APPENDIX H

AIR QUALITY TECHNICAL REPORT

AIR QUALITY ANALYSIS

TECHNICAL REPORT

I-69, Evansville to Indianapolis

Section 2 – SR 64 to US 50

Daviess, Gibson, and Pike Counties, Indiana

Prepared for:

Indiana Department of Transportation

Federal Highway Administration

Prepared by:

Jacobs Engineering

501 North Broadway

St. Louis, MO 63102

January 2007

Revised April 2008

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1.0 PROJECT DESCRIPTION

The proposed I-69 project runs between the Evansville area and the Indianapolis area in southwest Indiana. The study corridor for Section 2 of the proposed project, the subject of this analysis, begins at SR 64 in Gibson County, continues northeastward through Pike County, and terminates at US 50 in Daviess County, for a total length of approximately 29 miles. For purposes of this analysis, current conditions are assumed to be those of the year 2002, while the design year for this analysis is the year 2030.

2.0 ALTERNATIVE ALIGNMENTS UNDER CONSIDERATION

In the I-69 Tier 1 EIS, a preferred corridor was selected for I-69, and six sections were defined. Within Section 2, two alternative alignments were developed and studied in detail. These were identified as Alternatives A and B. Because the selected corridor within which these alternatives were developed was generally only 2,000 ft in width, there is very little difference between the two alternatives with regard to those factors which would influence potential air quality impacts. Both alternatives would have the same projected traffic volumes and characteristics. Both alternatives would have four proposed interchanges in essentially the same locations, with essentially the same traffic volumes using those interchanges.

The four DEIS interchanges are named, in south to north order, to reflect their service areas, as follows: Petersburg (SR 61), North Pike County (which connects with realigned Blackburn Road at realigned SR 57), South Daviess County (which connects with SR 57 at CR 300S), and Washington (US 50).

The Section 2 corridor and the four proposed interchange locations are shown on Figure H-1 on the following page.

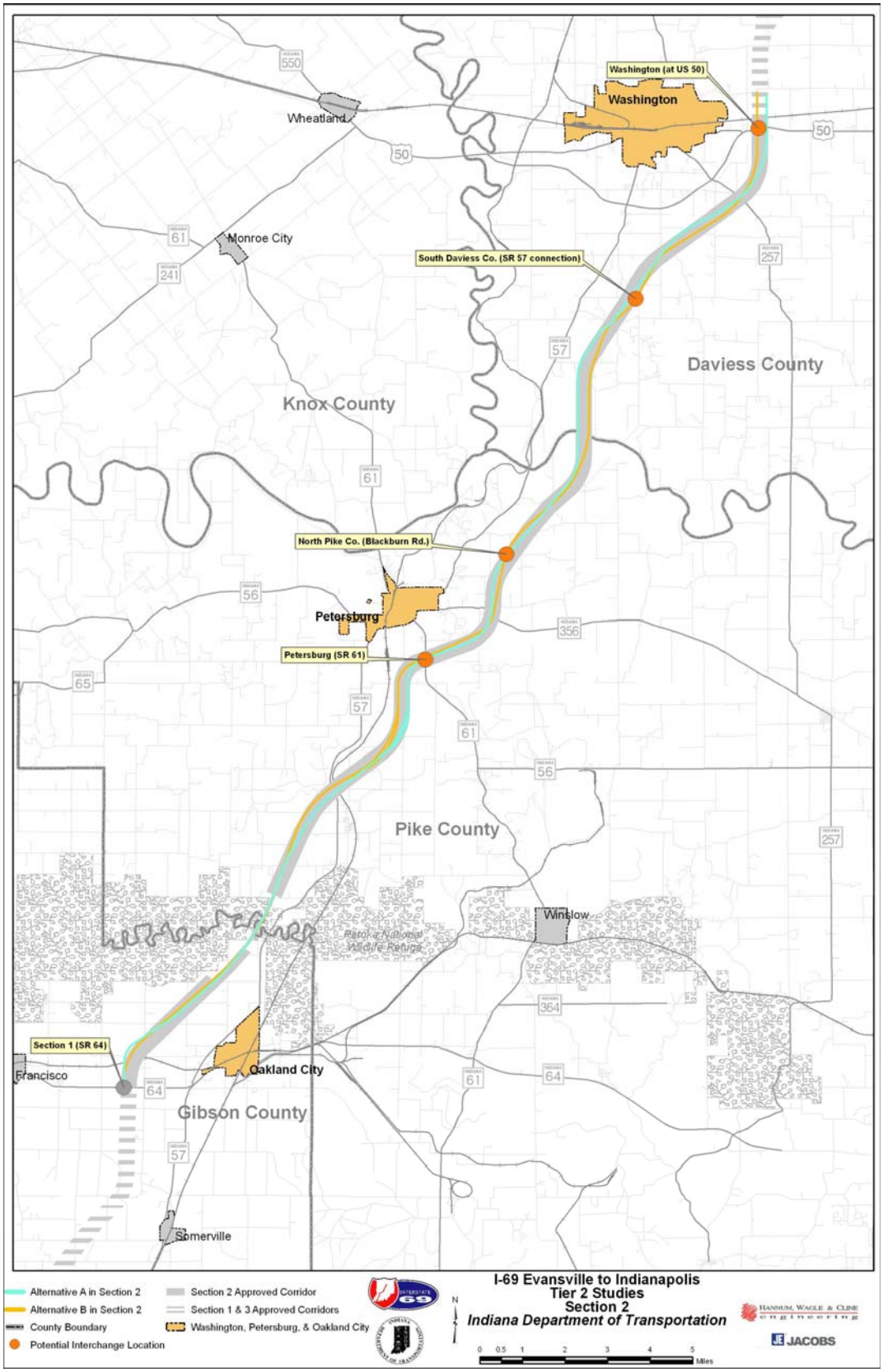

Figure H-1: Section 2 Proposed Alternatives and Interchanges

3.0 METHODOLOGY

3.1 Introduction

Pollution from the use of motor vehicles is the main source of air pollutants from either the construction of a new highway or the modification of an existing highway. Carbon monoxide (CO) is the major pollution caused by the incomplete combustion of fuel in motor vehicles.

3.2 Analysis Techniques

CO emissions are generally associated with large volumes of traffic which are stopped or moving very slowly, like a traffic intersection. Areas with high levels of CO are called CO "hot spots" and NEPA requires CO "hot spot" or microscale analyses for most transportation projects.

The "hot spot" analysis determines whether a new road or a modification to an existing road will either cause an exceedance of the National Ambient Air Quality Standards (NAAQS) or will make an existing exceedance of the standards worse. The NAAQS values for CO are:

One hour: 35 ppm

Eight hour: 9 ppm

Note: ppm = parts per million

If a model shows that the values will be exceeded with the addition or modification of a road, the project would be considered in violation of the standards. CO is a product of incomplete fuel combustion and is generally found in the highest concentrations near the intersections. For this project, CO concentrations were evaluated at locations 10 feet, 50 feet, 100 feet, and 150 feet from the edge of the roadway.

