FEASIBILITY STUDY TO INVESTIGATE

INTERCHANGE LIGHTING CRITERIA

Prepared by
Feasibility Studies Unit
Program Development Branch
Division of Highways

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Feasibility Study to Investigate

Interchange Lighting Criteria

The Feasibility Studies Unit has investigated suitable criteria to aid upper management in making decisions relative to requests for interchange lighting. Our effort has involved research of published literature, coordination with Design Services and Traffic Engineering, and a complete inventory of all interchanges in the I-95 corridor within North Carolina.

National Cooperative Highway Research Report 152 specifically deals with the issue of interchange lighting. We utilized criteria established within this report to develop the "NEED" factor. This factor takes into consideration the physical attributes of the interchange as well as its operational characteristics, such as level of service and accident history. The "Benefit" factor is taken to be 25% of the sum of the mainline and crossroad traffic and is representative of nighttime traffic, the traffic that would benefit from a lighting project. The Lighting Section in our Design Services Unit has developed a lighting layout for approximately 35 standard interchanges. An estimated cost for lighting has been developed for each of these of these interchanges. Experience has shown that the annual electric cost per interchange is approximately 5% of the capital cost.

NCHRP 152 recommends that a priority index be calculated using the following relationship,

$$PI = \frac{NEED \times BENEFIT}{COST\ FACTOR}$$

NEED as a function of geometry, operations, environment and accident considerations as defined in NCHRP 152
BENEFIT as 25% of the sum of mainline and crossroad traffic
COST FACTOR as 5% of the capital cost plus annual electric cost

Our Lighting Section recommends that a threshold of 80 be used to consider an interchange for a lighting project.

The results of our analysis following NCHRP 152 findings are presented in the following two tables identified as Interchange Analysis. The two tables differ only in that the second contains a column identified as Accident Index which is the ratio of the night to day accident rates. The next table suggests a priority grouping based on the index calculated as outlined above.

