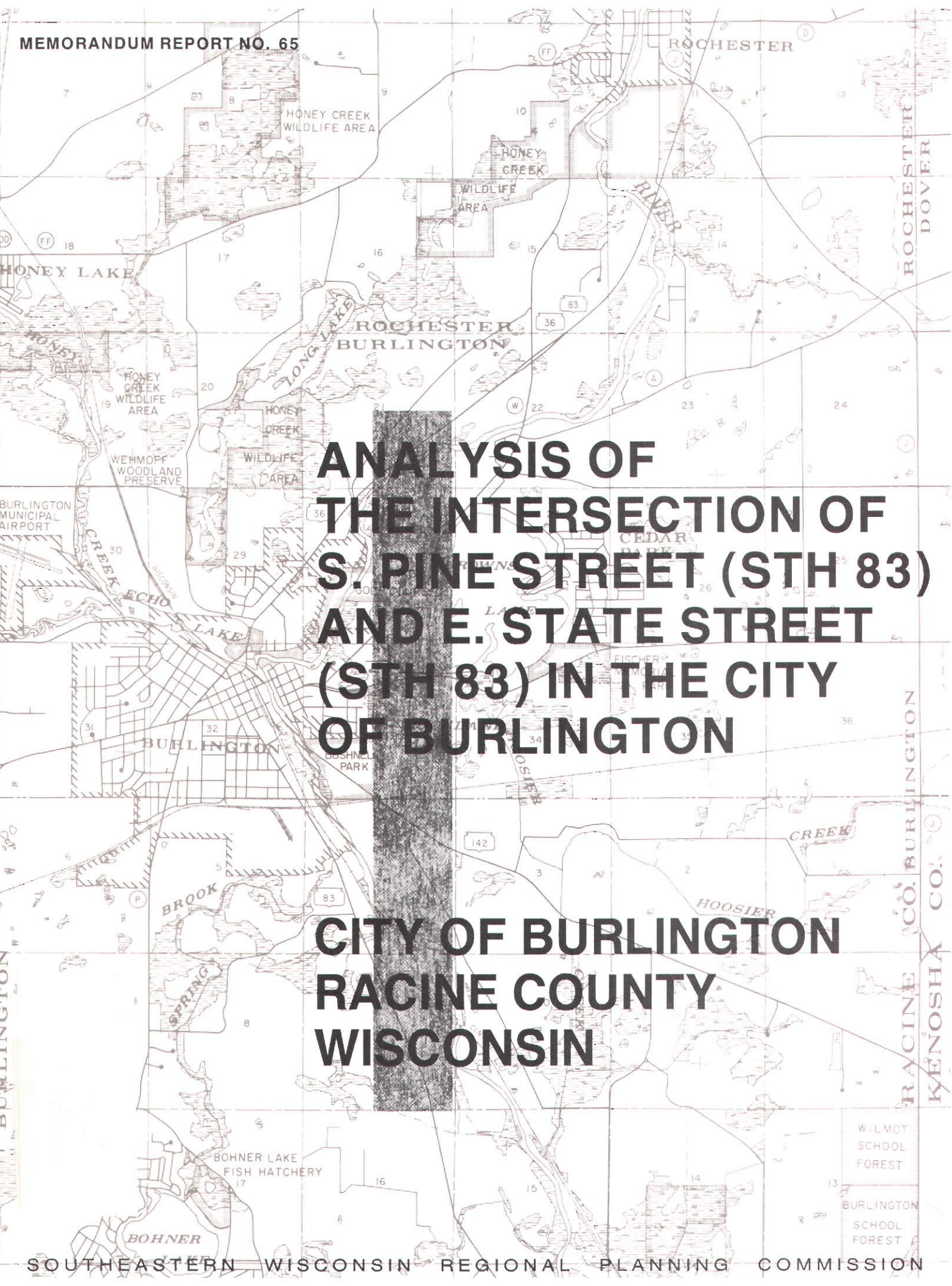
MEMORANDUM REPORT NO. 65



ANALYSIS OF THE INTERSECTION OF S. PINE STREET (STH 83) AND E. STATE STREET (STH 83) IN THE CITY OF BURLINGTON

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MEMORANDUM REPORT
NUMBER 65

ANALYSIS OF THE INTERSECTION OF S. PINE STREET (STH 83) AND E. STATE STREET (STH 83) IN THE CITY OF BURLINGTON

Prepared by the

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ANALYSIS OF THE INTERSECTION OF S. PINE STREET (STH 83) AND E. STATE STREET (STH 83) IN THE CITY OF BURLINGTON

INTRODUCTION

On August 29, 1990, the City of Burlington Street Committee requested that the Commission staff study the operation of the intersection of S. Pine Street (STH 83) and E. State Street (STH 83). As part of that study the Commission staff was asked to consider and evaluate the impacts of rerouting northbound STH 83 between the intersections of S. Pine Street with E. Adams Street and the intersection of E. State Street with S. Dodge Street. The alternative route for STH 83 to be considered was E. Adams Street between S. Pine Street and S. Dodge Street and S. Dodge Street between E. Adams Street and E. State Street. This memorandum report presents the findings and recommendations of the requested traffic study.

EXISTING CONDITIONS

Study Area

The study area, as shown on Figure 1, includes the intersection under consideration, the street segments which route STH 83 through the intersection, and the proposed alternative routing for STH 83.

Jurisdictional Classification

South Pine Street, E. State Street between S. Pine Street and S. Dodge Street, and S. Dodge Street north of E. State Street are connecting highways. A connecting highway is a state highway marked, signed, and routed over a local street, providing continuity for the route of the state trunk highway through a municipality. Maintenance of the connecting highway is a municipal responsibility, while the State is responsible for construction and operation. Therefore, approval of the Wisconsin Department of Transportation is required prior to any action which substantially alters the use or capacity of S. Pine Street or its intersections with E. State Street and E. Adams Street, and of E. State Street between S. Pine Street and S. Dodge Street. Such actions requiring approval include the installation or modification of traffic control devices, prohibition of turning movements, modification of intersection geometrics, and rerouting a connecting highway.

East State Street west of S. Pine Street, E. Adams Street, and S. Dodge Street south of E. State Street are local streets under the jurisdiction of the City of Burlington. The City is responsible for the construction maintenance, and operation of these facilities.

Roadway Physical and Operational Characteristics

Within the study area, all the facilities are constructed as 48-feet-wide urban cross-sections with curb and gutter and storm sewer as shown in Figure 1. Also shown in Figure 1 are the current number of traffic lanes and direction of travel on the facilities in the study area as well as turning movements permitted on each intersection approach. It should be noted that the operation of S. Pine Street is one-way southbound north of its intersection with E. State Street, but two-way south of the intersection. The state trunk highway segment of E. State Street, that is, the segment east of its intersection with S. Pine Street is one-way eastbound. The segment of E. State Street not a state trunk highway, west of the intersection with S. Pine Street, is two-way. South Dodge Street (STH 83) north of its intersection with E. State Street is one-way northbound. South of E. State Street, S. Dodge Street is a two-way facility. Finally, E. Adams Street currently operates as a two-way facility. Parking is permitted on all the streets within the study area in the locations shown on Figure 1.

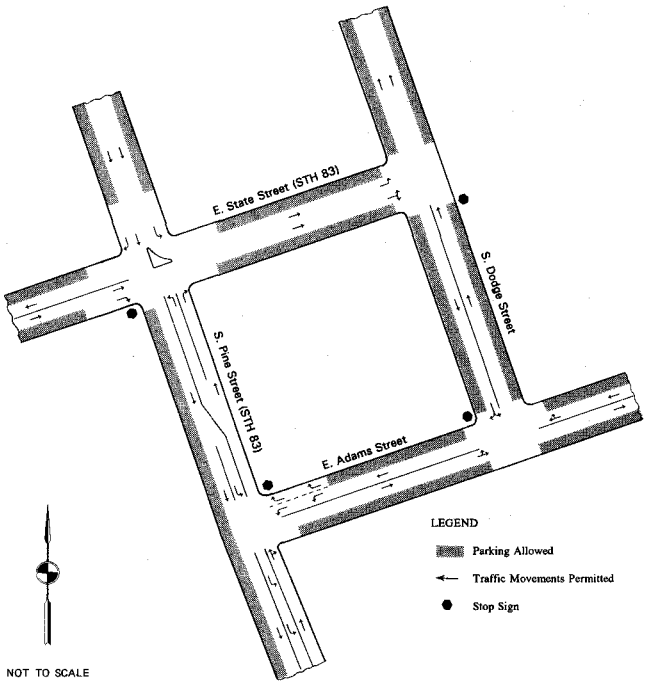
The posted speed limit on S. Pine Street north of E. State Street is 25 miles per hour, but south of E. State Street it increases to 30 miles per hour. All other streets within the study area have posted speed limits of 25 miles per hour.

Finally, stops signs located on only one approach at each of the four intersections in the study area provide traffic control. These include the eastbound approach at the S. Pine Street intersection with E. State Street, the northbound approach to the intersection of E. State Street and S. Dodge Street, the westbound approach to the intersection of S. Pine Street and E. Adams Street, and the southbound approach to the intersection of E. Adams Street and S. Dodge Street.

A traffic island in the S. Pine Street E. State Street intersection provides channelization for

Figure 1

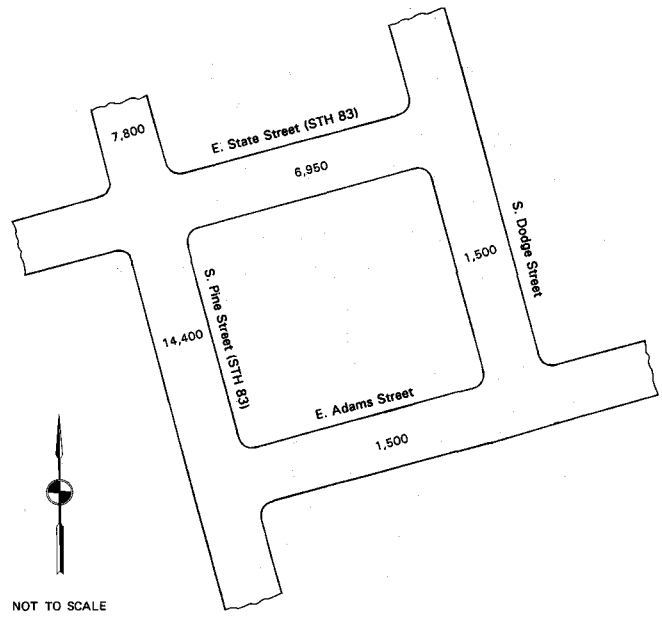
LANE CONFIGURATION, DIRECTION OF TRAVEL, AND PARKING AREAS WITHIN THE STUDY AREA: 1991



Source: SEWRPC.

Figure 2

24-HOUR AVERAGE WEEKDAY TRAFFIC VOLUME ON THE STUDY SEGMENTS: 1991



Source: SEWRPC.

southbound left-turning traffic and acts as a barrier to prevent northbound traffic from entering the north leg of the intersection, which is one-way southbound.

