# Appendix "I"
# CITY OF YAKIMA, WASHINGTON
# EVALUATION OF MOBILE SOURCE CARBON MONOXIDE EMISSIONS IN THE YAKIMA CBD

Prepared by the City of Yakima, Washington Public Works Department in cooperation with the Yakima Regional Clean Air Authority and Yakima Conference of Governments
September 8, 2000

## INTRODUCTION AND SUMMARY

This study will present findings related to air quality and traffic flow in the downtown area of Yakima, Washington. Included in this report is an evaluation of the existing conditions and a strategy for improving traffic flow in order to reduce Carbon Monoxide mobile emissions. Additionally, this report will provide the foundation for a Transportation Contingency Measure (TCM) and related Mitigation Measures which may be included in the Yakima Carbon Monoxide Limited Maintenance Plan, required under the Federal Clean Air Act Amendments of 1990. This study includes background information about the weather related conditions which have been documented in association with recorded air quality standard exceedences and violations. However, this study presents recommendations which can result in reduced vehicle emissions of Carbon Monoxide throughout the year and reduce the likelihood of a CO violation during winter temperature inversion conditions.

### METHODOLOGY AND DATA COLLECTION

In this study, the PM peak was used for modeling and evaluation purposes. Between May 9 and May 30, 2000 each of the 40 intersections with fixed time traffic signal controllers were studied for turning movements and traffic volumes. Detailed data for turning movements, traffic flow and geometrics for each intersection was entered into the computer software program SYNCHRO 4.0 to construct a model of current conditions. SYNCHRO 4.0 generates an estimate of CO emissions by intersection using a fuel consumption calculation. Fuel consumption is calculated based upon total travel volume, delay, and travel speeds for each intersection phase.

Once current traffic conditions were modeled, modifications in the signal timings were tested to determine and quantify resulting air quality improvements. SYNCHRO was used to analyze intersection capacity; coordinate traffic signals, and generate time-space diagrams which report platoon characteristics. The work included in this study represents a calibrated model of actual conditions. The findings used by SYNCHRO with respect to fuel consumption and resulting emissions are based on data from the Federal Highway Administration for average fleet types.

# EXECUTIVE SUMMARY OF STUDY FINDINGS

## Existing Conditions: Carbon Monoxide Output At Study Intersections

Under current operating conditions a total of 57,632 grams (57.63 Kg) of Carbon Monoxide (CO) are generated by mobile(vehicle) emissions at the study area intersections during the average PM Peak hour. This equals 126.7 pounds of CO emissions during PM peak hour at these 40 intersections (1 Kg = 2.2 pounds). City data indicates that PM peak hour is 8.7% of the total daily average traffic. Given the modeling conditions of the fixed time signals, a total of 1,443.8 pounds of CO are loaded into the air at these 40 intersections on an average day which equates to .72 tons of CO per day.

A total of 824 gallons of fuel are used during the PM peak hour by vehicles stopped at these 40 intersections, with an average travel speed of 14 miles per hour. Fuel efficiency is calculated at 9.4 miles per gallon during these conditions.

## Proposed CO Air Quality Contingency Measure

During a period of rising CO values which reach a defined level, the City of Yakima agrees to implement an alternate signal timing plan which will give priority to traffic flow on the major arterial streets within the CBD Core area, and traffic on the less busy side streets will be delayed, providing maximum efficiency for the busiest streets. The effect on Carbon Monoxide emissions of this CO Air Quality Contingency Measure has been modeled by the City of Yakima. During this limited period of time, the master controller will operate on a 90- second cycle length, rather than the existing 80-second cycle. Priority will be given to traffic on Yakima Avenue, First Street, Lincoln Avenue, B Street and Walnut. Vehicles on other streets at those intersections will experience longer delay.

Air quality will be improved during this CO Air Quality Contingency Measure. Carbon Monoxide emissions will be reduced from the existing 57.6 Kg/ per peak hour to 51.0 Kg/peak hour. Average Travel Speed will improve from 14 to 15 miles per hour and fuel consumption will be reduced from 824 gallons to 726 gallons during peak hour. Fuel efficiency will improve to 10.6 miles per gallon.

## Optimized Intersection Mitigation Measures

Reduction of unnecessary intersection delay and vehicle emissions while idling will improve air quality. The 40 intersections within this study area are closely grouped and can be coordinated effectively to work as a system. A more efficient system would include shorter signal cycles and vehicle detection to allow for actuated or semi-actuated operations. For modeling purposes signal cycle lengths were shortened to 75 seconds. Most of the traffic controllers were modeled as semi-actuated, rather than the current fixed time operation. Optimized timings and offsets for the peak hour were established based upon recommendations from SYNCHRO. Left turn storage and protection were modeled at four intersections.

The result of this Optimized Intersection Mitigation was a reduction in Carbon Monoxide emissions from 57.6 to 48.01 KG during average PM Peak hour traffic. This is a reduction in emissions by 16.6% during peak hour. Fuel consumption is reduced from 824 gallons to 687 gallons during peak hour. Average travel speed increases from 14 to 16 miles per hour through the study area. Fuel efficiency improves from 9.4 to 11.2 miles per gallon.

# YAKIMA CARBON MONOXIDE NON-ATTAINMENT AREA

The Yakima CO Non-attainment Area is 4102 acres or 6.4 square miles in size. The Area is bounded on the east by I- 82, the west by 16th Avenue, on the south by Mead Avenue and extending into Union Gap to Valley Mall Boulevard and on the north by "G" and "I" Streets. The majority of the mapped area is within the City of Yakima, with a portion also located in the City of Union Gap. The CO Non-attainment Area is less than one percent of the land area of the Yakima MPO and includes the Central Business District of the City of Yakima as well as a portion of downtown Union Gap. Total Vehicle Miles Traveled (VMT) in the CO Non-attainment Area is 23.8 % of all the Vehicle Travel Miles in Yakima County on Classified Streets.

A total of 147 miles of streets are located within the CO Non-attainment area, including 32.4 miles of classified streets, nearly 81 miles of local streets, 34.5 miles of alleys and three freeway interchanges with Interstate 82. The City of Yakima maintains a total of 65 signalized intersections within this area. Of those 65 traffic signals, 17 are fully actuated, 40 operate on fixed time, 5 arterial streets have pedestrian activated school signals and 3 locations have cautionary flashers.

## VEHICLE MILES TRAVELED IN CO NON-ATTAINMENT AREA

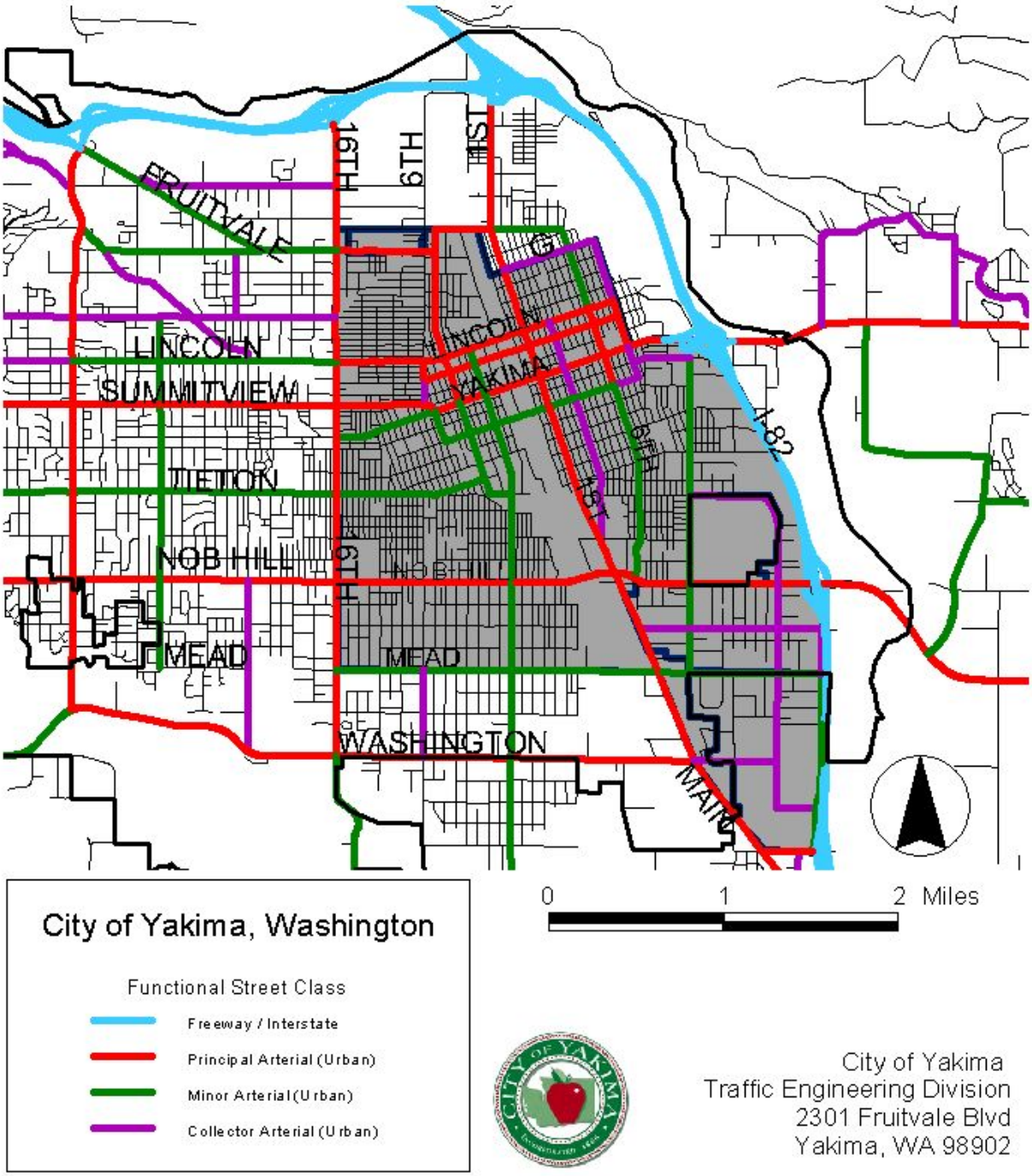
The Yakima CO Non-attainment Area includes a total of 147.73 miles of classified arterial streets, local streets, alleys and freeway. Using City of Yakima Geographic Information Systems (ARCView GIS) the following mileage totals were identified. Vehicle Miles Traveled (VMT) was calculated using segment average traffic counts. Actual 24 hour traffic counts have been field verified and averaged for each street by street classification. Vehicle Miles Traveled is a segment measure of all miles traveled by vehicles and displayed both daily and annually. Traffic counts within the City of Yakima are 24-hour counts taken during weekdays under normal conditions.