INTERCHANGE ANALYSIS

EXIT	CROSSROAD	LIGHTED (Y/N/P)	INTERCHANGE TYPE (REF #)	NEED INDEX	BENEFIT INDEX	CONSTRUCTION COST	ESTIMATED ANNUAL ELECTRIC COST	PRIORITY INDEX
1	US 301	N	LARGE DIAMOND (I-3)	112	8975	$274,000	$13,700	37
2	NC 130	N	PARTIAL CLOVER (I-19)	114	7800	$149,000	$7,400	60
7	SR 2455	N	RURAL DIAMOND (I-1)	113	7395	$195,000	$9,800	43
10	SR 1003	N	RURAL DIAMOND (I-1)	73	7650	$195,000	$9,800	29
14	US 74	N	RURAL DIAMOND (I-1)	75	9700	$195,000	$9,800	37
17	NC 72	P	LARGE DIAMOND (I-3)	53	13175	$274,000	$13,700	25
19	SR 1536	P	RURAL DIAMOND (I-1)	54	11300	$195,000	$9,800	31
20	NC 211	P	URBAN DIAMOND (1-2)	81	15975	$123,000	$6,200	105
22	US 301	P	RURAL DIAMOND (I-1)	58	10900	$195,000	$9,800	32
25	US 301	N	PARTIAL CLOVER (I-19)	94	8885	$149,000	$7,400	56
31	NC 20	N	RURAL DIAMOND (I-1)	136	9900	$195,000	$9,800	69
33	US 301	N	RURAL DIAMOND (I-1)	100	9525	$195,000	$9,800	49
40	US 301	N	DIRECT ACCESS	*	*	*	*	*
41	SR 2252	N	RURAL DIAMOND (I-1)	84	8375	$195,000	$9,800	36
44	SR 2219	N	LARGE DIAMOND (I-3)	71	7650	$274,000	$13,700	20
46	NC 87	N	COLLECTOR-DISTRIBUTOR (I-22)	70	9575	$394,000	$19,700	17
49	NC 53/210	P	1/2 DIAMOND, 1/4 CLOVER (I-6)	55	10425	$123,000	$6,200	47
52	NC 24	N	COLLECTOR-DISTRIBUTOR (I-22)	70	9850	$394,000	$19,700	18
55	SR 1832	N	LARGE DIAMOND (I-3)	75	7425	$274,000	$13,700	20
56	US 301	N	TRUMPET (I-33)	73	12300	$100,000	$5,000	90
58	US 13	N	LARGE DIAMOND (I-3)	121	9900	$274,000	$13,700	117
61	SR 1815	N	RURAL DIAMOND (I-1)	114	9075	$195,000	$9,800	53
65	NC 82	N	LARGE DIAMOND (I-3)	78	9050	$274,000	$13,700	26
70	SR 1811	N	PARTIAL CLOVER (I-19)	116	8850	$149,000	$7,400	69
71	SR 1002	N	RURAL DIAMOND (I-1)	79	9625	$195,000	$9,800	39
72	SR 1793	Y	RURAL DIAMOND (I-1)	51	9950	**	$9,800	**
73	US 421	Y	LARGE DIAMOND (I-3)	51	12725	**	$13,700	**
75	SR 1808	N	RURAL DIAMOND (I-1)	127	9400	$195,000	$9,800	61
77	SR 1709	N	RURAL DIAMOND (I-1)	118	8875	$195,000	$9,800	54
79	NC 50	N	LARGE DIAMOND (I-3)	90	11600	$274,000	$13,700	38
81	I-40	N	DIRECTIONAL (I-32)	67	11475	$439,000	$22,000	18
87	SR 1162 / SR 1178	N	QTY 2 - 1/2 RURAL DIAMOND (I-4)	109	7375	$183,000	$9,200	88
90	US 301	N	1/2 DIAMOND, 1/4 CLOVER (I-6)	130	7625	$123,000	$6,200	80
93	SR 1007	N	PARTIAL CLOVER (I-19)	101	8600	$149,000	$7,400	58
95	US 70	N	3/4 DIAMOND, 1/4 CLOVER (I-9)	128	9275	$195,000	$9,800	61
97	US 70	P	DIAMOND, 1/2 CLOVER (1-9)	61	11825	$195,000	$9,800	37
98	SR 1297	P	1/2 CLOVER (I-16)	51	7725	$123,000	$6,200	32
101	SR 2137	N	RURAL DIAMOND (I-1)	119	7000	$195,000	$9,800	43
102	SR 2130	N	URBAN DIAMOND (I-2)	80	7200	$123,000	$6,200	47
105	SR 2339	N	RURAL DIAMOND (I-1)	75	7162.5	$195,000	$9,800	28
106	SR 2399	P	RURAL DIAMOND (I-1)	77	7300	$195,000	$9,800	29
107	US 301	P	1/2 DIAMOND, 1/4 CLOVER (I-6)	85	8225	$123,000	$6,200	57
116	NC 42	N	RURAL DIAMOND (I-1)	120	7275	$195,000	$9,800	45
121	US 264	Y	URBAN DIAMOND (I-31)	40	10500	**	$6,500	**
127	NC 97	N	RURAL DIAMOND (I-1)	107	6875	$195,000	$9,800	38
132	NC 58	N	LARGE DIAMOND (I-3)	107	7100	$274,000	$13,700	28
138	US 64	N	COLLECTOR-DISTRIBUTOR (I-22)	112	11800	$394,000	$19,700	34
141	NC 43	N	RURAL DIAMOND (I-1)	98	8775	$195,000	$9,800	44
145	US 301	P	1/4 CLOVER / DIRECTIONAL (I-33)	53	9375	$195,000	$9,800	26
150	NC 44	N	RURAL DIAMOND (I-1)	121	7625	$195,000	$9,800	47
154	NC 481	N	RURAL DIAMOND (I-1)	117	7550	$195,000	$9,800	45
160	NC 561	N	RURAL DIAMOND (I-1)	84	7675	$195,000	$9,800	33
168	NC 903	N	RURAL DIAMOND (I-1)	113	8550	$195,000	$9,800	49
173	US 158	N	URBAN DIAMOND (I-2)	99	14875	$123,000	$6,200	119
176	NC 46	N	RURAL DIAMOND (I-1)	120	8900	$195,000	$9,800	55
180	NC 48	N	RURAL DIAMOND (I-1)	100	7725	$195,000	$9,800	39

