TRAFFIC STUDIES AND PLANS FOR CERTAIN STRATEGIC POINTS IN STILLWATER, OKLAHOMA

By

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THESIS AND ABSTRACT APPROVED:

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PREFACE

This study of Stillwater traffic was undertaken with the view of determining the local causes of congestion and the locations within the city at which it occurrs. The results of this study are interpreted in a plan for improving the conditions at certain strategic points.

The writer wished to express his appreciation to Professor Ren G. Saxton, Head of the School of Civil Engineering, for his assistance in obtaining basic reading material covering various phases of the problem and for his advice during the preparation of this report.

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CHAPTER I

PRESENT CONDITIONS

Stillwater, Oklahoma is a city of approximately 25,000 people of which about 17,000 may be considered as permanent residents, the other 8,000 being college students and their families. The street system is composed of narrow disorderly paths, laid out, in the main, on a semblance of a rectangular system erratically connected to the narrow winding streets of College Gardens that were apparently laid out without regard for sight distance or elimination of multiple street intersections.

There exist no streets for direct routing of traffic to different parts of the city from the college, which is the principal means of support for the town, nor from the business district on Main Street. Main Street is the oldest business street in the town; it is 72 feet wide curb to curb or six traffic lanes if the street were unobstructed by parked cars. Present parking regulations on Main Street allow it to be congested to as little as 20 feet, or a width less than adequate for a two lane street. Angle parking is allowed on both sides of the street with double parking allowed behind each row of angled cars. Movement of cars into and out of parking places further reduces the efficiency of the street, and creates an accident hazard. Left turns are allowed at intersections to further complicate the traffic pattern, and add to the general congestion and confusion. Heavy pedestrian traffic further confuses the picture.

Streets in the residential section are narrow and are blocked by parked cars. Blight caused by commercial encroachment is widespread throughout the city, due to failure to provide an adequate street system. The evidence that the street system is at fault is that the commercial blight does not center, but like the blood born cancer, breaks out all over and each blight may be supported by a trade area of only ten or twenty city blocks. Further evidence is the fact that there are three well defined "string" business sections in the town, and it is only a ten or fifteen minute walk from any of the three to either of the other two.

Inefficient and improperly constructed intersections create traffic accident hazards and add to the general confusion of the traffic pattern. Traffic controls are inadequate, inefficient and obsolete. Street lighting in residential areas is non-existent except for a few obsolete lights at intersections in the older parts of town. Walks are a non-existent item in all newer parts of town; so pedestrians must walk in streets which were never meant to carry more than two lanes of traffic even without parked vehicles.

Two state highways serve the city; Highway 51 connects with State Highway 33 at Oilton for traffic eastbound and is paved to Oilton. West of town Highway 51 is a gravel road past Lake Carl Blackwell but is a connection with U. S. Highway 77. Highway 40 is a paved highway from the Kansas line on the north to Stillwater and from Stillwater to its junction with State Highway 33, nine miles south. Stillwater bound traffic from the south two thirds of the state enters the city from the south over Highway 40. Traffic from the north and northwest and some from the northeast parts of the state enters the city on Highway 40 from the north. In addition some rural traffic enters over these highways, although a considerable amount of rural traffic enters over section line roads.

At the present time both highways follow streets through town that are not desirable transcity routes. Highway 40 dumps its load of high speed traffic onto Main Street, Highway 51 onto Sixth Avenue. The congestion on Main Street has already been mentioned. Sixth Avenue is a narrow street with two very bad intersections and passes two elementary schools. Sixth Avenue carries about 60 to 70 per cent of all east west crosstown intracity traffic. There is one elementary school on Main Street north of the business district.

A Booster organization has been formed by cities and towns along Highway 51 to press for improvement of that highway as a trans-state route; and Highway 40 is being talked as the new routing for U. S. 77.

No adequate dispersal is possible for terminal traffic. This traffic forms 80 to 90 per cent of all traffic entering and leaving Stillwater. The peculiarity of this traffic is that only a small part of it is destined for the downtown area. Week end traffic is very heavy throughout the year, and traffic jams are a serious daily occurrence. The street system is quite inadequate to handle the influxes.

Stillwater is a growing city. Assuming that the citizens become progressive, rather than passive, the growth should continue, and a city of 40,000 to 50,000 could result in 20 years. As will be shown in the later sections of this thesis, the growth of Stillwater is blocked on the north and west by Oklahoma A. and M. College, and growth to the south will be retarded by blighted areas and by Stillwater creek.

At the present time there is no heavy industry in Stillwater, but if transportation is made available it might move in.

A planning report of this type should include a discussion of corrective measures for present faults and present a pattern by which orderly growth can be accomplished without repeating past mistakes.

The scope of a thesis, such as this, is too limited to be considered a complete planning report. A few of the elements will be discussed in some detail with maps and drawings being used to illustrate the details.

CHAPTER II

A TRAFFIC LOOP

As pointed out previously, the through traffic on Highway 40 must traverse Main Street to pass through Stillwater, and also terminal traffic must fight the Main Street congestion before it can reach a point of dispersion to the part of town that is its destination. Most of this traffic must pass through the school zone at Jefferson Elementary School. Highway 51 makes a very bad intersection with Lowry Street and another at Washington Street; also its present route intersects Main Street at grade and passes two elementary schools. Sixth Avenue is the only crosstown street east and west; it is narrow, crowded by parked cars and carries a very heavy load of local traffic. Highway 51 is also the principal connector to Lake Carl Blackwell, a popular resort west of town. As the lake is very popular with out of town residents, as well as local residents, Sixth Avenue west of Main Street has a very heavy traffic load. The portion of Sixth Avenue east of Main Street is the connector between the rapidly building east section of town with the business section and the west part of town.

Washington Street has served as a dispersion route for traffic from the north, but with its closing to make way for the new library this route will no longer be a satisfactory dispersion route.

