

APPENDIX F

Design Concept Safety Performance Analysis

Existing Configuration

Project Element	Total Crashes/yr (KABCO)		Fatal and Injury Crashes/yr (KABC)		Property Damage Only Crashes/yr (PDO)		Post Processing			
	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABCO)	Adjusted PACF N _{expected} (KABCO)	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABC)	Adjusted PACF N _{expected} (KABC)	Raw HSM Output: Predicted average crash frequency N _{predicted} (O)	Adjusted PACF N _{expected} (O)	Site Condition		Adj. Factor	Notes
							HSM	Actual		
INDIVIDUAL SEGMENTS										
SR 28: Grant to 3rd Segment 1	1.5	0.0	0.5	0.0	1.1	0.0	4U	n/a	0	Removed from study area
SR 28: 3rd to Battermann Segment 2	24.4	24.4	6.7	6.7	17.7	17.7	2U	2U	1	
Battermann Segment 3	0.2	0.2	0.1	0.1	0.1	0.1	2U	2U	1	
RIR (East)/Saunders Segment 4	2.3	2.3	0.8	0.8	1.5	1.5	2U	2U	1	
RIR (West) Segment 5	2.9	2.9	1.0	1.0	1.9	1.9	2U	2U	1	
INDIVIDUAL INTERSECTIONS										
SR 28 Spur and Grant Road Intersection 1	2.3	0.0	0.8	0.0	1.5	0.0	4SG	n/a	0	Removed from study area
SR 28 Spur and 3rd St SE Intersection 2	1.3	1.3	0.4	0.4	0.9	0.9	4SG	4SG	1	
SR 28 and S Mary Ave Intersection 3	1.0	1.0	0.4	0.4	0.6	0.6	4ST	4ST	1	
SR 28 and S Nile Ave Intersection 4	1.0	1.0	0.4	0.4	0.6	0.6	4ST	4ST	1	
SR 28 and S Tyee Ave Intersection 5	1.2	1.2	0.4	0.4	0.7	0.7	4ST	4ST	1	
SR 28 and Rock Island Rd (West) Intersection 6	0.1	0.1	0.1	0.1	0.1	0.1	3ST	3ST	1	
SR 28 and Rock Island Rd (East) Intersection 7	0.6	0.6	0.2	0.2	0.4	0.4	3ST	3ST	1	
SR 28 and Rock Island Dr Intersection 8	0.7	0.7	0.3	0.3	0.4	0.4	4ST	4ST	1	
SR 28 and Battermann Rd Intersection 9	0.4	0.4	0.2	0.2	0.2	0.2	3ST	3ST	1	
Battermann Rd and Saunders Ave Intersection 10	0.0	0.0	0.0	0.0	0.0	0.0	3ST	3ST	1	
Saunders Ave and N Garden Ave Intersection 11	0.0	0.0	0.0	0.0	0.0	0.0	4ST	4ST	1	
Rock Island Rd (West) and S Nile Ave Intersection 12	0.4	0.4	0.1	0.1	0.3	0.3	4ST	4ST	1	
Rock Island Rd (West) and 8th St SE Intersection 13	0.1	0.1	0.1	0.1	0.1	0.1	3ST	3ST	1	
Rock Island Rd (West) and 3rd St SE Intersection 14	0.8	0.8	0.3	0.3	0.5	0.5	4ST	4ST	1	
Rock Island Rd (West) and Grant Rd Intersection 15	3.9	0.0	1.4	0.0	2.5	0.0	4SG	n/a	0	Removed from study area
SR 28 and Lyle Ave Intersection 16	0.8	0.8	0.4	0.4	0.5	0.5	3ST	3ST	1	
SR 28 and Perry Ave S Intersection 17	1.8	1.8	0.7	0.7	1.1	1.1	4ST	4ST	1	
SR 28 and Quincy Ave S/Akamai Way Intersection 18	2.1	2.1	0.8	0.8	1.3	1.3	4ST	4ST	1	
SR 28 and S Union Ave Intersection 19	1.8	1.8	0.7	0.7	1.1	1.1	4ST	4ST	1	
SR 28 and Nature Shore Dr Intersection 20	0.4	0.4	0.2	0.2	0.2	0.2	3ST	3ST	1	
SR 28 and Columbia Cove Ln Intersection 21	0.4	0.4	0.2	0.2	0.2	0.2	3ST	3ST	1	
SR 28 and Riverside Pl Intersection 22	0.7	0.7	0.2	0.2	0.4	0.4	4ST	4ST	1	
TOTAL	53.5	45.4	17.6	14.7	35.9	30.8				