* INTERCHANGE IS AN OFF RAMP AND DOES NOT WARRANT LIGHTING

** INTERCHANGE IS CURRENTLY LIT

INTERCHANGE ANALYSIS

EXIT	CROSSROAD	LIGHTED (Y/N/P)	INTERCHANGE TYPE (REF #)	NEED INDEX	BENEFIT INDEX	ACCIDENT INDEX **	CONSTRUCTION COST	ESTIMATED ANNUAL ELECTRIC COST	PRIORITY INDEX
1	US 301	N	LARGE DIAMOND (I-3)	112	8975	2	$274,000	$13,700	37
2	NC 130	N	PARTIAL CLOVER (I-19)	114	7800	4	$149,000	$7,400	60
7	SR 2455	N	RURAL DIAMOND (I-1)	113	7395	MAX	$195,000	$9,800	43
10	SR 1003	N	RURAL DIAMOND (I-1)	73	7650	0.67	$195,000	$9,800	29
14	US 74	N	RURAL DIAMOND (I-1)	75	9700	0.71	$195,000	$9,800	37
17	NC 72	P	LARGE DIAMOND (I-3)	53	13175	0	$274,000	$13,700	25
19	SR 1536	P	RURAL DIAMOND (I-1)	54	11300	0.55	$195,000	$9,800	31
20	NC 211	P	URBAN DIAMOND (1-2)	81	15975	1.9	$123,000	$6,200	105
22	US 301	P	RURAL DIAMOND (I-1)	58	10900	0	$195,000	$9,800	32
25	US 301	N	PARTIAL CLOVER (I-19)	94	8885	1.5	$149,000	$7,400	56
31	NC 20	N	RURAL DIAMOND (I-1)	136	9900	2.1	$195,000	$9,800	69
33	US 301	N	RURAL DIAMOND (I-1)	100	9525	1.3	$195,000	$9,800	49
40	US 301	N	DIRECT ACCESS	*	*	*	*	*	*
41	SR 2252	N	RURAL DIAMOND (I-1)	84	8375	1	$195,000	$9,800	36
44	SR 2219	N	LARGE DIAMOND (I-3)	71	7650	0	$274,000	$13,700	20
46	NC 87	N	COLLECTOR-DISTRIBUTOR (I-22)	70	9575	0.67	$394,000	$19,700	17
49	NC 53/210	P	1/2 DIAMOND, 1/4 CLOVER (I-6)	55	10425	0	$123,000	$6,200	47
52	NC 24	N	COLLECTOR-DISTRIBUTOR (I-22)	70	9850	0	$394,000	$19,700	18
55	SR 1832	N	LARGE DIAMOND (I-3)	75	7425	0	$274,000	$13,700	20
56	US 301	N	TRUMPET (I-33)	73	12300	0	$100,000	$5,000	90
58	US 13	N	LARGE DIAMOND (I-3)	121	9900	3	$274,000	$13,700	117
61	SR 1815	N	RURAL DIAMOND (I-1)	114	9075	2	$195,000	$9,800	53
65	NC 82	N	LARGE DIAMOND (I-3)	78	9050	0.79	$274,000	$13,700	26
70	SR 1811	N	PARTIAL CLOVER (I-19)	116	8850	2	$149,000	$7,400	69
71	SR 1002	N	RURAL DIAMOND (I-1)	79	9625	0.71	$195,000	$9,800	39
72	SR 1793	Y	RURAL DIAMOND (I-1)	51	9950	0	***	$9,800	***
73	US 421	Y	LARGE DIAMOND (I-3)	51	12725	1.2	***	$13,700	***
75	SR 1808	N	RURAL DIAMOND (I-1)	127	9400	4.1	$195,000	$9,800	61
77	SR 1709	N	RURAL DIAMOND (I-1)	118	8875	2	$195,000	$9,800	54
79	NC 50	N	LARGE DIAMOND (I-3)	90	11600	0.71	$274,000	$13,700	38
81	I-40	N	DIRECTIONAL (I-32)	67	11475	0.89	$439,000	$22,000	18
87	SR 1162 / SR 1178	N	QTY 2 - 1/2 RURAL DIAMOND (I-4)	109	7375	1.8	$183,000	$9,200	88
90	US 301	N	1/2 DIAMOND, 1/4 CLOVER (I-6)	130	7625	2.4	$123,000	$6,200	80
93	SR 1007	N	PARTIAL CLOVER (I-19)	101	8600	1	$149,000	$7,400	58
95	US 70	N	3/4 DIAMOND, 1/4 CLOVER (I-9)	128	9275	2.7	$195,000	$9,800	61
97	US 70	P	DIAMOND, 1/2 CLOVER (1-9)	61	11825	0	$195,000	$9,800	37
98	SR 1297	P	1/2 CLOVER (I-16)	51	7725	0.66	$123,000	$6,200	32
101	SR 2137	N	RURAL DIAMOND (I-1)	119	7000	MAX	$195,000	$9,800	43
102	SR 2130	N	URBAN DIAMOND (I-2)	80	7200	0	$123,000	$6,200	47
105	SR 2339	N	RURAL DIAMOND (I-1)	75	7162.5	0	$195,000	$9,800	28
106	SR 2399	P	RURAL DIAMOND (I-1)	77	7300	6	$195,000	$9,800	29
107	US 301	P	1/2 DIAMOND, 1/4 CLOVER (I-6)	85	8225	1	$123,000	$6,200	57
116	NC 42	N	RURAL DIAMOND (I-1)	120	7275	2.7	$195,000	$9,800	45
121	US 264	Y	URBAN DIAMOND (I-31)	40	10500	0.86	***	$6,500	***
127	NC 97	N	RURAL DIAMOND (I-1)	107	6875	2	$195,000	$9,800	38
132	NC 58	N	LARGE DIAMOND (I-3)	107	7100	2	$274,000	$13,700	28
138	US 64	N	COLLECTOR-DISTRIBUTOR (I-22)	112	11800	2.9	$394,000	$19,700	34
141	NC 43	N	RURAL DIAMOND (I-1)	98	8775	1.5	$195,000	$9,800	44
145	US 301	P	1/4 CLOVER / DIRECTIONAL (I-33)	53	9375	0	$195,000	$9,800	26
150	NC 44	N	RURAL DIAMOND (I-1)	121	7625	16	$195,000	$9,800	47
154	NC 481	N	RURAL DIAMOND (I-1)	117	7550	4.8	$195,000	$9,800	45
160	NC 561	N	RURAL DIAMOND (I-1)	84	7675	1.1	$195,000	$9,800	33
168	NC 903	N	RURAL DIAMOND (I-1)	113	8550	1.6	$195,000	$9,800	49
173	US 158	N	URBAN DIAMOND (I-2)	99	14875	0.39	$123,000	$6,200	119
176	NC 46	N	RURAL DIAMOND (I-1)	120	8900	2.4	$195,000	$9,800	55
180	NC 48	N	RURAL DIAMOND (I-1)	100	7725	1.3	$195,000	$9,800	39