If Highway 51 should be paved and become an all weather trans-state highway, or if Highway 40 should become a part of U. S. Highway 77; or if both conditions should become a reality, their present routing in the city would probably cause such a chaotic traffic condition that even the merchants would agree to proper corrective measures. Through traffic should not be forced into a city's heaviest traffic in order to get to the other side of town.

Week end traffic is composed largely of students on their way home on

Saturday or on their way back on Sunday. At the beginning of a semester or summer term they are on their way into town; at the end of a term they are on their way out. At Thanksgiving, Christmas and Easter they take advantage of the vacation to go somewhere and, of course, must return. During football season, the week ends the team is at home, there is an influx of heavy traffic the morning of the game, and a congestion of traffic after the game as thousandsof out of town cars attempt to use the narrow, choked streets of Stillwater to reach a point to get on the highway home. Many residents of Stillwater will have driven to the game and will be using the same streets and adding to the congestion. Since the games are held on Saturday afternoon the downtown streets are blocked with farmer's cars double parked while their owners visit.

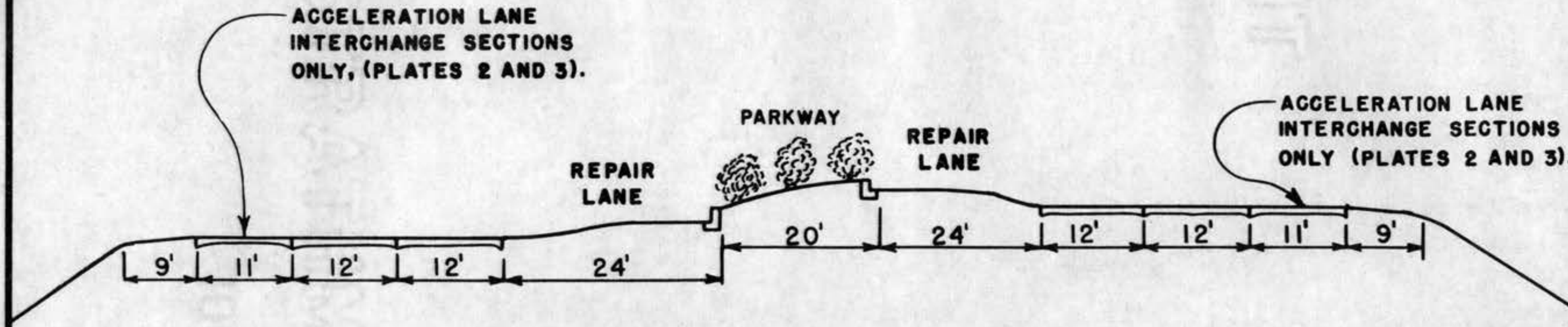
A loop route around Stillwater is proposed as the first element of the plan. The loop will serve to correct many of the shortcomings of the Stillwater traffic system if the loop is properly located and correctly designed. The loop, however, is more than a corrective measure; it is, in fact, an element necessary to planning for the future.

The proposed traffic loop would enclose all or a major part of the present city. Two routes have been studied and will be discussed in this chapter. A complete survey was not attempted for either route, in fact, a detailed survey was attempted at only three points. The topography was obtained for these three points. The topographic detail was obtained at the intersection of McElroy Avenue and Washington Street; a mile west of this intersection at the intersection of McElroy and the section line road; and at the wye a mile north of McElroy Avenue.

For convenience I have designated the routes as Loop 1 and Loop 2. Map number 1 is a diagram of the approximate route of Loop 1, Map number 2 is a diagram of the approximate routing of Loop 2. If the two maps are compared it will be noted that the only difference in the two loops is that in Loop 1 the north leg of the loop follows the present route of McElroy Avenue; but for Loop 2 the north leg lies approximately along the section line road a mile north of McElroy.

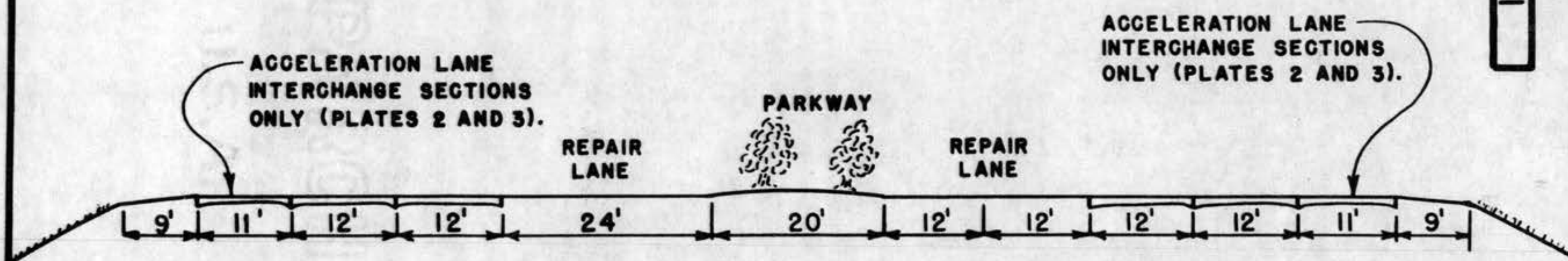
The purpose of the two loops is the same: (a) to provide a route around the city congestion for through traffic; (b) to provide a route for the systematic dispersal of terminal inbound traffic to its neighborhood destination; (c) to provide a concentration thoroughfare for outbound traffic originating in parts of town other than the commercial district; (d) to provide an alternate crosstown route for people living in the western section or eastern section, or the north or south sections; (e) and to provide a convenient inbound and outbound route capable of handling high traffic intensities, for the intermittent loads during football season and other times of heavy traffic.