For the Tier 2 study, the hot-spot analysis must be performed on the existing scenario and a future design year scenario at the interchange carrying the highest traffic volume in order to determine the impact of the modification. For Section 2, the interchange with the highest traffic

volume and worst LOS under the Build scenario was the proposed interchange of I-69 with US 50, in Daviess County. Since that interchange does not now exist, the No-Build and current year (2002) scenarios used the intersection of US 50 and the US 50 Bypass as the nearest intersection with the heaviest concentration of traffic.

In addition to the hot-spot analysis, a free-flow analysis of the proposed new roadway section of I-69 carrying the highest average peak hour traffic volumes was also conducted. Within Section 2, the portion of I-69 carrying the highest traffic volume is the southernmost portion, from the interchange with SR 64 at the southern end of Section 2 in Gibson County, northward to the SR 61 interchange in Pike County. Since vehicles cannot enter or leave the highway anywhere between these interchanges, traffic volumes are the same throughout that length, and the free-flow analysis is applicable throughout that same length. A location at the southern end of the section, in Gibson County, was used for the analysis.

The concentration of CO in the study area was modeled using CAL3QHC, a dispersion model used to predict CO concentrations from motor vehicles traveling near roadway intersections. This model is the standard model used by USEPA for these types of analyses. CO concentrations for 1-hour and 8-hour standards were modeled using traffic data and meteorological conditions designed to yield “worst-case” CO concentrations.

Figures H-2 and H-3 show a graphical representation of the roadways and receptor locations for the models used in the analysis. Figure H-2 shows the location used for the Existing conditions in the base year, 2002, and for the No-Build scenario for the forecast year, 2030. Figure H-3 shows the Build scenario for the year 2030.

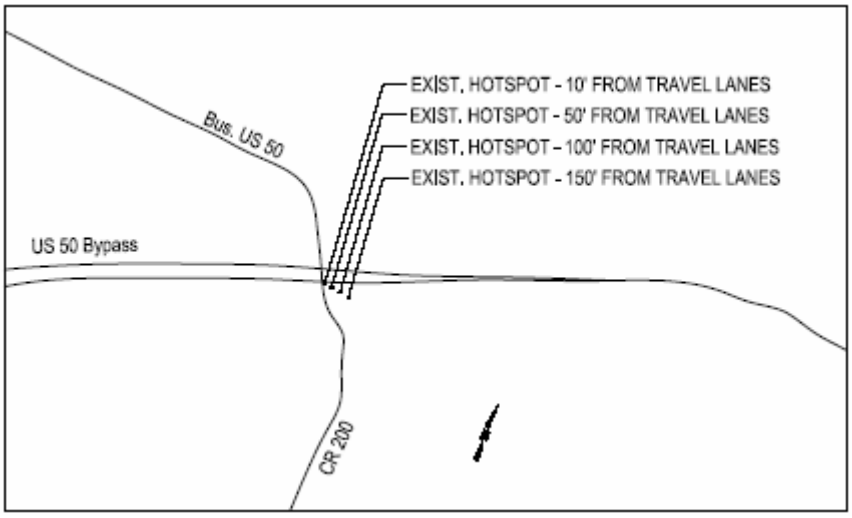

Figure H-2: Roadway/Receptor Diagram, "Hot Spot" Analysis, No-Build Condition

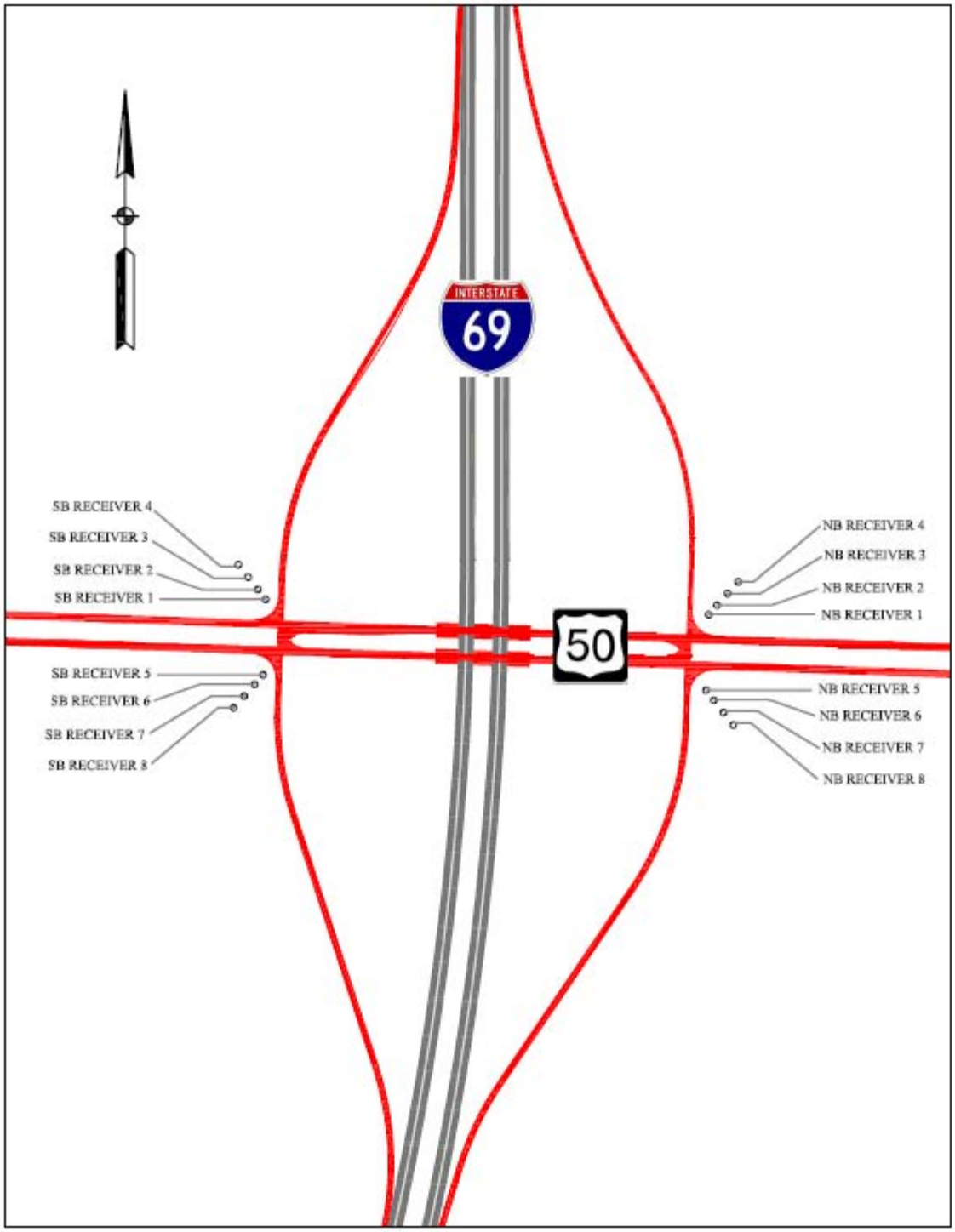

Figure H-3: Roadway/Receptor Diagram, "Hot Spot" Analysis, Build Condition

Inputs for the CAL3QHC model include: traffic volumes, motor vehicle emission factors, meteorological conditions, and receptor and roadway geometry. CO emission factors for Daviess and Gibson Counties were provided by Bernardin, Lochmueller and Associates Inc., as generated using the MOBILE6.2 computer modeling. Summaries of the CO emissions for the analysis are found in Appendix A. The emission factors are located in Appendix B and the CAL3QHC data files are located in Appendix C.