* INTERCHANGE IS AN OFF RAMP AND DOES NOT WARRANT LIGHTING

** ACCIDENT INDEX IS A RATIO OF NIGHT TO DAY ACCIDENT RATES

*** INTERCHANGE IS CURRENTLY LIT

This procedure is rather time consuming and risks inconsistency in the field evaluation of individual interchanges and thus the development of the NEED factor. In the course of this investigation, the Traffic Engineering Branch provided us with an in-depth analysis of the accident rates for each interchange. The tables presenting the results of their analysis follow. This information is available in electronic files and rates could be generated on a consistent basis, removing any bias that might result from the subjective field evaluation of individual interchanges.

Utilizing this analysis we ranked the I-95 interchanges based on (1) Night "Not Lighted" accident rate which accounts for accidents that occur in the unlit portions of the interchange and on (2) accident index which is a ratio of the night to day accident rates. The indication "Max" occurs when there are zero day accidents. Care should be exercised in developing the ratio to insure stability in the factor. For example, at Exit 150 the ratio is 16 and occurs as a function of 4 night and 1 day accidents combined with 80 % daytime and 20% nighttime traffic. Hence the ratio is 4 x 4, or 16.

Comparing these two rankings, the night accident rate and the accident index, only three interchanges appear in the top 10 in BOTH lists. These are Exits 75, 90 and 138. Exit 75 is the interchange of I-95 and SR 1808 between Dunn and Benson. Exit 90 is the interchange of I-95 and US 301 north of Four Oaks. Exit 138 is the collector-distributor interchange of I-95 with US 64 near Rocky Mount.

This last ranking scheme develops a priority on a relative basis. A threshold criteria is not established and transferability to other corridors based on an absolute index may not be advisable.

PRIORITY GROUPING

PRIORITY INDEX RANGE: 0-30

EXIT	COST	ESTIMATED ANNUAL ELECTRIC COST	TOTAL GROUP COST	TOTAL GROUP ANNUAL ELECTRIC COST
10	$195,000	$9,800		
17	$274,000	$13,700		
44	$274,000	$13,700		
46	$394,000	$19,700		
52	$394,000	$19,700		
55	$274,000	$13,700	$3,377,000	$169,100
65	$274,000	$13,700		
81	$439,000	$22,000		
105	$195,000	$9,800		
106	$195,000	$9,800		
132	$274,000	$13,700		
145	$195,000	$9,800		

PRIORITY INDEX RANGE: 30-50

EXIT	COST	ESTIMATED ANNUAL ELECTRIC COST	TOTAL GROUP COST	TOTAL GROUP ANNUAL ELECTRIC COST
1	$274,000	$13,700		
7	$195,000	$9,800		
14	$195,000	$9,800		
19	$195,000	$9,800		
22	$195,000	$9,800		
33	$195,000	$9,800		
41	$195,000	$9,800		
49	$123,000	$6,200		
71	$195,000	$9,800		
79	$274,000	$13,700		
97	$195,000	$9,800		
98	$123,000	$6,200	$4,626,000	$232,300
101	$195,000	$9,800		
102	$123,000	$6,200		
116	$195,000	$9,800		
127	$195,000	$9,800		
138	$394,000	$19,700		
141	$195,000	$9,800		
150	$195,000	$9,800		
154	$195,000	$9,800		
160	$195,000	$9,800		
168	$195,000	$9,800		
180	$195,000	$9,800		

PRIORITY INDEX RANGE: 50-70

EXIT	COST	ESTIMATED ANNUAL ELECTRIC COST	TOTAL GROUP COST	TOTAL GROUP ANNUAL ELECTRIC COST
2	$149,000	$7,400		
25	$149,000	$7,400		
31	$195,000	$9,800		
61	$195,000	$9,800		
70	$149,000	$7,400		
75	$195,000	$9,800	$1,889,000	$94,600
77	$195,000	$9,800		
93	$149,000	$7,400		
95	$195,000	$9,800		
107	$123,000	$6,200		
176	$195,000	$9,800		

