000.00	$0	
D	Survey Staking	1	LS	$3,000.00	$3,000	
E	Asphalt Pavement Saw Cutting	480	LF	$1.00	$480	
F	Removal of surfacings	213	SY	$5.00	$1,067	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb mountable	480	LF	$15.00	$7,200	
J	bike ramp	8	ea	$1,500.00	$12,000	
K	ADA Ramp (incl. truncated dome)	8	EA	$2,000.00	$16,000	
L	Concrete Sidewalk	3200	SF	$5.00	$16,000	
M	Bright Side Strips	0	EA	$50.00	$0	
N	Signing	4	EA	$200.00	$800	Yield Signs
O	Striping (thermoplastic)	600	LF	$2.60	$1,560	crosswalks, circulating line
P	Pavement Legends (thermoplastic)	12	EA	$300.00	$3,600	yield bar, (2) bike symbols each leg
Q	Colored ACP	240	SF	$10.00	$2,400	colored/stamped ACP truck apron
R	Traffic circle incl. landscaping	1	EA	$5,000.00	$5,000	central island = traffic circle
	SUBTOTAL CONSTRUCTION QUANTITIES				**$79,107**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	0%			$0	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	25%			$19,777	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$19,777**	
V	Engineering	10%			$20,000	
W	COB Internal Charges	5%			$3,955	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$2,373	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$26,329	
	TOTAL ESTIMATED PROJECT COST				**$98,883**	

City of Bend CIP

Bear Creek Pettigrew **Increase awareness of stops/intersection. Clear Sight Line.**

Cost Estimate

MARK-UPS	Percent				
ELEC/I&C	0%			Prepared By:	Robin Lewis
MECHANICAL	0%			Proj. Manager:	Robin Lewis
ALLOWANCE	0%			Project No:	ST0614
MOB/BOND/INS	0%			Date:	August 31, 2012
CONTINGENCY	10%				
ENGINEERING	0%				
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED			
COB INTERNAL CHARGES	5%	COB PROVIDED			
OTHER COB COSTS	0%	COB PROVIDED			
ADMIN/LEGAL	3%	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	0	LS	$2,000.00	$0	
B	Work Zone TC	1	LS	$2,000.00	$2,000	
C	Clearing and Grubbing	1	LS	$3,000.00	$3,000	Clear SE corner of bounders, grasses.
D	Survey Staking	0	LS	$0.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Vegetated Swale	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	
L	Concrete Sidewalk	0	SF	$1.00	$0	
M	Bright Side Strips	4	EA	$50.00	$200	Install one on each stop (WB, NB). Install one on each Adv Stop (WB, NB)
N	Signing	4	EA	$200.00	$800	2 oversize stop signs. 2 adv street name plaques on Adv. Stop Warnings (all 4 need new posts (taller posts).
O	Striping	40	LF	$5.00	$200	Transverse Peripheral (2' bar, 5 each side of lane, last set at Stop Ahead Sign)
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	bike lane symbol, turn lane arrows, stop bars, crosswalks
Q	Carbon Slurry Seal	0	EA	$2.60	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$6,200**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	0%			$0	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	10%			$620	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$620**	
V	Engineering	0%			$0	
W	COB Internal Charges	5%			$310	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$186	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$496	
	TOTAL ESTIMATED PROJECT COST				**$6,820**	

City of Bend CIP

Country Club at Murphy **Increase awareness of stops/intersection. Clear Sight Line.**

Cost Estimate

MARK-UPS	Percent			
ELEC/I&C	0%		Prepared By:	Robin Lewis
MECHANICAL	0%		Proj. Manager:	Robin Lewis
ALLOWANCE	0%		Project No:	ST0614
MOB/BOND/INS	0%		Date:	August 31, 2012
CONTINGENCY	10%			
ENGINEERING	0%			
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED		
COB INTERNAL CHARGES	5%	COB PROVIDED		
OTHER COB COSTS	0%	COB PROVIDED		
ADMIN/LEGAL	3%	COB PROVIDED		

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	0	LS	$2,000.00	$0	
B	Work Zone TC	1	LS	$2,000.00	$2,000	
C	Clearing and Grubbing	1	LS	$3,000.00	$3,000	Clear SE corner of boulders, grasses.
D	Survey Staking	0	LS	$0.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Vegetated Swale	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	
L	Concrete Sidewalk	0	SF	$1.00	$0	
M	Bright Side Strips	2	EA	$50.00	$100	Install one on each stop (NB). Install one on each Adv Stop (NB)
N	Signing	2	EA	$200.00	$400	1 oversize stop signs. 1 adv street name plaques on Adv. Stop Warnings (all 2 need new posts (taller posts).
O	Striping	20	LF	$5.00	$100	Transverse Peripheral (2' bar, 5 each side of lane, last set at Stop Ahead Sign)
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Carbon Slurry Seal	0	EA	$2.60	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$5,600**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	0%			$0	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	10%			$560	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$560**	
V	Engineering	0%			$0	
W	COB Internal Charges	5%			$280	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$168	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$448	
	TOTAL ESTIMATED PROJECT COST				**$6,160**	