The “hot spot” analysis was conducted using meteorological conditions which would predict the “worst case” CO concentrations, including:

Wind Speed - The wind speed was assumed to be one meter per second, representing little to no dispersion of the pollutants.

Stability Class - Pasquill’s stability class is a measure of atmospheric turbulence ranging from “A” (very turbulent) to “F” (very stable). A stability class of “D” (neutral) was used in this analysis.

Wind Angle - The wind angle varies from 0° to 360°, depending on the receptor location. The computer model allows the program to conduct an incremental “worst case” wind angle search. For this analysis, a wind angle search of 10° increments was used.

Surface Roughness - The characteristics of the terrain, or surface roughness, can alter the way pollutants are dispersed. The typical range is from 1 cm (flat, level terrain) to 500 cm (urban business districts). A surface roughness of 74 cm was used for this analysis.

Mixing Height - The mixing height considers the impact of nocturnal inversions and is generally assigned a value of 1,000 meters.

Background Concentrations - All concentrations of CO that are not emitted by the modeled sources are considered background concentrations. They originate from either nearby parking lots or nearby adjacent intersections. A one-hour background concentration of 2.0 ppm and a persistence factor of 0.7 for the eight-hour concentration were used for the Section 2 project corridor.

In addition to meteorological input data, the CAL3QHC computer model requires the roadway and receptor site geometries to be defined within a Cartesian coordinate system. Roadway segments are defined as free-flow links each having a constant width, height, traffic volume, and emission factor. Receptors are located where the maximum total projected pollutant concentration is most likely to occur, typically along the section of roadway carrying the highest volume of traffic. Receptors were located to the outside of the highway (along the non-highway side) on both the northbound and southbound I-69 interchange ramps with US 50.

The CAL3QHC modeling procedure described above was used to predict hourly "worst-case" CO concentrations. One-hour and eight-hour concentrations were calculated to permit comparison with NAAQS.

CO concentrations generated along the existing roadway network and the proposed project were predicted using the CAL3QHC computer model. The X, Y, and Z coordinates for 12 sites were entered into the model as representative receptors as described above.

4.0 AIR QUALITY ANALYSIS

The results of the hot-spot analysis conducted for the Existing, No-Build Alternative, and Build Alternative are summarized in Appendix A.

CO Hot-Spot Analysis

The anticipated worst-case location for CO with the proposed project is the proposed interchange of I-69 with US 50 in Daviess County.

Existing Alignment. A base-year analysis for I-69 could not be performed because the location of the future worst-case hot spot is currently farmland and an existing roadway does not exist at that location. The nearby location of the US 50/US 50 Bypass intersection was considered to best represent the proposed US 50/I-69 interchange, and was used for the base-year analysis. The highest 1-hour concentration of CO is 2.7 ppm, while the highest 8-hour concentration is 1.9 ppm. These concentrations occur at receptor Sites 1 and 5,located at the mixing zone boundary, 10 ft from the edge of pavement.

Future No-Build Alternative. A No-Build analysis could not be performed because the area is currently farmland and an existing alignment does not exist. As with the Year 2002 analysis, the nearby intersection of US 50 and the US 50 Bypass was used to represent a No-Build scenario in the Year 2030. The projected highest 1-hour concentration at this location is 2.4 ppm, while the highest 8-hour concentration is 1.7 ppm. These concentrations also occur at receptor Site 5, 10 feet from the edge of pavement. Because of expected reductions in emission factors for newer vehicles, the CO concentrations for the Future No-Build scenario are predicted to decrease from the the levels predicted for the base case.

Build Alternatives. For the Build Alternative in 2030, the proposed interchange of I-69 and US 50 was considered to be the worst-case location for the hot-spot analysis. The results of the Build alternative analysis indicate that the highest one-hour concentration is 3.0 ppm, while the highest eight-hour concentration is 2.1 ppm. These concentrations occur at receptor 5, located at the mixing zone boundary (ten feet from the edge of pavement). The one-hour and eight-hour CO concentrations for the Build alternative are well below the USEPA standards in the NAAQS and are not predicted to exceed them at any time.

Free-Flow Analysis

For the free-flow analysis, a speed of 65 mph was assumed and emission factors for Gibson County were utilized. All other input values remained the same.. The maximum 1-hour concentration for the Build Alternative is 5.8 ppm, and the highest 8-hour concentration is 4.1 ppm (see Table H-2 in Appendix A). These concentrations occur at receptor Site 1, located at the mixing zone boundary of the outside lane on the northbound side. None of the projected CO concentrations for the free-flow analysis exceeds the NAAQS.

5.0 SUMMARY AND CONCLUSIONS

An air quality analysis was performed for the Section 2 project. Gibson and Pike counties are considered as nonattainment for $PM_{2.5}$; however, Davies, Gibson, and Pike counties are in attainment for all other NAAQS criteria pollutants. As noted above at the conclusion of the section titled "CO Hot-Spot Analysis," none of the modeled CO values at the selected existing hot-spot location (Year 2002) exceeds the NAAQS for CO. Likewise, for the future year of 2030, neither the No-Build alternative nor the Build alternative is projected to produce CO levels that would exceed the CO ambient air quality standards mandated by USEPA at either the worst-case hot-spot location or the free-flow analysis location.

APPENDIX A

MAXIMUM ONE-HOUR AND EIGHT-HOUR CO CONCENTRATIONS

Table H-1: Maximum 1-Hour and 8-Hour CO Concentrations (in ppm)—Hot Spot Analsysis

Hot Spot	Existing Year 2002		No-Build Alternative Year 2030		Build Alternative Year 2030	
Receptor Site and Distance From Edge of Pavement	**1 Hr.**	**8 Hr.**	**1 Hr.**	**8 Hr.**	**1 Hr.**	**8 Hr.**
Site 1 – Existing Hot Spot – 10 feet	2.7	1.9	2.3	1.6	2.8	2.0
Site 2 – Existing Hot Spot – 50 feet	2.5	1.8	2.2	1.5	2.4	1.7
Site 3 – Existing Hot Spot – 100 feet	2.2	1.5	2.1	1.5	2.2	1.5
Site 4 – Existing Hot Spot – 150 feet	2.2	1.5	2.1	1.5	2.2	1.5
Site 5 – Existing Hot Spot – 10 feet	2.7	1.9	2.4	1.7	3.0	2.1
Site 6 – Existing Hot Spot – 50 feet	2.4	1.7	2.3	1.6	2.4	1.7
Site 7 – Existing Hot Spot – 100 feet	2.2	1.5	2.1	1.5	2.2	1.5
Site 8 – Existing Hot Spot – 150 feet	2.2	1.5	2.0	1.4	2.2	1.5
Maximum Value (ppm) 1 Hour	2.7		2.4		3.0	
Maximum Value (ppm) 8 Hour	1.9		1.7		2.1	

