

All Roads Transportation Safety (ARTS) Hot Spot Program

ODOT Region 4 Final Results Meeting
May 19, 2015

Agenda

- Introductions
- Purpose of the Meeting
 - Review Process and Present Final 300% List
- Project Overview & Summary
- Final 300% List and Report
- Next Steps
- Lessons Learned





Project Overview and Summary



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ARTS Program Goals

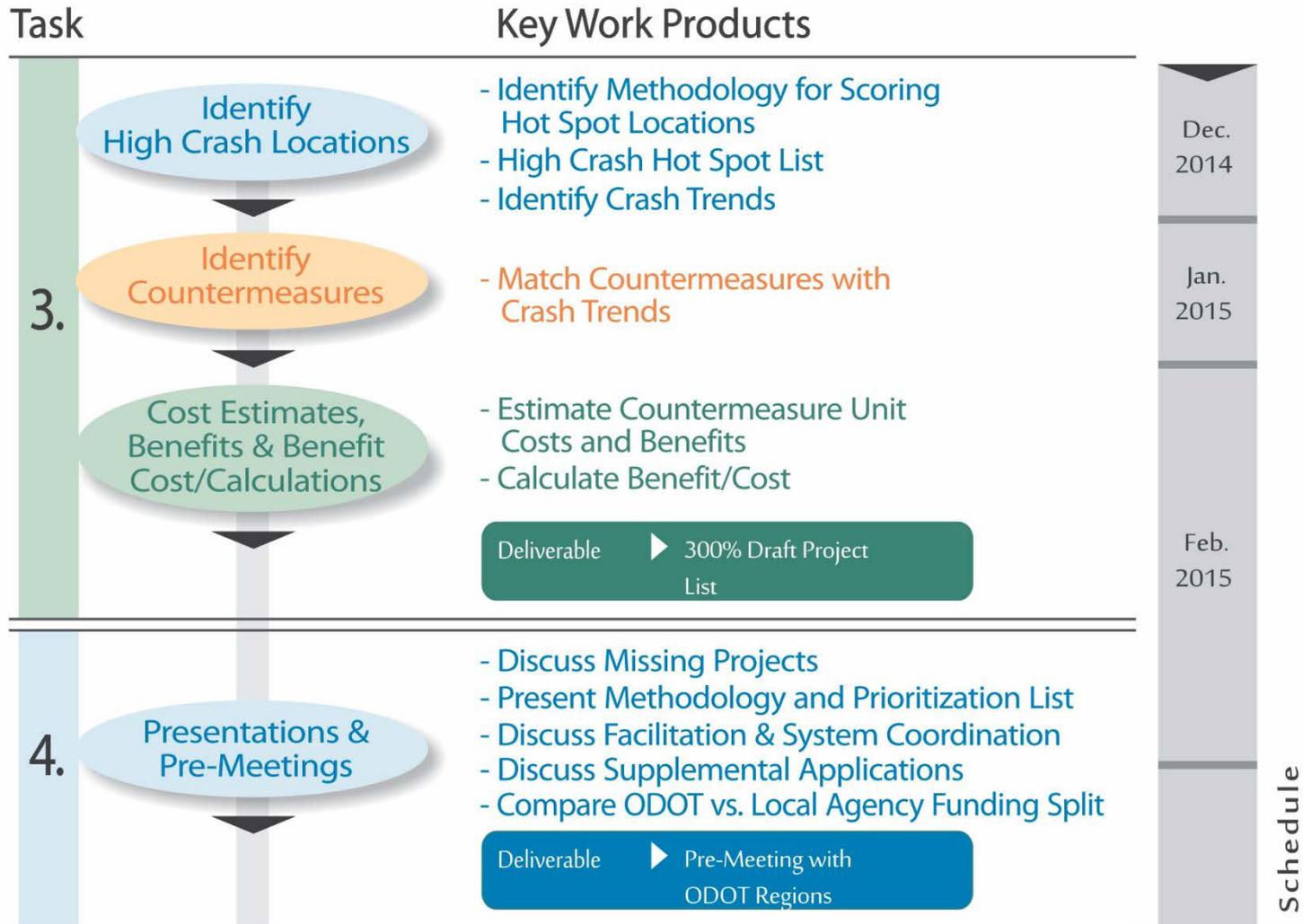
- Select the best projects to reduce fatalities and serious injuries
- Address safety on all roads
- Data-driven and blind to jurisdiction