City of Bend CIP
Greenwood Avenue at 1st Street Safety Mitigation — CURB EXTENSIONS SOUTH SIDE
Cost Estimate

MARK-UPS	Percent	
ELEC/I&C	0%	
MECHANICAL	0%	
ALLOWANCE	0%	
MOB/BOND/INS	0%	
CONTINGENCY	20%	
ENGINEERING	25%	
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED
COB INTERNAL CHARGES	8%	COB PROVIDED
OTHER COB COSTS	0%	COB PROVIDED
ADMIN/LEGAL	5%	COB PROVIDED

Prepared By: Robin Lewis
Proj. Manager: Robin Lewis
Project No: ST0614
Date: September 13, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$1,500.00	$1,500	
B	Work Zone TC	1	LS	$5,000.00	$5,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	1	LS	$1,000.00	$1,000	
E	Asphalt Pavement Saw Cutting	160	LF	$1.00	$160	curb ext SW, SE corners extension Greenwood and 1st (bulbs)
F	Removal of surfacings	1280	SY	$5.00	$6,400	
G	removal of curbs	160	LF	$2.00	$320	
H	Concrete inlet catchbasin with Sump	3	LS	$2,500.00	$7,500	
I	Concrete Curb 16"	200	LF	$20.00	$4,000	
J	Vegetated Swale	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	4	EA	$2,500.00	$10,000	
L	Concrete Sidewalk	100	SF	$1.00	$100	
M	Concrete Driveway Apron	0	SF	$10.00	$0	
N	Signing		EA	$300.00	$0	
O	Striping		LF	$3.00	$0	
P	Pavement Legends (thermoplastic)		EA	$300.00	$0	
Q	Striping Removal		LF	$5.00	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$36,980**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	0%			$0	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	20%			$7,396	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$7,396**	
V	Engineering	25%			$9,245	
W	COB Internal Charges	8%			$2,958	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	5%			$1,849	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$14,052	
	TOTAL ESTIMATED PROJECT COST				**$44,376**	

City of Bend CIP						
Greenwood Avenue at Hill Street Safety Mitigation		**Add Curb Extensions**				
Cost Estimate						
	MARK-UPS	**Percent**			**Prepared By:**	**Robin Lewis**
	ELEC/I&C	**0%**			**Proj. Manager:**	**Robin Lewis**
	MECHANICAL	**0%**			**Project No:**	**ST0614**
	ALLOWANCE	**0%**			**Date:**	**June 28, 2012**
	MOB/BOND/INS	**10%**				
	CONTINGENCY	**30%**				
	ENGINEERING	**25%**				Curb extensions at Hill Street (necessitates NE corner easement)
	CAPITALIZED INTEREST (BOND)	**0%**	COB PROVIDED			Adv. Stop
	COB INTERNAL CHARGES	**8%**	COB PROVIDED			Crosswalk markings
	OTHER COB COSTS	**0%**	COB PROVIDED			Illumination Changes
	ADMIN/LEGAL	**5%**	COB PROVIDED			

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	1	LS	$4,000.00	$4,000	
B	Work Zone TC	1	LS	$20,000.00	$20,000	
C	Erosion Control	1	LS	$1,000.00	$1,000	
D	Survey Staking	1	LS	$1,000.00	$1,000	
E	Asphalt Pavement Saw Cutting	580	LF	$1.00	$580	100 LF each corner; but NE corner = 220 LF 6' s/w; 280 LF curb/AC Cut; 2 d/w aprons; pkg stripes 150 LF;
F	Removal of surfacings	516	SY	$5.00	$2,578	
G	removal of curbs	580	LF	$2.00	$1,160	
H	Concrete inlet catchbasin with Sump	8	LS	$2,500.00	$20,000	
I	Concrete Curb 16"	580	LF	$20.00	$11,600	
J	driveway aprons	288	SF	$60.00	$17,280	
K	ADA Ramp (incl. truncated dome)	8	EA	$2,500.00	$20,000	
L	Concrete Sidewalk	3200	SF	$1.00	$3,200	
M	Concrete Driveway Apron	200	SF	$10.00	$2,000	
N	Signing	8	EA	$200.00	$1,600	xwalk ahead, stop for peds, walk zone, parking (2)
O	Striping (thermoplastic)	302	LF	$3.00	$906	adv 2' stop bars (20' each), sidestreet crosswalk (24' x 4), mainline crosswalk (9' long, 14 total bars)
P	Pavement Legends (thermoplastic)	8	EA	$300.00	$2,400	Look
Q	Illumination	2	EA	$5,000.00	$10,000	250 Watt
R	Parking striping	150	LF	$3.00	$450	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$119,754**	
S	Allowance	0%			$0	
T	Mob/Bond/Ins	10%			$11,975	
U	Capitalized Interest (Bond)	0%			$0	
V	Contingency	30%			$35,926	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$47,902**	
W	Engineering	25%			$29,938	
X	COB Internal Charges	8%			$9,580	
Y	Other COB Charges	0%			$0	
X	Admin/Legal	5%			$5,988	
AA	Property Costs (ROW/Easements)	1,500	EA	$ 15.00	$22,500	$15.00 per square foot x10' easement x 150 lf
AB	Utilities Costs	$0			$0	
AC	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$68,006	
	TOTAL ESTIMATED PROJECT COST				**$167,655**	