Legends and Abbreviations:

4U Four-lane, undivided

2U Two-lane, undivided

4SG Four-leg traffic signal

4ST Four-leg stop control (on minor streets)

3ST Three-leg stop control (on minor street)

n/a Not applicable

HSM Highway Safety Manual

PACF Predicted average crash frequency

KABCO All crashes

KABC Injury/fatal crashes

PDO Property damage only

Segment/intersection outside of study area

High-Speed, Two-Lane SR 28

Project Element	Total Crashes/yr (KABCO)		Fatal and Injury Crashes/yr (KABC)		Property Damage Only Crashes/yr (PDO)		Post Processing				
	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABCO)	Adjusted PACF N _{expected} (KABCO)	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABC)	Adjusted PACF N _{expected} (KABC)	Raw HSM Output: Predicted average crash frequency N _{predicted} (O)	Adjusted PACF N _{expected} (O)	Site Condition		Adj. Factor	Notes	
							HSM	Actual			
INDIVIDUAL SEGMENTS											
SR 28: Grant to 3rd	Segment 1	1.5	0.0	0.5	0.0	1.1	0.0	4U	n/a	0	Removed from study area
SR 28: 3rd to Battermann	Segment 2	23.9	16.5	6.6	4.0	17.4	12.5	2U	2D	0.61/0.72	Adjusted to divided *
Battermann	Segment 3	0.2	0.2	0.1	0.1	0.1	0.1	2U	2U	1	
RIR (East)/Saunders	Segment 4	2.3	2.3	0.8	0.8	1.5	1.5	2U	2U	1	
RIR (West)	Segment 5	2.9	2.9	1.0	1.0	1.9	1.9	2U	2U	1	
INDIVIDUAL INTERSECTIONS											
SR 28 Spur and Grant Road	Intersection 1	2.3	0.0	0.8	0.0	1.5	0.0	4SG	n/a	0	Removed from study area
SR 28 Spur and 3rd St SE	Intersection 2	1.3	1.3	0.4	0.4	0.9	0.9	4SG	4SG	1	
SR 28 and S Mary Ave	Intersection 3	0.9	0.5	0.3	0.2	0.5	0.3	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and S Nile Ave	Intersection 4	1.0	0.5	0.4	0.2	0.6	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and S Tyee Ave	Intersection 5	1.2	0.7	0.4	0.2	0.7	0.4	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and Rock Island Rd (West)	Intersection 6	0.1	0.0	0.1	0.0	0.1	0.0	3ST	n/a	0	Intersection deleted
SR 28 and Rock Island Rd (East)	Intersection 7	0.6	0.0	0.2	0.0	0.4	0.0	3ST	n/a	0	Intersection deleted
SR 28 and Rock Island Dr	Intersection 8	0.7	0.4	0.3	0.2	0.4	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and Battermann Rd	Intersection 9	0.3	0.2	0.1	0.1	0.2	0.1	3ST	3ST	0.67	Adjusted w/ new LT lane
Battermann Rd and Saunders Ave	Intersection 10	0.0	0.0	0.0	0.0	0.0	0.0	3ST	3ST	1	
Saunders Ave and N Garden Ave	Intersection 11	0.0	0.0	0.0	0.0	0.0	0.0	4ST	4ST	1	
Rock Island Rd (West) and S Nile Ave	Intersection 12	0.4	0.4	0.1	0.1	0.3	0.3	4ST	4ST	1	
Rock Island Rd (West) and 8th St SE	Intersection 13	0.1	0.1	0.1	0.1	0.1	0.1	3ST	3ST	1	
Rock Island Rd (West) and 3rd St SE	Intersection 14	0.8	0.8	0.3	0.3	0.5	0.5	4ST	4ST	1	
Rock Island Rd (West) and Grant Rd	Intersection 15	3.9	0.0	1.4	0.0	2.5	0.0	4SG	n/a	0	Removed from study area
SR 28 and Lyle Ave	Intersection 16	0.8	0.5	0.4	0.2	0.5	0.3	3ST	3-RIRO	0.55	Adjusted to RIRO
SR 28 and Perry Ave S	Intersection 17	1.8	0.0	0.7	0.0	1.1	0.0	4ST	n/a	0	Intersection deleted
SR 28 and Quincy Ave S/Akamai Way	Intersection 18	2.1	1.2	0.8	0.5	1.3	0.7	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and S Union Ave	Intersection 19	1.8	1.0	0.7	0.4	1.1	0.6	4ST	RAB	0.56	Adjusted to RAB
SR 28 and Nature Shore Dr	Intersection 20	0.4	0.2	0.2	0.1	0.2	0.1	3ST	3-RIRO	0.55	Adjusted to RIRO
SR 28 and Columbia Cove Ln	Intersection 21	0.4	0.0	0.2	0.0	0.2	0.0	3ST	n/a	0	Intersection deleted
SR 28 and Riverside Pl	Intersection 22	0.7	0.4	0.2	0.1	0.4	0.2	4ST	RAB	0.56	Adjusted to RAB
TOTAL		52.7	30.1	17.3	9.0	35.4	21.1				