Traffic Volumes and Congestion

In May 1991 the Commission staff conducted 24-hour machine traffic counts on the streets within the study area. The average weekday traffic volumes, which are based on the 24-hour machine traffic counts, are shown in Figure 2. Heavy truck traffic, including truck tractor-semitrailer combination vehicles, constituted approximately 6.5 percent of the average weekday traffic on S. Pine Street.

The historical growth trends since 1978 in average weekday traffic volume on the study segments are shown in Table 1. The traffic volume on S. Pine Street just south of its intersection with E. State Street decreased approximately 19 percent between 1978 and 1981, but has increased at a rate of about 2 percent annually since 1981 to the same level in 1991 as in 1978. Average weekday traffic volumes on S. Dodge Street between E. State Street and W. Jefferson Street also experienced a decrease between 1978 and 1981, approximately 8 percent. Since 1981, traffic volumes on this segment of S. Dodge Street have increased more than 32 percent, or nearly 3 percent annually. The decreases over the period 1978 through 1986 may be attributed in large part to the severe economic recession experienced during this period. Subsequent growth trends reflect the economic recovery and may reasonably be expected to continue, given the outlook for economic growth in the Burlington area.

The number of traffic lanes on a facility largely, although not entirely, establishes its traffic carrying capacity. A two-lane urban arterial generally has a design capacity of about 13,000 vehicles per average weekday. A four-lane undivided urban arterial has a design capacity of about 17,000 vehicles per average weekday. Also affecting urban arterial design capacity are the characteristics of its intersections, including intersection approach pavement width including provision of exclusive turn lanes, parking within

Table 1

AVERAGE WEEKDAY TRAFFIC ON STUDY SEGMENTS WITHIN THE CITY OF BURLINGTON

Location	Year							Annual Growth Rate (percent)
	1978	1981	1984	1986	1987	1990	1991	
S. Pine Street								
E. State Street to E. Adams Street	14,440	11,720	13,460	12,700	13,700	14,160	14,400	-0.2
E. State Street								
S. Pine Street to S. Dodge Street	--	--	--	6,000	--	--	6,950	2.5
E. Adams Street								
S. Pine Street to S. Dodge Street	--	--	--	--	--	--	1,500	--
S. Dodge Street								
E. State Street to E. Adams Street	--	--	--	--	--	--	1,500	--
W. Jefferson Street to Madison Street	6,610	6,100	6,940	6,000	6,890	--	8,070	1.4

Source: Wisconsin Department of Transportation and SEWRPC.

200 feet of the intersection, type and operation of traffic control, percentage of right and left turns at intersections, and percentage of trucks and buses in the traffic stream.

Based on a comparison of 1991 average weekday traffic volumes on study area roadway segments to the respective design capacities of those facilities, S. Pine Street between E. State Street and E. Adams Street, with an average weekday traffic volume of 14,400, currently carries traffic volumes, which exceed its design capacity.

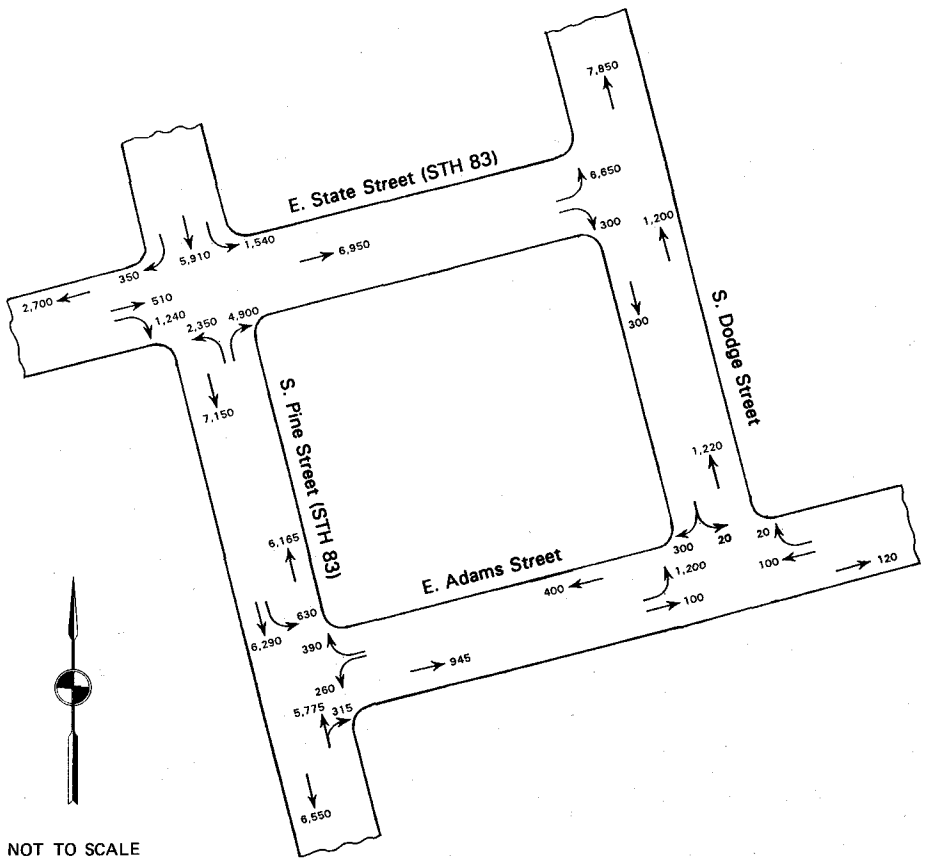
In order to determine intersection operating conditions, the Commission staff also conducted hourly turning-movement traffic counts from 6:00 a.m. to 8:00 p.m. at the intersection of S. Pine Street with E. State Street and the intersection of S. Pine Street with E. Adams Street in May 1991. The 6:00 a.m. to 8:00 p.m. time period includes the morning and afternoon peak traffic hours and accounts for more than 80 percent of the total average weekday traffic. The 14-hour count data are shown in Appendix A.

Shown on Figure 3 are the 24-hour average weekday turning-movement volumes at the intersections of S. Pine Street with E. State Street and E. Adams Street, and the intersections of S. Dodge Street with E. State Street and E. Adams Street, as estimated from the 6:00 a.m. to 8:00 p.m. count data. It may be noted that heavy right-turn movements exist from the northbound approach to the intersection of S. Pine Street and E. State Street. Of the estimated 7,250 vehicles on the northbound approach to this intersection, approximately 4,900 vehicles, or about 68 percent, turn right onto E. State Street, while the remaining 2,350 vehicles, or about 32 percent, turn left. There are approximately 5,900 through vehicles on the southbound approach, or about 76 percent of the 7,710 total vehicles observed on this approach. Of the remaining 1,890 vehicles on the southbound approach, about 1,540 vehicles turn left and 350 vehicles turn right, or about 20 percent and 4 percent, respectively. On the eastbound approach only about 510, or about 29 percent of the 1,750 total vehicles observed, were through vehicles, while the remaining 1,240 vehicles, or approximately 71 percent, made right turns.

Shown on Figure 4 are the 3:30 p.m. to 4:30 p.m. peak hour turning movement counts at the intersection. Similar to the 24-hour weekday turning movement counts, the movements with the highest volumes at the intersection of E. State Street and S. Pine Street were the northbound-to-eastbound right-turn movement of about 515 vehicles and the southbound through movement of about 445 vehicles. There

Figure 3

24-HOUR WEEKDAY TURNING MOVEMENT VOLUMES: 1991

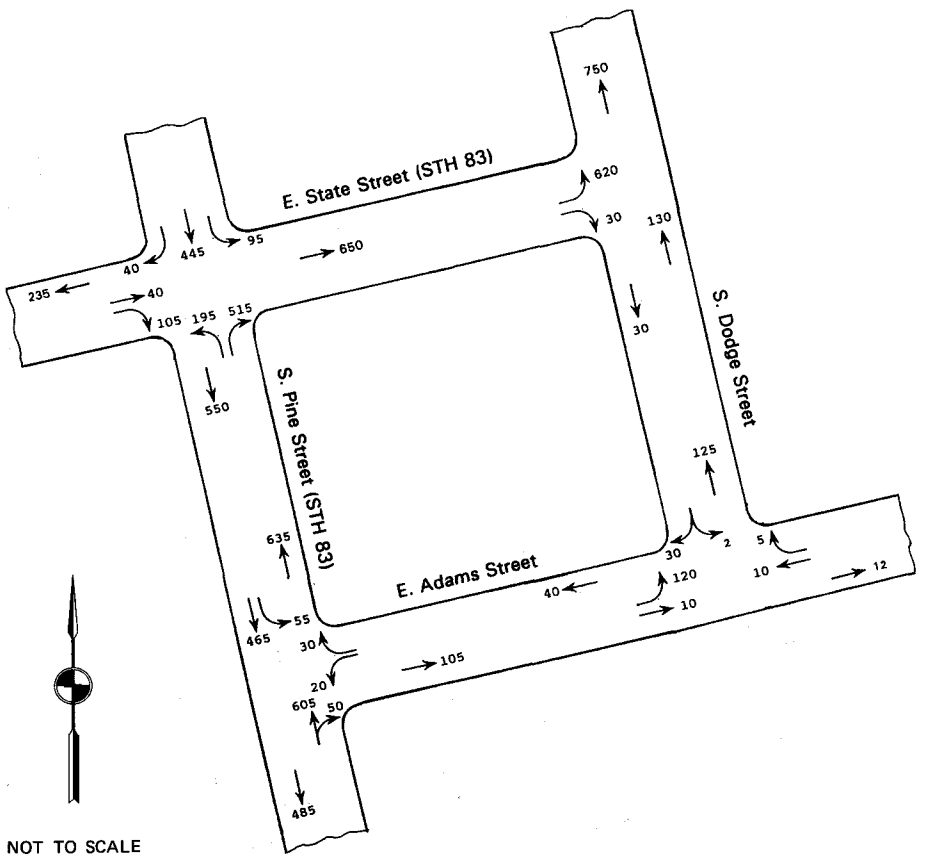


NOT TO SCALE

Source: SEWRPC.

Figure 4

EVENING HOUR PEAK TRAFFIC TURNING MOVEMENT VOLUMES: 1991



NOT TO SCALE

Source: SEWRPC.

are about 195 northbound left-turn movements which would typically require a gap of at least five seconds occurs in the southbound through traffic stream before proceeding through the intersection. Although there is little eastbound through traffic, about 40 vehicles, during the peak hour, this traffic must wait for a 6.5 second gap in the southbound through traffic and the northbound traffic streams before proceeding through the intersection.

A capacity analysis of each study area intersection was conducted for the evening peak hour to identify existing traffic congestion and delay problems. At the intersection of S. Pine Street and E. Adams Street, the westbound left-turn movement was determined to be the only movement operating over design capacity. Vehicles making this movement may be expected to incur substantial delay of nearly 35 seconds before a gap of at least 6.5 seconds occurs in the north- and southbound traffic streams. All the remaining movements at this intersection currently operate under design capacity.

A capacity analysis of the intersection of S. Pine Street and E. State Street indicated that the eastbound through movement is the only movement operating over design capacity. Vehicles making this movement may be expected to incur substantial delays of 40 seconds or more before a gap of at least 6.5 seconds occurs in the north- and southbound traffic streams. While all the remaining movements operate under design capacity, it may be noted that the staff did also occasionally observe traffic queues of four to five vehicles in the northbound left-turn lane. Average vehicular delay at these times was 15 seconds. Thus, it may be concluded that the northbound left-turn movement experiences periodic congestion and that the eastbound through movement experiences substantial congestion.