The two loops will utilize the same route for approximately seven miles of their length and will have other features in common. Both loops will be of the limited access, divided parkway type. A two level cross-section, as shown in part A of Plate 1, is the recommended section. The alternate section, a single level section, is shown in part B of Plate 1. The initial development should be four lanes, with the fifth and sixth lanes to be added when needed. The four lanes to be built first, as shown in Plate 1, would be the two extreme outside lanes, and the two adjacent inside lanes. The paving is to be seven inches thick, and either properly designed hot mix asphalt concrete or Portland cement concrete. All intersections will be of the two level interchange type; the design of the intersection being fitted to the topography. In the portion of the route common to both loops a total of four interchanges, a railroad overpass, two street overpasses and a bridge are required.



SECTION "A"
TWO LEVEL CROSS-SECTION

PLATE I



SECTION "B"
SINGLE LEVEL CROSS-SECTION

The four interchanges required are at the two intersections of the loop with Highway 51, at the intersection with Main Street, and at the intersection with Washington Street. The Washington intersection is designed to handle traffic from the city or to the city but not to handle farm road traffic from the south. The other three interchanges are to be of the four-way type. The interchange at Main Street is on a skew which will increase the expense somewhat.

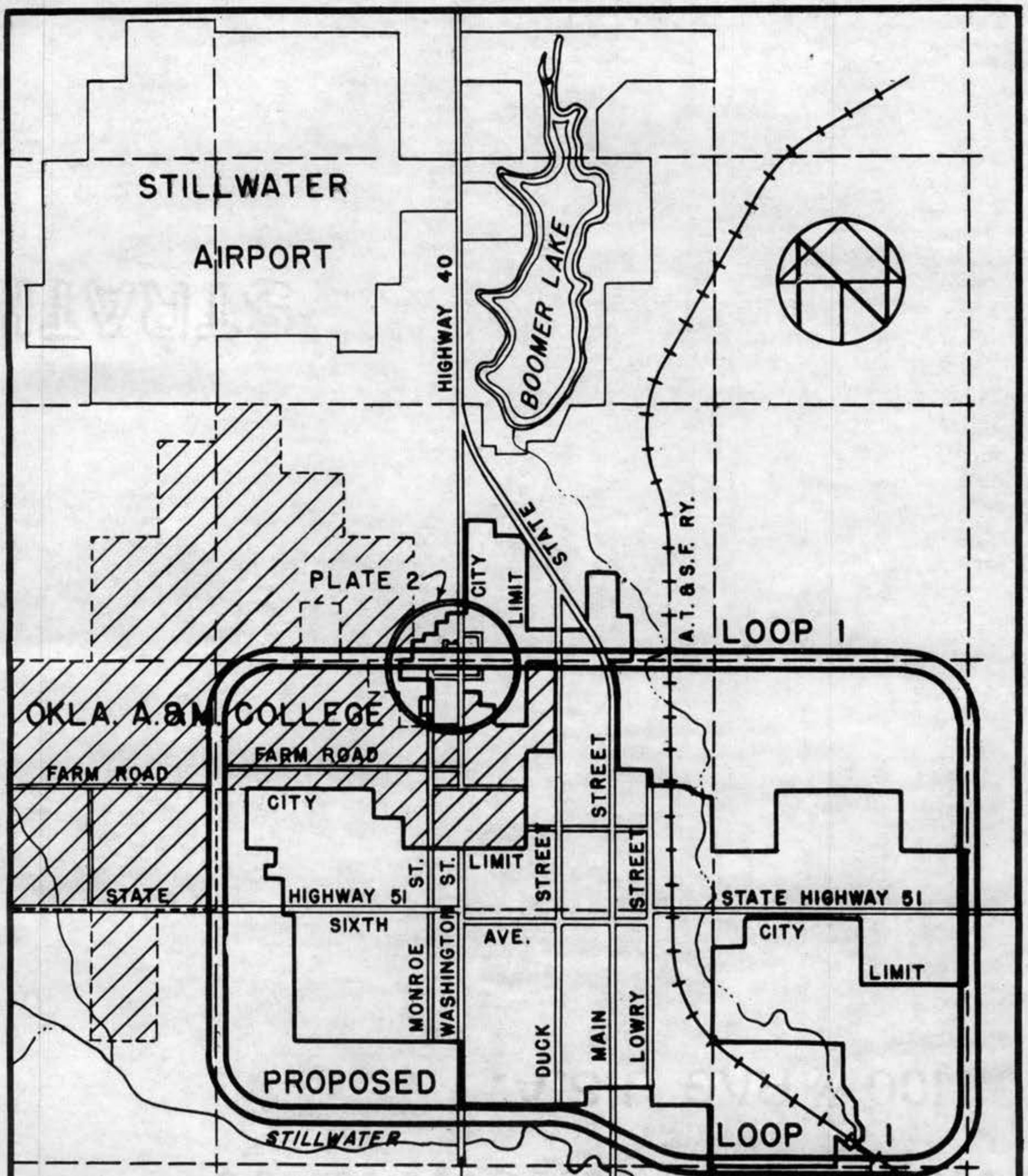
The route of the loop, along the south side of town, lies within the flood plain of Stillwater Creek. To be effective as a loop the roadway must be above highwater; so it will be necessary to build a fill of probably five or ten feet in height through parts of the route, though some parts of the route will probably require higher fills to allow sufficient clearance at Main Street and at the railroad. The route lies between the creek and the part of town that is subject to periodic flooding. The roadway fill can be made to serve a dual purpose by providing flood protection for the south part of the city.

The choice of Sixth Avenue as the east side and west side service street is not a particularly good choice since, on the west side, its traffic must pass through two school zones. The traffic entering town from the loop at the west intersection should disperse before reaching a point midway between the loop and Washington Street. It is probable that the loop traffic entering Stillwater on East Sixth Avenue will be dispersed before reaching the railroad. The south part of the loop affords a relief route for traffic destined for the downtown area, which is just slightly longer than the Sixth Avenue routes; but due to lack of obstruction and higher speed limit should prove attractive to this element of traffic.

