APPENDIX I

Alternatives Evaluation Summary for Intersections

Alternatives Cost Estimates

Alternatives Benefit/Cost Analysis Worksheets

OR 22 (W) Expressway Management Plan

Project Management Team Evaluation

As of: December 2007

● Directly/positively meets intent of criterion ◖ Partially meets intent of criterion ○ Does not support intent of criterion N/A Not applicable—neither meets/doesn't meet intent of criterion

	OR 22/OR 51 Interchange Alternatives				Doaks Ferry Road Alternatives			Greenwood Road Alternatives			
Evaluation Criteria —Features —Measures	**INH-3: Standard Diamond Interchange**	**INH-4: Tight Diamond Interchange**	**INH-5: Parclo-B**	**INH-6: Parclo-B Single Quadrant (WB to SB Loop)**	**DFR-2: Relocated Access Option—Riggs Street and RI only at DFR**	**DFR-4: Spring Street Undercrossing Option**	**DFR-7: Eastbound Access Option--center turn refuge; LI/RI/RO**	**GWR-3: Barrier median; RI/RO only**	**GWR-4a: Grade separate w/ WB RI/RO**	**GWR-4b: Grade separate w/o OR 22 access**	**GWR-6: Offset Dual "T" Intersections**
Mobility	◖	◖	●	◖	◖	●	◖	●	●	●	◖
—improves future flow —OHP standard for volume to capacity ratio	–Would require signalization of the ramp terminals to meet design mobility standards	–Would require signalization of the ramp terminals to meet design mobility standards	–Best accommodates the critical EB and WB left-turn movements at the ramp terminals under unsignalized conditions	–Would require signalization of the EB ramp terminal to meet the design mobility standard	–Does not eliminate the critical EB to NB left-turn which is forecast to operate above capacity through the 2030 horizon year.	–Eliminates need for center turn refuge for EB to left-in access	–Does not eliminate the critical EB to NB left-turn which is forecast to operate above capacity through the 2030 horizon year.	–Satisfies standard.	– Satisfies standard	– Satisfies standard	– Creates additional turning movements –Satisfies standard
Access Management	●	●	●	●	◖	◖	◖	●	●	●	◖
—fewer conflict points —spacing standards between ramps, public roads, and driveways	–Grade separated interchanges are consistent with the access management policy for Expressways.	–Grade separated interchanges are consistent with the access management policy for Expressways.	–Grade separated interchanges are consistent with the access management policy for Expressways.	–Grade separated interchanges are consistent with the access management policy for Expressways.	–Consistent with access management goals which call for highly controlled public road connections –Meets access spacing standards	–Consistent with access management goals which call for highly controlled public road connections –Meets access spacing standards	–Consistent with access management goals which call for highly controlled public road connections –Meets access spacing standards	–Consistent with access management goals which call for highly controlled public road connections.	–Consistent with access management goals which call for highly controlled public road connections. –Reduces conflict points from 40 to 2	–Goes above and beyond the access management standards by completely eliminating access to OR 22 –Best supports function of expressway.	–Not entirely consistent with access management goals. –Does not reduce conflict points but moves some to a different location.
Connectivity	●	●	●	●	◖	●	◖	○	●	◖	●
—direct, efficient access to industries and businesses —optional routes	–Connection to system of local frontage and backage roads provides access and optional routes	–Connection to system of local frontage and backage roads provides access and optional routes	–Connection to system of local frontage and backage roads provides access and optional routes	–Connection to system of local frontage and backage roads provides access and optional routes	–Eliminates SB to EB left turn, which is a minor move –Provides connection to local system on north side of highway –U-turn lane WB to EB provides optional route	–Provides access to properties on both sides of highway –Provides connections to local system on both sides of highway	–Eliminates SB to EB left turn, which is a minor move –Provides connection to local system on north side of highway –U-turn lane WB to EB provides optional route	–Eliminates north-south connectivity for farm equipment and school buses –Mitigation would be overcrossing at other location or improve informal farm equipment undercrossing at Derry (next to RR)	–Provides an efficient grade separated north/south crossing of OR 22 while still accommodating WB access to/from the highway. Will facilitate OR 22 detour route if there are problems on the highway.	–Provides an efficient grade separated north/south crossing of OR 22, but does not provide direct access to the highway	–Accommodates WB and EB access to/from the highway. Will facilitate OR 22 detour route if there are problems on the highway.