National Ambient Air Quality Standards: 1-hour: 35.0 parts per million (ppm); 8-hour, 9.0 ppm
Background CO Concentrations: 1-hour: 2.0 ppm

Table H-2: Maximum One-Hour and Eight-Hour CO Concentrations (in ppm)—Free-Flow Analysis

Free-Flow Receptors	Build Scenario Year 2030	
Receptor Site and Distance From Edge of Pavement	**1 Hr.**	**8 Hr.**
Site 1 – 10 feet	5.8	4.1
Site 2 – 50 feet	5.8	4.1
Site 3 – 100 feet	5.8	4.1
Site 4 – 150 feet	5.8	4.1
Site 5 – 10 feet	5.8	4.1
Site 6 – 50 feet	5.8	4.1
Site 7 – 100 feet	5.8	4.1
Site 8 – 150 feet	5.8	4.1
Maximum Value (ppm) 1 Hour	5.8	
Maximum Value (ppm) 8 Hour	4.1	

National Ambient Air Quality Standards: 1-hour: 35.0 parts per million (ppm); 8-hour, 9.0 ppm
Background CO Concentrations: 1-hour: 2.0 ppm

APPENDIX B
CO EMISSION FACTORS

Gibson County 2002
CO Emission Rates (g/mi)

Functional Class	Vehicle Class									
	LDGV	LDGT12 < 6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Rural Freeway/Freeway Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rural OPA	21.140	23.990	28.790	25.210	17.990	1.599	1.413	2.368	9.220	20.071
Rural Minor Arterial	20.340	23.190	28.010	24.410	17.540	1.597	1.412	2.363	9.400	20.341
Rural Major Collector	18.760	21.590	26.440	22.820	18.480	1.652	1.461	2.568	10.530	19.405
Rural Minor Collector	18.020	20.820	25.710	22.070	19.570	1.724	1.527	2.841	11.660	18.192
Rural Local	17.850	20.590	25.560	21.850	22.880	1.837	1.629	3.268	13.220	18.662
Urban Interstate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Urban Freeway/Expressway	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Urban OPA	19.230	22.060	26.910	23.300	17.430	1.625	1.437	2.469	10.070	19.925
Urban Minor Arterial	18.710	21.530	26.390	22.770	18.600	1.656	1.465	2.582	10.590	19.664
Urban Collector	18.020	20.820	25.710	22.070	19.590	1.724	1.526	2.840	11.660	19.244
Urban Local	16.130	19.970	25.210	21.300	63.270	2.928	2.611	7.405	26.430	18.706

Gibson County 2030
CO Emission Rates (g/mi)

Functional Class	Vehicle Class									
	LDGV	LDGT12 < 6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Rural Freeway/Freeway Ramp	7.340	7.870	8.220	7.960	7.810	0.566	0.298	0.215	23.180	5.980
Rural OPA	6.520	7.010	7.340	7.090	5.200	0.497	0.257	0.169	9.220	5.875
Rural Minor Arterial	6.310	6.790	7.110	6.870	5.040	0.497	0.257	0.170	9.410	5.990
Rural Major Collector	5.850	6.310	6.610	6.390	5.220	0.519	0.270	0.186	10.550	5.728
Rural Minor Collector	5.660	6.100	6.390	6.180	5.650	0.548	0.287	0.204	11.660	5.501
Rural Local	5.670	6.110	6.390	6.180	6.470	0.594	0.315	0.236	13.260	5.570
Urban Interstate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Urban Freeway/Expressway	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Urban OPA	5.910	6.380	6.680	6.450	5.120	0.513	0.267	0.180	10.300	5.816
Urban Minor Arterial	5.820	6.280	6.580	6.350	5.270	0.523	0.272	0.188	10.680	5.796
Urban Collector	5.660	6.100	6.390	6.180	5.650	0.548	0.287	0.204	11.660	5.727
Urban Local	6.310	6.710	7.000	6.780	15.090	1.030	0.572	0.555	26.430	6.496

Daviess County 2002

CO Emission Rates (g/mi)

Vehicle Class									
LDGV	LDGT12 < 6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22.560	26.470	33.390	28.230	18.960	1.609	1.492	2.413	9.320	21.896
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
21.430	25.300	32.260	27.070	18.180	1.594	1.478	2.357	9.450	22.466
18.780	22.530	29.620	24.330	20.090	1.737	1.613	2.896	12.010	19.472
18.660	22.370	29.510	24.190	22.020	1.793	1.666	3.110	12.810	19.994
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
18.830	22.590	29.650	24.390	19.470	1.716	1.593	2.817	11.700	20.271
18.750	22.410	29.660	24.260	24.840	1.901	1.767	3.512	14.200	20.508
19.350	22.930	30.390	24.830	30.740	2.150	2.000	4.450	17.110	21.376
16.950	21.890	29.590	23.850	63.850	2.923	2.725	7.406	26.750	20.274

Daviess County 2030

CO Emission Rates (g/mi)

Vehicle Class									
LDGV	LDGT12 < 6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
7.770	8.620	9.120	8.750	7.840	0.580	0.314	0.215	23.460	6.381
7.470	8.300	8.790	8.420	6.560	0.543	0.291	0.191	16.890	6.908
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7.150	7.950	8.430	8.070	5.620	0.518	0.276	0.176	9.320	7.073
6.820	7.600	8.060	7.710	5.140	0.509	0.271	0.169	9.370	6.574
5.980	6.670	7.090	6.780	6.170	0.590	0.320	0.224	12.810	5.964
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6.380	7.110	7.550	7.220	5.070	0.520	0.278	0.176	10.100	6.370
5.980	6.680	7.090	6.780	6.100	0.586	0.317	0.221	12.670	6.088
6.340	7.030	7.450	7.140	8.830	0.736	0.407	0.319	17.110	6.578
6.700	7.380	7.810	7.490	15.150	1.051	0.595	0.555	26.750	7.018

APPENDIX C
CAL3QHC INPUT AND OUTPUT FILES

2002 EXISTING ANALYSIS

```
'2002 50 & 50 BYPASS'  60.  74.   0. 0.   8    1.0000    1    1
'rec1'                             3.8         11.4        1.8
'rec2'                            11.6         20.8        1.8
'rec3'                            21.4         32.4        1.8
'rec4'                            31.2         44.1        1.8
'rec5'                             3.8        -11.4        1.8
'rec6'                            11.6        -20.8        1.8
'rec7'                            21.4        -32.4        1.8
'rec8'                            31.2        -44.1        1.8
'US 50 & 50 BYPASS'  10  1   1 'c'
  1
'NB app' 'AG' -12.5  -70.8   1.8     0.    140.  20.27  0. 9.66
  2
'NB QueueT'  'AG'  0.      -9.1  -3.1  -26.8 0.  3.66  1
         40       25       4.0 140  50.68  1900  2 3
  1
'NB dep' 'AG'  1.8   0.    -12.5    70.8   155.  20.27  0. 9.66
  1
'WB app.' 'AG'  168.9   5.5    0.  5.5     215.  20.27  0. 13.3
  2
'WB QueueTR' 'AG'  1.8    5.5     9.7   5.5  0.  7.32  2
         40       16       4.0 360  50.68  1900  2 3
1
'WB dep.' 'AG'    0.    5.5   -211.8 5.5   220.  20.27  0. 13.3
   1
'EB app.' 'AG' -211.8   -5.5  0.   -5.5     175.  20.27  0. 13.3
  2
'EB QueueT' 'AG' -1.8   -5.5 -15.1  -5.5    0. 7.32  2
         40       16       4.0 175  50.68 1900   2 3
   2
'EB QueueL' 'AG' -1.8     0.   -5.5    0.      0. 3.66  1
         40       16       4.0  10  50.68  1900  2 3
 1
'EB dep.' 'AG'    0.    -5.5  168.9 -5.5    310.  20.27  0. 13.3
1. 000. 4 1000. 0. 'Y' 10 0 36
```