Table 1 : 1999 Vehicle Miles by Street Class in CO Non Attainment Area

| Street Class | Miles | VMT/ Day | VMT Annual |
|---|---|---|---|
| Principal Arterial | 14.66 | 208,394.39 | 76,063,951.70 |
| Minor Arterial | 7.52 | 90,011.21 | 32,854,092.07 |
| Collector Arterial | 7.13 | 48,073.86 | 17,546,958.80 |
| Local Street | 80.80 | 121,200.06 | 44,238,020.74 |
| Alley | 34.50 | 6,899.70 | 2,518,392.16 |
| Freeway | 3.12 | 120,120.00 | 43,843,800.00 |
| Total | 147.73 | 594,699.22 | 217,065,215.46 |

Source: Traffic count data by City of Yakima. Total miles by street class calculated using GIS.

# Yakima CO Non-attainment Area



## EXISTING TRAVEL SPEED

Travel speed is the total time required for a vehicle to travel a street segment including time stopped at intersections. In general, the average travel speed is 68% of the posted speed limit in Yakima. Some Yakima streets had much lower than average travel speeds, including North First Street, Fifth Avenue and Yakima Avenue with an average of 35% of the posted speed limit. The presence of many traffic signals and pedestrians influences the average travel speed. Average travel speed for arterial streets was measured in 1993 for the background data of the Yakima Urban Area Comprehensive Plan, Transportation Element, prepared by Bell-Walker Traffic Engineers (adopted by the Yakima City Council on April 1, 1997). Travel speeds within the CO Non-Attainment area were modeled using SYNCHO and confirmed the 1993 findings. Traffic volumes have increased since 1993 but the travel patterns and signal timings have not changed.

Table 2:1999 Characteristics of Streets Within Yakima CO Non-attainment Area

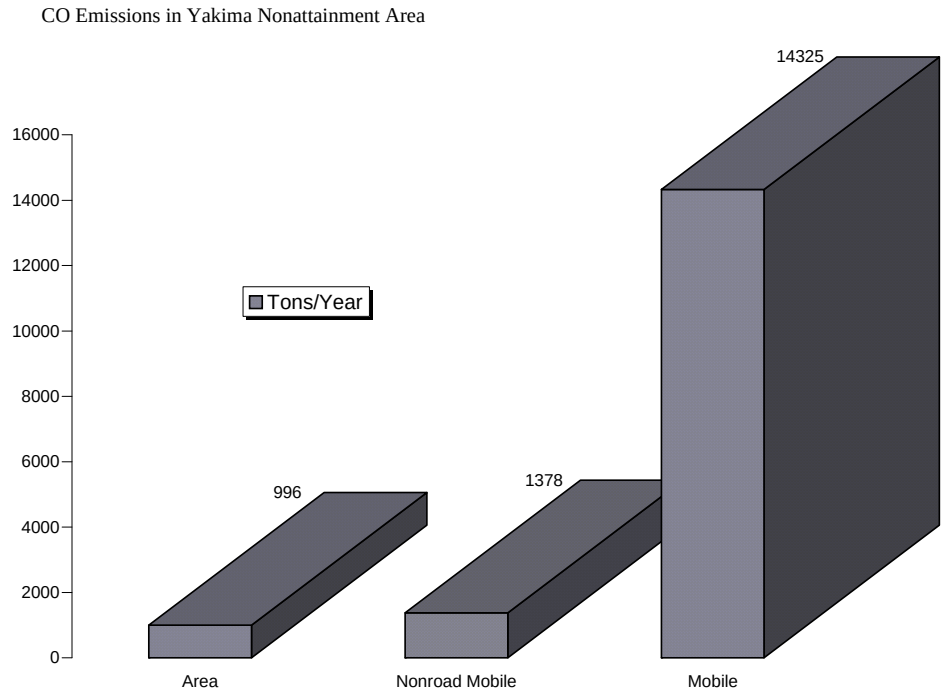
| STREET NAME | AVG ADT | SUM LENGTH (ft) | MILES | VMT | STREET CLASS | SPEED LIMIT | TRAVEL SPEED | VHT |
|---|---|---|---|---|---|---|---|---|
| 16th Ave | 22,150.00 | 13,252.80 | 2.51 | 55,596.50 | 1 | 35 | 24 | 2,316.52 |
| 1st St | 16,316.67 | 19,272.00 | 3.65 | 59,555.83 | 1 | 35 | 12 | 4,962.99 |
| 6th St | 6,800.00 | 8,397.03 | 1.59 | 10,814.36 | 1 | 30 | 20 | 540.72 |
| 7th St | 2,300.00 | 970.36 | 0.18 | 422.70 | 1 | 30 | 20 | 21.13 |
| B St | 8,891.67 | 6,041.57 | 1.14 | 10,174.17 | 1 | 30 | 20 | 508.71 |
| FRUITVALE | 8,850.00 | 523.19 | 0.10 | 876.94 | 1 | 35 | 24 | 36.54 |
| LINCOLN | 11,042.86 | 8,620.24 | 1.63 | 18,028.80 | 1 | 30 | 19 | 948.88 |
| NOB HILL | 21,475.00 | 8,099.55 | 1.53 | 32,942.78 | 1 | 30 | 20 | 1,647.14 |
| PIERCE | 5,000.00 | 1,294.03 | 0.25 | 1,225.41 | 1 | 30 | 20 | 61.27 |
| SUMMITVIEW | 13,450.00 | 3,035.76 | 0.57 | 7,733.14 | 1 | 30 | 20 | 386.66 |
| WALNUT | 9,516.67 | 6,116.17 | 1.16 | 11,023.77 | 1 | 30 | 20 | 551.19 |
| 5th St | 11,112.50 | 8,225.90 | 1.56 | 17,312.57 | 2 | 30 | 20 | 865.63 |
| DIVISION | 3,600.00 | 655.46 | 0.12 | 446.90 | 2 | 25 | 17 | 26.29 |
| MEAD | 6,476.67 | 14,836.80 | 2.81 | 18,199.43 | 2 | 35 | 24 | 758.31 |
| TIETON | 12,500.00 | 1,975.14 | 0.37 | 4,675.99 | 2 | 30 | 20 | 233.80 |
| WASHINGTON | 17,600.00 | 379.06 | 0.91 | 16,016.00 | 2 | 35 | 24 | 667.33 |
| Valley Mall Blvd | 13,900.00 | 1,795.20 | 0.34 | 4,726.00 | 1 | 35 | 24 | 196.92 |
| YAKIMA | 16,387.50 | 9,225.88 | 1.75 | 28,634.31 | 2 | 30 | 11 | 2,603.12 |
| 3rd Ave | 8,170.00 | 16,661.68 | 3.16 | 25,781.43 | 3 | 30 | 20 | 1,289.07 |
| 8th St | 6,540.00 | 4,329.13 | 0.82 | 5,362.22 | 3 | 30 | 20 | 268.11 |
| CHESTNUT | 1,500.00 | 1,706.57 | 0.32 | 484.82 | 3 | 25 | 17 | 28.52 |
| FAIR | 8,250.00 | 9,504.12 | 1.80 | 14,850.00 | 3 | 30 | 20 | 742.50 |
| VIOLA | 1,550.00 | 5,434.62 | 1.03 | 1,595.39 | 3 | 25 | 17 | 93.85 |
| LOCAL STREETS | 1,500.00 | 426,624.20 | 80.80 | 121,200.06 | 4 | 25 | 17 | 7,129.42 |
| ALLEYS | 200.00 | 182,152.20 | 34.50 | 6,899.70 | 5 | 15 | 10 | 689.97 |
| FREEWAY | 38,500.00 | 16,473.00 | 3.12 | 120,120.00 | 6 | 60 | 55 | 2,184.00 |
| TOTAL | 273,579.52 | 775,601.67 | 147.73 | 594,699.22 | | | | 29,758.58 |