	OR 22/OR 51 Interchange Alternatives				Doaks Ferry Road Alternatives			Greenwood Road Alternatives			
Evaluation Criteria **—Features** **—Measures**	**INH-3: Standard Diamond Interchange**	**INH-4: Tight Diamond Interchange**	**INH-5: Parclo-B**	**INH-6: Parclo-B Single Quadrant (WB to SB Loop)**	**DFR-2: Relocated Access Option—Riggs Street and RI only at DFR**	**DFR-4: Spring Street Undercrossing Option**	**DFR-7: Eastbound Access Option--center turn refuge; LI/RI/RO**	**GWR-3: Barrier median; RI/RO only**	**GWR-4a: Grade separate w/ WB RI/RO**	**GWR-4b: Grade separate w/o OR 22 access**	**GWR-6: Offset Dual "T" Intersections**
Safety	●	●	●	●	◖	●	◖	●	●	●	◖
—reduces conflict points —minimizes emergency response times	–A grade separated interchange would improve the operational safety concerns of the existing at-grade intersection.	–A grade separated interchange would improve the operational safety concerns of the existing at-grade intersection.	–A grade separated interchange would improve the operational safety concerns of the existing at-grade intersection.	–A grade separated interchange would improve the operational safety concerns of the existing at-grade intersection.	–Relocation to straight segment reduces potential for intersection related crashes but does not fully address the operational and safety problems. –Out of direction travel required for return route for emergency vehicles.	–Eliminates the most difficult EB to NB and SB to WB left-turn movements. –Provides fairly direct return route for emergency vehicles.	–The allowance of the EB to NB left-turn movement only partially addresses the operational and safety problems of intersection turning movements. –Out of direction travel required for return route for emergency vehicles.	–A median barrier would restrict the intersection to RI/RO, thereby eliminating the difficult left-turn and crossing movements.	–A grade separated overpass would provide a safe crossing opportunity for farm equipment and school busses.	–A grade separated overpass would provide a safe crossing opportunity for farm equipment and school busses.	–Adds conflict points from turn movements but would relocate some movements to a different location.
Natural Environment	◖	◖	◖	◖	●	◖	●	●	◖	◖	◖
—Farm, forest, wetlands, wildlife, air quality —minimum impacts to sensitive areas	–McNary Creek in all quadrants to avoid –Floodplain in extreme SE and SW quadrants	–McNary Creek in all quadrants to avoid –Floodplain in extreme SE and SW quadrants –Smallest footprint	–McNary Creek in all quadrants to avoid –Floodplain in extreme SE and SW quadrants –Largest footprint	–McNary Creek in all quadrants to avoid –Floodplain in extreme SE and SW quadrants	–Not anticipated to have any adverse environmental impacts.	–Possible adverse environmental impacts from extensive excavations.	–Not anticipated to have any adverse environmental impacts.	–Not anticipated to have any adverse environmental impacts.	–T&E plant in NW quadrant that would have to be avoided –Floodplain in SW quadrant to avoid –Wetlands in NE quadrant to avoid	–T&E plant in NW quadrant that would have to be avoided –Floodplain in SW quadrant to avoid –Wetlands in NE quadrant to avoid	–T&E plant in NW quadrant that would have to be avoided –Wetlands in NE quadrant to avoid
Built Environment	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	◖
—Developable properties, residential parcels, historic properties —Minimum land use, social, historic displacements	–Avoidance of Brunk House –Forest Zone in NE and SW quadrants to avoid –EFU Zone in NW and SW quadrants	–Avoidance of Brunk House –Forest Zone in NE and SW quadrants to avoid –Least land taken from EFU Zone in NW and SW quadrants	–Avoidance of Brunk House –Forest Zone in NE and SW quadrants to avoid –Most land taken from EFU Zone in NW and SW quadrants	–Avoidance of Brunk House –Forest Zone in NE and SW quadrants to avoid –EFU Zone in NW and SW quadrants	–Eliminates SB vehicle access from DFR to Holman Wayside –New roadway could impact existing land use	–Eliminates SB vehicle access from DFR to Holman Wayside –New roadway could impact existing land use	–Continues vehicle access to Holman Wayside –No change to land use	–	–Minor impacts to farm (EFU) lands –Frontage road impacts to EFU lands.	–Minor impacts to farm (EFU) lands	–Minor impacts to farm (EFU) lands –Frontage road impacts to EFU lands. –Turn lanes would need to accommodate farm equipment.
Business	◖	◖	◖	◖	●	◖	●	○	●	◖	◖
—Parking, access, jobs —Minimum business relocations or eliminations	–Would remove some acreage from producing hazelnut orchard	–Would remove least acreage from producing hazelnut orchard	–Would remove the most acreage from producing hazelnut orchard	–Would remove some acreage from producing hazelnut orchard	– U-turn could need more right-of-way	–Possible RV parking lost –Possible excavation impacts	–U-turn could impact weigh station	–Would prevent farm equipment movement across highway	–Supports farm operations and access	–Supports farm operations	–Supports farm operations

	OR 22/OR 51 Interchange Alternatives				Doaks Ferry Road Alternatives			Greenwood Road Alternatives			
Evaluation Criteria **—Features** **—Measures**	**INH-3: Standard Diamond Interchange**	**INH-4: Tight Diamond Interchange**	**INH-5: Parclo-B**	**INH-6: Parclo-B Single Quadrant (WB to SB Loop)**	**DFR-2: Relocated Access Option—Riggs Street and RI only at DFR**	**DFR-4: Spring Street Undercrossing Option**	**DFR-7: Eastbound Access Option--center turn refuge; LI/RI/RO**	**GWR-3: Barrier median; RI/RO only**	**GWR-4a: Grade separate w/ WB RI/RO**	**GWR-4b: Grade separate w/o OR 22 access**	**GWR-6: Offset Dual "T" Intersections**
Plan Consistency	◖	◖	◖	◖	◖	◖	●	◖	◖	◖	◖
—land use and transportation plans	–CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county and SKATS TSPs	–No CPA required to incorporate into county and SKATS TSPs	–CPA required to incorporate into county TSP	–CPA required to incorporate into county TSP –Goal exception	–CPA required to incorporate into county TSP –Goal exception	–CPA required to incorporate into county TSP –Goal exception
Flexibility	◖	◖	◖	◖	◖	◖	●	◖	◖	◖	●
—potential to phase or separate —constrained funding	–Interchange can be built as final phase after local access roads – interchange by itself probably not phaseable	–Interchange can be built as final phase after local access roads – interchange by itself probably not phaseable	–Interchange can be built as final phase after local access roads – interchange by itself probably not phaseable	–Interchange can be built as final phase after local access roads – interchange by itself probably not phaseable	–Component can be a phase of a larger project but not phaseable by itself	–Component can be a phase of a larger project but not phaseable by itself	–Component can be a phase of a larger project and is phaseable by itself	–component can be a phase of a larger project but not phaseable by itself	–component can be a phase of a larger project but not phaseable by itself	–component can be a phase of a larger project but not phaseable by itself	–component can be a phase of a larger project and also phaseable by itself
Cost	–●	–●	–●	–●	–●	–◖	–●	–●	–◖	–◖	–●
—multiple funding sources —benefit/cost ratio —cost effective	–Similar to others	–Similar to others	–Similar to others	–Similar to others	–Low cost –Pavement	–High cost –Excavation	–Low cost –Paint	–Median cost only	–Structure and frontage road costs	–Structure cost	–Provides movement without structure cost but requires frontage road

● Directly/positively meets intent of criterion ◖ Partially meets intent of criterion ○ Does not support intent of criterion N/A Not applicable—neither meets/doesn't meet intent of criterion

CH2M HILL
SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan North Backage Roads	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	LENGTH (MI.):	2.08	DATE 1/8/2008	NAME J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	5.89	$ 2,681,466.67
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$ -
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	0.00	$ -
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 2,681,466.67