Capacity analyses of the two remaining intersections indicated that all movements are operating under design capacity and, thus, no substantial congestion or delay problems exist at these intersections.

Intersection capacity and operation can be degraded by the proximity of driveways to the intersection. Located on the south side of E. State Street and approximately 30 feet east of S. Pine Street is the driveway entrance to patron parking at the U. S. Post Office. In addition, three mail-drop boxes are located on the north side of E. State Street and approximately 75 feet east of S. Pine Street.[1] Southbound left-turning vehicles destined for the Post Office patron parking lot must find a gap in the northbound right-turning traffic stream to make this maneuver. Similarly, northbound right-turning traffic destined for the mail-drop boxes must find a gap in the southbound left-turning traffic stream to complete this maneuver. Thus, traffic may be weaving in the area immediately east of the intersection, or a vehicle at the head of one traffic stream may stop to await a gap in the other traffic. This would, because of the island in the intersection limiting each of these movements to a single lane, cause a temporary lane blockage, effectively reducing the capacity of the movement affected to zero until the blockage is cleared. Commission staff also observed vehicles destined for the Post Office patron parking lot queued onto E. State Street. These vehicles also temporarily blocked the northbound right-turn lane.

It may be noted that none of the accidents reported at the intersection were the result of weaving traffic or lane blockages caused by motorists approaching either the mail-drop boxes or the off-street U. S. Post Office parking lot. Further, queues of vehicles waiting to enter the off-street parking lot were observed to clear very quickly. This fact, in combination with the relatively low southbound left-turn demand, tends to minimize the negative impacts of the traffic patterns caused by the proximity of the driveway and the mail-drop boxes to the intersection. Therefore, it may be concluded that the proximity of the driveway and the mail-drop boxes to the intersection is more a nuisance than a problem.

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[1] *In mid-May 1991, in order to facilitate reconstruction of the curb and gutter on the north side of E. State Street the mail-drop boxes were temporarily moved approximately 85 feet to the east, increasing the distance from S. Pine Street from 75 feet to 160 feet. City officials believe that this modest relocation has improved traffic operations on E. State Street east of S. Pine Street.*

Traffic Accidents

The incidence and location of traffic accidents provide other measures of the efficiency and operating characteristics of street and highway systems. A review of a three-and-a-half year vehicular accident history was conducted for study segment intersections and roadway segments. A total of 20 accidents occurred during that period: eight in 1988, three in 1989, six in 1990, and three between January 1 and June 7, 1991. Of the 20 total accidents, there were no fatal accidents, four were personal injury accidents, and the remaining 16 accidents were property damage only. Of the five personal injury accidents, two occurred in both 1988 and 1989, and one occurred in 1990.

Of the 20 total accidents, 17 occurred at one of the four study area intersections and three occurred at a midblock location. Of the 17 intersection accidents reported, 13 occurred at the intersection of S. Pine Street and E. State Street, and two each occurred at the S. Pine Street and E. Adams Street intersection, and the E. State Street and S. Dodge Street intersection. Of the three midblock accidents, two occurred on S. Pine Street between E. State Street and E. Adams Street. The remaining midblock accident occurred on E. Adams Street between S. Pine Street and S. Dodge Street. Because only one location, the intersection of S. Pine Street and E. State Street, experienced more than an average of one accident per year during the three and one-half year study period, it may be concluded that this is the only location in the study area which warrants additional investigation.

Analysis of the accidents at the S. Pine Street and E. State Street a total of four accidents occurred in 1988, one in 1989, five in 1990, and three in the first six months of 1991. The predominate accident type is the right-angle collision. During the three and one-half year accident history, 10 of the 13 accidents, or 77 percent, were right-angle collisions, and 10 accidents involved collisions between vehicles eastbound on E. State Street and vehicles southbound S. Pine Street (STH 83).[2] Right angle collisions potentially suggest that one or more of the following conditions may exist: 1) excessive vehicular speed, 2) restricted sight distance, and 3) a lack of adequate gaps in the north- and southbound traffic stream.

It may be noted that citations for failing to yield the right-of-way were issued in nine of the 10 right-angle collisions at the intersection of S. Pine Street and E. State Street. This may indicate that eastbound E. State Street motorists on the stop sign controlled leg grew impatient waiting for an adequate gap and entered the intersection, colliding with an oncoming vehicle. Alternatively, the gap may have been shorter than perceived by the motorist, as the presence of a moving vehicle in the westernmost southbound lane may be obscured by a parked vehicle in the curb lane,[3] although it should be noted that sufficient stopping sight distance is available if motorists are traveling at the posted 25 mile per hour speed limit.

Neither weather, nor time of day, nor intersection geometrics appears to have contributed significantly to the occurrence of these accidents. Of the three remaining accidents, one was a rear end collision, one a sideswipe, and one was a left turn into through vehicle collision.

Summary of Existing Conditions

The traffic problems identified within the study area include traffic congestion and delay and traffic accidents at the intersection of S. Pine Street and E. State Street. Specifically, a traffic congestion and delay problem was identified on the eastbound E. State Street through movement and the northbound left-turn movement, and a traffic accident problem was identified. A traffic

[2] *The collision diagrams for the accidents at this intersection are shown in Appendix B.*

[3] *The unobstructed stopping sight distance is dependent upon vehicular speed. For vehicles traveling at the posted 25 mile per hour speed limit, this distance is 125 feet; at 30 miles per hour, this distance is 200 feet. A vehicle parked on the west side of S. Pine Street at the southern limit of the existing parking zone restricts sight distance to approximately 130 feet at 30 miles per hour.*

congestion and delay problem was also identified on the westbound left-turn movement at the S. Pine Street and E. Adams Street intersection. Also, a traffic congestion problem was identified on the segment of S. Pine Street between E. Adams Street and E. State Street, as this facility currently carries average weekday traffic volumes which exceed its design capacity.

ALTERNATIVE ACTIONS TO ABATE TRAFFIC PROBLEMS IDENTIFIED IN THE STUDY AREA

This section of the memorandum evaluates the potential of short-range low cost traffic engineering actions to abate the existing traffic problems identified at the intersections of S. Pine Street (STH 83) and E. State Street (STH 83) and of S. Pine Street (STH 83) and E. Adams Street. Included is the evaluation of alternative intersection traffic control and an evaluation of rerouting northbound STH 83 over E. Adams Street and S. Dodge Street between E. Adams Street and E. State Street (STH 83).

Stop Signs

The first alternative traffic engineering action considered to reduce the congestion and delay experienced by eastbound through traffic and to reduce accidents was the installation of additional stop signs on the north- and southbound approaches to the S. Pine Street and E. State Street intersection. The advantages of this alternative action may be expected to include: 1) a reduction in delay for eastbound through traffic and 2) a reduction in right-angle collisions. The disadvantage of this alternative action include: 1) a substantial increase in vehicular delay and attendant fuel consumption and air pollutant emissions, as all vehicles at the intersection would be required to stop, as opposed to the current traffic control, which only requires about 10 percent of the traffic at the intersection to stop, 2) because of a substantial imbalance in approach volumes, as shown in Figure 3, vehicles on S. Pine Street may be expected to stop when there is no vehicle on the eastbound E. State Street approach, 3) because some motorists may be required to stop on S. Pine Street when no vehicles are on the eastbound E. State Street approach, it may be expected that disrespect for, and disregard of, the stop sign would exist, and 4) an increase in rear end accidents may be expected. It may be further noted that, because of the substantial approach volume imbalance, the traffic volume warrant contained in the Manual on Uniform Control Devices[4] is not met. Therefore, this alternative traffic action is not recommended for further consideration by the City's Street Committee for implementation at this intersection.

This same traffic engineering action was considered at the intersection of S. Pine Street and E. Adams Street. The same advantages and disadvantages identified above may be expected at this intersection as well. It may be noted that traffic volumes on the intersection approach legs are even more unbalanced than those at the S. Pine Street and E. State Street intersection. Thus, this alternative traffic management action is not recommended for further consideration by the City's Street Committee for implementation at this intersection.

Traffic Signalization

Another traffic management action considered to reduce the congestion and delay experienced by eastbound through traffic and to reduce accidents at the intersection of S. Pine Street and E. State Street was the installation of a fully actuated traffic signal. The installation of a traffic signal requires that one or more of the warrants set forth in the Manual on Uniform Traffic Control Devices be met. It should be noted, however, that although meeting one of the warrants is a necessary condition for traffic signal installation, meeting the warrant should not be considered a mandate for installation. The impacts of the signal installation must be evaluated and installation considered only if the operation of the intersection is thereby improved. A total of five traffic signal installation warrants were considered, four related to traffic volumes and five related to the accident experience at the intersection.

The first warrant considered, the minimum vehicular volume warrant, is satisfied if the sum of the current traffic volumes on the major approaches and the corresponding volumes on the minor street approaches meet or exceed

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[4] *U. S. Department of Transportation, Federal Highway Administration, "Warrants for the Installation of Traffic Signals and Stop and Yield Signs, Manual on Uniform Traffic Control Devices, 1989.*

specified minimum volume requirements for eight hours of an average weekday. The minimum volume requirements at this intersection are 600 vehicles per hour on the major street and 150 vehicles per hour on the minor street.[5] This warrant is not met, as E. State Street traffic volumes are substantially less than the warrant volume, as shown in Table 2.

The second warrant considered, the interruption of continuous traffic warrant, is satisfied when traffic for eight hours of an average weekday exceeds 900 vehicles per hour on the major street and 75 vehicles per hour for the same eight hours on the minor street. This warrant is not met, as traffic volumes during three of the required eight hours on S. Pine Street are minimally, about 1 percent, less than required, as shown in Table 2.

The third volume warrant considered, the four-hour volume warrant, is satisfied when the volume on the minor street approach exceeds a threshold volume corresponding to the volume on the major street approaches in each of any four hours of an average day. During the hour with the highest major street approach volumes, 1,065 vehicles, the required minor street approach volume is 120 vehicles, or 10 vehicles per hour more than the 110 vehicles observed. In the hour with the fourth highest major street volume, 995, the required minor street approach volume is 140 vehicles, or 40 vehicles per hour more than the 100 vehicles observed. The volume criteria for this warrant were not satisfied in any of the four hours.

The fourth volume warrant considered, the peak hour volume warrant, is satisfied when the volume on the minor street approach exceeds the threshold volume corresponding to the volume on the major street approaches during the peak hour. The peak hour volume of 1,065 vehicles requires a corresponding minor street approach volume of 260 vehicles, or 150 vehicles more than the 110 vehicles observed. Thus, the volume criteria for this warrant are not satisfied.

The fifth warrant considered, the accident experience warrant, is satisfied when two criteria are met: 1) five or more accidents of a type susceptible to correction by the installation of traffic signals have occurred within a 12-month period and 2) when there exists a volume of traffic not less than 80 percent of the requirements specified in either the minimum vehicular volume warrant or the interruption of continuous traffic warrant. A total of seven right-angle collisions, an accident type considered correctable through the installation of traffic signals, occurred in the nine month period between the middle of September 1990 and the middle of June 1991. Thus, the accident criteria are satisfied for this warrant.