JOB: 2002 50 & 50 BYPASS RUN: US 50 & 50 BYPASS

DATE : 4/ 6/ 8
TIME : 21:43:58

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 74. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT) X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. NB app	*	-41.0	-232.3	5.9	0.0	*	237.	11.	AG	140.	20.3	0.0	31.7		
2. NB QueueT	*	0.0	-29.9	-3.3	-48.7	*	19.	190.	AG	85.	100.0	0.0	12.0	0.33	1.0
3. NB dep	*	5.9	0.0	-41.0	232.3	*	237.	349.	AG	155.	20.3	0.0	31.7		
4. WB app.	*	554.1	18.0	0.0	18.0	*	554.	270.	AG	215.	20.3	0.0	43.6		
5. WB QueueTR	*	5.9	18.0	21.7	18.0	*	16.	90.	AG	109.	100.0	0.0	24.0	0.21	0.8
6. WB dep.	*	0.0	18.0	-694.9	18.0	*	695.	270.	AG	220.	20.3	0.0	43.6		
7. EB app.	*	-694.9	-18.0	0.0	-18.0	*	695.	90.	AG	175.	20.3	0.0	43.6		
8. EB QueueT	*	-5.9	-18.0	-13.5	-18.0	*	8.	270.	AG	109.	100.0	0.0	24.0	0.10	0.4
9. EB QueueL	*	-5.9	0.0	-6.8	0.0	*	1.	270.	AG	54.	100.0	0.0	12.0	0.01	0.0
10. EB dep.	*	0.0	-18.0	554.1	-18.0	*	554.	90.	AG	310.	20.3	0.0	43.6		

JOB: 2002 50 & 50 BYPASS RUN: US 50 & 50 BYPASS

DATE : 4/ 6/ 8
TIME : 21:43:58

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB QueueT	40	25	4.0	140	1900	50.68	2	3
5. WB QueueTR	40	16	4.0	360	1900	50.68	2	3
8. EB QueueT	40	16	4.0	175	1900	50.68	2	3
9. EB QueueL	40	16	4.0	10	1900	50.68	2	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. rec1	12.5	37.4	5.9
2. rec2	38.1	68.2	5.9
3. rec3	70.2	106.3	5.9
4. rec4	102.4	144.7	5.9
5. rec5	12.5	-37.4	5.9
6. rec6	38.1	-68.2	5.9
7. rec7	70.2	-106.3	5.9
8. rec8	102.4	-144.7	5.9

JOB: 2002 50 & 50 BYPASS RUN: US 50 & 50 BYPASS

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.1	0.0	0.0	0.0	0.6	0.2	0.2	0.1
10.	0.0	0.0	0.0	0.0	0.5	0.2	0.2	0.1
20.	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.1
30.	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.1
40.	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.1
50.	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1
60.	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1
70.	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1
80.	0.1	0.0	0.0	0.0	0.5	0.3	0.1	0.0
90.	0.4	0.1	0.0	0.0	0.5	0.1	0.0	0.0
100.	0.4	0.2	0.1	0.0	0.2	0.0	0.0	0.0
110.	0.5	0.2	0.2	0.0	0.1	0.0	0.0	0.0
120.	0.4	0.2	0.2	0.2	0.0	0.0	0.0	0.0
130.	0.5	0.2	0.2	0.2	0.0	0.0	0.0	0.0
140.	0.4	0.2	0.2	0.2	0.0	0.0	0.0	0.0
150.	0.4	0.2	0.2	0.2	0.0	0.0	0.0	0.0
160.	0.5	0.2	0.2	0.2	0.0	0.0	0.0	0.0
170.	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0
180.	0.7	0.2	0.2	0.2	0.1	0.0	0.0	0.0
190.	0.6	0.3	0.2	0.2	0.1	0.0	0.0	0.0
200.	0.6	0.4	0.2	0.2	0.2	0.0	0.0	0.0
210.	0.6	0.3	0.1	0.0	0.2	0.1	0.0	0.0
220.	0.5	0.5	0.0	0.0	0.3	0.1	0.0	0.0
230.	0.4	0.3	0.1	0.0	0.2	0.1	0.0	0.0
240.	0.5	0.3	0.2	0.1	0.3	0.1	0.0	0.0
250.	0.5	0.3	0.2	0.1	0.3	0.1	0.0	0.0
260.	0.5	0.3	0.1	0.0	0.4	0.1	0.0	0.0
270.	0.4	0.2	0.0	0.0	0.7	0.2	0.0	0.0
280.	0.2	0.1	0.0	0.0	0.7	0.3	0.1	0.0
290.	0.1	0.1	0.0	0.0	0.7	0.3	0.2	0.2
300.	0.1	0.1	0.0	0.0	0.6	0.4	0.2	0.1
310.	0.1	0.1	0.0	0.0	0.6	0.4	0.1	0.0
320.	0.2	0.1	0.0	0.0	0.5	0.3	0.0	0.0
330.	0.2	0.1	0.0	0.0	0.6	0.2	0.1	0.1
340.	0.2	0.0	0.0	0.0	0.5	0.2	0.1	0.1
350.	0.2	0.0	0.0	0.0	0.6	0.3	0.2	0.1
360.	0.1	0.0	0.0	0.0	0.6	0.2	0.2	0.1
MAX	0.7	0.5	0.2	0.2	0.7	0.4	0.2	0.2
DEGR.	180	220	110	120	270	300	0	290

THE HIGHEST CONCENTRATION OF 0.70 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2002 50 & 50 BYPASS RUN: US 50 & 50 BYPASS

DATE : 4/ 6/ 8
TIME : 21:43:58

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM) ANGLE (DEGREES)							
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
LINK #	* 180	220	110	120	270	300	0	290
1	* 0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
2	* 0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
3	* 0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
4	* 0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0
5	* 0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
6	* 0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1
7	* 0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.1
8	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	* 0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0