City of Bend CIP

Wilson & 2nd **Signal Queue Blocks Sight Lines**

Cost Estimate

MARK-UPS	Percent		
ELEC/I&C	0%		
MECHANICAL	0%		
ALLOWANCE	0%		
MOB/BOND/INS	0%		
CONTINGENCY	10%		
ENGINEERING	10%		
CAPITALIZED INTEREST (BOND)	0%	COB PROVIDED	
COB INTERNAL CHARGES	5%	COB PROVIDED	
OTHER COB COSTS	0%	COB PROVIDED	
ADMIN/LEGAL	3%	COB PROVIDED	

					Prepared By:	Robin Lewis
					Proj. Manager:	Robin Lewis
					Project No:	ST0614
					Date:	August 31, 2012

NO.	DESCRIPTION	QTY	UNIT	Unit Cost Unit $	TOTAL	RESOURCE
A	Mobilization	0	LS	$5,000.00	$0	
B	Work Zone TC	1	LS	$5,000.00	$5,000	
C	Clearing and Grubbing	0	LS	$3,000.00	$0	
D	Survey Staking	0	LS	$0.00	$0	
E	Asphalt Pavement Saw Cutting	0	LF	$1.00	$0	
F	Removal of surfacings	0	SY	$5.00	$0	
G	removal of curbs	0	LF	$2.00	$0	
H	Concrete inlet catchbasin with Sump	0	LS	$2,500.00	$0	
I	Concrete Curb 16"	0	LF	$20.00	$0	
J	Vegetated Swale	0	LF	$60.00	$0	
K	ADA Ramp (incl. truncated dome)	0	EA	$2,500.00	$0	
L	Concrete Sidewalk	0	SF	$1.00	$0	
M	Bright Side Strips	0	EA	$50.00	$0	
N	Signing	2	EA	$200.00	$400	do not block intersection EB reg. signal queue blocks sight lines NB Warning
O	Striping (thermoplastic)	2280	LF	$5.00	$11,400	
P	Pavement Legends (thermoplastic)	0	EA	$300.00	$0	
Q	Carbon Slurry Seal	0	EA	$2.60	$0	
	SUBTOTAL CONSTRUCTION QUANTITIES				**$16,800**	
R	Allowance	0%			$0	
S	Mob/Bond/Ins	0%			$0	
T	Capitalized Interest (Bond)	0%			$0	
U	Contingency	10%			$1,680	
	SUBTOTAL SOFT CONSTRUCTION COSTS				**$1,680**	
V	Engineering	10%			$1,680	
W	COB Internal Charges	5%			$840	
X	Other COB Charges	0%			$0	
Y	Admin/Legal	3%			$504	
Z	Property Costs (ROW/Easements)	$0			$0	
AA	Utilities Costs	$0			$0	
AB	Permit Fees	$0			$0	
	SUBTOTAL DESIGN, PERMITS AND ROW				$3,024	
	TOTAL ESTIMATED PROJECT COST				**$18,480**	

Appendix D Cost-Benefit Analysis Worksheets

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Arizona at Wall			Region:	IV	Date:	9/12/12
Project on Local Agency Facility Route Number:		Street Name:	Arizona	MP Range or Cross Street:	Wall		
Project on State Highway Route Number:		Hwy Name:	RINGS	MP From:		to	
Road Character:		Facility Type:	WAY				
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Adjust All Red Clearance Interval, add Dutch Bike lanes						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	Added visibility of the signal head, improved one-way signing; si	Angle, Head On	40%
Countermeasure 2	Improved one-way signage	Angle and Head On	20%
Countermeasure 3			
Countermeasure 4			

Collision Type	*Angle, Head On*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes	10	4.0	$47,500	=	$ 192,000
	PDO Crashes	2	0.8	$15,000	=	$ 12,000

Collision Type	*Angle and Head On*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.4	$47,500	=	$ 19,000
	PDO Crashes	2	0.4	$15,000	=	$ 6,000

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 29,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 46,000

Estimated Project Cost = $ 83,266

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 46,000 x 12.46 [2] = 6.88

$ 83,266

Notes

1 Composite crash reducion factor calculated if more than one countermeasure is applied

2 Select a PWF for the life of countermeasure. See instructions

3 PDO value is $7,500 per crash adjusted with an under reporting factor of 2.0. NationalSafety Council, 2005 estimates of value per crash.