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 67,000.00
	TP & DT		3.0-8.0%	8.0%	$ 215,000.00
	Mobilization		8.0-10.0%	10.0%	$ 268,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 54,000.00
	Contingency		40.0%	40.0%	$ 1,073,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 4,358,466.67
	Design Engineering	13.0%	13.0%	13.0%	$ 567,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 436,000.00
	TOTAL PROJECT COST				**$5,361,467**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan South Backage Roads	**REFERENCE NAME/PHONE**			**SHEET** 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	**LENGTH (MI.):**	1.77	**DATE** 1/8/2008	**NAME** J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	5.02	$ 2,281,825.00
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$ -
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	1,700.00	$ 340,000.00
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 2,621,825.00

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 66,000.00
	TP & DT		3.0-8.0%	8.0%	$ 210,000.00
	Mobilization		8.0-10.0%	10.0%	$ 262,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 52,000.00
	Contingency		40.0%	40.0%	$ 1,049,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 4,260,825.00
	Design Engineering	13.0%	13.0%	13.0%	$ 554,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 426,000.00
	TOTAL PROJECT COST				**$5,240,825**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan GWR-3	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 0.4		DATE 6/1/2007	NAME Geoff Hunsaker

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$0
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$416,000	0.02	$8,320
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$445,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$12,000	2.00	$24,000
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	0.00	$0
14	Landscaping	Mi.	$225,000	0.00	$0
15	Bridges (See note 2)	SF	$200	0.00	$0
16	Walls	SF	$50	0.00	$0
	SUBTOTAL				***$32,320***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$1,000
	TP & DT		3.0-8.0%	8.0%	$3,000
	Mobilization		8.0-10.0%	10.0%	$3,000
	Erosion Control		0.5-2.0%	2.0%	$1,000
	Contingency		40.0%	40.0%	$13,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$53,320***
	Design Engineering	13.0%	13.0%	0.0%	$7,000
	Construction Engineering	10.0%	10.0%	0.0%	$5,000
	TOTAL PROJECT COST				**$65,320**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan GWR-4a	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 0.4		DATE 6/1/2007	NAME Geoff Hunsaker

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$0
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$1,637,000	0.08	$130,960
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$1,665,000	0.72	$1,198,800
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$12,000	1.00	$12,000
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	0.00	$0
14	Landscaping	Mi.	$225,000	0.00	$0
15	Bridges (See note 2)	SF	$200	8,000.00	$1,600,000
16	Walls	SF	$50	0.00	$0
	SUBTOTAL				***$2,941,760***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$74,000
	TP & DT		3.0-8.0%	8.0%	$235,000
	Mobilization		8.0-10.0%	10.0%	$294,000
	Erosion Control		0.5-2.0%	2.0%	$59,000
	Contingency		40.0%	40.0%	$1,177,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$4,780,760***
	Design Engineering	13.0%	13.0%	0.0%	$621,000
	Construction Engineering	10.0%	10.0%	0.0%	$478,000
	TOTAL PROJECT COST				**$5,879,760**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan GWR-4b	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 0.4		DATE 6/1/2007	NAME Geoff Hunsaker

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$0
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$1,637,000	0.08	$130,960
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$1,665,000	0.72	$1,198,800
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$12,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	0.00	$0
14	Landscaping	Mi.	$225,000	0.00	$0
15	Bridges (See note 2)	SF	$200	8,000.00	$1,600,000
16	Walls	SF	$50	0.00	$0
	SUBTOTAL				***$2,929,760***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$73,000
	TP & DT		3.0-8.0%	8.0%	$234,000
	Mobilization		8.0-10.0%	10.0%	$293,000
	Erosion Control		0.5-2.0%	2.0%	$59,000
	Contingency		40.0%	40.0%	$1,172,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$4,760,760***
	Design Engineering	13.0%	13.0%	0.0%	$619,000
	Construction Engineering	10.0%	10.0%	0.0%	$476,000
	TOTAL PROJECT COST				**$5,855,760**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan GWR-6	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.):		DATE 1/8/2008	NAME J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$0
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$455,000	1.40	$638,723
4	Overlay Existing Roadway	Lane-Mi.	$66,000	2.34	$154,519
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$12,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	0.00	$0
14	Landscaping	Mi.	$225,000	0.00	$0
15	Bridges (See note 2)	SF	$200	0.00	$0
16	Walls	SF	$50	0.00	$0
	SUBTOTAL				***$793,242***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$20,000
	TP & DT		3.0-8.0%	8.0%	$63,000
	Mobilization		8.0-10.0%	10.0%	$79,000
	Erosion Control		0.5-2.0%	2.0%	$16,000
	Contingency		40.0%	40.0%	$317,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$1,288,242***
	Design Engineering	13.0%	13.0%	13.0%	$167,000
	Construction Engineering	10.0%	10.0%	10.0%	$129,000
	TOTAL PROJECT COST				**$1,584,242**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan INH-3	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 1.52		DATE 6/1/2007	NAME Darren Hippenstiel

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	1.52	$825,360
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$835,000	5.61	$4,684,350
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$863,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$25,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	1.52	$395,200
14	Landscaping	Mi.	$225,000	1.52	$342,000
15	Bridges (See note 2)	SF	$200	12,300.00	$2,460,000
16	Walls	SF	$50	1,500.00	$75,000
	SUBTOTAL				***$8,781,910***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$220,000
	TP & DT		3.0-8.0%	8.0%	$703,000
	Mobilization		8.0-10.0%	10.0%	$878,000
	Erosion Control		0.5-2.0%	2.0%	$176,000
	Contingency		40.0%	40.0%	$3,513,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$14,271,910***
	Design Engineering	13.0%	13.0%	0.0%	$1,855,000
	Construction Engineering	10.0%	10.0%	0.0%	$1,427,000
	TOTAL PROJECT COST				**$17,553,910**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan INH-4	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 1.23		DATE 6/1/2007	NAME Darren Hippenstiel

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	1.23	$667,890
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$927,000	4.59	$4,254,930
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$955,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$25,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	1.23	$319,800
14	Landscaping	Mi.	$225,000	1.23	$276,750
15	Bridges (See note 2)	SF	$200	12,300.00	$2,460,000
16	Walls	SF	$50	3,000.00	$150,000
	SUBTOTAL				***$8,129,370***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$203,000
	TP & DT		3.0-8.0%	8.0%	$650,000
	Mobilization		8.0-10.0%	10.0%	$813,000
	Erosion Control		0.5-2.0%	2.0%	$163,000
	Contingency		40.0%	40.0%	$3,252,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$13,210,370***
	Design Engineering	13.0%	13.0%	0.0%	$1,717,000
	Construction Engineering	10.0%	10.0%	0.0%	$1,321,000
	TOTAL PROJECT COST				**$16,248,370**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan INH-5	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway/Structure	LENGTH (MI.): 1.81		DATE 6/1/2007	NAME Darren Hippenstiel