Source: SYNCHRO and City of Yakima Transportation Plan (1993 data) for travel speeds, City of Yakima Traffic counts and City of Yakima GIS, 2000.

## EMISSION INVENTORIES

Pollutant emissions are classified into four components: point sources, area emissions, non-road mobile, and mobile emission sources. A 1996 Carbon Monoxide (CO) emission inventory was conducted for the Yakima Non Attainment Area with the following findings.

- Point sources are stationary sources emitting CO at or above a standard cut-off level. There are no point sources in the Yakima non-attainment area. Boise Cascade lumber mill is located outside of the Co non-attainment area and therefor not studied in this report.
- Area emissions include wood stoves, fireplaces and inserts, petrofuel combustion and outdoor burning. Area emissions contributed 6% of the total CO reported in 1996.
- Non-road mobile emissions include train locomotives, aircraft, construction, industrial and farm equipment, and lawn or garden (lawnmowers, snow-blowers) emissions. In Yakima, Non-road mobile emissions are reported at 9% of the total CO emissions.
- Mobile emissions include cars, trucks buses and motorcycles. In the Yakima CO Non-attainment area contribute 85% of the total Carbon Monoxide.




1996 CO Emission Inventory as reported by the Yakima Regional Clean Air Authority

**Table 3: Summary of 1996 CO Emissions for the Yakima Non-attainment Area**

| Source Category | Annual | | Typical Winter Day | |
|---|---|---|---|---|
| | (Tons/Yr) | (% Total) | (Tons/Day) | (% Total) |
| Point | 0 | 0.0 | 0 | 0.0 |
| Area Emission | 996 | 6.0% | NA | NA |
| Non-road Mobile | 1,378 | 8.2% | NA | NA |
| Subtotal | 2,373 | 14.2 | 15 | 27.8% |
| Mobile | 14,325 | 85.8% | 39 | 72.2% |
| TOTAL | 16,698 | 100% | 54 | (100%) |

[Data Source: Yakima Regional Clean Air Authority. 1996 Emission Inventory]

## WEATHER CONDITIONS

Weather conditions in Yakima have a direct influence on air quality. Since 1979 the Yakima Urban Area has experienced a total of 24 recorded events when the Carbon Monoxide (CO) levels were reported as exceeding or near the maximum CO National Ambient Air Quality Standards (NAAQS). The events and weather conditions during those days are listed below. The recorded events measure an average of the previous 8-hour period of conditions.

Table 4 : CO Events and Weather Conditions

| Date | Weekday | Event time | CO (ppm) | Max temp | Min temp | Dew-point | %Hu-midity | wind speed (knots) | Cloud Cover | Cloud Elev. | Condition | Visi-bility (mi.) | Temp range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/20/79 | Thursday | 1700 | 10 | 38 | 23 | 35 | 92 | 5 | ovc | 3900 | Fog | 3 | 9 |
| 12/21/79 | Friday | 1500 | 11 | 40 | 32 | 38 | 96 | 7 | ovc | 8000 | Fog | 2 | 8 |
| 1/14/80 | Monday | 2300 | 10 | 40 | 21 | 22 | 88 | 0 | clr | unl | rain,snow | 5 | 19 |
| 12/16/81 | Wednesday | 1800 | 10 | 32 | 25 | 7 | 77 | 5 | pc | 25000 | Fog | 1 | 7 |
| 12/21/81 | Monday | 100 | 10 | 48 | 42 | 10 | 77 | 8 | clr | unl | Fog | 10 | 6 |
| 1/13/82 | Wednesday | 1200 | 10 | 27 | 10 | 18 | 81 | 0 | ovc | 13000 | Fog | 0.25 | 17 |
| 1/13/82 | Wednesday | 2000 | 12 | 27 | 10 | 16 | 52 | 5 | pc | unl | Fog | 0.5 | 17 |
| 1/14/82 | Thursday | 400 | 11 | 49 | 12 | 32 | 92 | 17 | clr | unl | Fog | 1 | 37 |
| 1/4/83 | Tuesday | 1800 | 10 | 36 | 23 | 24 | 89 | 0 | ovc | 1200 | rain | 0.12 | 13 |
| 12/14/83 | Wednesday | 1300 | 11 | 37 | 24 | 32 | 89 | 0 | ovc | 7000 | Fog | 0.75 | 13 |
| 1/4/84 | Wednesday | 1000 | 15 | 43 | 27 | 27 | 89 | 3 | ovc | 12000 | Fog | 0.5 | 16 |
| 1/4/84 | Wednesday | 1800 | 16 | 43 | 27 | 34 | 83 | 5 | pc | unl | Fog | 0.5 | 16 |
| 1/5/84 | Thursday | 1400 | 13 | 44 | 33 | 36 | 89 | 3 | ovc | 9000 | Fog | 4 | 11 |
| 1/5/84 | Thursday | 2300 | 13 | 44 | 33 | 32 | 89 | 5 | clr | unl | Fog | 2 | 11 |
| 12/10/84 | Monday | 1800 | 12 | 35 | 19 | 11 | 68 | 7 | clr | unl | Fog | 10 | 16 |
| 12/4/85 | Wednesday | 100 | 11 | 37 | 20 | 26 | 92 | 7 | ovc | 10000 | fog, rain | 5 | 17 |
| 12/4/85 | Wednesday | 1800 | 10 | 37 | 20 | 24 | 85 | 9 | ovc | 20000 | fog, rain | 15 | 17 |
| 12/24/86 | Wednesday | 1900 | 10 | 41 | 19 | 22 | 96 | 6 | clr | unl | | 7 | 22 |
| 12/19/91 | Thursday | 1800 | 11.6 | 33 | 15 | 26 | 89 | 7 | ovc | 10000 | Fog | 6 | 18 |
| 12/21/92 | Monday | 1900 | 9.6 | 29 | 9 | 18 | 96 | 0 | pc | 20000 | | 5 | 20 |
| 1/18/94 | Tuesday | 1800 | 9.4 | 42 | 27 | 30 | 92 | 7 | pc | unl | | 10 | 15 |
| 2/7/96 | Wednesday | 1400 | 12 | 38 | 34 | 37 | 100 | 3 | ovc | 2500 | rain, fog | 0.25 | 4 |
| 2/7/96 | Wednesday | 2200 | 10.5 | 38 | 34 | 36 | 100 | 6 | ovc | 500 | rain, fog | 2 | 4 |
| 1/10/97 | Friday | 1800 | 9.4 | 41 | 32 | 28 | 89 | 0 | clr | unl | | 7 | 9 |
| Average | | | | 38.3 | 23.8 | 25.9 | 87.1 | 4.8 | | 5920.8 | | 4.1 | 14.3 |

Data Source: Ken Kohagan, National Weather Service Climatological Observer for Yakima (4-26-2000)

All of the identified air quality exception events took place between the months of December and February. All 24 events occurred during weekdays and no events were reported on weekends with 11 occurring (46%) between the hours of 5 PM and 7 PM during the PM peak rush hour for traffic. Another 5 events (21%) occurred between 8 PM and midnight. The remaining 8 events (33%) occurred between midnight and 5 PM. Air quality monitor readings report an 8-hour average.