4 Economic costs per crash are calculated using 2004-2006 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2007 dollars with GDP impicit

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Colorado at Bond			Region:	IV	Date:	9/12/12
Project on Local Agency Facility Route Number:		Street Name:	Colorado		MP Range or Cross Street:	Bond	
Project on State Highway Route Number:		Hwy Name:	PRINGS	MP From:		to	
Road Character:		Facility Type:	WAY				
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Improve visibility of the signal heads (yellow backplates; signal ahead warning sign; next signal signing; tree trimming; coordinated signals)						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	Added visibility of the signal head, improved one-way signing	Angle, Head On	40%
Countermeasure 2			
Countermeasure 3			
Countermeasure 4			

Collision Type	Angle, Head On	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes	9	3.6	$47,900	=	$ 172,000
	PDO Crashes	11	4.4	$15,000	=	$ 66,000

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes	0	0.0	$55,000	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,300
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,300
Other State Highway	$47,900	$55,300
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,469,000
Other State Highway	$840,000	$1,509,000

Total Crash Value for 60 Months = $ 238,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 48,000

Estimated Project Cost = $ 58,776

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 48,000 x 12.46 [2] / $ 58,776 = **10.18**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Brosterhous at 3rd		Region: IV	Date:	9/12/12
Project on Local Agency Facility Route Number:		Street Name: Brosterhous	MP Range or Cross Street: 3rd Street		
Project on State Highway Route Number:		Hwy Name: PRINGS	MP From:	to	
Road Character:		Facility Type: NAY			
County:		City:	Crash Data From: 1/1/2006	to	12/31/2010
Project Description:	Adjust All Red Clearance Interval, add 3.0-15				
Prepared By:	Robin Lewis		Title: Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	Adjust signal timng and phasing for rear end, RLR	Angle, Head On, Rear End	40%
Countermeasure 2	Convert to Exclusive Walk Phases	Ped angle	99%
Countermeasure 3			
Countermeasure 4			

Collision Type	*Angle, Head On, Rear End*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Tota Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - injury B & C Crashes	6	2.4	$47,900	=	$ 115,000
	PDO Crashes	11	4.4	$15,000	=	$ 66,000

Collision Type	*Ped angle*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Tota Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - injury B & C Crashes	1	1.0	$47,900	=	$ 47,000
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Tota Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Tota Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,440,000
Other State Highway	$840,000	$1,560,000

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

Total Crash Value for 60 Months = $ 228,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 46,000

Estimated Project Cost = $ 69,000

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 46,000 x 12.46 [2] = 8.31
$ 69,000

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Butler Market at 27th		Region: IV	Date:	9/10/12
Project on Local Agency Facility Route Number:		Street Name: 27th Street	MP Range or Cross Street: Butler Market		
Project on State Highway Route Number:		Hwy Name: IN	MP From:	to	
Road Character:		Facility Type:			
County:		City:	Crash Data From: 1/1/2006	to	12/31/2010
Project Description:	Convert permitted phasing to protected only phasing by changing signal head/timing. Add double arrow sign to NB span wire. Add bike lane EB				
Prepared By:	Robin Lewis		Title: Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	Convert to Protected only phasing from permitted	Angle	99%
Countermeasure 2	Add double headed arrow to span wire	Run off Road - Fixed Object	20%
Countermeasure 3	Add bike lane eastbound	Right turn rear end	20%
Countermeasure 4	Adjust All Red and Clearance Intervals	Angle	20%

Collision Type	*Angle*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Miror - Injury B & C Crashes	3	3.0	$47,900	=	$ 142,000
	PDO Crashes	2	2.0	$15,000	=	$ 30,000

Collision Type	*Run off Road - Fixed Object*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Miror - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	1	0.2	$15,000	=	$ 3,000

Collision Type	*Right turn rear end*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Miror - Injury B & C Crashes	1	0.2	$47,900	=	$ 10,000
	PDO Crashes	1	0.2	$15,000	=	$ 3,000

Collision Type	*Angle*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Miror - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	4	0.8	$15,000	=	$ 12,000

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 200,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 40,000

Estimated Project Cost = $ 56,560

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 40,000 x 12.46 [2] / $ 56,560 = **8.81**

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File Code: PRO 08 -_____-_____

OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Division at Revere		Region: IV	Date:	9/10/12
Project on Local Agency Facility					
Route Number:		Street Name: Revere Street Road Diet	MP Range or Cross Street: Division Street		
Project on State Highway					
Route Number:		Hwy Name: IN	MP From:	to	
Road Character:		Facility Type:			
County:		City:	Crash Data From: 1/1/2006	to	12/31/2011
Project Description:	Convert permitted phasing to protected only phasing by creating left turn lanes; road diets.				
Prepared By:	Robin Lewis		Title: Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1			
Countermeasure 2	Adjust All Red Phasing	RLR	40%
Countermeasure 3	Protected Only Phasing & Road Diet	L v. T	99%
Countermeasure 4			

Collision Type	*0*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	5	0.0	$47,900	=	$ -
	PDO Crashes	4	0.0	$15,000	=	$ -

Collision Type	*RLR*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.8	$47,900	=	$ 38,000
	PDO Crashes	5	2.0	$15,000	=	$ 30,000

Collision Type	*L v T*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	1.0	$840,000	=	$ 832,000
	Mod and Minor - Injury B & C Crashes	6	5.9	$47,900	=	$ 285,000
	PDO Crashes	14	13.9	$15,000	=	$ 208,000

Collision Type	*0*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 72 Months = $ 1,393,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 232,000

Estimated Project Cost = $ 158,259

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 232,000 x 12.46 [2] = **18.27**

$ 158,259

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Franklin at 3rd Street			Region:	IV	Date:	7/25/12
Project on Local Agency Facility							
Route Number:		Street Name:	Franklin Avenue		MP Range or Cross Street:	3rd Street	
Project on State Highway							
Route Number:		Hwy Name:	PRINGS	MP From:		to	
Road Character:		Facility Type:	WAY				
County:		City:		Crash Data From:	1/1/2006	to	1/1/2010
Project Description:	Install Dutch Bike Lane Design & Signal Upgrade for Angle/Rear End crashes & road diet -E-W						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Dutch Bike Lane Design	Right Turn Hooks	99%	No CMF Estimated***
Countermeasure 2	Angle Crashes at Signal/Rear End Crashes	Angle/Rear End	15%	clearing house
Countermeasure 3	Road Diet	All	29%	13.4.2.3
Countermeasure 4				

Collision Type	*Right Turn Hooks*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	3	3.0	$47,900	=	$ 142,000
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	*Angle/Rear End*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	0.2	$840,000	=	$ 126,000
	Mod and Minor - Injury B & C Crashes	13	2.0	$47,900	=	$ 93,000
	PDO Crashes	12	1.8	$15,000	=	$ 27,000

Collision Type	*All*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	14	4.1	$47,900	=	$ 194,000
	PDO Crashes	14	4.1	$15,000	=	$ 61,000

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,440,000
Other State Highway	$840,000	$1,540,000

Total Crash Value for 48 Months = $ 643,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 161,000

Estimated Project Cost = $ 259,256

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 161,000 x 12.46 [2] / $ 259,256 = **7.74**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Franklin at Wall Street		Region: IV	Date:	8/8/12
Project on Local Agency Facility Route Number:		Street Name: Franklin Avenue		MP Range or Cross Street:	Wall Street
Project on State Highway Route Number:		Hwy Name: IN	MP From:	to	
Road Character:		Facility Type:			
County:		City:	Crash Data From:	1/1/2006 to	12/31/2010
Project Description:	Signage, Signal timing and phasing audit and changes				
Prepared By:	Robin Lewis		Title:	Transportation Engineer	

		Collsion Type	Crash Reduction Factor	
Countermeasure 1	Signal Changes, Signs (eliminate SB Dedicated Right turn lane); sign no RTOR	Right turn Hooks with Bikes	39%	Preusser 1982
Countermeasure 2				
Countermeasure 3				
Countermeasure 4				

Collision Type	*Right turn Hooks with Bikes*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.8	$47,900	=	$ 37,000
	PDO Crashes	2	0.8	$15,000	=	$ 12,000

Collision Type	*0*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$479,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 49,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 10,000

Estimated Project Cost = $ 80,663

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 10,000 x 12.46 [2] = **1.54**

$ 80,663

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Neff Road at Purcell Boulevard		Region:	ODOT Region 4	Date: 7/11/12
Project on Local Agency Facility Route Number:		Street Name: Neff		MP Range or Cross Street:	Purcell
Project on State Highway Route Number:		Hwy Name: PRINGS		MP From:	to
Road Character:		Facility Type: WAY			
County:		City: Bend	Crash Data From:	1/1/2006	to 12/31/2010
Project Description:	RTOR, Protected Only Lefts, signing and striping; signal, timing, detection, phasing audit				
Prepared By:			Title:		

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Eliminate RTOR	RTOR with Bikes	39%	Preusser 1982 (bikes only)
Countermeasure 2	Protected only lefts	Permitted Lefts	99%	14.7.2.4 lefts only
Countermeasure 3				CMF
Countermeasure 4	Signal Timing, Detection and Phasing Audit	Red Light Running; Rear End	9%	