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	1.81	$982,830
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$835,000	6.08	$5,076,800
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$863,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$25,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	1.81	$470,600
14	Landscaping	Mi.	$225,000	1.81	$407,250
15	Bridges (See note 2)	SF	$200	12,300.00	$2,460,000
16	Walls	SF	$50	1,500.00	$75,000
	SUBTOTAL				***$9,472,480***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$237,000
	TP & DT		3.0-8.0%	8.0%	$758,000
	Mobilization		8.0-10.0%	10.0%	$947,000
	Erosion Control		0.5-2.0%	2.0%	$189,000
	Contingency		40.0%	40.0%	$3,789,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$15,392,480***
	Design Engineering	13.0%	13.0%	0.0%	$2,001,000
	Construction Engineering	10.0%	10.0%	0.0%	$1,539,000
	TOTAL PROJECT COST				**$18,932,480**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan INH-6	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	LENGTH (MI.):		DATE 1/9/2008	NAME Darren Hippenstiel

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	1.68	$912,240
2	Bike Boulevard	Mi.	$102,000	0.00	$0
3	New Roadway	Lane-Mi.	$836,000	6.06	$5,066,160
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$0
5	Reconstruct Existing Roadway	Lane-Mi.	$864,000	0.00	$0
6	Intersection Widening	EA	$46,000	0.00	$0
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$0
8	Interconnect Signal	LS	$30,000	0.00	$0
9	New Signal	EA	$180,000	0.00	$0
10	Signal Modifications	EA	$60,000	0.00	$0
11	Transit Enhancements	EA	$25,000	0.00	$0
12	Traffic Calming (See note 1)	%	-	0.0%	$0
13	Illumination	Mi.	$260,000	1.68	$436,800
14	Landscaping	Mi.	$225,000	1.68	$378,000
15	Bridges (See note 2)	SF	$200	12,300.00	$2,460,000
16	Walls	SF	$50	1,500.00	$75,000
	SUBTOTAL				***$9,328,200***

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$233,000
	TP & DT		3.0-8.0%	8.0%	$746,000
	Mobilization		8.0-10.0%	10.0%	$933,000
	Erosion Control		0.5-2.0%	2.0%	$187,000
	Contingency		40.0%	40.0%	$3,731,000
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$0
	TOTAL CONSTRUCTION COST				***$15,158,200***
	Design Engineering	13.0%	13.0%	0.0%	$1,971,000
	Construction Engineering	10.0%	10.0%	0.0%	$1,516,000
	TOTAL PROJECT COST				**$18,645,200**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan DFR-2	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	LENGTH (MI.):		DATE 1/8/2008	NAME J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	1.00	$ 455,735.35
4	Overlay Existing Roadway	Lane-Mi.	$66,000	2.31	$ 152,712.50
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	0.00	$ -
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 608,447.85

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 15,000.00
	TP & DT		3.0-8.0%	8.0%	$ 49,000.00
	Mobilization		8.0-10.0%	10.0%	$ 61,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 12,000.00
	Contingency		40.0%	40.0%	$ 243,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 988,447.85
	Design Engineering	13.0%	13.0%	13.0%	$ 128,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 99,000.00
	TOTAL PROJECT COST				**$1,215,448**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan DFR-4	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	LENGTH (MI.):		DATE 1/8/2008	NAME J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$715,000	0.39	$ 278,850.00
4	Overlay Existing Roadway	Lane-Mi.	$66,000	0.00	$ -
5	Reconstruct Existing Roadway	Lane-Mi.	$743,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$300	5,650.00	$ 1,695,000.00
16	Walls	SF	$50	15,736.00	$ 786,800.00
	SUBTOTAL				$ 2,760,650.00

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 69,000.00
	TP & DT		3.0-8.0%	8.0%	$ 221,000.00
	Mobilization		8.0-10.0%	10.0%	$ 276,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 55,000.00
	Contingency		40.0%	40.0%	$ 1,104,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 4,485,650.00
	Design Engineering	13.0%	13.0%	13.0%	$ 583,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 449,000.00
	TOTAL PROJECT COST				**$5,517,650**

CH2M HILL

SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan DFR-7	REFERENCE NAME/PHONE			SHEET 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	LENGTH (MI.):		DATE 1/8/2008	NAME J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	0.61	$ 277,641.92
4	Overlay Existing Roadway	Lane-Mi.	$66,000	3.49	$ 230,625.00
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	0.00	$ -
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 508,266.92

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 13,000.00
	TP & DT		3.0-8.0%	8.0%	$ 41,000.00
	Mobilization		8.0-10.0%	10.0%	$ 51,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 10,000.00
	Contingency		40.0%	40.0%	$ 203,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 826,266.92
	Design Engineering	13.0%	13.0%	13.0%	$ 107,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 83,000.00
	TOTAL PROJECT COST				**$1,016,267**

CH2M HILL
SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan DFR-7 **Doaks Ferry Left Turn**	**REFERENCE NAME/PHONE**			**SHEET** 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	**LENGTH (MI.):**		**DATE** 1/8/2008	**NAME** J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	0.32	$ 143,370.96
4	Overlay Existing Roadway	Lane-Mi.	$66,000	1.75	$ 115,312.50
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	0.00	$ -
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 258,683.46

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 6,000.00
	TP & DT		3.0-8.0%	8.0%	$ 21,000.00
	Mobilization		8.0-10.0%	10.0%	$ 26,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 5,000.00
	Contingency		40.0%	40.0%	$ 103,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 419,683.46
	Design Engineering	13.0%	13.0%	13.0%	$ 55,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 42,000.00
	TOTAL PROJECT COST				**$516,683**