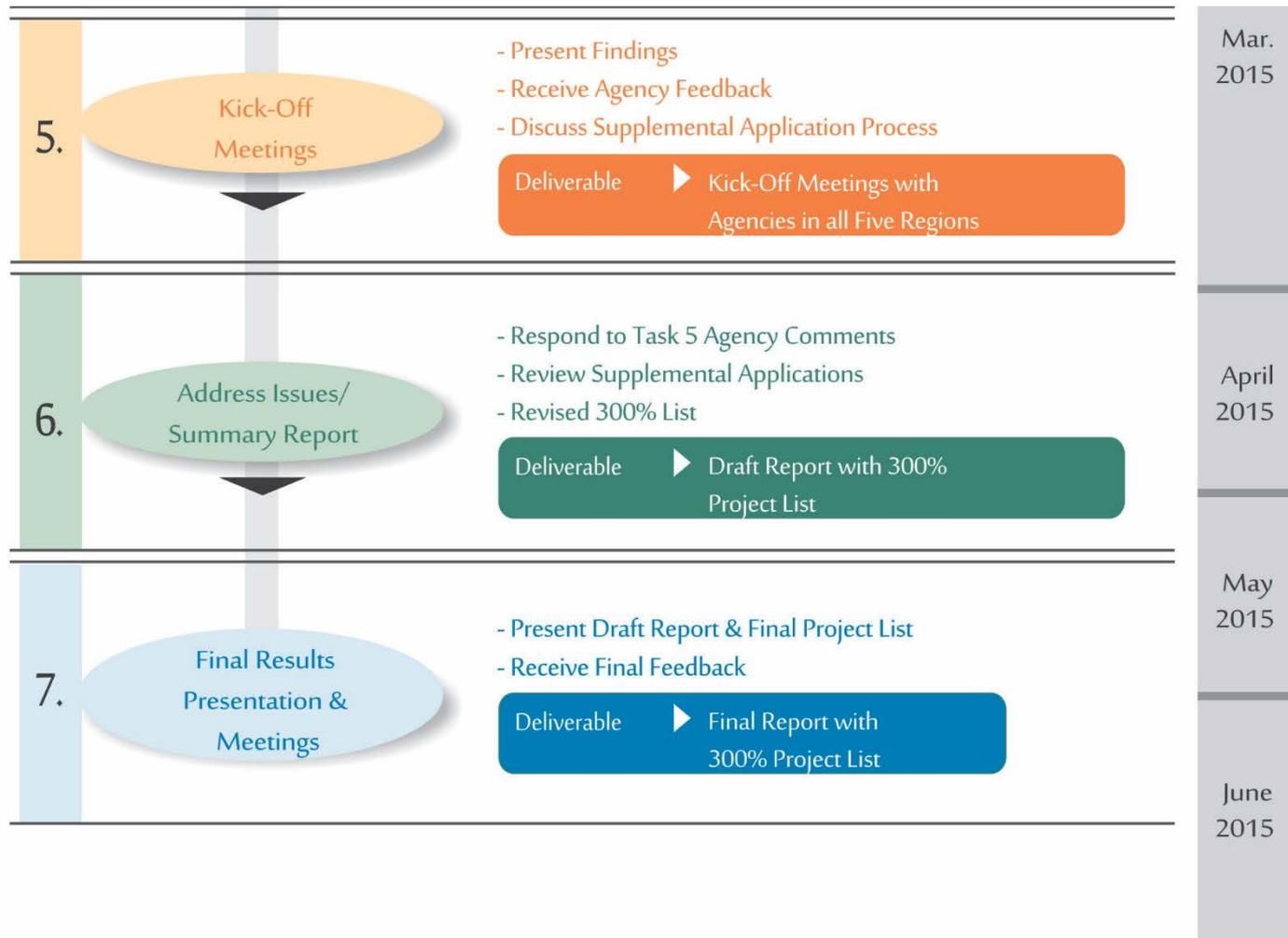
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ARTS Process and Timeline



ARTS Process and Timeline



ODOT Crash Data

- ARTS Hot Spot analysis based on ODOT Collision Records
- 5 Years of crash Data (2009 – 2013)
- ODOT data unbiased and consistent
- No additional collision data considered for hot spot analysis