Shown in Table 2 are the minimum vehicular volumes required to satisfy the accident experience warrant. The volumes entering the intersection exceed the minimum volume requirements of the accident experience warrant on all approaches, thereby satisfying the second criterion of the accident experience warrant. Because both these criteria are met, the accident experience warrant is satisfied. Because the accident experience warrant is satisfied, it may be concluded that traffic signals could be installed at this intersection.

The advantages of the installation of a traffic signal at this intersection include: 1) the provision of gaps at regular intervals to accommodate both eastbound through traffic and northbound left turns, 2) eastbound through traffic may be expected to experience a substantial reduction in delay, and 3) a potential improvement in traffic safety may be expected by reducing the incidence of right-angle collisions. Pedestrian safety may also be enhanced by pedestrian signals.

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[5]*Because right turns on red are permitted under Wisconsin Statutes, the Wisconsin Department of Transportation reduces the volume making right turns by one-half. This policy may be waived in certain situations such as intersections with severely restricted sight distance. The Commission staff, in recognition of this policy, included only half the right-turning volume on the northbound, southbound, and eastbound approaches in its analysis of the volume-related warrants. Further, based on the Department's position, which was established during the conduct of a traffic engineering study of Milwaukee Avenue (STH 36) within the City of Burlington completed in August 1988 by the Commission staff, disallowing the 30 percent volume reduction permitted in the Manual on Uniform Traffic Control Devices for communities with populations under 10,000, the full warrant volumes are used in these analyses.*

Table 2

TRAFFIC SIGNAL WARRANTS FOR THE INTERSECTION OF E. STATE STREET AND S. PINE STREET: 1991

SIGNAL WARRANT 1-MINIMUM VEHICULAR VOLUME

MINIMUM VEHICULAR VOLUMES	NUMBER OF TRAFFIC LANES		WARRANT TRAFFIC VOLUMES		EXISTING TRAFFIC VOLUMES HOUR NUMBER								
	MAJOR STREET	MINOR STREET	MAJOR STREET SUM BOTH APPROACHES	MINOR STREET HIGHEST APPROACH		1	2	3	4	5	6	7	8
	1.....	1.....	500	150	MAJOR								
	2 OR MORE	1.....	600	150	STREET	1,065	895	1,060	1,050	995	890	955	895
	2 OR MORE	2 OR MORE	600	200	MINOR								
	1.....	2 OR MORE	500	200	STREET	110	110	105	105	100	100	90	85

SIGNAL WARRANT 2-INTERRUPTION OF CONTINUOUS TRAFFIC

INTERRUPTION OF CONTINUOUS TRAFFIC	NUMBER OF TRAFFIC LANES		WARRANT TRAFFIC VOLUMES		EXISTING TRAFFIC VOLUMES HOUR NUMBER								
	MAJOR STREET	MINOR STREET	MAJOR STREET SUM BOTH APPROACHES	MINOR STREET HIGHEST APPROACH		1	2	3	4	5	6	7	8
	1.....	1.....	750	75	MAJOR								
	2 OR MORE	1.....	900	75	STREET	1,065	895	1,060	1,050	995	890	955	895
	2 OR MORE	2 OR MORE	900	100	MINOR								
	1.....	2 OR MORE	750	100	STREET	110	110	105	105	100	100	90	85

SIGNAL WARRANT 6-ACCIDENT EXPERIENCE MINIMUM VEHICULAR VOLUME

INTERRUPTION OF CONTINUOUS TRAFFIC	NUMBER OF TRAFFIC LANES		WARRANT TRAFFIC VOLUMES		EXISTING TRAFFIC VOLUMES HOUR NUMBER								
	MAJOR STREET	MINOR STREET	MAJOR STREET SUM BOTH APPROACHES	MINOR STREET HIGHEST APPROACH		1	2	3	4	5	6	7	8
	1.....	1.....	600	60	MAJOR								
	2 OR MORE	1.....	720	60	STREET	1,065	895	1,060	1,050	995	890	955	895
	2 OR MORE	2 OR MORE	720	80	MINOR								
	1.....	2 OR MORE	600	80	STREET	110	110	105	105	100	100	90	85

Note all right-turn movements have been reduced by 50 percent.

Source: SEWRPC.

The disadvantages of installing a traffic signal at this intersection may be expected to include: 1) motorists who previously did not have to stop at the intersection may be expected to incur an average of three seconds of delay per vehicle, or an estimated total of one vehicle hour of delay in the evening peak hour. The average vehicular delay on all approaches may be expected to approximate 4.5 seconds per vehicle, or an estimated total of two vehicle hours of delay during the peak hour compared to the 3.7 seconds per vehicle, or 1.5 total vehicle hours of delay during the peak hour under the current traffic control, 2) an increase in fuel consumption and air pollutant emissions, 3) an increase in certain accident types such as rear end accidents, and 4) the potential to weave immediately east of the intersection, along with attendant negative impacts on traffic operations, is not eliminated. The estimated capital cost of implementing this recommendation is $65,000, with an estimated annual operations and maintenance cost of $2,500.

Operation of the proposed traffic signal with a two-phase signal cycle, one phase to accommodate the eastbound traffic movements and one phase to accommodate the northbound and

southbound traffic movements, may be expected to substantially reduce delay on the eastbound approach while introducing very modest delay on the northbound and southbound approaches. Because of the heavy northbound left turn movement, the introduction of a third phase to the signal cycle may be considered. The additional phase, which may be expected to minimize the delay for the northbound left turn movement, would precede the phase for northbound and southbound traffic. Delay for the northbound left turn movement may be expected to be reduced by about 20 percent, but may be expected to increase the total by about 5 percent compared to the two-phase operation.

Because of the gaps in the traffic stream which would be provided by the signals for eastbound through traffic and northbound left turns, and because of the potential to improve traffic safety through the reduction of certain types of accidents, it is recommended that the City consider, in cooperation with the Wisconsin Department of Transportation, the installation of fully actuated traffic signals at this intersection.

The traffic signal installation warrants were also applied to the intersection of S. Pine Street and E. Adams Street. The traffic volumes for the highest eight hours are shown in Table 3. Because the E. Adams Street approach volumes are so low, none of the warrants for traffic signal installation are met. Therefore, this alternative traffic action is not recommended for further consideration for implementation at this intersection by the City's Street Committee.

Eliminate Selected Additional On-Street Parking

The third alternative traffic management action considered to abate the traffic problems identified at the intersection of S. Pine Street and E. State Street was the elimination of 50 feet of additional on-street parking on the west side of S. Pine Street and the south side of E. State Street on the southbound and eastbound intersection approaches, respectively. The advantages of this alternative traffic management action may be expected to include: 1) the provision of more than 200 feet of unobstructed sight distance in the northeast quadrant may be expected to reduce the incidence of right-angle collisions, thereby improving traffic safety at the intersection, 2) a potential increase in intersection capacity as a result of increasing the length of the curb lane available to accommodate southbound-to-westbound and eastbound-to-southbound right-turn movements, and 3) implementation on a trial basis which would permit the impacts to be evaluated prior to a decision to implement permanently. It may be noted that, because of the substantial delay incurred by eastbound through traffic, queues may extend from the intersection to the parking zone. Thus, right turning vehicles may be unnecessarily delayed in reaching the intersection as they wait in the queue.

One disadvantage of this alternative traffic management action is the loss of two on-street parking stalls on each intersection approach in the area of commercial land uses. Although off-street parking is available in the immediate vicinity of the intersection, based on staff observation, substantial use is made of the on-street parking proposed for elimination on S. Pine Street. Another disadvantage is that the provision of additional capacity for the right-turn movements only on these approaches may be expected to have only a minimal impact on intersection operations. The estimated cost of implementing this alternative action is $150.

Because of the potential to improve traffic safety by increasing the unobstructed sight distance, it is recommended that the City Street Committee consider the elimination of 50 feet of on-street parking on the west side of S. Pine Street and the south side of E. State Street on the south- and eastbound intersection approaches, respectively. It is further recommended that implementation be for a trial period of one year, to be made permanent only if a decrease in right-angle collisions is experienced.

Provide an Additional Through Traffic Lane on the Southbound Intersection Approach

Another alternative traffic management action considered to abate the traffic problems identified at the intersection of S. Pine Street and E. State Street was provision of an additional through traffic lane on the southbound approach to the intersection. This would require the elimination of parking on the west side of S. Pine Street between E. State Street and a point 300 feet south of E. Adams Street. If implemented with the elimination of parking as previously identified, the following advantages may be expected: 1) conversion of the curb lane on the southbound approach to a through and right-turn movement lane would substantially increase the

Table 3

TRAFFIC SIGNAL WARRANTS FOR THE INTERSECTION OF E. ADAMS STREET AND S. PINE STREET: 1991

SIGNAL WARRANT 1-MINIMUM VEHICULAR VOLUME

MINIMUM VEHICULAR VOLUMES	NUMBER OF TRAFFIC LANES		WARRANT TRAFFIC VOLUMES		EXISTING TRAFFIC VOLUMES HOUR NUMBER								
	MAJOR STREET	MINOR STREET	MAJOR STREET SUM BOTH APPROACHES	MINOR STREET HIGHEST APPROACH		1	2	3	4	5	6	7	8
	1.....	1.....	500	150	MAJOR								
	2 OR MORE	1.....	600	150	STREET	1,070	1,055	935	905	900	865	790	770
	2 OR MORE	2 OR MORE	600	200	MINOR								
	1.....	2 OR MORE	500	200	STREET	45	60	40	50	45	45	35	35

SIGNAL WARRANT 2-INTERRUPTION OF CONTINUOUS TRAFFIC

INTERRUPTION OF CONTINUOUS TRAFFIC	NUMBER OF TRAFFIC LANES		WARRANT TRAFFIC VOLUMES		EXISTING TRAFFIC VOLUMES HOUR NUMBER								
	MAJOR STREET	MINOR STREET	MAJOR STREET SUM BOTH APPROACHES	MINOR STREET HIGHEST APPROACH		1	2	3	4	5	6	7	8
	1.....	1.....	750	75	MAJOR								
	2 OR MORE	1.....	900	75	STREET	1,070	1,055	935	905	900	865	790	770
	2 OR MORE	2 OR MORE	900	100	MINOR								
	1.....	2 OR MORE	750	100	STREET	45	60	40	50	45	45	35	35

Note all right-turn movements have been reduced by 50 percent.

Source: SEWRPC.

capacity of the southbound approach, 2) southbound through traffic would be distributed in two lanes compared to a single lane under existing conditions, which may be expected to increase the number and duration of gaps in the southbound traffic stream, 3) the delay currently incurred by eastbound through and northbound left-turning vehicles may be expected to be reduced by the availability of more and longer gaps, and 4) the availability of more and longer gaps in the southbound traffic stream may improve traffic safety at the intersection as eastbound through motorists may be less impatient and wait for a suitable gap in conflicting traffic to proceed through the intersection.