CH2M HILL
SUMMARY - ORDER-OF-MAGNITUDE ESTIMATE

PROJECT:	OR22/51 Expressway Management Plan DFR-7 **Weigh Station U-Turn**	**REFERENCE NAME/PHONE**			**SHEET** 1 of 1
DESIGN LEVEL:	Preliminary				
KIND OF WORK:	Roadway	**LENGTH (MI.):**		**DATE** 1/8/2008	**NAME** J. Shamrell

NO.	ITEM	UNIT	UNIT COST	QUANTITY	COST
1	Curb, Gutter, Sidewalks & Drainage	Mi.	$543,000	0.00	$ -
2	Bike Boulevard	Mi.	$102,000	0.00	$ -
3	New Roadway	Lane-Mi.	$455,000	0.30	$ 134,270.96
4	Overlay Existing Roadway	Lane-Mi.	$66,000	1.75	$ 115,312.50
5	Reconstruct Existing Roadway	Lane-Mi.	$483,000	0.00	$ -
6	Intersection Widening	EA	$46,000	0.00	$ -
7	Restriping Existing Roadway	Lane-Mi.	$15,000	0.00	$ -
8	Interconnect Signal	LS	$30,000	0.00	$ -
9	New Signal	EA	$180,000	0.00	$ -
10	Signal Modifications	EA	$60,000	0.00	$ -
11	Transit Enhancements	EA	$25,000	0.00	$ -
12	Traffic Calming (See note 1)	%	-	0.0%	$ -
13	Illumination	Mi.	$260,000	0.00	$ -
14	Landscaping	Mi.	$225,000	0.00	$ -
15	Bridges (See note 2)	SF	$200	0.00	$ -
16	Walls	SF	$50	0.00	$ -
	SUBTOTAL				$ 249,583.46

	ADDITIONAL COSTS		RANGE	PERCENTAGE	COST
	Construction Surveying		1.0-2.5%	2.5%	$ 6,000.00
	TP & DT		3.0-8.0%	8.0%	$ 20,000.00
	Mobilization		8.0-10.0%	10.0%	$ 25,000.00
	Erosion Control		0.5-2.0%	2.0%	$ 5,000.00
	Contingency		40.0%	40.0%	$ 100,000.00
	Escalation (per year)		0.5-2.0%	0.0%	
	-Current Year			0	$ -
	TOTAL CONSTRUCTION COST				$ 405,583.46
	Design Engineering	13.0%	13.0%	13.0%	$ 53,000.00
	Construction Engineering	10.0%	10.0%	10.0%	$ 41,000.00
	TOTAL PROJECT COST				**$499,583**

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HEP File Code: PRO 08 - ____ - ____

OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: DFR 2 | Region: 2 | Date: 6/3/07

Project on State Highway

Route Number: 22 | Hwy Name: WILLAMINA-SALEM | MP From: MP 21.94 | to: MP 22.14

Road Character: RURAL | Facility Type: OTHER HIGHWAY

County: POLK | City: Salem | Crash Data From: 8/1/1999 | to: 7/31/2004

Project Description: Connection to north backage road, deceleration lane, and center turn refuge for left-in at Riggs Street with painted island channel

Prepared By: Haregu Nemariam | Title: Transportation Engineer

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14 (ID No.)	<==Total PDO Crashes			[1] 7.6 (Type of Crash Prevented)	$13,000	=	$ 102,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		-10%	3.9	All Crash Types			
Countermeasure 2: Spacing 600-1000 feet	20.0		60%	3.9	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	13 (ID No.)	<==Total Injury B&C Crashes			[1] 8.3 (Type of Crash Prevented)	$55,000	=	$ 468,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		10%	4.2	All Crash Types			
Countermeasure 2: Spacing 600-1000 feet	20.0		60%	4.2	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	(ID No.)	<==Total Fatal & InjA Crashes			[1] 0.0 (Type of Crash Prevented)	$1,388,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

27 <==Crashes **Total Crash Value for** 60 Months = $ 560,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 112,000

Estimated Project Cost = $ 1,215,000

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

B/C Ratio = $ 112,000 x [2] 13.59 / $ 1,215,000 = **1.25**

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$689,000	$1,359,000

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied
2. Select a PWF for the life of countermeasure. See instructions
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **DFR 4** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **21.94** to **22.14**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **MORROW** City: **Salem** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **New roadway and undercrossing at Spring Street connecting north and south side backage roads.**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.		Number of Target Crashes		A: Number of Preventable Crashes	B: Economic Value per Crash		A*B: Total Economic Value
PDO Crashes	14	<==Total PDO Crashes			9.4 [1] Type of Crash Prevented	$13,000	=	$ 122,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		-10%	4.7	All Crash Types			
Countermeasure 2: Left-Turn Bay, Unsignalized, 4-Leg, Curbed/Raised	7.0		70%	4.7	All Crash Types			
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	13	<==Total Injury B&C Crashes			10.7 [1] Type of Crash Prevented	$65,000	=	$ 586,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		10%	5.3	All Crash Types			
Countermeasure 2: Left-Turn Bay, Unsignalized, T-Intersection	9.0		80%	5.3	All Crash Types			
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes		<==Total Fatal & InjA Crashes			0.0 [1] Type of Crash Prevented	$1,389,000	=	$ -
Countermeasure 1	No.		0%	0.0				
Countermeasure 2	No.		0%	0.0				
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$684,000	$1,352,000
Other Highway	$689,000	$1,359,000

27 <==Crashes **Total Crash Value for** 60 Months = $ 706,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 142,000

Estimated Project Cost = **$ 5,518,000**

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 142,000 x [2] 13.59 / $ 5,518,000 = **0.35**

Notes

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

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

3 PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.

4 Economic costs per crash are calculated using 1996-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: DFR 7 | Region: 2 | Date: 6/2/07

Project on State Highway

Route Number: 22 | Hwy Name: WILLAMINA-SALEM | MP From: 21.94 | to: 22.14

Road Character: RURAL | Facility Type: OTHER HIGHWAY

County: MORROW | City: Salem | Crash Data From: 8/1/1999 | to: 7/31/2004

Project Description: Realigned right-out connection, painted island, center turn refuge for left-in at DFR; WB center turn refuge and U-turn lane at wel