A right-of-way two hundred feet wide should be sufficient, except at interchanges and along the south leg of the loops. At interchanges the required right-of-way width will be determined by the design of the individual interchanges. Along the south leg the required width will depend on the field location of the route, which will determine the height of fill necessary for a freeboard of about five or ten feet above high water.

Re-routing of local farm to market traffic that now uses the county maintained section line roads, that will be blocked, is a problem that will have to be solved in the instance of both loops. There are also half section roads which are presently utilized that must be considered as a part of the same problem. It is the opinion of the writer that the design of the loop should exclude farm to market traffic, except at the regular interchanges, and then only if the vehicle is in condition to maintain the minimum speed limit of 30 miles per hour; of course, during periods of ice, snow, rain or fog the minimum would have to be lowered radically. In order to care for rural traffic, a rerouting over remaining county roads might be possible in some places, but parallel roads equivalent to the present road would have to be supplied at other points. In both loops the section line easements are included within the right-of-way for each loop; so additional right-of-way will have to be procured where rural traffic cannot be conveniently re-routed over other existing rural roads. In the portion of the loop common to both loops the half section road marked "Field Road", and the section line road north from this road might prove to be of sufficient importance to require that the traffic they carry, not be interrupted or re-routed.

Referring to Map 1, Loop 1 will be seen to have three intersections requiring interchanges. Intersections at Duck Street and Main Street (Highway 51) are to be of the four-way type; as will the one at Washington Street. The details of the interchanges at Washington Street are shown. A railroad underpass and a creek bridge are necessary on the north leg of Loop 1.



MAP 1
LOOP 1
STILLWATER, OKLA.

It is believed that football traffic will utilize the loop to reach the parking lots, which the college is getting ready to provide, as the main portion of this traffic, even now, drives as close to the Stadium as it can get immediately upon arrival in town. The interchanges at Washington and at Duck on the north leg will allow this traffic dual direct entry to the parking lots; and when the game is over, two direct short outlets to the loop are available to home bound out of town fans. Some of the out of town traffic will undoubtedly use the internal streets but the relief provided should be sufficient to eliminate the snail like movement that was observed during the 1949 season. During that time the movement of traffic on West Street, Maple Avenue and Knoblock Street were observed from the porch in front of my apartment. After the more poorly attended games, five to ten minutes were required for a car to move three hundred feet on West Street or Maple Avenue though the time on Knoblock for the same distance was usually about two minutes. After the Homecoming game the times on all three streets were much longer, as much as thirty minutes time being required on Maple or West Street to move a block. Exhibit 1 is a series of four photographs covering a period of twenty minutes, showing progressive steps in the dissolution of congestion at West and Maple.

Plate 2 is the plan of the interchange at the Washington Street intersection with Loop 1. Washington is shown widened to four lanes, each lane eleven feet wide. This widening should extend two thousand feet to twenty-five hundred feet north and south of the intersection of the center lines of Washington Street and McElroy Avenue.

A typical section of Washington Street as widened is shown on the plate. It should be noted that an island four feet wide and eighteen inches high is shown dividing the north and south bound traffic. The island should be continued through the interchange area for a distance of a thousand feet on each