Weather conditions during these 24 events also showed strong similarities and were characterized by temperature inversions. The average maximum temperature was 38.3 degrees with only four of the 24 days reporting maximum temperature below freezing (32 degrees F). Low temperatures averaged 23.8 degrees F. The temperature range between high and low was very narrow with an average of only a 14 degree difference. Fog was observed on most of the days with reported events. The average dewpoint was 25.9 degrees with high (87%) relative humidity. Wind speeds were low to non-existent and visibility was generally poor and limited. Cloud elevations varied widely but averaged near 6,000 feet above the surface. Barometric pressure averaged 30.16 during these events. The temperature inversion is caused by a high pressure system which overlies the valley and holds the cooler air at ground level. With low wind speeds, the fog becomes trapped and will not dissipate.

When these conditions occur, ground level air including fog and pollution, cannot mix with the air at higher elevations. Air quality may be compromised during these weather conditions, especially if it persist for several days. In summary, critical air quality in Yakima is closely related to the occasional periods of short duration temperature inversions during winter months.

This study does not include any special strategies for dealing with cold weather vehicle starts or other weather related conditions. Through traffic flow enhancements, air quality can be improved during the entire year including the critical winter months.

# VEHICLE EMISSIONS MODELING

The City of Yakima conducted a comparative model of air quality using SYNCHRO 4.0, a software program used by municipal agencies to simulate and test traffic signal timing plans. SYNCHRO implements the methodologies of the 1997 Highway Capacity Manual for performing the industry standard evaluation of intersection performance, including signal delay, optimization, capacity analysis and progression. Actual site-specific data is required for each of the signalized intersections and street links in order to build the SYNCHRO model. Base level data represents a calibrated model with data collected in May of 2000 including street geometrics, traffic volumes and turning movements for each intersection during PM peak hour traffic.

Vehicle emissions are modeled by SYNCHRO as a result of cumulative fuel consumed per hour by all traffic movements at each study intersection. The fuel consumption calculation is based on the following.

- Total signal delay in seconds
- Travel speed in miles per hour
- Total vehicle miles traveled
- Total stops in vehicles per hour
- Default formulas for fuel consumption used in TRANSYT 7-F.

Emission calculations are a factor of fuel consumption based on a rate of emission in grams per gallon of gasoline used. The fleet mixture includes a standard default of 2% heavy vehicles as noted in the 1997 Highway Capacity Manual for average modeling. The rate used to determine the Carbon Monoxide Emission within the SYNCHO 4.0 model is

CO= F * 69.9grams/gal =Carbon Monoxide Emission (g)

Where F= fuel consumption in gallons of all vehicles in the intersection during PM peak hour. This rate was supplied by the Federal Highway Administration based upon information from the Oak Ridge National Laboratory.

Once the current conditions were modeled using calibrated data additional scenarios were analyzed in SYNCHRO. Comparisons of relative data provided a means to evaluate the performance of each scenario. The premise of this study was to reduce unnecessary vehicle delay and improve vehicle speed through signal optimization which in turn yields a reduction in Carbon Monoxide emissions. The SYNCHRO model provides excellent and well–documented results for each intersection. Taken as a system of 40 related signals, the entire study area was evaluated for performance.

Other air quality studies may rely on modeling of the dispersion of Carbon Monoxide such as with the CALINE-4 Dispersion Model. The Yakima County Conference of Governments (Yakima MPO) uses MOBILE5B (an EPA software model) to evaluate air quality results of planned construction projects in the Regional Transportation Plan and annual updates. MOBILE5B is a good tool for generalizing air quality for a region. However, the lack of detailed inputs for MOBILE5B limits the application for sub-area analysis. SYNCHRO is an ideal software model to evaluate a sub-area with 40 signals such as the Yakima CBD.

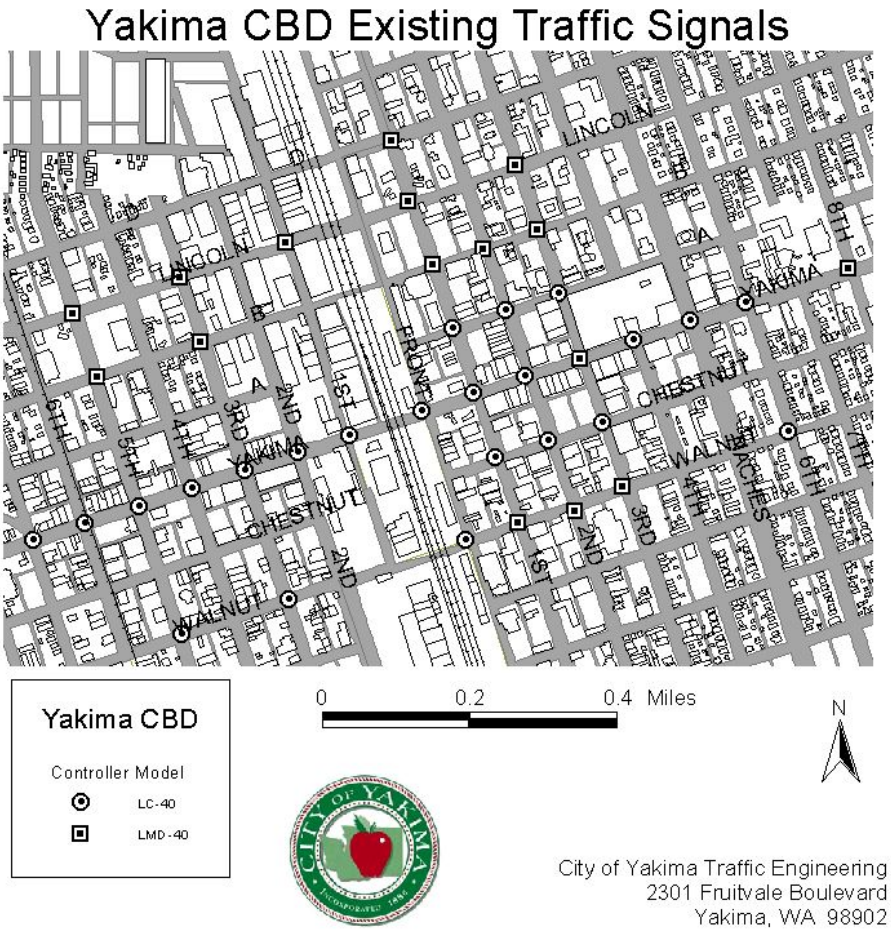
This study does not attempt to relate vehicle generated emissions (or reduction in emissions) to air quality samples measured by pollutant levels in parts per million, nor is dispersion of Carbon Monoxide modeled in this study. This study reveals that traffic flow enhancements within the Yakima CBD can significantly reduce the relative value of CO emissions and improve air quality.

# EXISTING CONDITIONS

## CONGESTION IN THE YAKIMA CBD

The Yakima CBD is a fully developed area which includes a broad and intense mixture of commercial, industrial, governmental uses and recreational activities. Yakima County and the City of Yakima as well as numerous State agencies operate government, legal, and court services within the Yakima CBD. Pedestrian activity within the CBD is very prevalent.

The Yakima CBD is bisected by two Principal Arterial Streets: the first is Yakima Avenue, which runs east to west; and secondly, First Street, a north to south arterial street. Yakima Avenue has 15 traffic signals within 1.17 miles of the CBD spaced approximately 400 feet apart. First Street has 7 traffic signals in less than one mile, spaced 500 feet apart. Both Yakima Avenue and First Street carry a daily traffic volumes over 17,000 within the Yakima CBD. Average Travel Speeds are less than 12 miles per hour due to the repeated delay created by the signalized intersections.




A total of 40 fixed time controlled intersections are located within the City of Yakima Central Business District. The signal controller types are a mixture of 18 LMD-40 units and 22 LC-40 units. A single

master controller operates the 40 signals on an 80 second cycle and a single split with one offset which is manually selected at the masters and not subject to change. Signal operation remains in the 80-second fixed-time cycle from 6 AM to 10 PM when most of the signals are in a flash mode except the major arterial street intersections. Due to its age, the master controller for the CBD system cannot support optimization with vehicle actuation. During off-peak periods of time the signal continues to operate on the 80-second cycle regardless of the presence of traffic. Many of the fixed time controlled intersections have a long green phase because of required minimum pedestrian crossing period which is included in every signal cycle regardless of the presence of pedestrians.

Traffic Volume counts for the classified streets were reviewed for the non-attainment area. The 24-hour volume counts revealed that the AM peak traffic is spread out over several hours. No single hour can be identified as the AM peak. The noon peak hour is very pronounced in the Yakima CBD and generally accounts for 8-9% of the total daily traffic. PM peak hour in the Yakima CBD generally begins at 5 PM and is approximately 9% of the total volume. However, the three heaviest traffic periods are the hours between 3 and 6 PM.