Prepared By: Haregu Nemariam | Title: Transportation Engineer

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14	<==Total PDO Crashes			9.4	$13,000	=	$ 122,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		-10%	4.7	All Crash Types			
Countermeasure 2: Left-Turn Bay, Unsignalized, 4-Leg, Curbed/Raised	7.0		70%	4.7	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	13	<==Total Injury B&C Crashes			10.7	$55,000	=	$ 586,000
Countermeasure 1: Concrete Median Barrier (3-6' Shy)	1.0		10%	5.3	All Crash Types			
Countermeasure 2: Left-Turn Bay, Unsignalized, T-Intersection	9.0		80%	5.3	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes		<==Total Fatal & InjA Crashes			0.0	$1,359,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$994,000	$1,352,000
Other Highway	$999,000	$1,359,000

27 <==Crashes **Total Crash Value for** 60 Months = $ 709,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 142,000

Estimated Project Cost = $ 1,016,000

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

B/C Ratio = $ 142,000 x 8.11 / $ 1,016,000 = **1.13**

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied
2. Select a PWF for the life of countermeasure. See instructions
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash
4. Economic costs per crash are calculated using 1996-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **DFR 7 (U-Turn Only)** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **21.94** to **22.14**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **MORROW** City: **Salem** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **WB center turn refuge and U-turn lane at weigh station.**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes		Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes		14	<==Total PDO Crashes			[1] 9.4	$13,000	=	$ 122,000
		ID No.				Type of Crash Prevented			
Countermeasure 1	Concrete Median Barrier (3-6' Shy)	1.0		-10%	4.7	All Crash Types			
Countermeasure 2	Left-Turn Bay, Unsignalized, 4-Leg, Curbed/Raised	7.0		70%	4.7	All Crash Types			
Countermeasure 3		No.		0%	0.0				
Countermeasure 4		No.		0%	0.0				
Countermeasure 5		No.		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes		13	<==Total Injury B&C Crashes			[1] 10.7	$55,000	=	$ 586,000
		ID No.				Type of Crash Prevented			
Countermeasure 1	Concrete Median Barrier (3-6' Shy)	1.0		10%	5.3	All Crash Types			
Countermeasure 2	Left-Turn Bay, Unsignalized, T-Intersection	9.0		80%	5.3	All Crash Types			
Countermeasure 3		No.		0%	0.0				
Countermeasure 4		No.		0%	0.0				
Countermeasure 5		No.		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes			<==Total Fatal & InjA Crashes			[1] 0.0	$1,359,000	=	$ -
		ID No.				Type of Crash Prevented			
Countermeasure 1		No.		0%	0.0				
Countermeasure 2		No.		0%	0.0				
Countermeasure 3		No.		0%	0.0				
Countermeasure 4		No.		0%	0.0				
Countermeasure 5		No.		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$689,000	$1,359,000

27 <==Crashes **Total Crash Value for** 60 Months = $ 708,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 142,000

Estimated Project Cost = $ 500,000

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 142,000 x [2] 8.11 / $ 500,000 = **2.30**

Notes

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

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

3 PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.

4 Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **DFR 7 (Doaks Ferry Left Turn Only)** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **21.94** to **22.14**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **MORROW** City: **Salem** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **Realigned right-out connection, painted island, center turn refuge for left-in at DFR**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14 (ID No.)	<==Total PDO Crashes			[1] 9.4 (Type of Crash Prevented)	$13,000	=	$ 122,000
Countermeasure 1 Concrete Median Barrier (3-6' Shy)	1.0		-10%	4.7	All Crash Types			
Countermeasure 2 Left-Turn Bay, Unsignalized, 4-Leg, Curbed/Raised	7.0		70%	4.7	All Crash Types			
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	13 (ID No.)	<==Total Injury B&C Crashes			[1] 10.7 (Type of Crash Prevented)	$55,000	=	$ 586,000
Countermeasure 1 Concrete Median Barrier (3-6' Shy)	1.0		10%	5.3	All Crash Types			
Countermeasure 2 Left-Turn Bay, Unsignalized, T-Intersection	9.0		80%	5.3	All Crash Types			
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	(ID No.)	<==Total Fatal & InjA Crashes			[1] 0.0 (Type of Crash Prevented)	$1,359,000	=	$ -
Countermeasure 1	No.		0%	0.0				
Countermeasure 2	No.		0%	0.0				
Countermeasure 3	No.		0%	0.0				
Countermeasure 4	No.		0%	0.0				
Countermeasure 5	No.		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$689,000	$1,359,000

27 <==Crashes **Total Crash Value for** 60 Months = $ 708,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 142,000

Estimated Project Cost = $ 517,000

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 142,000 x [2] 8.11 / $ 517,000 = **2.23**

Notes

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

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

3 PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.

4 Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **GWR 3 Install Raised Median (GWR Right In/Out)** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **MP 18.41** to **MP 18.62**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **POLK** City: **OUT SIDE SALEM UBG** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **Install raised median and make Greenwood Road right in/out**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes		<---Total PDO Crashes			[1] 0.0 Type of Crash Prevented	$13,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	4	<---Total Injury B&C Crashes			[1] 0.4 Type of Crash Prevented	$55,000	=	$ 22,000
Countermeasure 1 Concrete Median Barrier (3-6' Shy)	1.0		10%	0.4	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes		<---Total Fatal & InjA Crashes			[1] 0.0 Type of Crash Prevented	$1,359,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,362,000
Other Highway	$989,000	$1,359,000

4 <---Crashes **Total Crash Value for** 60 Months = $ 22,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 4,000

Estimated Project Cost = $ 40,000

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 4,000 x [2] 13.59 / $ 40,000 = **1.36**

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied
2. Select a PWF for the life of countermeasure. See instructions
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **GWR 4a** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **MP 18.41** to: **MP 18.62**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **POLK** City: **OUT SIDE SALEM UBG** Crash Data From: **8/1/1999** to: **7/31/2004**