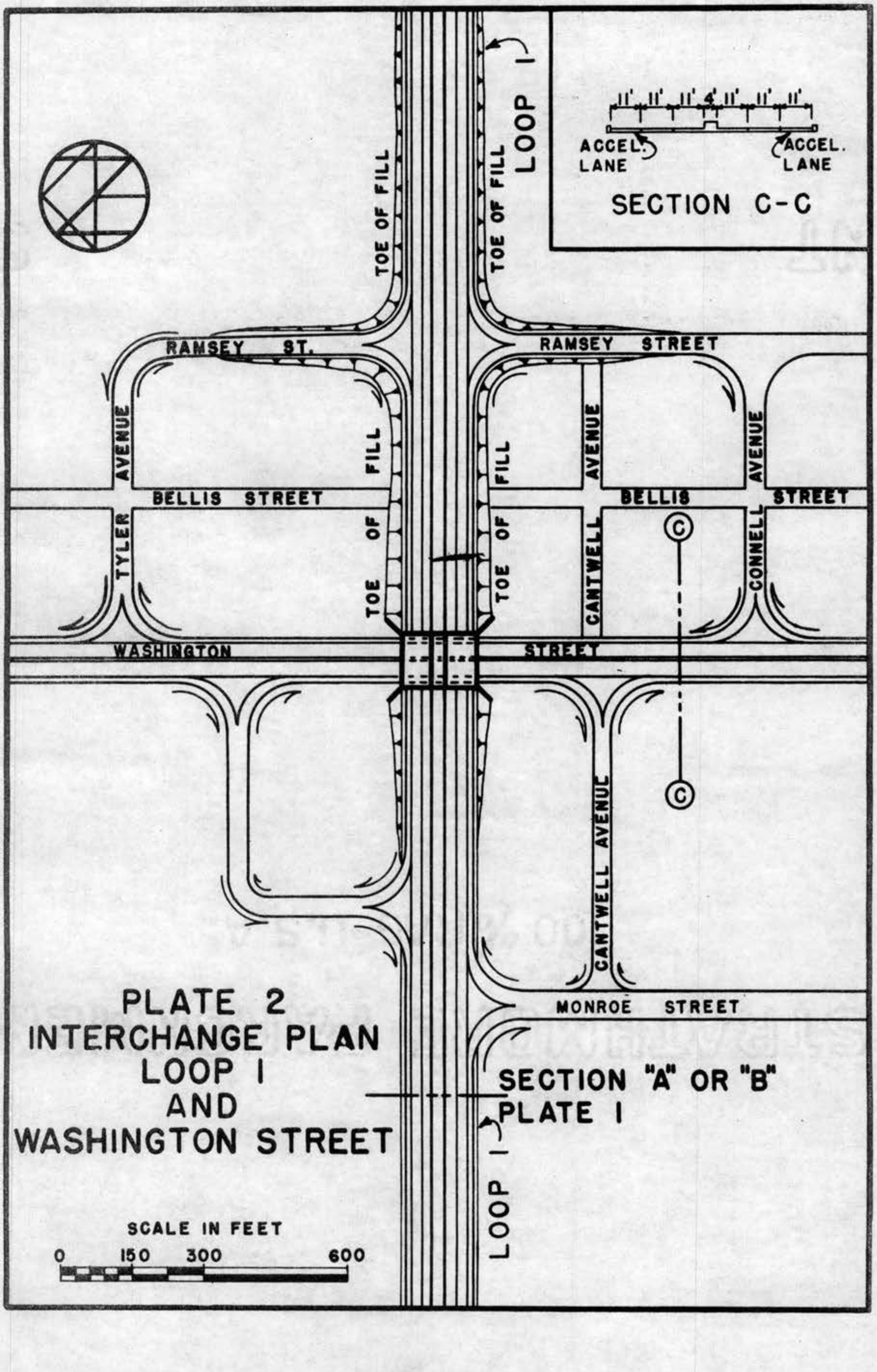


PLATE 2
INTERCHANGE PLAN
LOOP I
AND
WASHINGTON STREET

PICTURE NUMBER 1
Both lines of traffic stopped on Maple Ave.

PICTURE NUMBER 2
Traffic on near lane has begun to move.

PICTURE NUMBER 3
Picture **shows** street as jam began to clear.

PICTURE NUMBER 4
Twenty minutes after Picture No. 1; Movement restored.

EXHIBIT I

side of the McElroy center line. At the point where widening of the highway begins the two traffic directions should begin separation; the space between the north bound and the south bound traffic way being graded up but not paved. Noticeable signs of warning should be placed about five hundred feet ahead of the changes in highway character, to notify drivers of the division or narrowing of the highway.

The interchange is designed for the loop route to overpass Washington Street, and to take advantage of present street routes in the area. Fill amounting to as much as 20 feet high will be required to provide a fourteen foot clearance for the overpass above Washington Street. The ground drops sharply to the east; the fall amounting to about thirty-two feet in a distance of nine hundred feet. The elevation of the roadway will be about 942 feet above mean sea level datum at the east abutment of the overpass and the grade at that point will be zero. Two streets east of the overpass are available on the north of the loop, as interchange turnouts. The first, Bellis, is only 300 feet from the overpass; so was not considered as usable due to the excessive grade required to reach its elevation of about 912 feet. The second street, Ramsey, is 300 feet east of the first and its elevation is probably about six feet lower or about 906 feet. A spur fill will be required to carry the approach and turnout lanes. The same street will be utilized for both entering and leaving the loop. Ramsey will also be the street used on the south side of the loop to carry outbound traffic to the eastbound lanes of the loop, and to provide egress for eastbound loop traffic that desires to go north or to come to the college. North Ramsey, south of the loop, ends at McGeorge Avenue near the north entrance to the Stadium; so provides a direct route to that point for football traffic from the eastbound lanes of the loop. Connell Avenue will serve as the connector from Ramsey to Washington for traffic interchanging from eastbound to northbound, or interchanging from northbound to eastbound. North of the loop Tyler Avenue will be utilized as the connector between Ramsey Street and Washington Street. West of Washington Street, Monroe Street is to be extended from its present terminus with the "Farm Road" (Plate 2) to serve as the south connector with the loop. Connell Avenue is to be the connector between Washington Street and Monroe Street for interchanging traffic; see Plate 2. Traffic bound for Stillwater or the college is afforded the choice of three routes; Monroe Street is to be made sixty feet wide into town through the west edge of the campus, and connecting with the Stadium by means of the Farm Road; Washington and Ramsey provide access principally to the Stadium, the college, and the part of town between Washington Street and Duck Street. North of the loop and west of Washington an unnamed pair of streets are to be utilized for interchanging between the westbound lanes of the loop and the southbound lane of Washington Street.

Another interchange of importance to football traffic will be the Duck Street intersection. Knoblock Street will be used as the west side exit and entrance west of Duck Street, and Duncan Street will be used east of Duck. Both Knoblock and Duck would provide direct routes between the Stadium parking lots and the loop. The two interchanges then provide a total of five routes for the football crowds. If entrance to the parking lots is free flowing, congestion should not develop on the loop or on the connectors. Duck Street will also serve that midtown residential area for general service terminal traffic.