## LEVEL OF SERVICE AND VEHICLE DELAYS

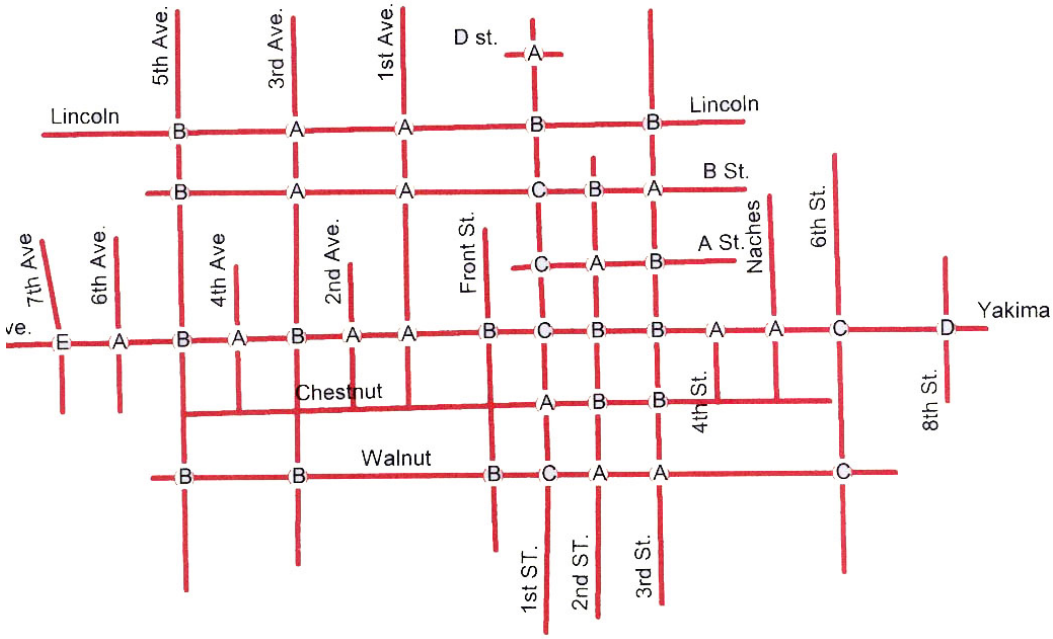
The Level of Service (LOS) concept rates intersections into 6 levels which relate to operational conditions. The six levels rate intersections from A to F with LOS A representing the highest performance. Each letter designation is associated with delay in seconds at the intersection: A= <5.0 seconds, B = 5.1 to 15.0 seconds, C = 15.1 to 25 seconds, D = 25.1 to 40 seconds, E = 40.1 to 60 seconds, F=>60 seconds.

Current Level of Service was calculated by SYNCHRO at the 40 signalized study intersections. Level of Service for most intersections was LOS A and LOS B. Four intersections on First Street operate at LOS C, both of the 6$^{th}$ Street intersections operate at LOS C while the Yakima Avenue / 8$^{th}$ Street intersection operates at LOS D. The Yakima /7$^{th}$ Avenue intersection does not model well and is calculated at LOS E. The south leg of 7$^{th}$ Avenue has only 2 lanes, while the north leg represents the combined intersection of both Summitview and 7$^{th}$ Avenue and has 5 lanes.

Level of Service calculations by SYNCHRO use the standard formulas of the Highway Capacity Manual which factor delay per vehicle at the intersection. Delay is calculated as an average for each vehicle by signal phase. In the Yakima CBD a few intersections have left turn protection and almost all intersections operate with a four phase cycle. Intersection delay in the Yakima CBD ranges from 3 seconds to 67 seconds depending on location. First Street averages over 20 seconds delay for each vehicle along the corridor in the study area.

Average intersection delay is a concept articulated in the Highway Capacity Manual which provides an estimate of the average stopped delay per vehicle for each lane group. The delay per vehicle is the sum of two items: the delay which would result from the uniform arrival of vehicles over the course of a signal cycle; and, the tendency for occasional overflow which occurs as a result of random arrivals. Factors which are used to compute this delay include traffic volumes, queue discharge rate, length of red/green signal phases, vehicle flow rates, length of storage at the intersection and left turn protection.

It is common for the various lane groups within an intersection to have different lengths of delay. The average intersection delay represents the mathematical average of the various lane directions.




Existing Intersection Level of Service, PM Peak Hour Conditions, Average Delays
SYNCHRO 4.0

## EXISTING CARBON MONOXIDE OUTPUT AT STUDY INTERSECTIONS

As modeled by SYNCHRO, a total of 57,632 grams (57.63 Kg) of Carbon Monoxide are currently generated by mobile emissions at the study area intersections during the average PM peak. Converted to pounds, this equals 126.7 pounds of CO emissions during the PM Peak hour at these 40 intersections (1 Kg = 2.2 pounds). Over the entire average day, given the modeling conditions of the existing fixed time signals, a total of 1,443.8 pounds of CO are loaded into the air at these 40 intersections which equates to .72 tons of CO per day.

A total of 824 gallons of fuel are used during the PM peak hour by vehicles stopped at these 40 intersections, with an average travel speed of 14 miles per hour. Fuel efficiency is calculated at 9.4 miles per gallon during these conditions. Refer to page 21 for a representative map of existing CO emissions. Values for each intersection are listed on page 19 in Table 5.

The proximity and number of signalized intersections in the Yakima CBD concentrates the CO loading along Yakima Avenue, First Street and Walnut Street. These three corridors carry heavy traffic volumes which experience repeated delay within the Yakima CBD. The fixed time signals maintain the same cycle length between the hours of 6:00AM and 10:00PM, regardless of the presence of vehicles or pedestrians. Consequently, vehicles experience delay often when no other traffic is served by the signal.

The Yakima Regional Clean Air Authority, in cooperation with the Department of Ecology and the Environmental Protection Agency maintain a CO air quality monitor in the Yakima CBD on the west side of the County Courthouse, at First Street and B Street. The air quality monitor reports background air quality samples for an 8-hour period of CO in parts per million (ppm). When winter weather conditions are conducive to air quality problems, the existing CO emission level may create a CO Violation. A reduction in CO emissions will reduce the probability of such an event.

# CO AIR QUALITY CONTINGENCY MEASURE

Existing fixed time intersection controllers within the Yakima CBD have limitations regarding their responsiveness to actual traffic conditions. However, if air quality conditions approach a threshold, as determined by the Department of Ecology CO monitoring device, the City of Yakima will implement an alternate signal timing plan to address air quality by reducing CO emissions. This CO Air Quality Contingency Measure can be accomplished within a short response time using existing equipment.

During a period of rising CO values, the City of Yakima agrees to establish an alternate signal timing plan which will give priority of traffic flow to the major arterial streets within the CBD Core area, while traffic on the less busy side streets will be delayed to create better overall system efficiency. In effect, traffic will be held at the signalized intersections on the side streets for a longer period of time, while the main arterial streets is allowed to flow more effectively.

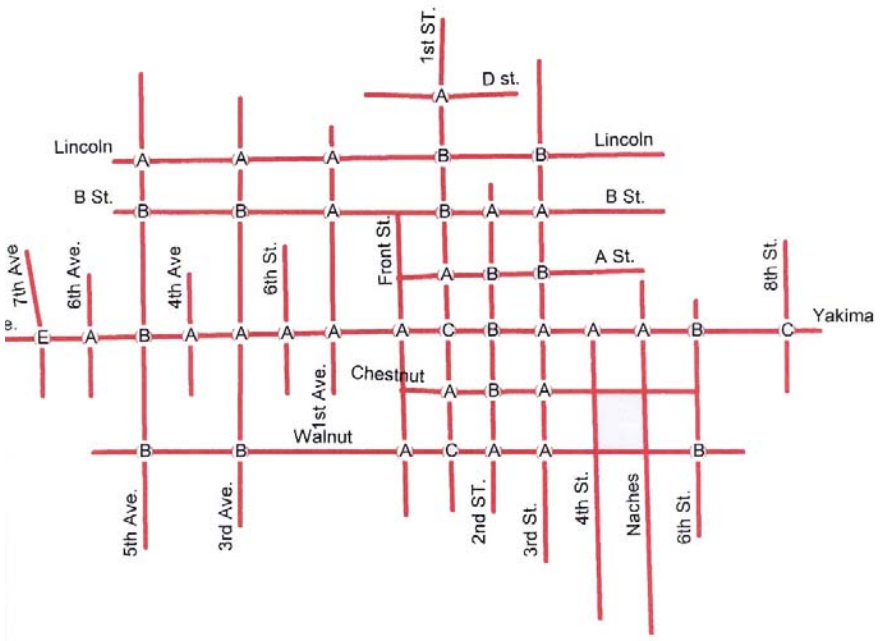
This alternative signal timing plan serves as the Yakima Transportation Contingency Measure* (TCM) as required by the Federal Highway Administration and Environmental Protection Agency and by the Clean Air Act (CAA) [42 U.S.C. §7509 Section 176 (c)]. Implementation of the TCM is governed by an inter-local agreement between the City of Yakima, the Yakima Regional Clean Air Authority and the MPO. This TCM will be added to the State Implementation Plan (SIP). A copy of the draft TCM including protocol for implementation is included in the appendix portion of this report.