Crash ID	Crash Year	Street Number	Nearest Intersecting Street Number	Collision Type	Crash Severity	Weather Condition	Road Surface Condition	Light Condition
1355116	2009	810	5209	3	5	2	2	1
1399940	2010	810	5209	9	5	1	4	2
1374464	2010	810	933	1	4	1	1	1
1403260	2011	810	5185	3	4	1	1	2
1421960	2011	810	5185	3	5	1	1	1
1309863	2008	810	5209	6	5	6	3	1
1231845	2007	810	933	3	5	1	1	1
1233602	2007	810	933	3	5	1	1	1



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Hot Spot Identification

- Only considered locations with at least one Fatal or Injury A crash
- Used 250' radius in urban setting and 500' radius in Rural setting
- Created initial ranking based on ODOT SPIS severity calculation

Severity Scoring Assumptions

- 100 points for Fatal or Injury A
- 10 points for Injury B or Injury C
- 1 point for Property Damage Only



Countermeasures

- Used ODOT's Approved Crash Reduction Factor List
- Countermeasures split into 4 categories:
 - Hot Spot
 - Intersection Systemic
 - Bike/Pedestrian Systemic
 - Roadway Departure Systemic

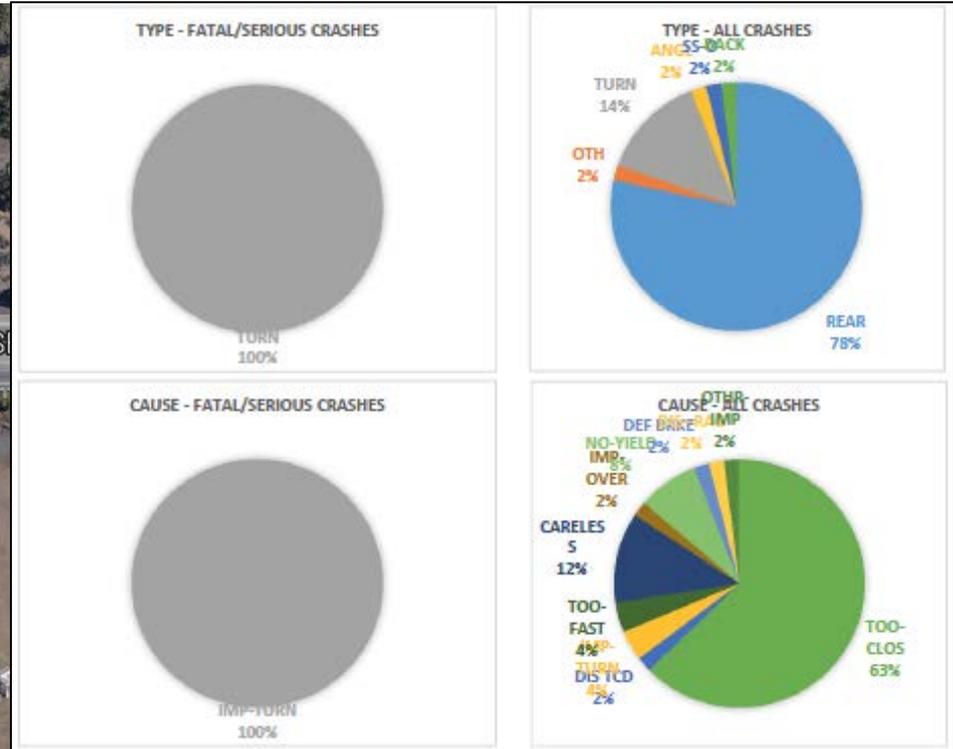


Systemic or Hotspot	Consider for Hotspot	Countermeasure Number	Countermeasure	Crash Type	Injury, PDO or All	Service Life (Yea)	Existing Intersection Traffic Control	Urban or Rural	CRF %
Hotspot	N/A	H1	Median U-Turn Intersection Treatment	All	All Injury	20	Signal or Non Signal	Either	30
Hotspot	N/A	H4	Right Turn Lane on Single Major Road Approaches: Signalized Intersection (3- or 4-leg)	All	All	20	Signal	Either	4
	N/A	H5	Right Turn Lane on Both Major Road Approaches: Signalized Intersection (3- or 4-leg)	All	All	20	Signal	Either	8
Hotspot	N/A	H6	Channelized Right Turn Lane with Raised Median	All	All	20	Signal or Non Signal	Either	35
Hotspot	N/A	H11	Left Turn Lane on Single Major Road Approach: Urban, Signalized Intersection (3-leg)	All	All	20	Signal	Urban	7
	N/A	H12	Left Turn Lane on Both Major Road Approaches: Urban, Signalized Intersection (4-leg)	All	All	20	Signal	Urban	19