Collision Type	RTOR with Bikes	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.8	$47,900	=	$ 37,600
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	Permitted Lefts	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	2.0	$47,900	=	$ 95,600
	PDO Crashes	3	3.0	$15,000	=	$ 45,000

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	Red Light Running; Rear End	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	0.1	$840,000	=	$ 76,000
	Mod and Minor - Injury B & C Crashes	7	0.6	$47,900	=	$ 30,000
	PDO Crashes	14	1.3	$15,000	=	$ 19,000

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 302,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 60,000

Estimated Project Cost = $ 100,390

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 60,000 x 12.46 [2] = **7.45**

$ 100,390

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Powers at 3rd			Region:	IV	Date: 9/11/12
Project on Local Agency Facility						
Route Number:		Street Name: Powers		MP Range or Cross Street:	3rd Street	
Project on State Highway						
Route Number:		Hwy Name: PRINGS		MP From:		to
Road Character:		Facility Type: WAY				
County:		City:		Crash Data From:	1/1/2006	to 12/31/2010
Project Description:	Adjust All Red Clearance Interval, add R10-15					
Prepared By:	Robin Lewis			Title:	Transportation Engineer	

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Adjust Signal Timing, phasing and detection incl. all red	Angle, Head On	40%	
Countermeasure 2	Controller Timing to create exclusive walk phase	Ped angle	99%	14A-5 HSM +T
Countermeasure 3				
Countermeasure 4				

Collision Type	Angle, Head On	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	0.4	$840,000	=	$ 336,000
	Mod and Minor - Injury B & C Crashes	16	6.4	$47,900	=	$ 307,000
	PDO Crashes	16	6.4	$15,000	=	$ 96,000

Collision Type	Ped angle	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	2.0	$47,900	=	$ 95,000
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 834,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 167,000

Estimated Project Cost = $ 65,856

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 167,000 x 12.46 [2] = 31.60

$ 65,856

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Reed Market at 3rd Street			Region:	IV	Date:	9/12/12
Project on Local Agency Facility							
Route Number:		Street Name:	ReedMarket		MP Range or Cross Street:	3rd Street	
Project on State Highway							
Route Number:		Hwy Name:	RINGS		MP From:		to
Road Character:		Facility Type:	WAY				
County:		City:			Crash Data From:	1/1/2006	to 12/31/2010
Project Description:	Adjust All Red Clearance Interval, add Dutch Bike lanes						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	Adjust All Red Clearance Interval	Angle, Head On	40%
Countermeasure 2	Add Dutch Bike Lanes	Right turn hook (bike and ped)	99%
Countermeasure 3			
Countermeasure 4			

Collision Type	*Angle, Head On*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	0.4	$840,000	=	$ 336,000
	Mod and Minor - Injury B & C Crashes	3	1.2	$47,900	=	$ 57,000
	PDO Crashes	13	5.2	$15,000	=	$ 78,000

Collision Type	*Right turn hook (bike and ped)*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	1.0	$840,000	=	$ 832,000
	Mod and Minor - Injury B & C Crashes	1	1.0	$47,900	=	$ 47,000
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$55,000	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [1]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 1,350,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 270,000

Estimated Project Cost = $ 183,538

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 270,000 x 12.46 [2] = **18.33**

$ 183,538

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	27th at Reed Market			Region:	IV	Date:	9/10/12
Project on Local Agency Facility Route Number:		Street Name:	27th Street	MP Range or Cross Street:	Reed Market		
Project on State Highway Route Number:		Hwy Name:	IN	MP From:		to	
Road Character:		Facility Type:					
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Convert permitted phasing to protected only phasing bychanging signal head/timing. Convert to arrow heads EB with Lane Assignment signs						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Convert to Protected only phasing from permitted	Angle	99%	CMF
Countermeasure 2	Convert to Arrow heads EB with Laneassignment signs	Run off Road - Fixed Object	20%	est
Countermeasure 3				
Countermeasure 4				

Collision Type	Angle	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	2	2.0	$840,000	=	$ 1,663,000
	Mod and Minor - Injury B & C Crashes	2	2.0	$47,900	=	$ 95,000
	PDO Crashes	1	1.0	$15,000	=	$ 15,000

Collision Type	Run off Road - Fixed Object	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	3	0.6	$47,900	=	$ 29,000
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 1,802,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 360,000

Estimated Project Cost = $ 96,740

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 360,000 x 12.46 [2] = **46.37**

$ 96,740

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	**Franklin at 1st Street Crash Mitigation**		Region:	**IV**	Date:	**7/23/12**
Project on Local Agency Facility						
Route Number:		Street Name: **Franklin Avenue**		MP Range or Cross Street:		
Project on State Highway						
Route Number:		Hwy Name: **PRINGS**	MP From:		to	
Road Character:		Facility Type: **WAY**				
County:		City: **Bend**	Crash Data From:	**1/1/2006**	to	**12/31/2010**
Project Description:	**Road Diet to eliminate 2 to 5 road widening without proper tapers; project will sequentially organize 2 to 3 to 5 lane widening and accommodate**					
Prepared By:	**Robin Lewis**		Title:	**Transportation Engineer**		