The effect on Carbon Monoxide emissions of this Air Quality Contingency Measure has been modeled by the City of Yakima. During the alternative signal timing plan, the master controller will operate on a 90-second fixed time cycle, rather than the existing 80-second cycle. Also, priority will be given to traffic on Yakima Avenue, First Street, Lincoln Avenue, B Street and Walnut. Vehicles on the approaches of other streets at those intersections will experience longer delay.

Air quality will be improved during this CO Air Quality Contingency Measure. Carbon Monoxide emissions will be reduced from the existing 57.6 Kg/ per peak hour to 51.0 Kg/peak hour. Average Travel Speed will improve from 14 to 15 miles per hour. Fuel consumption will be reduced from 824 gallons to 726 gallons during peak hour. Fuel efficiency will improve to 10.6 miles per gallon. These improvements represent an 11.6% reduction in CO emissions and improved intersection performance.

This TCM has several advantages. It is relatively quick to implement and will immediately change traffic flow patterns thereby reducing CO emissions in the CBD during peak traffic periods. The City has tested the master controller and established the ability to implement the Contingency Plan.

However, if the alternative signal plan is left in effect for an extended period of time traffic patterns will adjust to maximize the reduced delay conditions on the arterial streets. Although the signal cycle length is only 10 seconds greater, the directional splits of the “green-time” are altered at each intersection to favor progression along the major arterial streets. In some cases the directional splits have been increased by up to 50%. During the Contingency measure, traffic on the side streets are given a shorter period to enter the intersection. Progression along these streets is also hindered. In some cases, not all the vehicles in the queues on the side streets will be able to clear the intersection during a signal cycle. Pedestrians must also wait for up to a 30 to 35 second delay to cross a major street in some cases. As traffic volumes shift to the arterial streets, the reduction in CO and delay will diminish.




Air Quality Contingency Measure, 90-second signal cycle
SYNCHRO 4.0

## LEVEL OF SERVICE AND INTERSECTION DELAY OF CONTINGENCY MEASURE

Average vehicle delay for the entire 40-intersection study area will be reduced by the contingency measure. Overall, intersection Level of Service (LOS) will be either held constant or improved at most intersections with this contingency measure. However, there exist some intersections where Level of Service will actually become slightly degraded and delay increases. These shifts in delay and LOS represent the tradeoffs which must occur in order to implement this Contingency Measure.

As priority is given to the traffic flows on Yakima Avenue, First Street, Walnut Street, B Street and Lincoln, the side streets will be delayed. Traffic signal cycle splits on those arterial streets will be weighted for through movement while the side streets wait.This contingency measure is a short- term solution. Air quality can be improved with quick response time. However, the delay and inconvenience to pedestrian traffic and vehicular traffic (and businesses) on the side streets makes this solution desirable in the CBD setting for short-term events only.

## IMPLEMENTATION OF CONTINGENCY MEASURE

The proposed air quality advisory contingency measure (TCM) has been tested with existing equipment. The Master Signal controller is over 15 years old and needs to be replaced, but is capable of accommodating an alternate signal plan. If and when this contingency measure is implemented, a signal technician will need to switch the controller to the alternate setting. The programming of the alternate setting has been designed and established based upon the findings of this study prior to the implementation. A draft inter-local agreement with terms is included in the appendix of this study.

For a specific listing of all the intersection impacts, please refer to Table 5, Yakima CBD Signalized Intersection Plan.

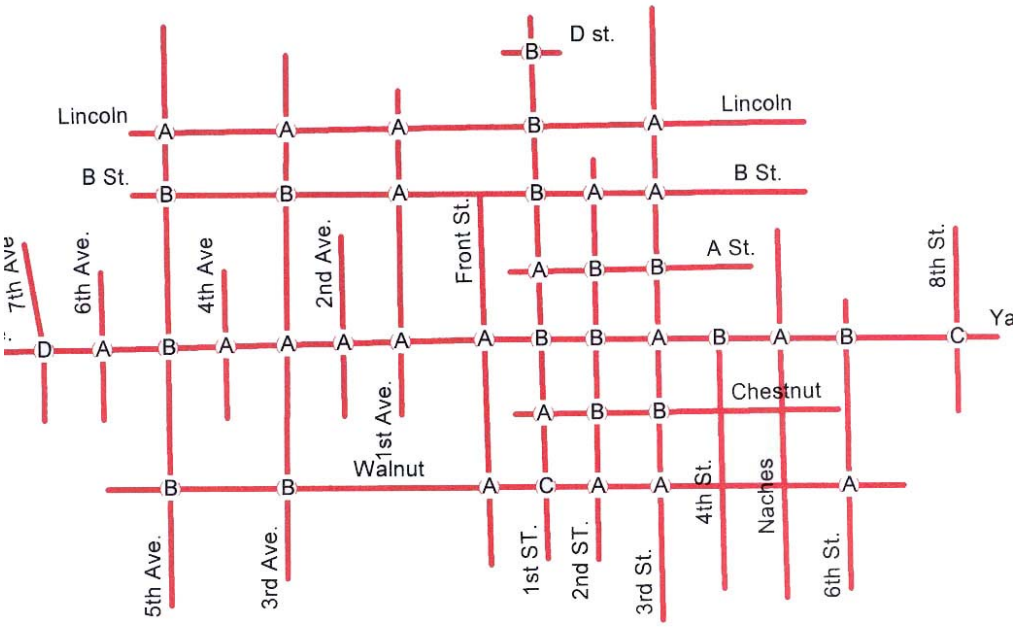
# AIR QUALITY MITIGATION: OPTIMIZED INTERSECTION CONDITIONS

Reduction of unnecessary intersection delay and vehicle idling will improve air quality. The 40 intersections within this study area are closely grouped and can be coordinated to work as a system. Overall efficiencies of this system can be significantly improved while air quality also benefits.

A more efficient system would include shorter signal cycles and vehicle detection to allow for actuated or semi-actuated operations. For modeling purposes signal cycle lengths were shortened to 75 seconds. Before selecting the 75-second signal cycle, analysis was also conducted for 45, 50, 60, 100 and 120 seconds cycles.Most of the traffic controllers were modeled as semi-actuated rather than the current fixed time controllers. During the peak traffic periods coordination between the signals is desirable to allow for progression along the street corridors.

Optimized timings and offsets for the one-hour peak period were established based on recommendations from SYNCHRO. Left turn storage and protection was added at four intersections: Yakima Avenue at both 2nd Street and 4th Street, and Walnut at 2nd Street and 3rd Street.

The result of this optimized intersection model was a reduction in Carbon Monoxide emissions from 126.7 to 105.6 pounds (57.6 to 48.01 KG) during average PM peak hour traffic. This is a reduction in emissions by 16.6% during peak hour. Fuel consumption is reduced from 824 gallons to 687 gallons during peak hour. Average travel speed improves from 14 to 16 miles per hour through the study area. Fuel efficiency improves from 9.4 to 11.2 miles per gallon.




75-Second Semi-Actuated/ Optimized Signal Plan
SYNCHRO

## Level of Service and Intersection Delay Under Optimized Intersection Plan

The operating Level of Service for nearly all of the study area intersections will improve as a result of vehicle detection, signal actuation and signal coordination. Average vehicle delay is reduced or held constant at all intersections. Level of Service for all intersections is LOS A and B, with only two intersections operating at LOS C and one intersection at LOS D. Yakima Avenue / 8th Street will function at LOS C with an average intersection delay of 25 seconds for vehicles in each lane group (reduced from the existing 40 seconds). Walnut / First Street will operate at LOS C with an average intersection delay of 26 seconds (reduced from the existing 31 seconds). Yakima Avenue /7th Avenue has very unique intersection geometry and is difficult to model because of the one lane approach on the south side from Davis High School and the dual left turn entry from Summitview and Yakima Avenue on the north. Average intersection delay is estimated to improve from the current 67 seconds to 53 seconds for each lane group and operate at a LOS D (improved from the current LOS E).