Countermeasure Identification

- Evaluated crash trends at each location to determine appropriate countermeasures



Cost Estimates

- Develop standard cost for each countermeasure, including:
 - 66% Markup for Design, Contingency and Temporary Traffic Control
 - 30% Markup for HAZMAT Mitigation (countermeasures that involve earthwork)
- Adjusted cost based on specific location characteristics that are not included in standards cost estimate

ID	Name	Unit	Traffic Cost	Civil Cost	Markup	R/W	HAZMAT	Total
H1	Median U-Turn Intersection Treatment	EA		\$ 275,000	\$ 181,500	\$ 20,000	\$ 82,500	\$ 559,000.00
H2	Right turn lane for single major road approach, unsignalized	EA	\$ 2,000	\$ 87,000	\$ 58,740	\$ 17,186	\$ 26,100	\$ 192,000.00
H3	Right turn lane for both major road approach, unsignalized	INT (2 approaches)	\$ 4,000	\$ 174,000	\$ 117,480	\$ 34,373	\$ 52,200	\$ 383,000.00
H4	Right turn lane on single major road approach, signalized	EA	\$ 84,000	\$ 81,000	\$ 108,900	\$ 23,008	\$ 24,300	\$ 322,000.00
H5	Right turn lane on both major road approach, signalized	INT (2 approaches)	\$ 168,000	\$ 162,000	\$ 217,800	\$ 46,015	\$ 48,600	\$ 643,000.00
H6	Channelized right turn lane w/raised median	EA	\$ 104,000	\$ 436,000	\$ 356,400	\$ 53,325	\$ 130,800	\$ 1,081,000.00
H7	Left turn lane on single major road approach, urban, unsignalized	EA	\$ 2,000	\$ 321,000	\$ 213,180	\$ 117,740	\$ 96,300	\$ 751,000.00
H8	Left turn lane on both major road approach, urban, unsignalized	INT (2 approaches)	\$ 4,000	\$ 642,000	\$ 426,360	\$ 235,480	\$ 192,600	\$ 1,501,000.00
H9	Left turn lane on single major road approach, rural, unsignalized	EA	\$ 2,000	\$ 410,000	\$ 271,920	\$ 89,816	\$ 123,000	\$ 897,000.00
H10	Left turn lane on both major road approach, rural, unsignalized	INT (2 approaches)	\$ 4,000	\$ 667,000	\$ 442,860	\$ 179,632	\$ 200,100	\$ 1,494,000.00
H11	Left turn lane on single major road approach, urban, signalized	EA	\$ 150,000	\$ 321,000	\$ 310,860	\$ 117,740	\$ 96,300	\$ 996,000.00



Benefit/Cost Ranking

- Utilized ODOT's Benefit/Cost Calculation Spreadsheet (see ARTS website)
- Projects Ranked Based on Benefit/Cost Ratio
- Combined Benefit/Cost Ratio when Multiple Countermeasures Proposed



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

Project Name: Region: Date:

Project on Local Agency Facility

Route Number: Street Name: MP Range or Cross Street:

Project on State Highway

Route Number: Hwy Name: MP From: To:

Road Character: Facility Type:

County: City: Crash Data From: To:



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Final 300% List and Report



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Final 300% List

- Please review proposed projects
- Last chance for additional comments to get incorporated (all comments by June 1st)
- Reminder: Local match of 7.78% is required