The disadvantages of this alternative traffic management action include the loss of 15 on-street parking stalls. Those stalls near E. State Street are heavily used by Post Office patrons. Those stalls near E. Adams Street, however, are only used infrequently. Because the length of two-lane southbound operation is limited to one block before merging back into a single lane, the number of motorists using the curb lane may be expected to be relatively small, thereby substantially limiting both the increase in the number and duration of the gaps. Finally, this alternative would not eliminate the potential for weaving just east of the intersection along with the attendant negative impacts on traffic operations.

Because of the loss of on-street parking and expected limitations on the potential benefit to be derived through its implementation, this alternative traffic management action is not recommended for further consideration.

Reroute Northbound STH 83

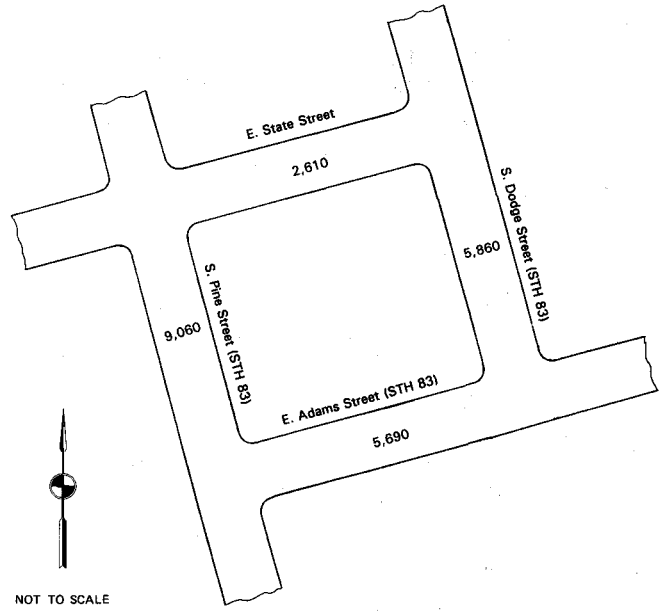
The final traffic management action, proposed by the City's Street Committee, considered to abate the identified traffic problems was the

rerouting of existing northbound STH 83 between the intersections of S. Pine Street and E. Adams Street and S. Dodge Street and E. State Street from S. Pine Street and E. State Street to E. Adams Street and S. Dodge Street.

In order to minimize changes in access to existing businesses and the attendant imposition of circuitous travel and increase in travel time, fuel consumption, and air pollutant emissions, it was assumed that no additional street segments in the study area would be converted from two-way to one-way operation. It was also assumed that the shortest travel time path between the intersections of S. Pine Street with E. Adams Street, and S. Dodge Street and E. State Street would be over E. Adams Street and S. Dodge Street, the proposed new state trunk highway. In part, this would be accomplished by increasing speed limits on the new state trunk highway route to 30 miles per hour and potentially reducing speed limits on the original route to 25 miles per hour. The 24-hour average weekday traffic volumes which may be expected on study area facilities if northbound STH 83 were rerouted are shown in Figure 5. The 24-hour and evening peak hour turning movement volumes which may be expected at study area intersections if northbound STH 83 was rerouted are shown in Figures 6 and 7, respectively.

Figure 5

24-HOUR AVERAGE WEEKDAY TRAFFIC VOLUME ON THE STUDY SEGMENTS AS A RESULT OF REROUTING NORTHBOUND STH 83: 1991



Source: SEWRPC.

Rerouting northbound STH 83 may be expected to substantially decrease traffic volumes entering the intersection of E. State Street and S. Pine Street and, thus, traffic operating conditions at the intersection may be expected to improve. The eastbound through traffic movement may be expected to operate at design capacity compared to over design capacity under existing conditions. No change would be expected in the operation of the northbound left-turn movement because the traffic volumes conflicting with that movement, namely the southbound through and right-turning traffic remain unchanged as a result of the rerouting of northbound STH 83. Further, because there would be no change in approach volumes with the exception of the northbound right-turn volumes, rerouting northbound STH 83 would not be expected to abate the accident problem at this intersection.

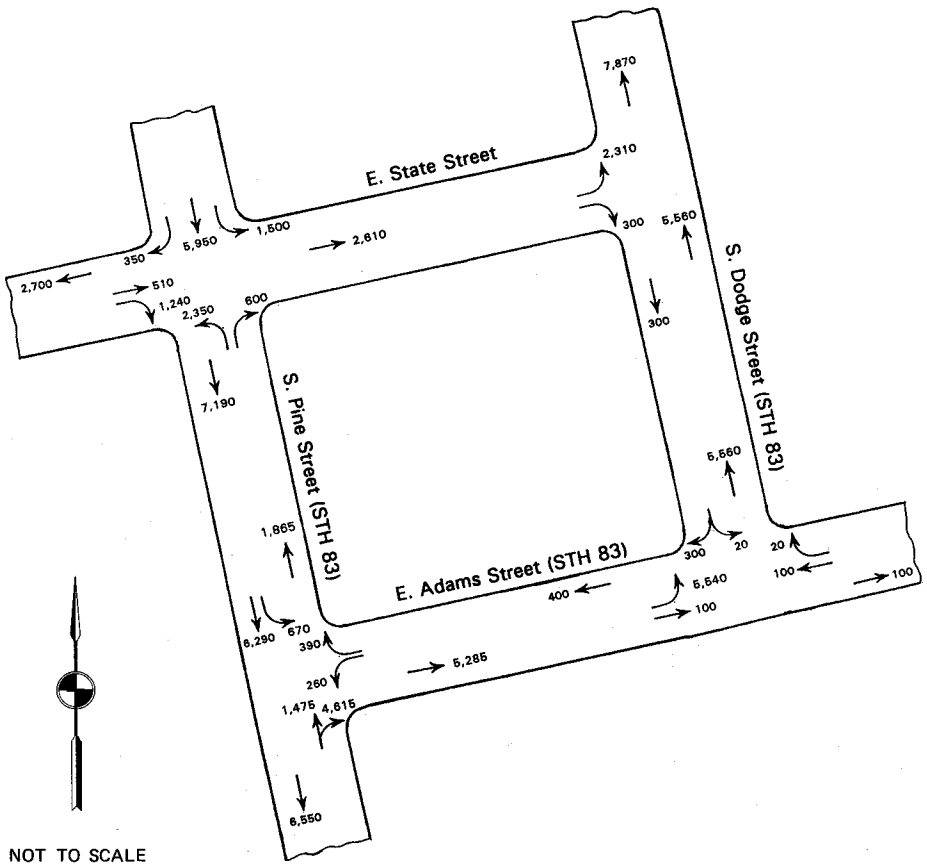
The traffic entering the intersection of E. Adams Street and S. Dodge Street may be expected to increase substantially and, as a result, the southbound left-turning movement may be expected to operate over its design capacity. This approach currently operates under design capacity.

Although traffic volumes entering the intersection of E. Adams Street with S. Pine Street and S. Dodge Street with E. State Street may not be expected to change substantially, significant changes may be expected in the volume of traffic making selected movements at each intersection. Because of substantially less conflicting northbound through traffic, the westbound left-turn movement at the intersection of E. Adams Street and S. Pine Street may be expected to operate at design capacity, representing an improvement with respect to existing operations on this movement.

All movements at the intersection of E. State Street and S. Dodge Street may be expected to continue to operate within its design capacity if northbound STH 83 is rerouted. It should be noted, however, that, because the eastbound approach, which would be stop sign controlled if

Figure 6

24-HOUR WEEKDAY TURNING MOVEMENT VOLUMES AS A RESULT OF REROUTING NORTHBOUND STH 83: 1991

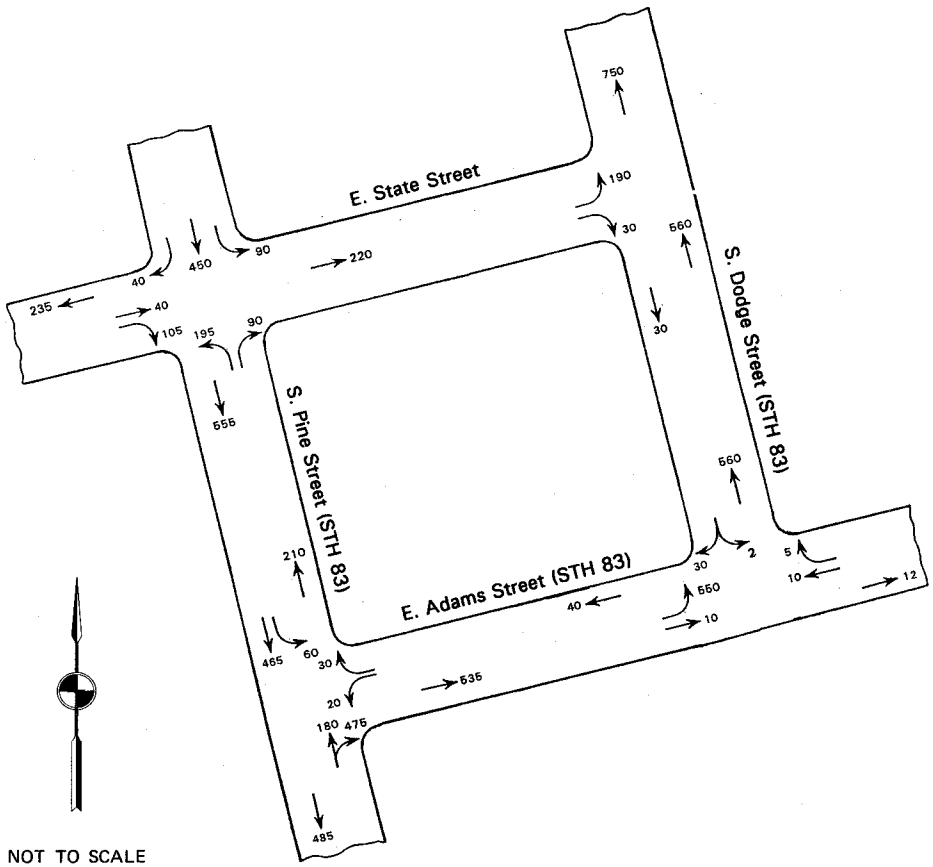


NOT TO SCALE

Source: SEWRPC.

Figure 7

EVENING HOUR PEAK TRAFFIC TURNING MOVEMENT VOLUMES AS A RESULT OF REROUTING NORTHBOUND STH 83: 1991



NOT TO SCALE

Source: SEWRPC.

STH 83 is rerouted, may be expected to have approach volumes nearly twice as high as the existing northbound approach, the overall delay at the intersection would increase.

Thus, it may be concluded that the two movements which currently experience the worst operating conditions in the study area, namely, the eastbound through traffic at the S. Pine Street and E. State Street intersection and the westbound left turn at the S. Pine Street and E. Adams Street intersection, would improve if northbound STH 83 is rerouted as proposed. It should be noted, however, that the evening peak hour traffic making these two movements, 40 vehicles and 20 vehicles, respectively, represents about 2.8 and 1.6 percent of the total evening peak hour traffic entering each respective intersection. One intersection approach may be expected to experience a substantial degradation of operating conditions, the southbound left-turn movement at the intersection of S. Dodge Street and E. Adams Street, representing about 60 vehicles during the evening peak hour.