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Road Diet	All	29%	hsm 13.4.2.3
Countermeasure 2				
Countermeasure 3				
Countermeasure 4				

Collision Type	All	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	3	0.9	$47,900	=	$ 42,000
	PDO Crashes	1	0.3	$15,000	=	$ 4,000

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Total Crash Value for 60 Months = $ 46,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 9,000

Estimated Project Cost = $ 207,531

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = $ 9,000 x 12.46 [2] / $ 207,531 = **0.54**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Awbrey at Portland		Region: IV	Date:	9/10/12
Project on Local Agency Facility Route Number:		Street Name: Portland	MP Range or Cross Street: Awbrey		
Project on State Highway Route Number:		Hwy Name: IN	MP From:	to	
Road Character:		Facility Type:			
County:		City:	Crash Data From: 1/1/2006	to	12/31/2010
Project Description:	Do not block intersection regulatory/signal blocks sight lines warning				
Prepared By:	Robin Lewis		Title: Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	mini roundabout, illumination, marked crosswalks	all	78%
Countermeasure 2			
Countermeasure 3			
Countermeasure 4			

Collision Type	all	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	6	4.7	$47,900	=	$ 224,000
	PDO Crashes	5	3.9	$15,000	=	$ 59,000

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	3	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 283,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 57,000

Estimated Project Cost = $ 98,883

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 57,000 x 12.46 [2] = **7.18**

$ 98,883

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Bear Creek at Pettigrew			Region:	IV	Date:	9/10/12
Project on Local Agency Facility							
Route Number:		Street Name:	Bear Creek		MP Range or Cross Street:	Pettigrew	
Project on State Highway							
Route Number:		Hwy Name:	IN	MP From:		to	
Road Character:		Facility Type:					
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Awareness of Stop Sign - Northbound and Westbound						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	stop sign compliance/awareness	Angle	50%
Countermeasure 2			
Countermeasure 3			
Countermeasure 4			

Collision Type	Angle	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	1	0.5	$840,000	=	$ 420,000
	Mod and Minor - Injury B & C Crashes	8	4.0	$47,900	=	$ 192,000
	PDO Crashes	6	3.0	$15,000	=	$ 45,000

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	3	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Collision Type	0	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
	PDO [3]	
All facilities	$15,000	$15,000
	Moderate (Injury B) and Minor (Injury C) Injury [4]	
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
	Fatal and Severe (Injury A) Injury [4]	
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 657,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 131,000

Estimated Project Cost = $ 6,820

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 131,000 x 12.46 [2] / $ 6,820 = 239.33

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Country Club at Murphy			Region:	IV	Date:	9/18/12
Project on Local Agency Facility							
Route Number:		Street Name:	Country Club		MP Range or Cross Street:	Murphy	
Project on State Highway							
Route Number:		Hwy Name:	IN	MP From:		to	
Road Character:		Facility Type:					
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Awareness of Stop Sign - Northbound						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	stop sign compliance/awareness	Angle	50%
Countermeasure 2			
Countermeasure 3			
Countermeasure 4			

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*Angle*					
	Fatal and Severe - Fat & Inj A Crashes	1	0.5	$840,000	=	$ 420,000
	Mod and Minor - Injury B & C Crashes	1	0.5	$47,900	=	$ 24,000
	PDO Crashes	0	0.0	$15,000	=	$ -

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
	PDO [3]	
All facilities	$15,000	$15,000
	Moderate (Injury B) and Minor (Injury C) Injury [4]	
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
	Fatal and Severe (Injury A) Injury [4]	
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 444,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 89,000

Estimated Project Cost = $ 6,160

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = $ 89,000 x 12.46 [2] / $ 6,160 = **180.02**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Greenwood at 1st			Region:	IV	Date:	9/13/12
Project on Local Agency Facility Route Number:		Street Name:	Greenwood Avenue		MP Range or Cross Street:	1st	
Project on State Highway Route Number:		Hwy Name:	PRINGS	MP From:		to	
Road Character:		Facility Type:	WAY				
County:		City:		Crash Data From:	1/1/2006	to	1/1/2010
Project Description:	Curb Extensions						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Curb Extensions	Angle	20%	NO CMF - estimated based on improved
Countermeasure 2				
Countermeasure 3				
Countermeasure 4				