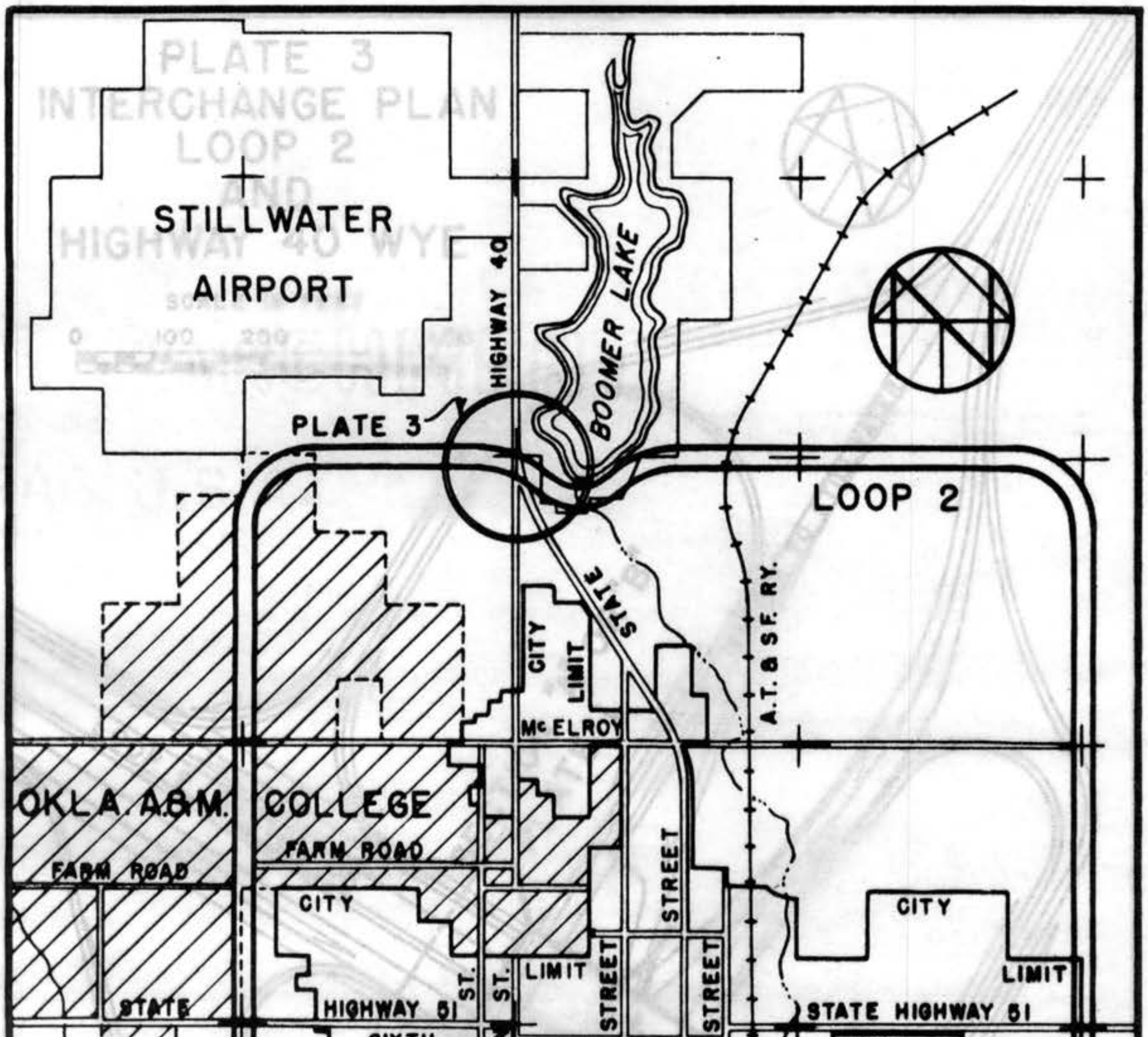
Traffic destined for the downtown commercial area will find it convenient to use the interchange at the intersection of Main and the loop. Traffic outbound from the northern end of the commercial area would also use this interchange.

In addition to the three interchanges a railroad grade separation will be necessary as will a bridge over Boomer Creek. Also the west mile of the north leg will require a considerable amount of re-grading to eliminate excessive grades. Right-of-way procurement for the north leg of Loop 1 will be expensive and difficult. The required right-of-way will, in places, encompass the improvements in the form of residences.

Provision should be made to allow access to Loop 1 from future development south of the east end of the north leg, and north and northeast of the loop. This area has been receiving considerable attention recently, and with construction of a school in this area interest in this section as a residential area should increase. With the quick access to other parts of the city, that would be available through the loop, the growth of this area would be practically assured.

Loop 2 will follow approximately the route shown in Map 2. The cross section of the loop will be either section A or section B, Plate 1. Attention is called to the note on each section in reference to the acceleration lane shown in these cross sections. These lanes are used to allow entering traffic an opportunity to reach traffic speed before entering the traffic lanes, and to allow traffic leaving the loop an opportunity to slow to a safe interchange speed. Plate 3 is a plan of the only interchange necessary on the north leg of Loop 2. This interchange is located at the wye near Boomer Lake, a mile north of McElroy Avenue.

At the present time the wye intersection is the junction of two, two lane paved roads. In the plan, as shown in Plate 3, these existing two lane roads will be used to carry southbound traffic through the interchange area. The north-south branch of the wye is an extension of Washington Street and, for the purpose of identification, that portion south of the present wye will be referred to as Washington Street. Highway 40 follows the southeast branch of the



MAP 2
LOOP 2
STILLWATER, OKLA.

wye, curving into the north end of Main Street, which will be called the Main Street branch. Only the highway north of the wye will be referred to as Highway 40.

The present wye junction, while not having a particularly bad accident record to the present time, does have the potentialities to become a man killer. Traffic entering the wye from Washington Street must enter head-on into opposing traffic from Highway 40, that cannot be seen until it is too late. The Washington traffic enters at the crest of a hill that hides the oncoming traffic. The plan of the interchange shows a double lane branching east from Washington, underpassing the Main Street branch and joining Highway 40 at a point where visibility of hostile traffic is good. This lane should be built even though the loop is not. This new lane would carry northbound traffic into northbound traffic, making it easier for traffic from Washington Street to enter Highway 40 and eliminating the hazard of crossing almost head-on the traffic traveling in the opposite direction.

The design of the interchange was determined to a considerable extent by the topography. The location of the interchange is six hundred to eight hundred feet south of the section line, due to the nature of the intersection and to take advantage of more favorable topography at this location. The loop overpasses the wye, so there are three levels to the interchange. The Main Street branch is widened to four eleven foot lanes separated by a four foot parkway. The outbound lanes branch to the right to form a junction with the new outbound lanes from Washington. All interchange routes are to be single lanes twelve feet wide. Assuming a speed of about twenty miles per hour for cars on the interchange lanes, and assuming a continuous stream of cars at minimum safe spacing, the maximum rate per lane is 2640 to 3520 cars per hour. This is a computed value so actual maximum capacity would probably be about

1800 cars. This load would probably be excessive over a long period but should not cause congestion for periods of less than two hours duration. The interchange is designed to handle 7200 cars per hour inbound to the town and college. Inbound traffic destined for the college may use the Washington leg or the Main Street leg of the wye. That portion using the Main Street branch would turn onto Duck Street to reach McGeorge Avenue or other interval avenues, leading to the college. The system has a probable total inbound capacity for a two hour period of 8,000 cars. This rate is made larger than anything to be expected during the next five years. The outbound capacity is approximately the same as the inbound capacity.