Rerouting of northbound STH 83 between the intersections of S. Pine Street with E. Adams Street, and of S. Dodge Street and E. State Street may be expected to entail the following actions: 1) relocation of existing stop signs from the northbound to the eastbound approach at the S. Dodge Street and E. State Street intersection, 2) installation of a new stop sign on the westbound approach at the E. Adams Street and S. Dodge Street intersection, 3) elimination of the existing parking from the south side of E. Adams Street from S. Pine Street to S. Dodge Street, and from the east side of S. Dodge Street from E. Adams Street to E. State Street, representing a loss of 19 on-street parking stalls, and the installation of lane line pavement markings to provide two traffic lanes for northbound STH 83, 4) the acquisition of the necessary right-of-way and the reconstruction of the southeast quadrant of the S. Pine Street and E. Adams Street intersection to increase the existing corner radius from the existing 12 feet to 60 feet to facilitate right turns by truck tractor-semitrailer combination vehicles;[6] and 6) relocation of state trunk highway route markers and appropriate arrows. The estimated cost of implementing the actions necessary to reroute northbound STH 83 is $10,000.

Briefly summarized, the traffic-related impacts of the proposed rerouting of northbound STH 83 is the shift of an estimated 4,340 vehicles per average weekday from the current route to E. Adams Street between S. Pine Street and S. Dodge Street and to S. Dodge Street between E. Adams Street and E. State Street. The shift in traffic would modestly improve operating conditions for the eastbound through movement and the westbound left-turn movement at the intersection of S. Pine Street with E. State Street and E. Adams Street, respectively. Operating conditions at the intersections of S. Dodge Street with E. Adams Street and E. State Street would be degraded. A total of 19 onstreet parking stalls would be eliminated. Finally, the rerouting would not be expected to abate the accident problem at the intersection of S. Pine Street and E. State Street.

Because the shift in traffic anticipated with the proposed rerouting of northbound STH 83 would not be expected to substantially improve operating conditions at any study area intersection, or to abate the accident problem at the intersection of S. Pine Street and E. State Street, but would be expected to degrade operating conditions at the intersection of S. Dodge Street and E. Adams Street, and also require the elimination of 19 on-street parking stalls, the proposed rerouting is not recommended for further consideration by the City Street Committee.

Mail-Drop Box Relocation

An alternative action which was implemented on a temporary basis in May 1991 and which City of Burlington officials believe to have improved traffic flow on E. State Street between S. Pine Street and S. Dodge Street is the permanent relocation of the three Post Office mail-drop boxes. The drop boxes, originally located 75 feet east of S. Pine Street on the north side of E. State Street, have been temporarily relocated to a point approximately 160 feet east of S. Pine

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[6] *This reconstruction may be expected to result in the loss of four trees in the existing curb lawn on the east side of S. Pine Street, ranging in diameter from an estimated 15 to 24 inches, and the relocation of overhead utility poles on both the east side of S. Pine Street and the south side of E. Adams Street.*

Street on the north side of E. State Street. This alternative action has reduced the weaving immediately east of the S. Pine Street and E. State Street intersection. It is recommended that City of Burlington officials work with the City of Burlington Postmaster to permanently locate the drop boxes 160 feet east of S. Pine Street on the north side of E. State Street.

Improve Corner Radius

Although not identified as a problem, the existing corner radius in the southeast quadrant of the S. Pine Street and E. State Street intersection does not meet design standards for truck tractor-semi trailer combination vehicles. Such traffic constitutes about 6.5 percent of the traffic on STH 83 between E. State Street and E. Adams Street. These vehicles must substantially reduce speeds to execute the northbound right-turn movement.

The advantage of reconstructing the corner radius in the southeast quadrant of the intersection would be to permit large trucks to execute the northbound rightturn movement at higher speeds, thereby improving the operation of the intersection. The disadvantages of reconstructing this corner radius are: 1) need to acquire right-of-way, 2) the loss of trees in the curb lawn on the south side of E. State Street, 3) the need to relocate overhead utility poles on the east side of S. Pine Street and the south side of E. State Street, and 4) the improvement in operating conditions may be expected to be minimal. The estimated cost of reconstructing the corner radius is $8,300.

Because the advantage of this improvement is expected to be minimal and because of the disadvantages of this improvement, this action is not recommended for further consideration by the City Street Committee.

Second Generation Racine County Jurisdictional Highway System Plan

On October 9, 1990, and December 5, 1990., the Racine County Board of Supervisors and the Southeastern Wisconsin Regional Planning Commission, respectively, adopted an amendment to the Racine jurisdictional highway system plan.[7] This second generation jurisdictional highway system plan recommends the provision of a bypass of the City of Burlington, including the routing of STH 83. Upon its completion, it is expected that the state trunk highway routes which currently go through the City, including STH 83, would be realigned over this new facility and the existing state trunk highway routes would revert to local trunk highways. Thus, a reduction in the traffic volumes at the intersection of S. Pine Street and E. State Street may be expected. This improvement is identified in the plan to have a high priority for implementation. Therefore, it is recommended that City of Burlington officials work with officials from the Towns of Burlington and Rochester, as well as with officials from Racine County and the Wisconsin Department of Transportation, to seek the earliest possible implementation of this recommendation.

Conclusions and Recommendations

A total of five traffic engineering actions and two other actions were considered to improve the operating conditions and to abate the congestion and delay and accident problems identified in the study area. The five traffic engineering actions included: 1) the implementation of multiway stops at the intersections of S. Pine Street (STH 83) with E. State Street and E. Adams Street, 2) the installation of traffic signals at the aforementioned intersections, 3) the elimination of two additional on-street parking stalls on the west side of S. Pine Street and the south side of E. State Street at the intersection of these two streets to improve the stopping sight distance in the northeast quadrant, 4) the elimination of parking on the west side of S. Pine Street from E. State Street to a point 200 feet south of E. Adams Street, and 5) rerouting northbound STH 83. The other two actions considered included: 1) the relocation of the mail-drop boxes on E. State Street and 2) reconstruction of the corner radius in the southeast quadrant of the S. Pine Street and E. State Street intersection.

Two traffic engineering actions and one other action are recommended for further consideration by the City Street Committee: 1) the installation of fully actuated traffic signals at the S. Pine Street intersection with E. State Street,

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[7] *The amended Racine County jurisdictional highway system plan is documented in a SEWRPC report entitled, Amendment to the Racine County Jurisdictional Highway System Plan—2000, December 1990.*

2) the elimination on a trial basis of two on-street parking stalls on the west side of S. Pine Street and the south side of E. State Street at the intersection of the two streets, and 3) the relocation of the mail-drop boxes on the north side of E. State Street. The installation of traffic signals and the elimination of the on-street parking may be expected to abate the right-angle collision problem at the S. Pine Street and E. State Street intersection while improving the operating conditions for eastbound through and northbound left-turn traffic.

City officials believe that the temporary relocation of the mail-drop boxes has been beneficial and it was recommended that the relocation be made permanent. The total cost of implementing these actings is estimated to be $65,500.

It was also recommended that the City seek implementation of the recommended Burlington bypass which has the potential to alleviate these and other traffic problems in the Burlington area in the short and long term.

SUMMARY

On August 29, 1990, the City of Burlington Street Committee requested that the Commission staff study the operation of the intersection of S. Pine Street (STH 83) and E. State Street (STH 83). In addition to this analysis, the Commission staff was requested to evaluate the impacts of rerouting northbound STH 83 between the intersections of S. Pine Street with E. Adams Street and the intersection of E. State Street with S. Dodge Street. The alternative route for STH 83 proposed to be considered was E. Adams Street between S. Pine Street and S. Dodge Street and S. Dodge Street between E. Adams Street and E. State Street. This report presents the findings and recommendations of that study.

In May 1991 a count of traffic using the study segments was taken. Approximately 14,400 vehicles per average weekday use S. Pine Street between its intersections with E. State Street and E. Adams Street, approximately 6,950 vehicles per average weekday use E. State Street between S. Pine Street and S. Dodge Street, and approximately 1,500 vehicles per average weekday use E. Adams Street between S. Pine Street and S. Dodge Street

Based on a comparison of the existing traffic volume on S. Pine Street to its design capacity, S. Pine Street between its intersections with E. State Street and E. Adams Street is operating in excess of its design capacity.

Intersection hourly turning movement counts were also collected to determine intersection operating conditions and capacity. At the intersection of S. Pine Street and E. State Street, the eastbound through traffic movement operates over capacity, experiencing delay in excess of 40 seconds as motorists wait to find an acceptable gap in the north- and southbound traffic streams. The remaining traffic movements at the intersection operate under their design capacity; however, the northbound left-turning movement was observed to experience periodic congestion, with a delay of approximately 15 seconds.

Traffic accident data were also collected to identify any recurring traffic accident patterns. Twenty traffic accidents occurred in the period of 1988, 1989, and 1990, and between January 1 and June 7, 1991. There were no fatal accidents, four accidents involved personal injury, and the remaining 16 accidents were property damage accidents. Thirteen of the 20 accidents occurred at the intersection of E. State Street and S. Pine Street. The predominant type of accident at this intersection is the right-angle collision, which potentially suggests excessive vehicle speed, restricted sight distance, and a lack of adequate gaps in the S. Pine Street traffic stream.

Five traffic engineering actions and two other actions were considered to improve the operating conditions and abate the congestion and delay and accident problems identified in the study area. The traffic engineering actions recommended for further consideration by the City Street Committee include: 1) the installation of fully actuated traffic signals at the intersection of S. Pine Street and E. State Street, 2) the removal on a trial basis of 50 feet of on-street parking stalls on the west side of S. Pine Street and the south side of E. State Street at the intersection of the two streets, and 3) the relocation of the mail-drop boxes on the north side of E. State Street. It may be expected that the installation of traffic signals at the intersection of S. Pine Street and E. State Street, in addition to the removal of the two on-street parking spaces, may improve traffic safety and intersection operation. Therefore, it is recom-

mended that City staff consider, in cooperation with the Wisconsin Department of Transportation, the installation of fully actuated traffic signals at this intersection. The cost of implementing this recommendation is estimated at $65,000, with an estimated annual operations and maintenance cost of $2,500.

The advantages that removing the selected on-street parking may be expected to provide are the provision of more than 200 feet of unobstructed sight distance, which may be expected to reduce the occurrence of right-angle accidents and a potential increase in the capacity of the intersection. In addition, this action may be implemented on a trial basis, which would permit the impacts to be determined prior to being implemented permanently. The estimated cost of implementing this alternative action is $150.

The temporary relocation of the mail-drop boxes on the north side of E. State Street to a point 160 feet east of S. Pine Street has been reported by City officials as having improved traffic flow on E. State street. In addition, this action has reduced weaving immediately east of the intersection of S. Pine Street with E. State Street. It is recommended that City officials work with the City of Burlington Postmaster to permanently locate the mail-drop boxes 160 feet east of S. Pine Street on the north side of E. State Street.

A traffic management action proposed to reduce congestion and increase traffic safety at the intersection of S. Pine Street and E. State Street was the rerouting of existing northbound STH 83 between the intersections of S. Pine Street and E. Adams Street, and between E. Adams Street and S. Dodge Street. It can be expected that rerouting northbound STH 83 will result in a decrease in the volume of northbound right-turning traffic entering the intersection. While this traffic reduction can be expected to modestly improve the operation of the eastbound through traffic, it will not improve the operation of the northbound left-turning movement because the southbound through and right-turning traffic will remain unchanged. In addition, because only the northbound right-turning traffic volume will be reduced, rerouting northbound STH 83 would not be expected to abate the accident problem at this intersection.