PRIORITY INDEX RANGE: 70+

EXIT	COST	ESTIMATED ANNUAL ELECTRIC COST	TOTAL GROUP COST	TOTAL GROUP ANNUAL ELECTRIC COST
20	$123,000	$6,200		
56	$100,000	$5,000		
58	$274,000	$13,700	$926,000	$46,500
87	$183,000	$9,200		
90	$123,000	$6,200		
173	$123,000	$6,200		

INTERCHANGES CURRENTLY LIGHTED

EXIT	ESTIMATED ANNUAL ELECTRIC COST	TOTAL GROUP ANNUAL ELECTRIC COST
72	$9,800	
73	$13,700	$37,200
121	$13,700	

ACCIDENT LISTING FOR 08/1991 THRU 07/1994 ON I-95 / ACCIDENT RATE DAY Vs. NIGHT & NIGHT LIGHTED Vs. NOT LIGHTED

#	CO	INTERSECT ROUTE	MP	ADT	DAY Daylight * 91	92	93	94	TOTAL	NIGHT Night Lighted 91	92	93	94	TOTAL	NIGHT Night Not Lighted 91	92	93	94	TOTAL	NIGHT TOTAL	TOTAL ACCIDENTS	AVERAGE ACCIDENT RATE R (spot)	DAY ACCIDENT RATE R (spot)	NIGHT ACCIDENT RATE R (spot)	NIGHT LIGHTED ACCIDENT RATE R (spot)	NIGHT NOT LIGHTED ACCIDENT RATE R (spot)
1	65	NC46	01.83	30200	1	5	2	2	10	0	0	0	0	0	0	3	2	1	6	6	16	0.4838	0.3780	0.9072	0.0000	0.9072
2	65	NC48	06.02	27600	1	1	6	1	9	0	0	0	0	0	2	0	1	0	3	3	12	0.3971	0.3722	0.4963	0.0000	0.4963
SUBTOTAL			**	28900	2	6	8	3	19	0	0	0	0	0	2	3	3	1	9	9	28	0.4424	0.3753	0.7110	0.0000	0.7110
1	41	NC481	02.67	28900	1	3	1	0	5	0	0	0	0	0	0	2	3	1	6	6	11	0.3476	0.1975	0.9480	0.0000	0.9480
2	41	NC561	09.49	28600	1	1	4	1	7	0	0	0	0	0	0	0	2	0	2	2	9	0.2874	0.2794	0.3193	0.0000	0.3193
3	41	NC903	16.69	29000	3	7	8	2	20	0	0	0	0	0	1	2	4	1	8	8	28	0.8818	0.7873	1.2596	0.0000	1.2596
4	41	US158	21.94	29700	6	17	29	10	62	3	5	3	1	12	0	1	5	0	6	18	80	2.4599	2.3830	2.7674	0.3449	2.6225
SUBTOTAL			**	29050	11	28	42	13	94	3	5	3	1	12	1	5	14	2	22	34	128	1.0060	0.9235	1.3361	0.4716	0.8645
1	63	NC97	02.23	26200	1	1	0	0	2	0	0	0	0	0	0	0	0	1	1	1	3	0.1046	0.0871	0.1743	0.0000	0.1743
2	63	SR1717	07.67	26500	0	4	3	1	8	0	0	0	0	0	1	0	2	1	4	4	12	0.4135	0.3446	0.6892	0.0000	0.6892
3	63	US64	13.75	26500	2	2	2	1	7	0	0	0	0	0	2	1	0	2	5	5	12	0.4135	0.3015	0.8615	0.0000	0.8615
4	63	NC43	16.11	28800	1	1	2	4	8	0	0	0	0	0	1	0	0	2	3	3	11	0.3488	0.3171	0.4756	0.0000	0.4756
5	63	US301	20.41	28100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6	63	NC44	25.04	29700	0	1	0	0	1	0	0	0	0	0	1	1	2	0	4	4	5	0.1537	0.0384	0.6150	0.0000	0.6150
SUBTOTAL			**	27633	4	9	7	6	26	0	0	0	0	0	5	2	4	6	17	17	43	0.2368	0.1790	0.4682	0.0000	0.4682
1	97	NC42	08.12	25000	0	0	3	0	3	0	0	1	0	1	1	0	0	1	2	3	6	0.2192	0.1370	0.5479	0.0000	0.5479
2	97	US264	13.17	24900	4	4	3	3	14	0	0	0	0	0	0	0	3	0	3	3	17	0.6235	0.6418	0.5501	0.0000	0.5501
SUBTOTAL			**	24950	4	4	6	3	17	0	0	1	0	1	1	0	3	1	5	6	23	0.4209	0.3889	0.5490	0.0915	0.4575
1	50	NC50	01.62	35800	2	7	4	4	17	0	0	0	1	1	0	1	2	0	3	4	21	0.5357	0.5421	0.5102	0.1276	0.3826