2030 NO-BUILD ALTERNATIVE

```
'2030 50 & 50 BYPASS NO BUILD'  60.  74.   0. 0.   8    1.0000    1    1
'rec1'                            3.8         11.4        1.8
'rec2'                           11.6         20.8        1.8
'rec3'                           21.4         32.4        1.8
'rec4'                           31.2         44.1        1.8
'rec5'                            3.8        -11.4        1.8
'rec6'                           11.6        -20.8        1.8
'rec7'                           21.4        -32.4        1.8
'rec8'                           31.2        -44.1        1.8
'US 50/50 BYPASS NO BUILD'  10  1   1 'c'
  1
'NB app' 'AG' -12.5  -70.8   1.8     0.    405.   6.37  0. 9.66
  2
'NB QueueT'  'AG'  0.      -9.1 -12.6  -80.8 0.  3.66  1
         40       27       4.0 405  15.93  1900  2 3
  1
'NB dep' 'AG'  1.8   0.    -12.5    70.8   200.   6.37  0. 9.66
  1
'WB app.' 'AG'  168.9   5.5    0.  5.5     240.   6.37  0. 13.3
  2
'WB QueueTR' 'AG'  1.8    5.5     9.7   5.5  0.  7.32  2
         40       15       4.0 240  15.93  1900  2 3
1
'WB dep.' 'AG'    0.    5.5   -211.8 5.5   620.   6.37  0. 13.3
   1
'EB app.' 'AG' -211.8   -5.5  0.   -5.5     335.   6.37  0. 13.3
  2
'EB QueueT' 'AG' -1.8   -5.5 -15.1  -5.5    0. 7.32  2
         40       15       4.0 335  15.93 1900   2 3
   2
'EB QueueL' 'AG' -1.8     0.   -5.5    0.      0. 3.66  1
         40       15       4.0  20  15.93  1900  2 3
 1
'EB dep.' 'AG'    0.    -5.5  168.9 -5.5    360.   6.37  0. 13.3
1. 000. 4 1000. 0. 'Y' 10 0 36
```

JOB: 2030 50 & 50 BYPASS NO BUILD RUN: US 50/50 BYPASS NO BUILD

DATE : 4/ 6/ 8
TIME : 21:44:28

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 74. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT) X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. NB app	*	-41.0	-232.3	5.9	0.0	*	237.	11.	AG	405.	6.4	0.0	31.7		
2. NB QueueT	*	0.0	-29.9	-150.0	-883.2	*	866.	190.	AG	29.	100.0	0.0	12.0	1.22	44.0
3. NB dep	*	5.9	0.0	-41.0	232.3	*	237.	349.	AG	200.	6.4	0.0	31.7		
4. WB app.	*	554.1	18.0	0.0	18.0	*	554.	270.	AG	240.	6.4	0.0	43.6		
5. WB QueueTR	*	5.9	18.0	15.7	18.0	*	10.	90.	AG	32.	100.0	0.0	24.0	0.13	0.5
6. WB dep.	*	0.0	18.0	-694.9	18.0	*	695.	270.	AG	620.	6.4	0.0	43.6		
7. EB app.	*	-694.9	-18.0	0.0	-18.0	*	695.	90.	AG	335.	6.4	0.0	43.6		
8. EB QueueT	*	-5.9	-18.0	-19.6	-18.0	*	14.	270.	AG	32.	100.0	0.0	24.0	0.19	0.7
9. EB QueueL	*	-5.9	0.0	-7.5	0.0	*	2.	270.	AG	16.	100.0	0.0	12.0	0.02	0.1
10. EB dep.	*	0.0	-18.0	554.1	-18.0	*	554.	90.	AG	360.	6.4	0.0	43.6		

JOB: 2030 50 & 50 BYPASS NO BUILD RUN: US 50/50 BYPASS NO BUILD

DATE : 4/ 6/ 8
TIME : 21:44:28

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB QueueT	40	27	4.0	405	1900	15.93	2	3
5. WB QueueTR	40	15	4.0	240	1900	15.93	2	3
8. EB QueueT	40	15	4.0	335	1900	15.93	2	3
9. EB QueueL	40	15	4.0	20	1900	15.93	2	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. rec1	12.5	37.4	5.9
2. rec2	38.1	68.2	5.9
3. rec3	70.2	106.3	5.9
4. rec4	102.4	144.7	5.9
5. rec5	12.5	-37.4	5.9
6. rec6	38.1	-68.2	5.9
7. rec7	70.2	-106.3	5.9
8. rec8	102.4	-144.7	5.9

JOB: 2030 50 & 50 BYPASS NO BUILD RUN: US 50/50 BYPASS NO BUILD

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
10.	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
30.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
40.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
50.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
60.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
70.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
80.	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
90.	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
100.	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0
110.	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150.	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160.	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
170.	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180.	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0
190.	0.3	0.2	0.0	0.0	0.2	0.0	0.0	0.0
200.	0.2	0.2	0.0	0.0	0.3	0.1	0.0	0.0
210.	0.1	0.0	0.0	0.0	0.3	0.2	0.0	0.0
220.	0.1	0.0	0.0	0.0	0.2	0.2	0.0	0.0
230.	0.1	0.1	0.1	0.0	0.2	0.2	0.0	0.0
240.	0.2	0.1	0.1	0.1	0.2	0.1	0.0	0.0
250.	0.3	0.1	0.1	0.1	0.2	0.1	0.0	0.0
260.	0.3	0.1	0.1	0.0	0.3	0.1	0.0	0.0
270.	0.2	0.1	0.0	0.0	0.4	0.1	0.0	0.0
280.	0.1	0.0	0.0	0.0	0.4	0.3	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.4	0.3	0.1	0.0
300.	0.1	0.0	0.0	0.0	0.3	0.3	0.1	0.0
310.	0.1	0.0	0.0	0.0	0.3	0.2	0.1	0.0
320.	0.1	0.0	0.0	0.0	0.2	0.2	0.0	0.0
330.	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
340.	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0
350.	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
360.	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
MAX	0.3	0.2	0.1	0.1	0.4	0.3	0.1	0.0
DEGR.	180	190	230	240	270	280	290	0

THE HIGHEST CONCENTRATION OF 0.40 PPM OCCURRED AT RECEPTOR REC5 .

JOB: 2030 50 & 50 BYPASS NO BUILD RUN: US 50/50 BYPASS NO BUILD

DATE : 4/ 6/ 8
TIME : 21:44:28

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM) ANGLE (DEGREES)							
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
LINK #	* 180	190	230	240	270	280	290	0
1	* 0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0
2	* 0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
3	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	* 0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	* 0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
7	* 0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
8	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2030 BUILD ALTERNATIVE