In addition, rerouting northbound STH 83 would entail: 1) relocating stop signs at the intersections of S. Dodge Street with E. Adams Street, and S. Dodge Street with E. State Street, 2) elimination of the existing on-street parking from the south side of E. Adams Street between S. Pine Street and S. Dodge Street, and from the east side of E. Dodge Street between E. Adams Street and E. State Street, 3) the acquisition of right-of-way in the southeast quadrant of the intersection of E. Adams Street and S. Pine Street to increase the curb radius to accommodate truck tractor-semitrailer combination vehicles, and 4) the relocation of the existing state trunk highway route markers.

Because rerouting northbound STH 83 would not be expected to substantially improve operating conditions at any study area intersection, or to improve traffic safety at the intersection of S. Pine Street and E. State Street, it is not recommended for further consideration by the City Street Committee.

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APPENDICES

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Appendix A

HOURLY TURNING MOVEMENT VOLUMES FOR THE INTERSECTIONS OF S. PINE STREET AND E. STATE STREET AND S. PINE STREET AND E. ADAMS STREET: 1991

Adams15.wk1 Intersection: S. Pine St. & E. Adams St.
Count Date: May 7, 1991

	FROM NORTH				FROM SOUTH			FROM EAST		
TIME PERIOD	LEFT	AHEAD	RIGHT	TOTAL	AHEAD	RIGHT	TOTAL	LEFT	RIGHT	TOTAL
6-7	18	366	0	384	162	7	169	13	4	17
7-8	16	365	0	381	194	6	200	11	12	23
8-9	47	304	0	351	297	24	321	24	24	48
9-10	49	304	0	353	305	19	324	25	20	45
10-11	48	333	0	381	369	18	387	9	27	36
11-12	44	435	0	479	405	21	426	14	34	48
12-13	56	432	0	488	423	26	449	14	24	38
13-14	42	401	0	443	332	15	347	15	22	37
14-15	38	488	0	526	357	19	376	19	28	47
15-16	43	407	0	450	578	27	605	21	40	61
16-17	51	472	0	523	506	41	547	13	34	47
17-18	38	413	0	451	391	24	415	14	33	47
18-19	24	352	0	376	302	13	315	15	19	34
19-20	26	338	0	364	346	10	356	17	12	29
TOTAL	540	5,410	0	5,950	4,967	270	5,237	224	333	557
14 HOUR TOTAL	540	5,410	0	5,950	4,967	270	5,237	224	333	557

Pine15.wk1 Intersection: S. Pine Street & E. State Street
Count Date: May 7, 1991

	FROM NORTH				FROM SOUTH			FROM WEST		
TIME PERIOD	LEFT	AHEAD	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	AHEAD	RIGHT	TOTAL
6-7						0				
7-8	40	266	10	316	55	230	286	28	53	80
8-9	107	300	15	422	84	273	357	25	66	91
9-10	174	374	20	568	154	325	479	36	93	129
10-11	145	426	25	597	211	369	580	41	92	133
11-12	96	474	22	591	169	367	536	33	92	124
12-13	117	494	26	638	187	430	617	41	93	134
13-14	137	515	27	679	187	394	581	30	98	128
14-15	116	430	26	572	170	316	486	51	84	135
15-16	110	428	31	569	170	407	578	17	90	107
16-17	124	482	46	652	206	431	638	61	96	157
17-18	75	425	28	529	226	295	521	38	107	144
18-19	52	352	18	421	154	277	431	28	80	107
19-20										
TOTAL	1,294	4,965	295	6,554	1,973	4,116	6,089	428	1,042	1,470
14 HOUR TOTAL	1,294	4,965	295	6,554	1,973	4,116	6,089	428	1,042	1,470

Source: SEWRPC.

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Appendix B

MOTOR VEHICLE COLLISION DIAGRAMS

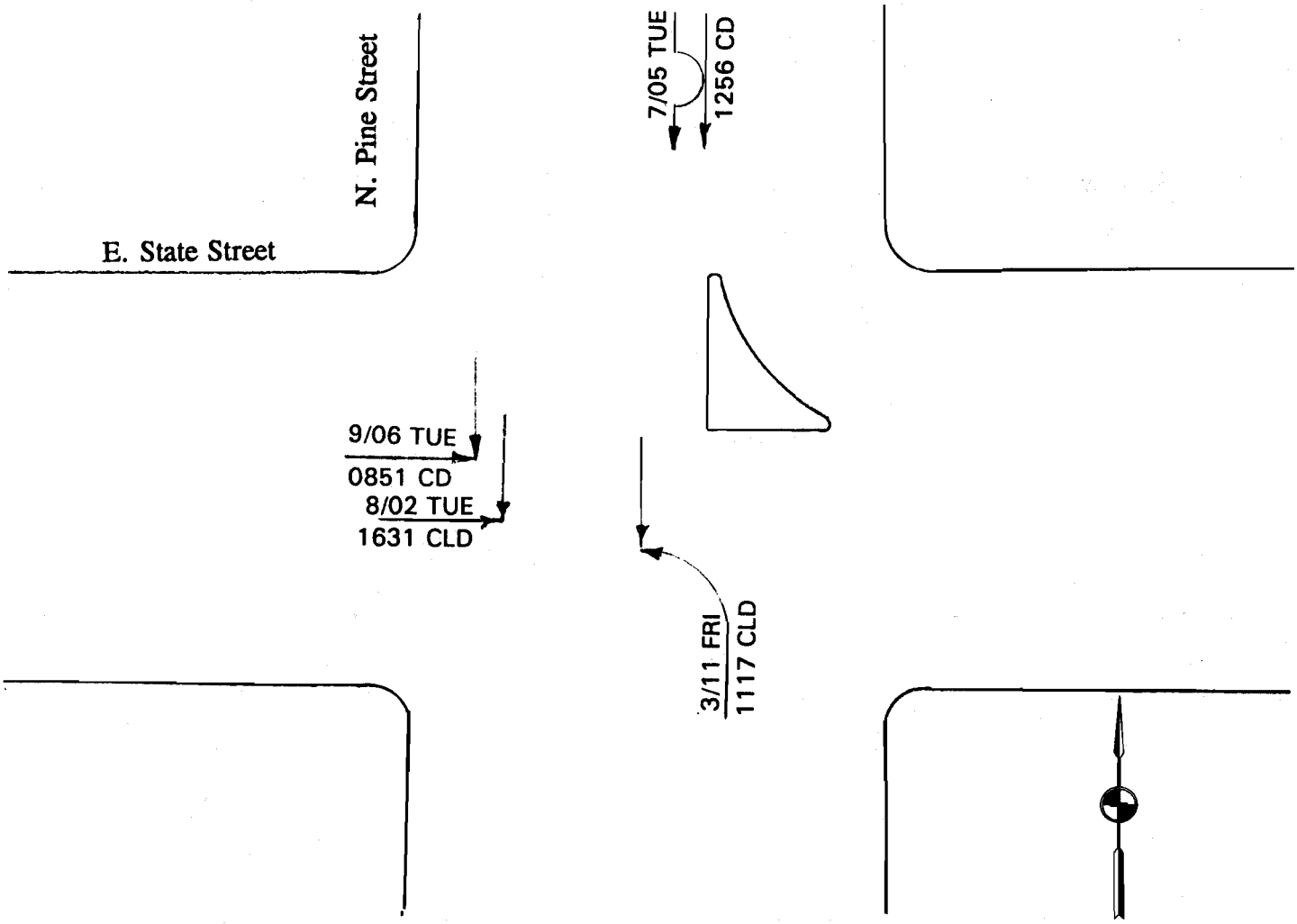
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Pine Street & E. State Street

PERIOD 1988 FROM _____ TO _____

MUNICIPALITY Burlington PREPARED BY SEWRPC



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY
1. Time, Day & Date 2. Pavement: D = Dry I = Icy W = Wet 3. Weather C = Clear; F = Fog; R = Rain; SL = Sleet; SN = Snow; CL = Cloudy 4. NITE - If between dusk and dawn.	SYMBOLS Moving vehicle Backing vehicle Non-involved vehicle Pedestrian Bicycle Parked vehicle Fixed object Fatal accident Injury accident	TYPES OF COLLISION Rear end Head on Side swipe Out of control Left turn Right angle	

Type	Day	Night	Total
Fatal	--	--	--
Pedestrian Injury	--	--	--
Other Injury	--	--	--
Property Damage Only	4	--	4
Total	4	--	4

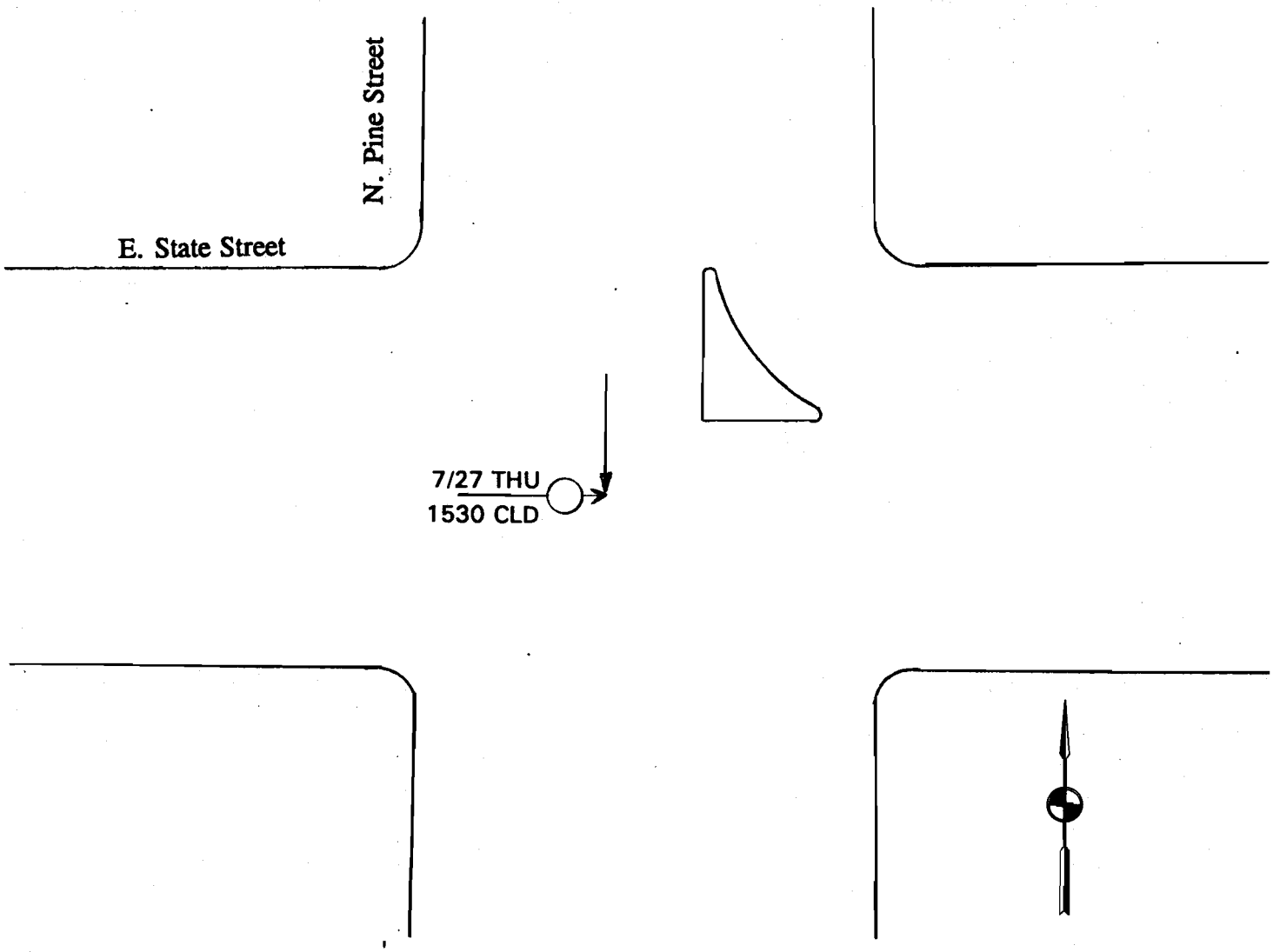
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Pine Street & E. State Street