Three overpasses are required in the design of the interchange. They are shown in Plate 1. The main overpass, carrying loop traffic over the wye, is shown as a single overpass, 250 feet long by 155 feet wide; however, two overpasses, each with a roadway width of 42 feet, will provide a saving of 46% in deck concrete. The 42 foot width will allow for future widening to three lanes in each direction when the city grows sufficiently, or Highway 40 and 51 are improved to four lanes across Oklahoma.

The north leg of Loop 2 does not pass through or near any extensive residential developments so right-of-way procurement would be somewhat less expensive than the right-of-way for the north leg of Loop 1. It will be necessary to procure an additional mile of right-of-way on the east and west legs of the loop if the routing shown in the map is followed. A saving in right-of-way can be obtained by cutting through from the wye interchange, southwest to re-enter the common portion of the loop near the west end of the north leg of Loop 1. The saving would amount to a half mile more or less, depending on the field location.

A fill of about twenty feet in height will be required to go through the low land south of Boomer Dam. The present road on the top of the dam is too narrow to be utilized for even one direction of the loop, however, the new fill could be made a thickening of the dam which would reduce the amount of fill to be placed by as much as 20%. A bridge across the spillway channel is also required.

Provision should be made in the east mile of the north leg for a future interchange with a thoroughfare to urban development north and northeast of Loop 2, and a mile north of Sixth Avenue on the east leg provision should be made to allow access to the loop from developments lying east and west of the east leg of the loop. This provision will also provide relief for Sixth Avenue since traffic bound for the college or the west parts of town will choose to use the loop, because of its lack of congestion and higher speed limit.

Loop 2 would probably be the more desirable location as the difference in right-of-way cost would probably make it somewhat less expensive from that standpoint, and suitable grades are more easily obtained. Approaches to the Stadium are adequate to handle football crowds, though Loop 1 would appear to provide for a greater amount of dispersion for this traffic. Through east west traffic would probably use the south leg of the loop almost exclusively; but would tend to divide more evenly between the north and south legs of Loop 1. North south traffic will tend to divide about evenly between the east leg and west leg of both loops; the west leg receiving the greatest amount of traffic in both loops. It is the opinion of the writer that a portion of the through traffic will continue to make use of Main Street. This is the portion of the through traffic that would stop and trade in Stillwater if it were not for the present congestion of Main Street.

It is my belief that either of the loops will accomplish the following:

(1) Reduce congestion on Main Street;

(2) Reduce congestion on Sixth Avenue;

(3) Reduce congestion on all streets during football games by providing direct access to the Stadium for out of town cars;

(4) Provide dispersion for terminal traffic without present congestion;

(5) Obtain goodwill for Stillwater from highway users;

(6) Provide a base for planned development of outlying areas.

CHAPTER III

THE PARKING PROBLEM

Parking of cars in cities has been such a serious problem it is now beginning to receive a great deal of attention from city planners. A great deal has been written on the subject; but unfortunately it has been written by men whose experience has been in the field of big city planning. The small city presents a more difficult problem, and less lucrative returns. The authors of texts and articles glibly state that the principles applied in planning the city which has already reached a population of several hundred thousand, and the principles to be applied to the smaller cities, are the same. On the surface this statement would appear to be true. Closer study of the two conditions, however, reveals some startling differences. In the larger cities the merchants and citizens alike realize that something must be done so they are willing to accept required changes. In the small cities the merchants and citizens may be aware of the needs but are not receptive toward corrective measures. The greater incomes of the larger cities allow large expenditures for corrective measures; while the smaller city, because of limited income, is unable to pay for much less expensive planning measures.

With the above in mind I will attempt to describe the parking problem in Stillwater, Oklahoma, and will also set forth what I believe to be a solution of the problem. The parking problem in Stillwater is not confined solely to the downtown area, but is general, causing congestion on residential streets as well as in the commercial area.

An exhibit, Exhibit 2, page 22, is composed of pictures of cars parked at the curb in residential areas. Picture number 1 shows the excessive use of Duck Street for parking, the truck having barely enough room to pass between the two lines of parked cars. Picture number 2 is of the traffic con-

PICTURE NUMBER I
Parking, north of Sixth, on Duck St.

PICTURE NUMBER 2
Traffic stoppage caused by parked cars narrowing the street.

PICTURE NUMBER 3
Parking in 500 block, W. Maple Ave.

PICTURE NUMBER 4
Parking in 200 block S. West

EXHIBIT 2

dition caused by allowing parking on both sides of Maple Avenue which has a curb to curb width at this point of thirty feet. The car in the right foreground was forced to stop, as indicated by the driver's arm signal, to allow the car approaching from the east to pass. Picture number 3 is a long range shot of the parking condition at the time picture number 2 was taken, openings between parked cars are driveway entrances, or crosswalks. Picture number 4 shows the present parking situation on a section of West Street that has parking prohibited on one side only, two lanes of traffic are available to slow traffic except at the far end where the bus is parked. These pictures are not localized conditions, but are representative of the general condition encountered throughout the town.

A bus line uses Maple Avenue, and the excessive width of the buses very effectively blocks the street to all traffic except the cars following the bus. Few of the city's streets are wide enough to accommodate the present buses even though curb parking were eliminated, but with parking permitted the buses are a menace, particularly on a street as narrow as Maple Avenue.

The residential parking problem has been brought on by a combination of factors. Perhaps the most important one factor is the lack of adequate zoning regulations. This lack has allowed overintensive land use for rental purposes without provision for sufficient offstreet parking facilities for the cars of the renters. A second cause is, of course, the streets themselves. Landlords insisted on narrow streets to reduce their share of the cost, and home owners were agreeable since it meant less expense to them as well. This second element could have been eliminated by proper planning and street zoning regulations.