HOT SPOT ANALYSIS

```
'2030 US 50 AND I-69 NB'  60.  74.   0. 0.   8    1.0000    1    1
'rec1'                            3.8          6.         1.8
'rec2'                           11.6         15.4        1.8
'rec3'                           21.4         27.         1.8

'rec4'                           31.2         38.7        1.8
'rec5'                            3.8         -6.         1.8
'rec6'                           11.6        -15.4        1.8
'rec7'                           21.4        -27.         1.8
'rec8'                           31.2        -38.7        1.8
'US 50 & I-69 NB'  9   1   1 'c'
  1
'NB app' 'AG' -22.9 -130.    1.8     0.      0.   6.37  0. 9.66
  2
'NB QueueT'  'AG'  0.      -3.7  -3.1  -21.1 0.  3.66  1
        80       61       4.0 150  15.93  1900  2 3
  1
'NB dep' 'AG'  1.8   0.    -24.0   136.    145.   6.37  0. 9.66
  1
'EB app.' 'AG' -117.7  -1.8    0. -1.8     590.   6.37  0. 9.66
  2
'EB QueueLT' 'AG' -1.8   -1.8   -14.   -1.8  0.  3.66  1
        80       21       4.0 740  15.93  1900  2 3
1
'EB dep.' 'AG'    0.   -1.8   209.7 -1.8   720.   6.37  0. 9.66
   1
'WB app.' 'AG'  209.7    1.8  0.    1.8     405.   6.37  0. 9.66
  2
'WB QueueTR' 'AG'  1.8    1.8  36.2   1.8    0. 3.66  1
        80       21       4.0 410  15.93 1900   2 3
 1
'WB dep.' 'AG'    0.     1.8 -117.7  1.8    425.   6.37  0. 9.66
1. 000. 4 1000. 0. 'Y' 10 0 36
```

JOB: 2030 US 50 AND I-69 NB RUN: US 50 & I-69 NB

DATE : 3/ 5/ 6
TIME : 18: 0:40

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 74. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
	*	X1	Y1	X2	Y2	*									
1. NB app	*	-75.1	-426.5	5.9	0.0	*	434.	11.	AG	0.	5.8	0.0	31.7		
2. NB QueueT	*	0.0	-12.1	-8.8	-61.4	*	50.	190.	AG	42.	100.0	0.0	12.0	0.49	2.5
3. NB dep	*	5.9	0.0	-78.7	446.2	*	454.	349.	AG	145.	5.8	0.0	31.7		
4. EB app.	*	-386.2	-5.9	0.0	-5.9	*	386.	90.	AG	590.	5.8	0.0	31.7		
5. EB QueueLT	*	-5.9	-5.9	-90.9	-5.9	*	85.	270.	AG	15.	100.0	0.0	12.0	0.59	4.3
6. EB dep.	*	0.0	-5.9	688.0	-5.9	*	688.	90.	AG	720.	5.8	0.0	31.7		
7. WB app.	*	688.0	5.9	0.0	5.9	*	688.	270.	AG	405.	5.8	0.0	31.7		
8. WB QueueTR	*	5.9	5.9	53.0	5.9	*	47.	90.	AG	15.	100.0	0.0	12.0	0.33	2.4
9. WB dep.	*	0.0	5.9	-386.2	5.9	*	386.	270.	AG	425.	5.8	0.0	31.7		

JOB: 2030 US 50 AND I-69 NB RUN: US 50 & I-69 NB

DATE : 3/ 5/ 6
TIME : 18: 0:40

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB QueueT	80	61	4.0	150	1900	20.67	2	3
5. EB QueueLT	80	21	4.0	740	1900	20.67	2	3
8. WB QueueTR	80	21	4.0	410	1900	20.67	2	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. rec1	12.5	19.7	5.9
2. rec2	38.1	50.5	5.9
3. rec3	70.2	88.6	5.9
4. rec4	102.4	127.0	5.9
5. rec5	12.5	-19.7	5.9
6. rec6	38.1	-50.5	5.9
7. rec7	70.2	-88.6	5.9
8. rec8	102.4	-127.0	5.9

JOB: 2030 US 50 AND I-69 NB RUN: US 50 & I-69 NB

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
10.	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
20.	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
30.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.0
40.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
50.	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1
60.	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1
70.	0.0	0.0	0.0	0.0	0.4	0.2	0.1	0.1
80.	0.2	0.0	0.0	0.0	0.4	0.2	0.1	0.0
90.	0.3	0.1	0.0	0.0	0.4	0.1	0.0	0.0
100.	0.4	0.2	0.0	0.0	0.2	0.0	0.0	0.0
110.	0.3	0.2	0.1	0.0	0.1	0.0	0.0	0.0
120.	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
130.	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
140.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
150.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
160.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
170.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
180.	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
190.	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
200.	0.3	0.1	0.1	0.0	0.1	0.0	0.0	0.0
210.	0.4	0.1	0.0	0.0	0.1	0.0	0.0	0.0
220.	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0
230.	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0
240.	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.0
250.	0.2	0.2	0.0	0.0	0.1	0.0	0.0	0.0
260.	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.0
270.	0.2	0.0	0.0	0.0	0.5	0.1	0.0	0.0
280.	0.1	0.0	0.0	0.0	0.5	0.2	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.5	0.3	0.1	0.0
300.	0.0	0.0	0.0	0.0	0.4	0.3	0.1	0.0
310.	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0
320.	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0
330.	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
340.	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0
350.	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0
360.	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
MAX	0.4	0.2	0.1	0.1	0.5	0.3	0.1	0.1
DEGR.	100	100	110	120	270	290	0	40

THE HIGHEST CONCENTRATION OF 0.50 PPM OCCURRED AT RECEPTOR REC5 .

JOB: 2030 US 50 AND I-69 NB RUN: US 50 & I-69 NB

DATE : 3/ 5/ 6
TIME : 18: 0:40

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM)							
	* ANGLE (DEGREES)							
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
LINK #	* 100	100	110	120	270	290	0	40
1	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	* 0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
3	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	* 0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
5	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	* 0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1
7	* 0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
8	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	* 0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0

```
'2030 US 50 AND I-69 SB'  60.  74.   0. 0.   8    1.0000    1    1
'rec1'                          -3.8          6.         1.8
'rec2'                         -11.6         15.4        1.8
'rec3'                         -21.4         27.         1.8

'rec4'                         -31.2         38.7        1.8
'rec5'                          -3.8         -6.         1.8
'rec6'                         -11.6        -15.4        1.8
'rec7'                         -21.4        -27.         1.8
'rec8'                         -31.2        -38.7        1.8
'US 50 & I-69 SB'  9   1   1 'c'
  1
'SB app' 'AG'  23.2  131.5  -1.8     0.     60.   6.37  0. 9.66
  2
'SB QueueT'  'AG'  0.       3.7   1.8   13.9 0.  3.66  1
         80       60       4.0  65  15.93  1900  2 3
  1
'SB dep' 'AG' -1.8   0.     21.5  -121.8   130.   6.37  0. 9.66
  1
'EB app.' 'AG' -260.3  -1.8    0. -1.8     725.   6.37  0. 9.66
  2
'EB QueueRT' 'AG' -1.8   -1.8   -91.1  -1.8  0.  3.66  1
         80       21       4.0 745  15.93  1900  2 3
1
'EB dep.' 'AG'    0.   -1.8   117.7 -1.8   730.   6.37  0. 9.66
   1
'WB app.' 'AG'  117.7    1.8  0.    1.8     315.   6.37  0. 9.66
  2
'WB QueueTL' 'AG'  1.8    1.8  26.5   1.8    0. 3.66  1
         80       21       4.0 425  15.93 1900   2 3
 1
'WB dep.' 'AG'    0.     1.8 -260.3  1.8    375.   6.37  0. 9.66
1. 000. 4 1000. 0. 'Y' 10 0 36
```