* Adjustment factors to convert from 2U to 2D borrowed from analysis of 4U vs. 4D with all other variables equal. KABC adjustment factor is the 0.614, PDO adjustment factor is 0.723.

Legends and Abbreviations:

4U	Four-lane, undivided	RAB	Roundabout
2U	Two-lane, undivided	n/a	Not applicable
2D	Two-lane, divided	HSM	Highway Safety Manual
4SG	Four-leg traffic signal	PACF	Predicted average crash frequency
4ST	Four-leg stop control (on minor streets)	KABCO	All crashes
4-RIRO	Four-leg right-in/right-out	KABC	Injury/fatal crashes
3ST	Three-leg stop control (on minor street)	PDO	Property damage only
3-RIRO	Three-leg right-in/right-out		Segment/intersection outside of study area

High-Speed, Four-Lane SR 28

Project Element	Total Crashes/yr (KABCO)		Fatal and Injury Crashes/yr (KABC)		Property Damage Only Crashes/yr (PDO)		Post Processing				
	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABCO)	Adjusted PACF N _{expected} (KABCO)	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABC)	Adjusted PACF N _{expected} (KABC)	Raw HSM Output: Predicted average crash frequency N _{predicted} (O)	Adjusted PACF N _{expected} (O)	Site Condition		Adj. Factor	Notes	
							HSM	Actual			
INDIVIDUAL SEGMENTS											
SR 28: Grant to 3rd	Segment 1	1.5	0.0	0.5	0.0	1.1	0.0	4U	n/a	0	Removed from study area
SR 28: 3rd to Battermann	Segment 2	19.5	19.5	5.4	5.4	14.1	14.1	4D	4D	1	
Battermann	Segment 3	0.2	0.2	0.1	0.1	0.1	0.1	2U	2U	1	
RIR (East)/Saunders	Segment 4	2.3	2.3	0.8	0.8	1.5	1.5	2U	2U	1	
RIR (West)	Segment 5	2.9	2.9	1.0	1.0	1.9	1.9	2U	2U	1	
INDIVIDUAL INTERSECTIONS											
SR 28 Spur and Grant Road	Intersection 1	2.3	0.0	0.8	0.0	1.5	0.0	4SG	n/a	0	Removed from study area
SR 28 Spur and 3rd St SE	Intersection 2	1.3	1.3	0.4	0.4	0.9	0.9	4SG	4SG	1	
SR 28 and S Mary Ave	Intersection 3	0.9	0.5	0.3	0.2	0.5	0.3	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and S Nile Ave	Intersection 4	1.0	0.5	0.4	0.2	0.6	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and S Tyee Ave	Intersection 5	1.2	0.7	0.4	0.2	0.7	0.4	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and Rock Island Rd (West)	Intersection 6	0.1	0.0	0.1	0.0	0.1	0.0	3ST	n/a	0	Removed