Project Description: **Grade Separate with westbound right in/out access to OR 22 overpass**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A: Number of Preventable Crashes	B: Economic Value per Crash		A*B: Total Economic Value
PDO Crashes	____ (ID No.)	<==Total PDO Crashes			[1] 0.0 (Type of Crash Prevented)	$13,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	4 (ID No.)	<==Total Injury B&C Crashes			[1] 3.1 (Type of Crash Prevented)	$55,000	=	$ 171,000
Countermeasure 1 Concrete Median Barrier (3-6 Ft)	1.0		10%	1.6	All Crash Types			
Countermeasure 2 Construct Grade Separation	37.0		75%	1.6	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	____ (ID No.)	<==Total Fatal & InjA Crashes			[1] 0.0 (Type of Crash Prevented)	$1,359,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$50,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$894,000	$1,352,000
Other Highway	$889,000	$1,359,000

4 <==Crashes **Total Crash Value for** 60 Months = $ 171,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 34,000

Estimated Project Cost = $ 5,880,000

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

B/C Ratio = $ 34,000 x 13.59 / $ 5,880,000 = **0.08**

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

Notes

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

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

3 PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.

4 Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory 'Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **GWR 4b** Region: **2** Date: **6/2/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **MP 18.41** to **MP 18.62**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **POLK** City: **OUT SIDE SALEM UBG** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **Grade Separate to allow north to south access without OR 22 access - overpass**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes		<==Total PDO Crashes			[1] 0.0 (Type of Crash Prevented)	$13,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	4	<==Total Injury B&C Crashes			[1] 3.1 (Type of Crash Prevented)	$56,000	=	$ 171,000
Countermeasure 1 Concrete Median Barrier (3-6' Shy)	1.0		10%	1.6	All Crash Types			
Countermeasure 2 Construct Grade Separation	37.0		75%	1.6	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes		<==Total Fatal & InjA Crashes			[1] 0.0 (Type of Crash Prevented)	$1,359,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$684,000	$1,362,000
Other Highway	$689,000	$1,359,000

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

4 <==Crashes **Total Crash Value for** 60 Months = $ 171,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 34,000

Estimated Project Cost = $ 5,856,000

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

B/C Ratio = $ 34,000 x [2] 13.59 / $ 5,856,000 = **0.08**

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied.
2. Select a PWF for the life of countermeasure. See instructions.
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory 'Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **GWR 6 Offset Dual T Intersections** Region: **2** Date: **6/2/07**

Project on State Highway
Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **MP 18.41** to **MP 18.62**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **POLK** City: **OUT SIDE SALEM UBG** Crash Data From: **8/1/1999** to **7/31/2004**

Project Description: **Install extra wide (16 ft) dual direction center turn lane between south Greenwood Rd and north frontage road; install decel lanes**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	____ ID No.	<==Total PDO Crashes			[1] 0.0 Type of Crash Prevented	$13,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	4 ID No.	<==Total Injury B&C Crashes			[1] 3.1 Type of Crash Prevented	$55,000	=	$ 171,000
Countermeasure 1: Corridor Median Barrier (3-6' 5%)	1.0		10%	1.6	All Crash Types			
Countermeasure 2: Construct Grade Separation	37.0		75%	1.6	All Crash Types			
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	____ ID No.	<==Total Fatal & InjA Crashes			[1] 0.0 Type of Crash Prevented	$1,359,000	=	$ -
Countermeasure 1	No		0%	0.0				
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$38,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$669,000	$1,359,000

4 <==Crashes **Total Crash Value for** 60 Months = $ 171,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 34,000

Estimated Project Cost = $ 1,584,000

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

B/C Ratio = $ 34,000 x 13.59 / $ 1,584,000 = **0.29**

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

Notes
1. Composite crash reduction factor calculated if more than one countermeasure is applied.
2. Select a PWF for the life of countermeasure. See instructions.
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1999-2006 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: INH 3 | Region: 2 | Date: 6/2/07

Project on State Highway
Route Number: 22 | Hwy Name: WILLAMINA-SALEM | MP From: MP 20.27 | to: MP 20.81

Road Character: RURAL | Facility Type: OTHER HIGHWAY

County: POLK | City: OUT SIDE SALEM UBG | Crash Data From: 8/1/1999 | to: 7/31/2004

Project Description: Standard diamond interchange

Prepared By: Haregu Nemariam | Title: Transportation Engineer

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14	<==Total PDO Crashes			[1] 0.0	$13,000	=	$ -
Countermeasure 1	No		0%	0.0		Type of Crash Prevented		
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	21	<==Total Injury B&C Crashes			[1] 15.8	$55,000	=	$ 868,000
Countermeasure 1 Construct Grade Separation	37.0		75%	15.8		Type of Crash Prevented		
Countermeasure 2	No		0%	0.0		All Crash Types		
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	1	<==Total Fatal & InjA Crashes			[1] 1.0	$1,359,000	=	$ 1,359,000
Countermeasure 1 Construct Grade Separation	37.0		100%	1.0		Type of Crash Prevented		
Countermeasure 2	No		0%	0.0		All Crash Types		
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$699,000	$1,359,000

36 <==Crashes | **Total Crash Value for** 60 Months = $ 2,228,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 445,000

Estimated Project Cost = $ 17,554,000

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 445,000 x [2] 13.59 / $ 17,554,000 = **0.34**

Notes
1. Composite crash reduction factor calculated if more than one countermeasure is applied.
2. Select a PWF for the life of countermeasure. See instructions.
3. PDO value is $6,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: INH 4 Region: 2 Date: 6/2/07

Project on State Highway
Route Number: 22 Hwy Name: WILLAMINA-SALEM MP From: MP 20.27 to: MP 20.61

Road Character: RURAL Facility Type: OTHER HIGHWAY

County: POLK City: OUT SIDE SALEM UBG Crash Data From: 8/1/1999 to: 7/31/2004

Project Description: Tight diamond interchange

Prepared By: Haregu Nemariam Title: Transportation Engineer

Type of Target Crashes	Total Crashes & Countermeasure ID No.		Number of Target Crashes		A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14	<==Total PDO Crashes			[1] 10.5 Type of Crash Prevented	$13,000	=	$ 137,000
Countermeasure 1: Construct Grade Separation	37.0		75%	10.5	All Crash Types			
Countermeasure 2:	No.		0%	0.0				
Countermeasure 3:	No.		0%	0.0				
Countermeasure 4:	No.		0%	0.0				
Countermeasure 5:	No.		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	21	<==Total Injury B&C Crashes			[1] 15.8 Type of Crash Prevented	$55,000	=	$ 866,000
Countermeasure 1: Construct Grade Separation	37.0		75%	15.8	All Crash Types			
Countermeasure 2:	No.		0%	0.0				
Countermeasure 3:	No.		0%	0.0				
Countermeasure 4:	No.		0%	0.0				
Countermeasure 5:	No.		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	1	<==Total Fatal & InjA Crashes			[1] 1.0 Type of Crash Prevented	$1,359,000	=	$ 1,359,000
Countermeasure 1: Construct Grade Separation	37.0		100%	1.0	All Crash Types			
Countermeasure 2:	No.		0%	0.0				
Countermeasure 3:	No.		0%	0.0				
Countermeasure 4:	No.		0%	0.0				
Countermeasure 5:	No.		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$38,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$894,000	$1,352,000
Other Highway	$889,000	$1,359,000