For a specific listing of all the intersection impacts, please refer to Table 5,Yakima CBD Signalized Intersection Plan. See page 22 for a map of CO emissions by intersection under optimized conditions.

## Implementation of Optimized Intersection Mitigation Plan

To implement enhancements in signal timings and controls in the CBD, much of the existing system will need upgrading. The actual signal poles and signal heads are in place, representing a substantial investment which can be used with an upgraded system. However, the signal controllers and communication equipment require upgrading. Replacement of older traffic control equipment and the existing masters would allow replacement of the fixed timed controllers with vehicle actuated controllers. Vehicle detection would need to be added at many of the intersections, either using video or loop detectors. Upgraded pedestrian actuation equipment would also be necessary. Existing signal interconnect would need to be upgraded with a fiber optic network or other communication device. The CO Contingency measure can be implemented with upgraded equipment of the Optimized Mitigation plan.

Below is an abbreviated list of implementation steps to achieve an optimized traffic control system which will improve air quality in the Yakima CBD and the CO non-attainment area.

1. Replacement of the 22 traffic controllers which are operated by LC-40 systems to LMD-40 Controllers or better.
2. Replacement of some of the traffic controller cabinets, as necessary to accommodate different hardware.
3. Replacement of the master controller and software for the CBD. A Closed Loop Mats System is proposed.
4. Video or loop detection for the 40 intersections to achieve actuation/ semi-actuation.
5. Enhanced Pedestrian Actuation system including Pedestrian buttons, LED pedestrian signals. Explore audible signals for selected locations within the CBD which have the highest pedestrian activity.
6. Replace old signal interconnect with fiber optic lines in order to facilitate video monitoring and control of intersection. Fiber optic communication lines have a small diameter with good flexibility and will fit into the current signal conduit. A design for the signal interconnect and related communications will need to be prepared by a qualified engineer.
7. Replacement of the existing signal conduit, between 3rd and 4th Avenues along West Yakima Avenue, which is in poor condition.

# FINDINGS AND RECOMMENDATIONS

The air quality of the Yakima CO non-attainment area and the Yakima CBD will be improved if excessive vehicle delay can be reduced. The effect of this reduction in Carbon Monoxide vehicle emissions has been modeled and quantified. Likewise, in a weather related air quality advisory situation, vehicle emissions can be reduced with Co Air Quality Contingency Plan which gives traffic flow priorities to the main arterial streets within the CBD. The maps shown on pages 21 and 22 illustrate the relative improvement of air quality.

The following Findings and Recommendations are derived from this study.

1. Yakima violations and exceedences of the National Clean Air Act standards for Carbon Monoxide have occurred during winter weather conditions often described as temperature inversions which may last for a few days until wind or precipitation changes the weather pattern. Further analysis reveals these conditions have occurred on weekdays and can be related to commuter traffic, primarily during the evening rush hour. The dominant source of CO within the Yakima Non-attainment area is from vehicle emissions.
2. The Yakima CBD represents the heaviest concentration of signalized intersections and traffic volumes within the Yakima Non-attainment Area. Additionally, the ability of the City of Yakima to make improvements in the traffic flow pattern is hampered by antiquated equipment. No vehicle detection is currently available within the CBD and all signals operate on a fixed time 80-second cycle (except during nighttime and early morning hours when many of the signals are set to flash).
3. The safety and convenience of pedestrians is paramount to a vital downtown core. Emphasis on vehicle movements within the CBD must balance the needs of the pedestrian. Current equipment of fixed time controllers does not allow for pedestrian actuation and therefore all signal cycles include the required pedestrian walk time, even when no pedestrians are present. The related vehicle delay of unused pedestrian phases could be eliminated with updated equipment which allows actuation.
4. This study presents data produced by “SYNCHRO”, a Traffic Engineering software program most commonly used for modeling intersection optimization. Vehicle emissions are modeled by SYNCHRO as a result of cumulative fuel consumed per hour by all traffic movements within each study intersection. The fuel consumption calculation is based on:
    - Total signal delay in seconds;
    - Travel speed in miles per hour;
    - Total vehicle miles traveled;
    - Total stops in vehicles per hour
    - Default formulas for fuel consumption used in TRANSYT 7-F and CORSIM.
5. The results of this study are best viewed as a comparative analysis. Data inputs for the SYNCHRO model are very rigorous to construct the calibrated scenario which represents current operating conditions of the 80 second fixed time signal cycle. Once this calibrated model was constructed, alternative scenarios were produced to evaluate the relative impacts to vehicle delay and CO emissions of modifying the current intersection controls. The study indicates a significant improvement can be made in the current conditions by altering the signal control plans within the Yakima CBD. SYNCHRO estimates a reduction of 16.6% in the CBD core, in CO emissions and fuel consumption if the traffic signal pattern was optimized.
6. A series of timing scenarios were modeled with SYNCHRO in the evaluation of the contingency measure (TCM) and the optimized scenario. Signal cycles of 45, 50, 60, 100 and 120 seconds in length were modeled in addition to the 75, 80 and 90 second cycles used for this study.

7. The most significant finding of this study was development of the Transportation Contingency Measure (TCM) under the federal guidelines. The City of Yakima and the Yakima Regional Clean Air Authority have developed implementation protocol which guide the initiation of the TCM. The Draft TCM Agreement is included as an appendix to this document.
8. The proposed TCM is estimated to provide approximately 11% reduction in CO emissions during PM peak hour traffic within the Yakima downtown area. Implementation of the TCM will reduce CO emission levels which will assist in stabilizing the air quality within the Non-attainment area.
9. The TCM is considered a temporary solution, suitable for implementation over a short time period. One negative aspect of the TCM is the inconvenience to pedestrians. With extended green phases on the busiest arterial streets, pedestrians at the intersections will also suffer extended delays, along with vehicles.
10. Implementation of the proposed traffic flow mitigation measures will improve both air quality and traffic movement. Significant improvement will be realized during PM peak hour. Additionally, during non-peak hours when traffic volumes are lighter, traffic control signals will be more responsive to actual conditions and delay will be significantly improved.
11. Data from the SYNCHRO modeling has been graphically depicted using the City of Yakima Geographic Information System (GIS). Two maps have been prepared which illustrate the existing condition for CO emissions and a comparative map of optimized conditions as described in the Air Quality mitigation scenario. These maps are displayed on pages 21 and 22 of this report. These maps do not indicate dispersion characteristics nor any information about background CO levels. The shaded areas represent contours of CO emission levels based upon calculated intersection emission values and proximity to other intersections. The point values for CO emissions at the intersections are shown on page 19, Table 5 “Yakima CBD Signalized Intersection Plan”. The maps are most useful as a relative comparison of Existing and Optimized Traffic Conditions of CO emissions.
12. The traffic flow mitigation measures can be phased. No additional street right of way is necessary, nor would any curb-line be moved. Existing conduit locations are appropriate for installation of a new fiber optic interconnect. No street construction is required. Existing signal poles and signal heads can generally be re-used, with some up-grading as appropriate.
13. Connection of the CBD signal interconnect to the I-82 interchanges, where video and fiber optic lines may be provided by WSDOT in the future. Message reader boards on the interchange ramps of I-82 could be constructed to warn motorists of “Air Quality Advisory Event. Motorists may want to choose alternative routes”. Sharing of video data from the interchanges would be possible over a fiber optic signal interconnect network.