2	50	I-40	03.02	46900	0	1	3	5	9	0	0	0	0	0	1	0	1	0	2	2	11	0.2142	0.2191	0.1947	0.0000	0.1947
3	50	SR1224	09.27	37500	0	1	2	2	5	0	0	0	0	0	0	0	3	0	3	3	8	0.1948	0.1522	0.3653	0.0000	0.3653
4	50	SR1224	09.70	37500	3	1	1	2	7	0	0	0	0	0	0	0	1	0	1	1	8	0.1948	0.2131	0.1218	0.0000	0.1218
5	50	US701	11.90	34100	3	1	2	0	6	0	0	0	0	0	3	1	2	2	8	8	14	0.3749	0.2009	1.0713	0.0000	1.0713
6	50	NC96	11.90	34100	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.0803	0.1004	0.0000	0.0000	0.0000
7	50	SR1162	09.27	27900	0	0	3	2	5	0	0	0	0	0	0	0	3	0	3	3	8	0.2619	0.2046	0.4910	0.0000	0.4910
8	50	US301	11.90	29600	5	3	7	2	17	0	0	0	0	0	2	2	2	2	8	8	25	0.7713	0.6556	1.2341	0.0000	1.2341
9	50	SR2502	15.24	32900	0	2	1	1	4	0	0	0	0	0	0	1	0	0	1	1	5	0.1388	0.1388	0.1388	0.0000	0.1388
10	50	US70	16.95	32900	0	2	2	2	6	0	0	1	0	1	1	2	1	0	4	5	11	0.3053	0.2082	0.6940	0.1388	0.5552
11	50	SR1927	20.20	29200	1	0	4	1	6	0	0	0	0	0	0	0	1	0	1	1	7	0.2189	0.2346	0.1564	0.0000	0.1564
12	50	SR1001	21.98	29200	0	0	2	0	2	0	0	0	0	0	0	0	0	1	1	1	3	0.0938	0.0782	0.1564	0.0000	0.1564
13	50	SR2137	23.48	29200	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	2	0.0626	0.0000	0.3128	0.0000	0.3128
14	50	SR2130	24.63	29200	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0.0626	0.0782	0.0000	0.0000	0.0000
15	50	SR1178	09.70	30100	1	1	0	1	3	0	0	0	0	0	0	0	1	0	1	1	4	0.1214	0.1138	0.1517	0.0000	0.1517
16	50	SR2399	28.08	29200	0	1	1	0	2	0	0	0	0	0	0	1	2	0	3	3	5	0.1564	0.0782	0.4691	0.0000	0.4691
17	50	US301	29.32	30700	1	1	5	1	8	0	0	0	0	0	0	1	0	1	2	2	10	0.2975	0.2975	0.2975	0.0000	0.2975
SUBTOTAL			**	32706	16	23	40	23	102	0	0	1	1	2	7	10	19	7	43	45	147	0.2415	0.2094	0.3696	0.0164	0.3531
1	42	SR1839	00.52	35100	0	0	1	1	2	0	0	0	0	0	0	1	0	0	1	1	3	0.0781	0.0650	0.1301	0.0000	0.1301
2	42	SR1872	01.74	35100	3	8	4	4	19	0	0	0	0	0	0	3	1	0	4	4	23	0.5984	0.6179	0.5204	0.0000	0.5204
3	42	SR1811	03.38	35600	0	4	5	1	10	0	2	0	0	2	0	0	0	0	0	2	12	0.3078	0.3207	0.2565	0.0000	0.2565
4	42	US421	03.99	35600	3	2	4	1	10	0	0	0	0	0	0	3	0	0	3	3	13	0.3335	0.3207	0.3848	0.0000	0.3848
5	42	SR1799	05.87	35800	1	1	3	1	6	0	0	0	1	1	2	0	1	2	5	6	12	0.3061	0.1913	0.7653	0.1275	0.6377
6	42	SR1002	01.74	37500	5	7	4	5	21	0	0	0	0	0	0	2	1	0	3	3	24	0.5845	0.6393	0.3653	0.0000	0.3653
7	42	SR1808	05.87	38300	0	0	3	2	5	0	0	0	1	1	2	1	1	2	6	7	12	0.2861	0.1490	0.8346	0.1192	0.7153
8	42	SR1793	03.38	40400	0	3	5	1	9	0	1	0	0	1	0	0	0	0	0	1	10	0.2261	0.2543	0.1130	0.1130	0.0000
9	42	SR1709	07.85	35800	1	3	1	1	6	0	0	0	1	1	0	2	0	1	3	4	10	0.2551	0.1913	0.5102	0.1275	0.3826
SUBTOTAL			**	36578	13	28	30	17	88	0	3	0	3	6	4	12	4	5	25	31	119	0.3301	0.3052	0.4300	0.0832	0.3468