SR 28 and Rock Island Rd (East)	Intersection 7	0.6	0.0	0.2	0.0	0.4	0.0	3ST	n/a	0	Removed
SR 28 and Rock Island Dr	Intersection 8	0.7	0.4	0.3	0.2	0.4	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and Battermann Rd	Intersection 9	0.3	0.2	0.1	0.1	0.2	0.1	3ST	3ST	0.67	Adjusted w/ new LT lane
Battermann Rd and Saunders Ave	Intersection 10	0.0	0.0	0.0	0.0	0.0	0.0	3ST	3ST	1	
Saunders Ave and N Garden Ave	Intersection 11	0.0	0.0	0.0	0.0	0.0	0.0	4ST	4ST	1	
Rock Island Rd (West) and S Nile Ave	Intersection 12	0.4	0.4	0.1	0.1	0.3	0.3	4ST	4ST	1	
Rock Island Rd (West) and 8th St SE	Intersection 13	0.1	0.1	0.1	0.1	0.1	0.1	3ST	3ST	1	
Rock Island Rd (West) and 3rd St SE	Intersection 14	0.8	0.8	0.3	0.3	0.5	0.5	4ST	4ST	1	
Rock Island Rd (West) and Grant Rd	Intersection 15	3.9	0.0	1.4	0.0	2.5	0.0	4SG	n/a	0	Removed from study area
SR 28 and Lyle Ave	Intersection 16	0.8	0.5	0.4	0.2	0.5	0.3	3ST	3-RIRO	0.55	Adjusted to RIRO
SR 28 and Perry Ave S	Intersection 17	1.8	1.0	0.7	0.4	1.1	0.6	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and Quincy Ave S/Akamai Way	Intersection 18	2.1	1.2	0.8	0.5	1.3	0.7	4ST	4-RIRO	0.55	Adjusted to RIRO
SR 28 and S Union Ave	Intersection 19	1.8	1.0	0.7	0.4	1.1	0.6	4ST	RAB	0.56	Adjusted to RAB
SR 28 and Nature Shore Dr	Intersection 20	0.4	0.2	0.2	0.1	0.2	0.1	3ST	3-RIRO	0.55	Adjusted to RIRO
SR 28 and Columbia Cove Ln	Intersection 21	0.4	0.2	0.2	0.1	0.2	0.1	3ST	3-RIRO	0.55	Adjusted to RIRO
SR 28 and Riverside Pl	Intersection 22	0.7	0.4	0.2	0.1	0.4	0.2	4ST	RAB	0.56	Adjusted to RAB
TOTAL		48.3	34.3	16.1	10.9	32.2	23.4				

Legends and Abbreviations:

4U	Four-lane, undivided	RAB	Roundabout
4D	Four-lane, divided	n/a	Not applicable
2U	Two-lane, undivided	HSM	Highway Safety Manual
4SG	Four-leg traffic signal	PACF	Predicted average crash frequency
4ST	Four-leg stop control (on minor streets)	KABCO	All crashes
4-RIRO	Four-leg right-in/right-out	KABC	Injury/fatal crashes
3ST	Three-leg stop control (on minor street)	PDO	Property damage only
3-RIRO	Three-leg right-in/right-out		Segment/intersection outside of study area