JOB: 2030 US 50 AND I-69 SB RUN: US 50 & I-69 SB

DATE : 4/ 6/ 8
TIME : 21:44: 6

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 74. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
	*	X1	Y1	X2	Y2	*									
1. SB app	*	76.1	431.4	-5.9	0.0	*	439.	191.	AG	60.	6.4	0.0	31.7		
2. SB QueueT	*	0.0	12.1	3.7	33.1	*	21.	10.	AG	32.	100.0	0.0	12.0	0.20	1.1
3. SB dep	*	-5.9	0.0	70.5	-399.6	*	407.	169.	AG	130.	6.4	0.0	31.7		
4. EB app.	*	-854.0	-5.9	0.0	-5.9	*	854.	90.	AG	725.	6.4	0.0	31.7		
5. EB QueueRT	*	-5.9	-5.9	-91.5	-5.9	*	86.	270.	AG	11.	100.0	0.0	12.0	0.59	4.3
6. EB dep.	*	0.0	-5.9	386.2	-5.9	*	386.	90.	AG	730.	6.4	0.0	31.7		
7. WB app.	*	386.2	5.9	0.0	5.9	*	386.	270.	AG	315.	6.4	0.0	31.7		
8. WB QueueTL	*	5.9	5.9	54.7	5.9	*	49.	90.	AG	11.	100.0	0.0	12.0	0.34	2.5
9. WB dep.	*	0.0	5.9	-854.0	5.9	*	854.	270.	AG	375.	6.4	0.0	31.7		

JOB: 2030 US 50 AND I-69 SB RUN: US 50 & I-69 SB

DATE : 4/ 6/ 8
TIME : 21:44: 6

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SB QueueT	80	60	4.0	65	1900	15.93	2	3
5. EB QueueRT	80	21	4.0	745	1900	15.93	2	3
8. WB QueueTL	80	21	4.0	425	1900	15.93	2	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. rec1	-12.5	19.7	5.9
2. rec2	-38.1	50.5	5.9
3. rec3	-70.2	88.6	5.9
4. rec4	-102.4	127.0	5.9
5. rec5	-12.5	-19.7	5.9
6. rec6	-38.1	-50.5	5.9
7. rec7	-70.2	-88.6	5.9
8. rec8	-102.4	-127.0	5.9

JOB: 2030 US 50 AND I-69 SB RUN: US 50 & I-69 SB

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
10.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
20.	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
30.	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
40.	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
50.	0.1	0.0	0.0	0.0	0.3	0.1	0.1	0.0
60.	0.1	0.0	0.0	0.0	0.4	0.1	0.1	0.1
70.	0.1	0.0	0.0	0.0	0.4	0.1	0.1	0.1
80.	0.2	0.0	0.0	0.0	0.5	0.1	0.1	0.0
90.	0.3	0.0	0.0	0.0	0.4	0.1	0.0	0.0
100.	0.4	0.1	0.0	0.0	0.1	0.0	0.0	0.0
110.	0.4	0.2	0.1	0.0	0.1	0.0	0.0	0.0
120.	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0
130.	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
140.	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
150.	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.0
160.	0.3	0.1	0.1	0.0	0.1	0.0	0.0	0.0
170.	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0
180.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
190.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
200.	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
210.	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
220.	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
230.	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
240.	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
250.	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0
260.	0.4	0.2	0.1	0.0	0.2	0.0	0.0	0.0
270.	0.4	0.1	0.0	0.0	0.4	0.1	0.0	0.0
280.	0.2	0.0	0.0	0.0	0.4	0.2	0.1	0.0
290.	0.0	0.0	0.0	0.0	0.4	0.2	0.1	0.1
300.	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1
310.	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1
320.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
330.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
340.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.0
350.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
360.	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1
MAX	0.4	0.2	0.1	0.1	0.5	0.2	0.1	0.1
DEGR.	100	110	110	120	80	280	0	0

THE HIGHEST CONCENTRATION OF 0.50 PPM OCCURRED AT RECEPTOR REC5 .

JOB: 2030 US 50 AND I-69 SB RUN: US 50 & I-69 SB

DATE : 4/ 6/ 8
TIME : 21:44: 6

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM)							
	* ANGLE (DEGREES)							
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
LINK #	* 100	110	110	120	80	280	0	0
1	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	* 0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	* 0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
5	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	* 0.2	0.1	0.1	0.1	0.3	0.0	0.0	0.0
7	* 0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
8	* 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	* 0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0

2030 BUILD ALTERNATIVE

FREE-FLOW ANALYSIS

JOB: 2030 I-69 FREEFLOW RUN: I-69 FREEFLOW

DATE : 2/ 3/ 8
TIME : 20: 7:36

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 74. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES
MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				
* LENGTH BRG TYPE VPH EF	H W V/C QUEUE					
*	X1	Y1	X2	Y2		
* (FT) (DEG)	(G/MI) (FT) (FT)		(VEH)			
1. SB	*	54.1	-3279.9	54.1	3279.9	
* 6560. 360. AG 13513.	5.8 0.0 43.6					
2. NB	*	-54.1	3279.9	-54.1	-3279.9	
* 6560. 180. AG 13702.	5.8 0.0 43.6					

DATE : 2/ 3/ 8
TIME : 20: 7:36

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. rec1	*	0.0	87.9	5.9	*
2. rec2	*	0.0	128.0	5.9	*
3. rec3	*	0.0	178.1	5.9	*
4. rec4	*	0.0	228.0	5.9	*
5. rec5	*	0.0	-87.9	5.9	*
6. rec6	*	0.0	-128.0	5.9	*
7. rec7	*	0.0	-178.1	5.9	*
8. rec8	*	0.0	-228.0	5.9	*

JOB: 2030 I-69 FREEFLOW RUN: I-69 FREEFLOW

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	3.7	3.7	3.7	3.7	3.8	3.8	3.8	3.8
10.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
20.	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
30.	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
40.	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
50.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
60.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
70.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
80.	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
90.	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
100.	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
110.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
120.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
130.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
140.	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
150.	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
160.	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
170.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
180.	3.8	3.8	3.8	3.8	3.7	3.7	3.7	3.7
190.	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
200.	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
210.	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
220.	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
230.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
240.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
250.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
260.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
270.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
280.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
290.	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
300.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
310.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
320.	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
330.	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
340.	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
350.	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
360.	3.7	3.7	3.7	3.7	3.8	3.8	3.8	3.8

```
MAX   *   3.8   3.8   3.8   3.8   3.8   3.8   3.8   3.8
DEGR. *  180   180   180   180     0     0     0     0
THE HIGHEST CONCENTRATION OF    3.80 PPM OCCURRED AT RECEPTOR REC5 .
```

DATE : 2/ 3/ 8
TIME : 20: 7:36

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM)							
	* ANGLE (DEGREES)							
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
LINK #	* 180	180	180	180	0	0	0	0
1	* 1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
2	* 1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

APPENDIX D

FHWA/FTA POLICY MEMORANDUM:

Air Quality Conformity

REFERENCES

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