36 <==Crashes **Total Crash Value for** 60 Months = $ 2,362,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 472,000

Estimated Project Cost = $ 16,248,000

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

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

B/C Ratio = $ 472,000 x 13.59 / $ 16,248,000 = **0.39**

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied.
2. Select a PWF for the life of countermeasure. See instructions.
3. PDO value is $8,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: INH 5 | Region: 2 | Date: 6/2/07

Project on State Highway

Route Number: 22 | Hwy Name: WILLAMINA-SALEM | MP From: MP 20.27 | to: MP 20.61

Road Character: RURAL | Facility Type: OTHER HIGHWAY

County: POLK | City: Out side Salem UBG | Crash Data From: 8/1/1999 | to: 7/31/2004

Project Description: Replace intersection with partial cloverleaf interchanges

Prepared By: Haregu Nemariam | Title: Transportation Engineer

Type of Target Crashes	Total Crashes & Countermeasure ID No.		Number of Target Crashes		A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14 (ID No.)	<==Total PDO Crashes			[1] 10.5 Type of Crash Prevented	$13,000	=	$ 137,000
Countermeasure 1 Construct Grade Separation	37.0		75%	10.5	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	21 (ID No.)	<==Total Injury B&C Crashes			[1] 15.8 Type of Crash Prevented	$55,000	=	$ 866,000
Countermeasure 1 Construct Grade Separation	37.0		75%	15.8	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	1 (ID No.)	<==Total Fatal & InjA Crashes			[1] 1.0 Type of Crash Prevented	$1,359,000	=	$ 1,359,000
Countermeasure 1 Construct Grade Separation	37.0		100%	1.0	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$39,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$694,000	$1,352,000
Other Highway	$880,000	$1,359,000

36 <==Crashes | **Total Crash Value for** 60 Months = $ 2,362,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 472,000

Estimated Project Cost = **$ 18,932,000**

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

B/C Ratio = $ 472,000 x [2] 13.59 / $ 18,932,000 = **0.34**

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied
2. Select a PWF for the life of countermeasure. See instructions
3. PDO value is $5,500 per crash adjusted with an under reporting factor of 2.0. National Safety Council, 2000 estimates of value per crash
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator

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OREGON DEPARTMENT OF TRANSPORTATION
HAZARD ELIMINATION PROGRAM
BENEFIT/COST ANALYSIS WORKSHEET

Project Name: **INH 6** Region: **2** Date: **5/22/07**

Project on State Highway

Route Number: **22** Hwy Name: **WILLAMINA-SALEM** MP From: **MP 20.27** to: **MP 20.61**

Road Character: **RURAL** Facility Type: **OTHER HIGHWAY**

County: **POLK** City: **Out side Salem UGB** Crash Data From: **8/1/1999** to: **7/31/2004**

Project Description: **Replace intersection with diamond interchange that includes westbound to southbound loop off-ramp from OR 22**

Prepared By: **Haregu Nemariam** Title: **Transportation Engineer**

Type of Target Crashes	Total Crashes & Countermeasure ID No.	Number of Target Crashes			A Number of Preventable Crashes	B Economic Value per Crash		A*B Total Economic Value
PDO Crashes	14	<---Total PDO Crashes			[1] 10.5 Type of Crash Prevented	$13,000	=	$ 137,000
Countermeasure 1 Construct Grade Separation	37.0		75%	10.5	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Moderate (Injury B) and Minor (Injury C) Injury Crashes	21	<---Total Injury B&C Crashes			[1] 15.8 Type of Crash Prevented	$55,000	=	$ 866,000
Countermeasure 1 Construct Grade Separation	37.0		75%	15.8	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				
Fatal and Severe (Injury A) Injury Crashes	1	<---Total Fatal & InjA Crashes			[1] 1.0 Type of Crash Prevented	$1,359,000	=	$ 1,359,000
Countermeasure 1 Construct Grade Separation	37.0		100%	1.0	All Crash Types			
Countermeasure 2	No		0%	0.0				
Countermeasure 3	No		0%	0.0				
Countermeasure 4	No		0%	0.0				
Countermeasure 5	No		0%	0.0				

Comprehensive Economic Value per Crash		
Highway/Street Type	Urban	Rural
PDO [3]		
All facilities	$13,000	$13,000
Moderate (Injury B) and Minor (Injury C) Injury [4]		
Interstate or Freeway	$38,000	$51,000
Other State Highway	$41,000	$55,000
Fatal and Severe (Injury A) Injury [4]		
Interstate or Freeway	$894,000	$1,362,000
Other Highway	$889,000	$1,359,000

Uniform Series Present Worth Factor (4%)	
10 years	20 years
8.11	13.59

36 <---Crashes **Total Crash Value for** 60 Months = $ 2,362,000

Annual Benefits = Total Crash Value / Total Months / 12 = $ 472,000

Estimated Project Cost = $ 18,645,000

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

B/C Ratio = $ 472,000 x [2] 13.59 / $ 18,645,000 = **0.34**

Notes

1. Composite crash reduction factor calculated if more than one countermeasure is applied.
2. Select a PWF for the life of countermeasure. See instructions.
3. PDO value is $9,500 per crash adjusted with an under reporting factor of 2.0, National Safety Council, 2000 estimates of value per crash.
4. Economic costs per crash are calculated using 1998-2000 Oregon crash data and FHWA's Technical Advisory "Motor Vehicle Accident Costs, T 7570.2, October 31, 1994 updated to 2001 dollars with GDP implicit price deflator.