Final 300% List: Example

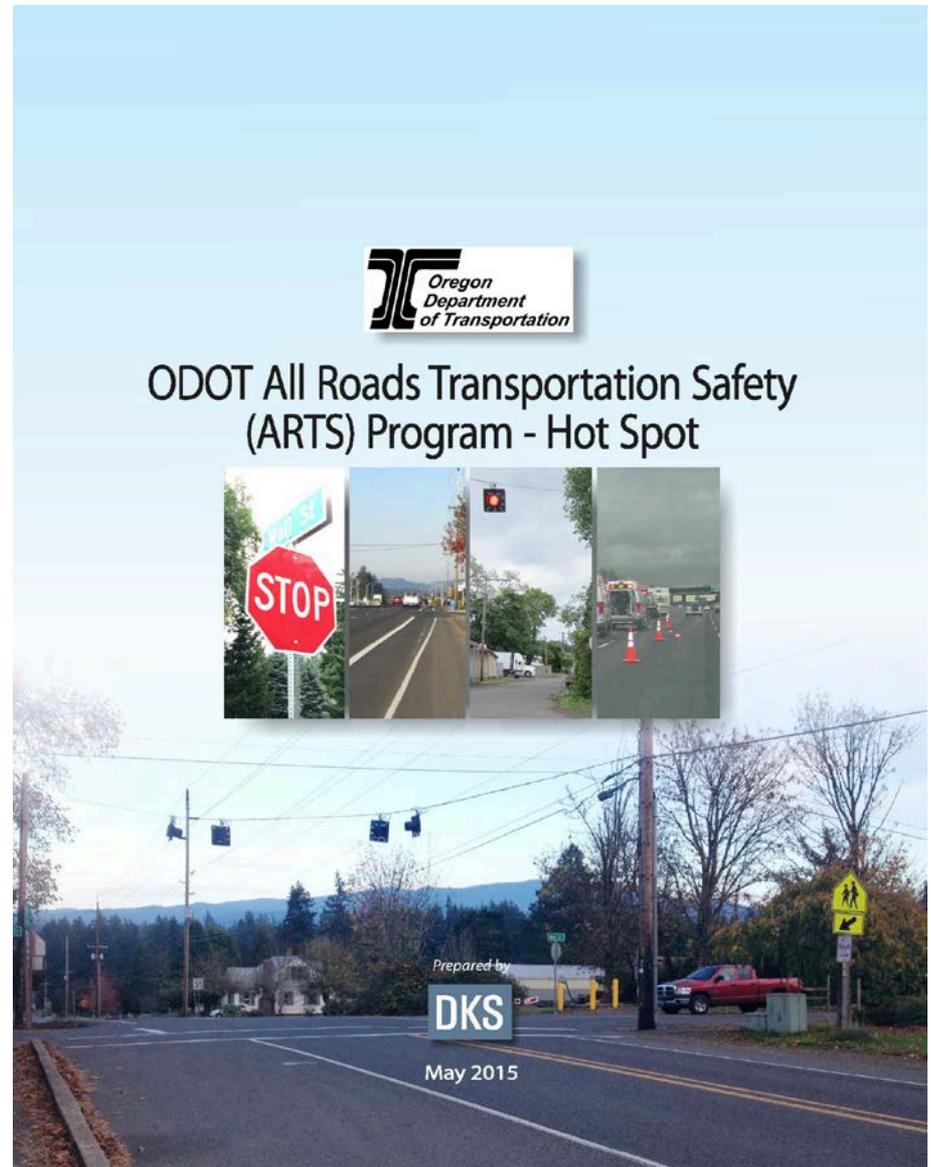
Rank	Location ID	Jurisdiction	Location Description	Group	Cost	Benefit	B/C Ratio	Countermeasures
17	5	City of Bend	REED MARKET RD @ S 3RD ST	1	\$ 688,000	\$ 3,793,000	5.5	I1 - Install Lighting at Intersection I2 - Improve Signal Hardware: Lenses, ReflectORIZED Back plates, Size, and Number BP3 - Install Urban Leading Pedestrian or Bicycle Interval at Signalized Intersection H27 - Install Any Type of Median Barrier

Local Match Calculation:
 $\$688,000 * 7.78\% = \$53,500$



Final Report

- Hard copies are available or you can request a digital version





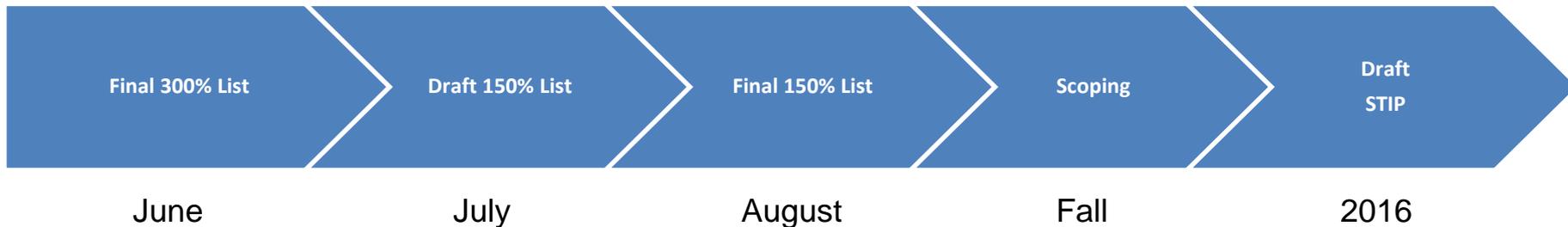
Next Steps and Lessons Learned



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Next Steps

- Final Report and Project List (June)
- Scoping this fall
 - Need to confirm support for local match
- Projects included in STIP in 2016