BY: TONY W. KU 10/12/94

SPECIAL ACCIDENT STUDY

1	25	NC87	07.32	28100	1	0	0	2	3	0	0	0	0	0	0	0	1	0	1	1	4	0.1400	0.1312	0.1750	0.0000	0.4750
2	25	NC87	07.81	28800	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0.0634	0.0793	0.0000	0.0000	0.0000
3	25	SR2007	09.91	28800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
4	25	NC53	10.32	28800	3	2	2	1	8	0	0	0	0	0	0	0	0	0	0	0	8	0.2537	0.3171	0.0000	0.0000	0.0000
5	25	NC24	12.38	27200	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.0336	0.0420	0.0000	0.0000	0.0000
6	25	SR1834	12.96	27200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
7	25	I-95	15.11	26600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
8	25	SR1833	15.45	26600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
9	25	SR1832	15.89	26600	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.0343	0.0429	0.0000	0.0000	0.0000
10	25	I-95BUS	16.34	26600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
11	25	SR1856	22.53	34400	1	1	2	0	4	0	0	0	0	0	1	0	1	2	2	6	0.1593	0.1327	0.2655	0.0000	0.2655
12	25	SR1815	22.53	36900	1	1	2	0	4	0	0	0	0	0	1	0	1	2	2	6	0.1485	0.1237	0.2475	0.0000	0.2475
13	25	US13	19.25	41200	1	0	0	3	4	0	0	0	0	0	2	0	1	0	3	7	0.1552	0.1108	0.3325	0.0000	0.3325
14	25	NC62	26.58	36200	1	2	2	0	5	0	0	0	0	0	0	0	0	1	1	6	0.1514	0.1577	0.1261	0.0000	0.1261
15	25	NC59	01.35	26100	0	2	2	0	4	0	0	0	0	0	0	0	1	0	1	1	5	0.1750	0.1750	0.1750	0.0000	0.1750
SUBTOTAL			**	29873	8	10	12	6	36	0	0	0	0	0	2	2	3	3	10	10	46	0.0937	0.0917	0.1019	0.0000	0.1019
1	77	US501	00.07	27700	1	8	8	7	24	0	0	0	0	0	3	3	1	5	12	12	36	1.1869	0.9891	1.9781	0.0000	1.9781
2	77	NC130	02.33	29700	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	2	0.0615	0.0364	0.1537	0.0000	0.1537
3	77	SR2455	07.17	29500	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0.0310	0.0000	0.1548	0.0000	0.1548
4	77	NC211	19.87	55300	1	1	0	1	3	0	0	2	0	2	1	0	0	0	3	3	6	0.0991	0.0619	0.2477	0.1651	0.0825
5	77	SR1003	10.41	30900	1	2	2	1	6	0	0	0	0	0	0	0	1	0	1	1	7	0.2069	0.2217	0.1478	0.0000	0.1478
6	77	CARTHAGE	18.75	46000	2	10	7	3	22	1	0	0	0	1	1	1	1	0	3	4	26	0.5162	0.5460	0.3971	0.0993	0.2978
7	77	US301	10.41	29500	1	2	1	2	6	0	0	0	0	0	0	0	1	0	1	1	7	0.2167	0.2322	0.1548	0.0000	0.1548
8	77	US74	13.72	31000	1	8	7	1	17	0	0	0	0	0	0	3	0	0	3	3	20	0.5892	0.6260	0.4419	0.0000	0.4419
9	77	NC72	17.03	33700	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.0271	0.0339	0.0000	0.0000	0.0000
10	77	ROBERT	19.87	42600	3	6	4	2	15	0	2	3	0	5	2	0	2	0	9	9	24	0.5145	0.4020	0.9647	0.5359	0.4288
11	77	US301	21.55	34200	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.0801	0.1001	0.0000	0.0000	0.0000
12	77	US301	25.05	33000	1	4	3	0	8	0	0	0	0	0	2	0	1	0	3	3	11	0.3044	0.2767	0.4151	0.0000	0.4151
13	77	NC20	31.41	33000	1	4	8	2	15	0	0	1	0	1	0	2	4	2	8	9	24	0.6642	0.5189	1.2453	0.1384	1.1070
14	77	SR1980	33.04	32500	1	3	2	0	6	0	0	0	0	0	0	1	1	0	2	2	8	0.2248	0.2107	0.2810	0.0000	0.2810
SUBTOTAL			**	34900	13	50	45	19	127	1	2	6	0	9	9	10	14	7	40	49	176	0.3290	0.2967	0.4579	0.0841	0.3738
TOTAL				30831	71	158	190	90	509	4	10	11	5	30	31	44	64	32	171	201	710	0.3048	0.2731	0.4314	0.0644	0.3670

NOTES:

* "Daylight" is defined as when light condition is one of the following: a: Daylight b: Dusk c: Dawn.
"Night" is defined as when light condition is either darkness lighted or darkness not lighted.

** Subtotal of ADT within a county is taken as the average. Total ADT of the whole section is weighted by section length.