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*Angle*					
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$1,500,000	= $	-
	Mod and Minor - Injury B & C Crashes	1	0.2	$47,900	= $	10,000
	PDO Crashes	4	0.8	$15,000	= $	12,000
Collision Type	*0*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	= $	-
	Mod and Minor - Injury B & C Crashes	3	0.0	$47,900	= $	-
	PDO Crashes	2	0.0	$15,000	= $	-
Collision Type	*0*	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	= $	-
	Mod and Minor - Injury B & C Crashes	2	0.0	$47,900	= $	-
	PDO Crashes	4	0.0	$15,000	= $	-
Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$1,500,000	= $	-
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	= $	-
	PDO Crashes		0.0	$15,000	= $	-

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO [3]		
All facilities	$15,000	$15,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate	$650,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 48 Months = $ 22,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 6,000

Estimated Project Cost = $ 44,376

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 6,000 x 12.46 [2] = $ 44,376 = **1.68**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Greenwood Hill		Region:	IV	Date: 7/23/12
Project on Local Agency Facility Route Number:		Street Name: Greenwood Avenue		MP Range or Cross Street: Hill Street	
Project on State Highway Route Number:		Hwy Name: PRINGS	MP From:		to
Road Character:		Facility Type: WAY			
County:		City:	Crash Data From:	1/1/2006	to 1/1/2010
Project Description:	Curb Extensions				
Prepared By:	Robin Lewis		Title:	Transportation Engineer	

		Collision Type	Crash Reduction Factor	
Countermeasure 1	Curb Extensions	Ped Crossing	20%	NO CMF - estimated based on improved
Countermeasure 2	Illumination on Curb Extensions	all night	38%	cmf
Countermeasure 3	Curb Extensions	sidestreet due to visibility	10%	NO CMF - estimated based o
Countermeasure 4				

Collision Type	Ped Crossing	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	1	0.2	$47,900	=	$ 10,000
1 rear end (did not ht ped)	PDO Crashes	1	0.2	$15,000	=	$ 3,000

Collision Type	all night	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.8	$47,900	=	$ 36,000
	PDO Crashes	1	0.4	$15,000	=	$ 6,000

Collision Type	sidestreet due to visibility	Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	2	0.2	$47,900	=	$ 10,000
	PDO Crashes	3	0.3	$15,000	=	$ 5,000

Collision Type		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
	PDO [3]	
All facilities	$15,000	$15,000
	Moderate (Injury B) and Minor (Injury C) Injury [4]	
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
	Fatal and Severe (Injury A) Injury [4]	
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 48 Months = **$ 70,000**

Annual Benefits = Total Crash Value / Total Months / 12 = **$ 18,000**

Estimated Project Cost = **$ 167,655**

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 18,000 x 12.46 [2] = $ 167,655 = **1.34**

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OREGON DEPARTMENT OF TRANSPORTATION
HIGHWAY SAFETY PROJECTS
BENEFIT/COST ANALYSIS WORKSHEET

Project Name:	Wilson at 2nd			Region:	IV	Date:	9/10/12
Project on Local Agency Facility							
Route Number:		Street Name:	Wilson		MP Range or Cross Street:	2nd	
Project on State Highway							
Route Number:		Hwy Name:	IN	MP From:		to	
Road Character:		Facility Type:					
County:		City:		Crash Data From:	1/1/2006	to	12/31/2010
Project Description:	Do not block intersection regulatory/signal blocks sight lines warning						
Prepared By:	Robin Lewis			Title:	Transportation Engineer		

		Collision Type	Crash Reduction Factor
Countermeasure 1	do not block intersection	Angle	50%
Countermeasure 2			
Countermeasure 3			
Countermeasure 4			

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*Angle*					
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	5	2.5	$47,900	=	$ 120,000
	PDO Crashes	4	2.0	$15,000	=	$ 30,000

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes	0	0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes	0	0.0	$47,900	=	$ -
	PDO Crashes	0	0.0	$15,000	=	$ -

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

		Number of Crashes	Number of Preventable Crashes	Economic Value per Crash		Total Economic Value
Collision Type	*0*					
	Fatal and Severe - Fat & Inj A Crashes		0.0	$840,000	=	$ -
	Mod and Minor - Injury B & C Crashes		0.0	$47,900	=	$ -
	PDO Crashes		0.0	$15,000	=	$ -

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
	PDO [3]	
All facilities	$15,000	$15,000
	Moderate (Injury B) and Minor (Injury C) Injury [4]	
Interstate	$48,900	$54,800
Other State Highway	$47,900	$55,000
	Fatal and Severe (Injury A) Injury [4]	
Interstate	$850,000	$1,460,000
Other State Highway	$840,000	$1,500,000

Total Crash Value for 60 Months = $ 150,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 30,000

Estimated Project Cost = $ 18,480

Uniform Series Present Worth Factor (5%)	
10 years	20 years
7.72	12.46

B/C Ratio = Annual Benefits X Present Worth Factor (10 or 20 years) / Estimated Project Cost

B/C Ratio = $ 30,000 x 12.46 [2] / $ 18,480 = **20.23**