Scoping

- Region staff will be coordinating project scoping of the final 150% project list
- Scoping will include local agency involvement where applicable
- Countermeasures will be confirmed and cost estimates will be refined



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Scoping

- Local match will be re-evaluated based on revised cost estimate
- Local agencies will provide final direction to ODOT for projects under their jurisdiction

Item	Quantity	Cost/Unit	Total Cost
Reflectorized Back Plates	27	\$250	\$6,750
Enforcement Assisted Lights for Red Light Running	12	\$350	\$4,200
Modify Protective-Permissive Phasing to FYA at Neff/Purcell	2	\$1,100	\$2,200
Structural Analysis of Signal Poles	2	\$700	\$1,400
Pedestrian Countdown Timers	8	\$600	\$4,800
Accessible Pedestrian Pushbutton	8	\$750	\$6,000
Pedestrian Pushbutton Control Unit	1	\$2,500	\$2,500
Subtotal:			\$28,000
Contingency (10%):			\$2,800
10% Construction Engineering (CE):			\$2,800
10% Mobilization:			\$2,800
10% Temporary Protection and Direction of Traffic (TP & DT):			\$2,800
30% Design and Delivery Cost (PE):			\$8,400
Total:			\$47,600
Original Estimate Provided in HSIP Report:			\$65,000
Difference:			-\$17,400



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Lessons Learned/Agency Feedback

- The final report incorporates some of the feedback/lessons learned through this process
 - Hot Spot Identification
 - HSM Predictive Method
 - Countermeasure List
 - Benefit Calculations
- Any additional thoughts?



Questions?

- Additional information on ARTS website:

<http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/Pages/ARTS.aspx>



Benefit/Cost Calculation Example

Countermeasure 1
Countermeasure 2
Countermeasure 3

Countermeasure 1	112
Countermeasure 2	110
Countermeasure 3	

Fatal Crash Reduction Factor	Injury Crash Reduction Factor	PDO Crash Reduction Factor
25%	25%	25%
48%	48%	
61%	61%	25%

Do not enter a CRF value for PDO Crashes if a countermeasure targets "All Injury" crashes only.

	Number of Crashes	Number of Preventable	Economic Value per	Total Economic Value
Fatal Crashes	1	0.6	\$1,680,000	= \$ 1,025,000
Severe (Injury A) Injury Crashes	1	0.6	\$1,680,000	= \$ 1,025,000
Moderate (Injury B) Injury Crashes	1	0.6	\$81,900	= \$ 50,000
Minor (Injury C) Injury Crashes	4	2.4	\$81,900	= \$ 200,000
PDO Crashes	8	2.0	\$19,400	= \$ 39,000

Comprehensive Economic Value per Crash		
Highway Type	Urban	Rural
PDO ³		
All facilities	\$19,400	\$19,400
Moderate (Injury B) and Minor (Injury C) Injury ⁴		
Interstate	\$69,300	\$79,200
Other State Highway	\$70,600	\$81,900
Off System	\$72,400	\$83,900
Fatal and Severe (Injury A) Injury ⁴		
Interstate	\$1,150,000	\$2,330,000
Other State Highway	\$1,170,000	\$1,680,000
Off System	\$870,000	\$1,670,000

Uniform Series Present Worth Factor (5%)		
5 years	10 years	20 years
4.33	7.72	12.46

Total Crash Value for 60 Months = \$ 2,339,000

Annual Benefits = $\frac{\text{Total Crash Value}}{\text{Total Months} / 12}$ = \$ 468,000

Estimated Project Cost = \$ 400,000

B/C Ratio = $\frac{\text{Annual Benefits} \times \text{Present Worth Factor (10 or 20 years)}}{\text{Estimated Project Cost}}$

B/C Ratio = $\frac{\$ 468,000 \times 7.72}{\$ 400,000}$ = 9.03