Intermediate-Speed SR 28

Project Element	Total Crashes/yr (KABCO)		Fatal and Injury Crashes/yr (KABC)		Property Damage Only Crashes/yr (PDO)		Post Processing				
	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABCO)	Adjusted PACF N _{expected} (KABCO)	Raw HSM Output: Predicted average crash frequency N _{predicted} (KABC)	Adjusted PACF N _{expected} (KABC)	Raw HSM Output: Predicted average crash frequency N _{predicted} (O)	Adjusted PACF N _{expected} (O)	Site Condition		Adj. Factor	Notes	
							HSM	Actual			
INDIVIDUAL SEGMENTS											
SR 28: Grant to 3rd	Segment 1	1.5	0.0	0.5	0.0	1.1	0.0	4U	n/a	0	Removed from study area
SR 28: 3rd to Battermann	Segment 2	26.6	26.6	7.2	7.2	19.4	19.4	3T	3T	1	
Battermann	Segment 3	0.2	0.2	0.1	0.1	0.1	0.1	2U	2U	1	
RIR (East)/Saunders	Segment 4	2.3	2.3	0.8	0.8	1.5	1.5	2U	2U	1	
RIR (West)	Segment 5	2.9	2.9	1.0	1.0	1.9	1.9	2U	2U	1	
INDIVIDUAL INTERSECTIONS											
SR 28 Spur and Grant Road	Intersection 1	2.3	0.0	0.8	0.0	1.5	0.0	4SG	n/a	0	Removed from study area
SR 28 Spur and 3rd St SE	Intersection 2	1.3	1.3	0.4	0.4	0.9	0.9	4SG	4SG	1	
SR 28 and S Mary Ave	Intersection 3	0.9	0.5	0.3	0.2	0.5	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and S Nile Ave	Intersection 4	1.0	0.5	0.4	0.2	0.6	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and S Tyee Ave	Intersection 5	1.2	0.5	0.4	0.2	0.7	0.3	4ST	4ST	0.4489	Adjusted w/ new LT lanes
SR 28 and Rock Island Rd (West)	Intersection 6	0.1	0.1	0.1	0.1	0.1	0.0	3ST	3ST	0.67	Adjusted w/ new LT lane
SR 28 and Rock Island Rd (East)	Intersection 7	0.6	0.6	0.2	0.2	0.4	0.4	3ST	3ST	1	
SR 28 and Rock Island Dr	Intersection 8	0.7	0.4	0.3	0.2	0.4	0.3	4ST	RAB	0.56	Adjusted to RAB
SR 28 and Battermann Rd	Intersection 9	0.3	0.2	0.1	0.1	0.2	0.1	3ST	3ST	0.67	Adjusted w/ new LT lane
Battermann Rd and Saunders Ave	Intersection 10	0.0	0.0	0.0	0.0	0.0	0.0	3ST	3ST	1	
Saunders Ave and N Garden Ave	Intersection 11	0.0	0.0	0.0	0.0	0.0	0.0	4ST	4ST	1	
Rock Island Rd (West) and S Nile Ave	Intersection 12	0.4	0.4	0.1	0.1	0.3	0.3	4ST	4ST	1	
Rock Island Rd (West) and 8th St SE	Intersection 13	0.1	0.1	0.1	0.1	0.1	0.1	3ST	3ST	1	
Rock Island Rd (West) and 3rd St SE	Intersection 14	0.8	0.8	0.3	0.3	0.5	0.5	4ST	4ST	1	
Rock Island Rd (West) and Grant Rd	Intersection 15	3.9	0.0	1.4	0.0	2.5	0.0	4SG	n/a	0	Removed from study area
SR 28 and Lyle Ave	Intersection 16	0.8	0.8	0.4	0.4	0.5	0.5	3ST	3ST	1	
SR 28 and Perry Ave S	Intersection 17	1.8	0.8	0.7	0.3	1.1	0.5	4ST	4ST	0.4489	Adjusted w/ new LT lanes
SR 28 and Quincy Ave S/Akamai Way	Intersection 18	2.1	0.9	0.8	0.4	1.3	0.6	4ST	4ST	0.4489	Adjusted w/ new LT lanes
SR 28 and S Union Ave	Intersection 19	1.8	0.8	0.7	0.3	1.1	0.5	4ST	4ST	0.4489	Adjusted w/ new LT lanes
SR 28 and Nature Shore Dr	Intersection 20	0.4	0.3	0.2	0.2	0.2	0.1	3ST	3ST	0.67	Adjusted w/ new LT lane
SR 28 and Columbia Cove Ln	Intersection 21	0.4	0.3	0.2	0.2	0.2	0.1	3ST	3ST	0.67	Adjusted w/ new LT lane
SR 28 and Riverside Pl	Intersection 22	0.7	0.3	0.2	0.1	0.4	0.2	4ST	4ST	0.4489	Adjusted w/ new LT lanes
TOTAL		55.4	41.6	17.9	13.1	37.5	28.9				

Legends and Abbreviations:

4U	Four-lane, undivided	RAB	Roundabout
2U	Two-lane, undivided	n/a	Not applicable
3T	Three-lane with center turn	HSM	Highway Safety Manual
4SG	Four-leg traffic signal	PACF	Predicted average crash frequency
4ST	Four-leg stop control (on minor streets)	KABCO	All crashes
4-RIRO	Four-leg right-in/right-out	KABC	Injury/fatal crashes
3ST	Three-leg stop control (on minor street)	PDO	Property damage only
3-RIRO	Three-leg right-in/right-out		Segment/intersection outside of study area