*** All accident data were obtained from mainframe by using the "CLUSTER" program. Accidents without milepost will not be included. The result may be deviated due to the miscoding in the accident information.

**** All accident rate calculations were based on Day - Night ADT distribution percentages of 80% and 20%, respectively.

25 <===> CUMBERLAND COUNTY

41 <===> HALIFAX COUNTY

42 <===> HARNETT COUNTY

50 <===> JOHNSTON COUNTY

63 <===> NASH COUNTY

65 <===> NORTHAMPTON CONUTY

77 <===> ROBESON COUNTY

97 <===> WILSON COUNTY

BY: TONY W. KU 10/12/94

RANKING BY ACCIDENT INDEX

RANKING	ACCIDENT INDEX *	EXIT	CROSSROAD
1	16	150	NC 44
2	6	106	SR 2399
3	4.8	154	NC 481
4	4.1	75	SR 1808
5	4	2	NC 130
6	3	58	US 13
7	***2.9***	***138***	***US 64***
8	2.7	95	US 70
9	2.7	116	NC 42
10	2.4	90	US 301
11	2.4	176	NC 46
12	2.1	31	NC 20
13	2	70	SR 1811
14	2	77	SR 1709
15	2	61	SR 1815
16	2	127	NC 97
17	2	1	US 301
18	2	132	NC 58
19	1.9	20	NC 211
20	1.8	87	SR 1162 / SR 1178
21	1.6	168	NC 903
22	1.5	25	US 301
23	1.5	141	NC 43
24	1.3	33	US 301
25	1.3	180	NC 48
26	1.2	73	US 421
27	1.1	160	NC 561
28	1	93	SR 1007
29	1	107	US 301
30	1	41	SR 2252
31	0.89	81	I-40
32	0.86	121	US 264
33	0.79	65	NC 82
34	0.71	71	SR 1002
35	0.71	79	NC 50
36	0.71	14	US 74
37	0.67	10	SR 1003
38	0.67	46	NC 87
39	0.66	98	SR 1297
40	0.55	19	SR 1536
41	0.39	173	US 158
42	0	56	US 301
43	0	102	SR 2130
44	0	49	NC 53/210
45	0	97	US 70
46	0	105	SR 2339
47	0	22	US 301
48	0	145	US 301
49	0	17	NC 72
50	0	55	SR 1832
51	0	44	SR 2219
52	0	52	NC 24
53	0	72	SR 1793
	MAX **	7	SR 2455
	MAX **	101	SR 2137

* ACCIDENT INDEX IS A RATIO OF NIGHT TO DAY ACCIDENT RATES
** MAX OCCURS WHERE THERE ARE ZERO DAY ACCIDENTS

RANKING BY NIGHT "NOT LIGHTED" ACCIDENT RATE

RANKING	NIGHT NOT LIGHTED ACCIDENT RATE *	EXIT	CROSSROAD
1	1.98	1	US 301
2	1.26	168	NC 903
3	1.11	31	NC 20
4	0.95	154	NC 481
5	0.92	173	US 158
6	0.91	176	NC 46
7	***0.86***	***138***	***US 64***
8	0.77	90	US 301
9	0.69	132	NC 58
10	0.68	75	SR 1808
11	0.62	150	NC 44
12	0.56	95	US 70
13	0.56	181	US 264
14	0.5	180	NC 48
15	0.48	141	NC 43
16	0.47	106	SR 2399
17	0.44	71	SR 1002
18	0.44	14	US 74
19	0.42	25	US 301
20	0.38	73	US 421
21	0.38	79	NC 50
22	0.38	77	SR 1709
23	0.37	116	NC 42
24	0.33	58	US 13
25	0.32	160	NC 561
26	0.31	101	SR 2137
27	0.3	19	SR 1536
28	0.3	107	US 301
29	0.28	87	SR 1162 / SR 1178
30	0.28	33	US 301
31	0.26	61	SR 1815
32	0.26	20	NC 211
33	0.19	81	I-40
34	0.18	41	SR 2252
35	0.17	127	NC 97
36	0.16	98	SR 1297
37	0.15	7	SR 2455
38	0.15	2	NC 130
39	0.15	10	SR 1003
40	0.14	93	SR 1007
41	0.13	70	SR 1811
42	0.13	65	NC 82
43	0.09	46	NC 87
44	0	145	US 301
45	0	105	SR 2339
46	0	102	SR 2130
47	0	97	US 70
48	0	17	NC 72
49	0	22	US 301
50	0	44	SR 2219
51	0	49	NC 53/210
52	0	52	NC 24
53	0	55	SR 1832
54	0	56	US 301
55	0	72	SR 1793

* THE NIGHT "NOT LIGHTED" RATE ACCOUNTS FOR ACCIDENTS THAT OCCUR IN UNLIT PORTIONS OF THE INTERCHANGE