Table 5: Yakima CBD Signalized Intersection Plan

| LOCATION | ADT entering intersection | 2000 Exist. delay in sec. | Critical Response Timing Average Delay | Projected Delay w/ Optimizat-ion in sec. | Existing CO Emission at Peak Hour (g/hr) | Critical Air Quality Advisory Response (g/hr) | CO Emissions with Optimized Signals (g/hr) |
|---|---|---|---|---|---|---|---|
| 1ST AVE & B STREET | 12,700 | 2.90 | 2.60 | 4.50 | 491 | 518 | 583 |
| 1ST AVE & LINCOLN | 12,900 | 7.50 | 3.20 | 1.60 | 1,004 | 779 | 671 |
| 1ST AVE & YAKIMA | 20,000 | 7.70 | 5.90 | 1.80 | 1,049 | 903 | 634 |
| 1ST STREET & A STREET | 18,700 | 23.60 | 9.50 | 4.50 | 1,823 | 1,071 | 788 |
| 1ST STREET & B STREET | 27,900 | 21.80 | 12.20 | 9.70 | 2,688 | 1,822 | 1,857 |
| 1ST STREET & CHESTNUT | 16,600 | 5.50 | 2.10 | 2.10 | 772 | 444 | 458 |
| 1ST STREET & D STREET | 21,500 | 8.10 | 10.20 | 10.40 | 981 | 1,113 | 1,082 |
| 1ST STREET & LINCOLN | 28,700 | 11.90 | 12.30 | 11.70 | 1,877 | 1,751 | 1,944 |
| 1ST STREET & WALNUT | 33,400 | 31.20 | 29.30 | 26.30 | 3,449 | 3,226 | 3,285 |
| 1ST STREET & YAKIMA AVE | 33,900 | 23.00 | 21.40 | 14.80 | 2,660 | 2,770 | 2,372 |
| 2ND AVE & YAKIMA AVE | 20,000 | 4.00 | 3.20 | 1.40 | 740 | 658 | 539 |
| 2ND STREET & A STREET | 5,900 | 9.00 | 12.90 | 11.40 | 384 | 471 | 424 |
| 2ND STREET & B STREET | 13,500 | 13.30 | 7.40 | 3.60 | 1,002 | 636 | 488 |
| 2ND STREET & CHESTNUT | 4,400 | 13.30 | 13.00 | 17.10 | 358 | 355 | 419 |
| 2ND STREET & YAKIMA AVE | 22,400 | 14.40 | 9.80 | 10.40 | 1,406 | 1,285 | 1,208 |
| 2ND STREET & WALNUT | 15,600 | 8.00 | 6.60 | 4.40 | 977 | 785 | 614 |
| 3RD AVE & B STREET | 17,800 | 7.90 | 13.80 | 11.10 | 1,292 | 1,585 | 1,373 |
| 3RD AVE & LINCOLN | 18,000 | 5.10 | 6.30 | 2.90 | 884 | 925 | 768 |
| 3RD AVE & WALNUT | 25,200 | 18.70 | 17.50 | 13.00 | 2,916 | 2,700 | 2,348 |
| 3RD AVE & YAKIMA | 25,600 | 11.00 | 5.60 | 8.60 | 1,830 | 1,294 | 1,573 |
| 3RD STREET & A STREET | 5,400 | 14.40 | 14.10 | 15.90 | 569 | 597 | 658 |
| 3RD STREET & B STREET | 14,800 | 6.00 | 4.80 | 3.40 | 472 | 437 | 421 |
| 3RD STREET & CHESTNUT | 9,200 | 12.60 | 8.00 | 13.60 | 501 | 336 | 523 |
| 3RD STREET & LINCOLN | 12,700 | 11.40 | 13.20 | 8.10 | 891 | 985 | 873 |
| 3RD STREET & WALNUT | 16,600 | 9.20 | 8.20 | 8.10 | 1,191 | 993 | 1,058 |
| 3RD STREET & YAKIMA AVE | 23,000 | 11.10 | 8.90 | 3.70 | 1,128 | 1,028 | 731 |
| 4TH AVE & YAKIMA | 18,600 | 8.00 | 5.30 | 2.70 | 924 | 816 | 611 |
| 4TH STREET & YAKIMA AVE | 18,100 | 9.00 | 3.80 | 11.50 | 921 | 714 | 1,034 |
| 5TH AVE & B STREET | 21,400 | 12.00 | 14.30 | 10.30 | 1,313 | 1,359 | 1,372 |
| 5TH AVE & LINCOLN | 26,500 | 13.80 | 8.80 | 8.00 | 1,757 | 1,511 | 1,367 |
| 5TH AVE & WALNUT | 18,100 | 17.00 | 15.70 | 14.30 | 2,034 | 2,142 | 1,990 |
| 5TH AVE & YAKIMA | 29,500 | 13.00 | 10.20 | 12.50 | 2,280 | 2,084 | 2,247 |
| 6TH AVE & YAKIMA | 22,600 | 8.00 | 6.10 | 4.10 | 977 | 867 | 680 |
| 6TH STREET & WALNUT | 17,900 | 20.50 | 16.90 | 8.70 | 1,336 | 1,182 | 1,007 |
| 6TH STREET & YAKIMA AVE | 27,700 | 20.20 | 10.30 | 11.90 | 2,193 | 1,601 | 1,788 |
| 7TH AVE & YAKIMA AVE | 19,800 | 67.30 | 64.10 | 53.30 | 3,350 | 3,187 | 2,861 |
| 8TH STREET & YAKIMA AVE | 37,000 | 40.10 | 32.60 | 25.40 | 3,003 | 2,785 | 2,311 |
| FRONT ST & WALNUT | 19,800 | 10.20 | 3.90 | 5.00 | 1,581 | 1,067 | 1,188 |
| FRONT STREET & YAKIMA AVE | 21,600 | 14.60 | 7.70 | 3.90 | 1,623 | 1,295 | 1,004 |
| NACHES & YAKIMA | 20,200 | 6.20 | 6.30 | 3.90 | 1,005 | 977 | 852 |
| Total | 795,200 | 572.5 | 468 | 399.6 | 57,632 | 51,054 | 48,004 |

Data Source: City of Yakima traffic counts, SYNCHRO calculations

Comparative Chart of CO Emission Levels

Map of Existing Conditions

Map of Optimized Conditions

# APPENDIX

**RESOLUTION NO. R-2000-_115____**

A RESOLUTION establishing a joint policy with the Yakima Regional Clean Air Authority for implementation of the Yakima CO Air Quality Contingency Measure.

WHEREAS, the City of Yakima and the Yakima Regional Clean Air Authority have cooperated in the development of the Yakima CO Limited Maintenance Plan for attainment of Carbon Monoxide Air Quality Standards established by the Federal Clean Air Act of 1990; and

WHEREAS, the Yakima Valley is subject to winter seasonal temperature inversions which can create poor air quality conditions, sometimes resulting in periods of elevated Carbon Monoxide levels due primarily to vehicle traffic; and

WHEREAS, rising CO values during temperature inversions may be reduced by implementation a temporary and alternate signal timing plan, referred to as the "Yakima CO Air Quality Contingency Measure" which reduces vehicle idling on major arterial streets in the Yakima CBD; now, therefore,

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF YAKIMA:**

Section 1: In order to reduce the Carbon Monoxide (CO) emissions in the Yakima CO Non-attainment Area during an air quality advisory period, the City of Yakima agrees to establish an alternate and temporary signal timing plan(herein referred to as the Co Air Quality Contingency Measure) to give priority of traffic flow to the major arterial streets within the CBD core area, while traffic on the less busy side streets is delayed to create better overall system efficiency. Traffic will be held at the signalized intersections on the side streets for a longer period of time, while the main arterial street traffic is allowed to flow more effectively.

This alternative plan serves as the Yakima Transportation Contingency Measure (TCM) as required by the Federal Highway Administration and Environmental Protection Agency and by Section 176 (c) of the Clean Air Act (CAA) [42 U.S.C. §7509]. Conformance of the TCM with the Washington State Implementation Plan (SIP) is required by Chapter 173-420 WAC.

Section 2: The Department of Ecology Carbon Monoxide monitoring device will be used to determine when an air quality advisory period is in effect which requires implementation of the TCM. The following thresholds will be used:

1. A Carbon Monoxide (CO) reading of greater than 5.5 parts per million (PPM), averaged over an 8-hour period until the Yakima CO Limited Maintenance Plan is approved by the Washington Department of Ecology and the Environmental Protection Agency grants attainment status for CO in Yakima;
2. A Carbon Monoxide (CO ) reading of greater than 7.0 parts per million (PPM), averaged over an 8-hour period after the Environmental Protection Agency grants attainment status for CO in Yakima.

Section 3: If threshold values described in Section 2 are observed on or after 5:00 PM on a Friday, implementation of the TCM will be deferred 48 hours (until 5:00 PM, Sunday), pending a threshold reading at that time.

Section 4: Yakima Regional Clean Air Authority will provide notice to the City of Yakima Department of Public Works that an air quality advisory event is in effect. The Yakima Regional Clean Air Authority will provide public notice that an air quality advisory event is in effect and the CO Air Quality Contingency Measure is in effect for the Yakima CBD.

Section 5: The City of Yakima Public Works Department will respond with implementation of the TCM within 4 hours of the notice given by the Clean Air Authority. The TCM will be in effect until air quality conditions are below the threshold values of Section 2.

ADOPTED BY THE CITY COUNCIL this 19th day of September, 2000.

S/ Mary Place
Mary Place, Mayor

ATTEST:

S/ Karen S. Roberts, CMC
City Clerk