PERIOD 1989 FROM _____ TO _____

MUNICIPALITY Burlington PREPARED BY SEWRPC



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY
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Type	Day	Night	Total
Fatal	--	--	--
Pedestrian Injury	--	--	--
Other Injury	1	--	1
Property Damage Only	--	--	--
Total	1	--	1

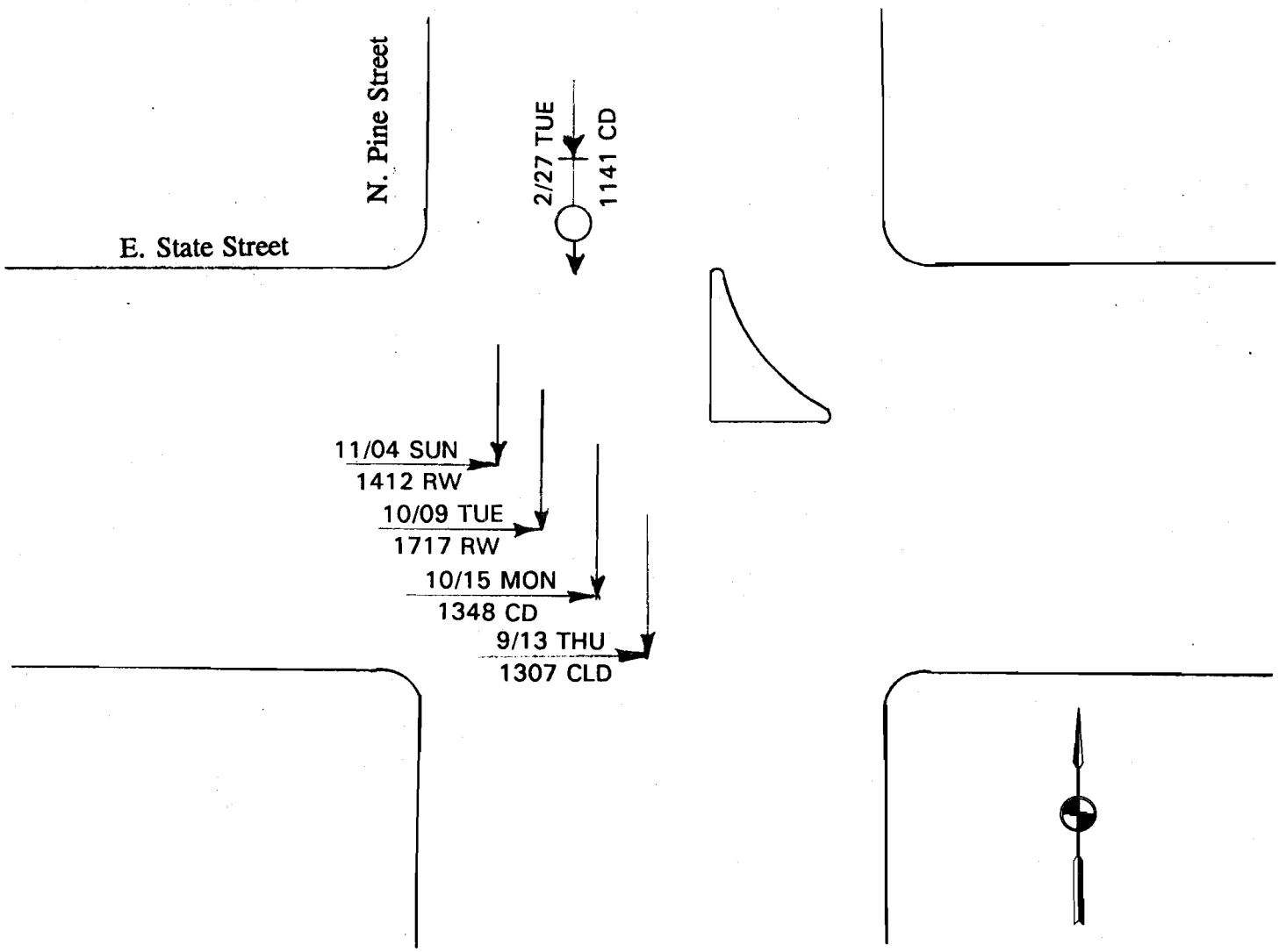
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Pine Street & E. State Street

PERIOD 1990 FROM _____ TO _____

MUNICIPALITY Burlington PREPARED BY SEWRPC



SHOW FOR EACH ACCIDENT	LEGEND	
1. Time, Day & Date 2. Pavement: D = Dry I = Icy W = Wet 3. Weather C = Clear; F = Fog; R = Rain; SL = Sleet; SN = Snow; CL = Cloudy 4. NITE - If between dusk and dawn.	SYMBOLS Moving vehicle Backing vehicle Non-involved vehicle Pedestrian Bicycle Parked vehicle Fixed object Fatal accident Injury accident	TYPES OF COLLISION Rear end Head on Side swipe Out of control Left turn Right angle

SUMMARY

Type	Day	Night	Total
Fatal	--	--	--
Pedestrian Injury	--	--	--
Other Injury	1	--	1
Property Damage Only	3	1	4
Total	4	1	5

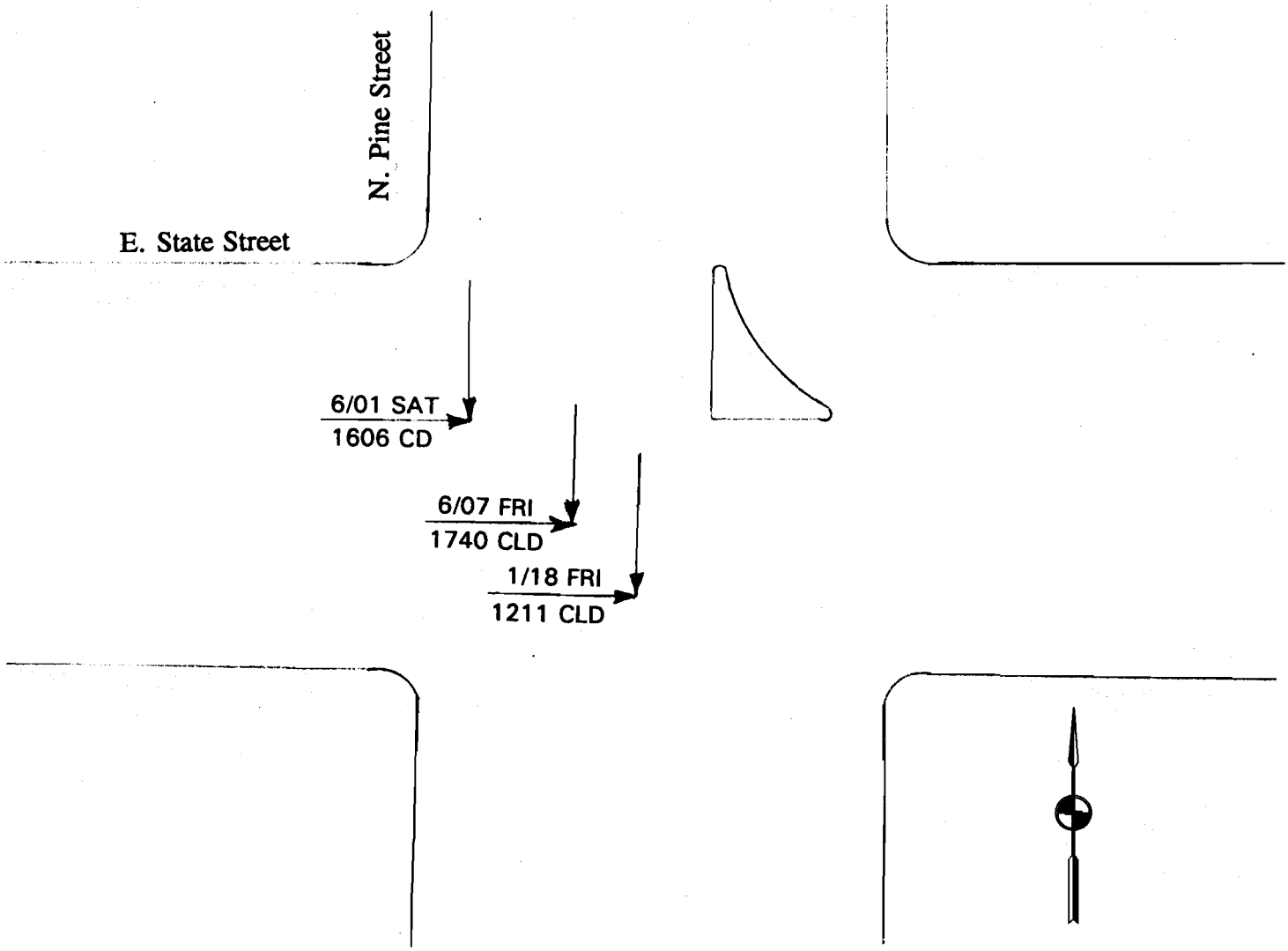
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Pine Street & E. State Street

PERIOD _____ FROM January 1, 1991 Through June 7, 1991

MUNICIPALITY Burlington PREPARED BY SEWRPC



SHOW FOR EACH ACCIDENT	LEGEND	
1. Time, Day & Date 2. Pavement: D = Dry I = Icy W = Wet 3. Weather C = Clear; F = Fog; R = Rain; SL = Sleet; SN = Snow; CL = Cloudy 4. NITE - If between dusk and dawn.	SYMBOLS Moving vehicle Backing vehicle Non-involved vehicle Pedestrian Bicycle Parked vehicle Fixed object Fatal accident Injury accident	TYPES OF COLLISION Rear end Head on Side swipe Out of control Left turn Right angle

SUMMARY

Type	Day	Night	Total
Fatal	--	--	--
Pedestrian Injury	--	--	--
Other Injury	--	--	--
Property Damage Only	3	--	3
Total	3	--	3

Source: SEWRPC.