There appear to be two solutions to the residential parking problem:

(1) Require landowners along the streets to provide adequate offstreet parking facilities, and prohibit parking at the curb;

(2) Require the property owners to widen the streets to a width of not less than 40 feet in single unit residence areas, provided that off-street facilities are available for at least one car per single unit.

Duck Street was originally designed as a divided 4 lane boulevard. This would make it an excellent traffic carrier if it were not for the excessive parking allowed on it. Three and four lanes of cars have been observed parked for blocks. Picture 1 of Exhibit 2 shows the crowding caused by allowing this parking. All parking should be eliminated on Duck to permit it to properly carry four lanes of traffic. Duck has recently been designated a fire lane, yet in its present condition it is not adequate for a fire lane. As frequently is the case, a car in front of the Fire Department truck is unable to move out of the way due to cars parked in a solid line at the curb.

The college parking problem is not entirely divorced from the city problem so it will be discussed. At the present time the narrow lanes of Morrill Avenue and Presidents Drive are designated for parking. Cross walks and fireplugs have been marked as no parking zones, and the speed limit set at 20 miles per hour when driving on the lanes. With the teen age drivers typical disregard for law and safety, the college students break all of these regulations every day. It is not unusual to see from one to three cars parked in the no parking zone of the high capacity fire hydrant across from Morrill Hall, and it is the exception rather than the rule to find the cross walks free of parked cars. Speed limits mean nothing to the driving demons, and I have observed them driving the wrong way on these one way streets at excessive rates of speed.

The following are quotations from Enrolled Senate Bill No. 3 - By Porter.

An Act entitled the 'Uniform Traffic Code'. Section 8 Paragraph (C)

No person shall stop, stand, or park a vehicle except when necessary to avoid conflict with other traffic, or traffic control device, in any of the following places:

(1) On a sidewalk:

(2) In the front of a public or private driveway;

(3) Within an intersection:

(4) Within fifteen (15) feet of a fire hydrant;

(5) On a crosswalk;

(6) Within twenty (20) feet of a crosswalk at an intersection;

(7) Within thirty (30) feet upon the approach to any flashing beacon, stop sign, or traffic control signal located at the side of a roadway;

(11) Alongside or opposite anystreet, excavation, or obstruction when stopping, standing, or parking would obstruct traffic;

(12) On the roadway side of any vehicle stopped, or parked, at the edge, or curb of a street.[1]

Parts 8, 9, and 10 were not included as they were not particularly applicable to the Stillwater problem.

Section 8 part 11 is sufficiently general to cover the removal of parked cars on the residential streets. The eldest decision relative to parking vehicles on a public right-of-way was one handed down in 1812 in an English Court by Lord Chief Justice Ellenborough. This decision is quoted here from a talk delivered by Harold S. Buttenheim before the first Highway Transporta-

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[1] Stillwater Police Department Bulletin, OKLAHOMA LAWS-RULES REGULATIONS, pp. 25-26.

tion Congress. The court said, "Every unauthorized obstruction of a highway to the annoyance of the King's subjects is a Nuisance. The King's highway is not to be used as a stable yard."[2] In addition American courts, when called upon, have rendered similar decisions, declaring in substance that streets are for the use of moving traffic, and that when vehicles parked at the curb interfere with the free movement of traffic, the parking must be discontinued. Thus in the light of the wording of the Uniform Traffic Code and of court decisions, it cannot be argued that the city does not have the authority to prohibit parking at the curb.

The commerical area on Main Street is a separate problem. Parking on Main can be classed under two heads -- angle parking and double parking. Main Street is 72 feet wide but the parking system usually leaves only two lanes of traffic. This condition is prevalent when the traffic movement is the heaviest; the very times that the street should be clear. Parking meters were installed in the hope that they would improve parking conditions on Main Street. Their principal benefit, to date, has been the additional revenue to the city.

Main Street should be capable of handling four twelve foot lanes of traffic with an eight foot separation in the center of the street, and an eight foot lane of parking parallel to each curb. Double parking should be prohibited and the prohibition enforced as stringently as the maximum fine will allow. Municipally owned or privately financed offstreet parking facilities will be required near the downtown area; actually these facilities are needed now. Angle parking not only reduces the apparent travel area of a street excessively, but cars backing across one traffic lane into another, further reduces the

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[2] Harold S. Buttenheim, CITY HIGHWAYS AND CITY PARKING--AN AMERICAN CRISIS, Address before the First Highway Transportation Congress, Washington, D. C., September 26, 1946.

carrying capacity of the street. The minor accident rate is always high on streets where angle parking is permitted. Elimination of angle parking and double parking should increase the capacity of Main Street to about 1260 cars without excessive congestion. This value is probably too high since left turns are permitted, and the present setting of the traffic control lights causes multiple stops in the length of a block when traffic is heavy.

An unsigned article appears in Public Works Magazine for April 1950 [3] which is the report of a study made in Washington State to provide a means of computing street capacities. It is a study based on three factors affecting capacity, street width, parking (prohibited, permitted one side, or permitted both sides), and whether or not left turns are permitted. This method was used in arriving at the value of 1260 cars for Main Street with parallel parking both sides, and left turns permitted, since it is a 72 foot street. The present congestion free volume would be that of a 40 foot street with parking permitted both sides, and left turns permitted; which would be about 675 cars per hour. In explanation of this last figure it should be noted that the method is based on the assumption that eight foot lanes parallel to the curb are used for parking.

There are, near the business district, blighted areas which if turned into attractive offstreet parking lots would serve two purposes: (1) Elimination of unsightly blight; (2) provide a place for customers of downtown merchants to park. If merchants in the downtown area would join together to provide adequate offstreet parking near the commercial area, and eliminate downtown congestion, they would find that they would soon be repaid by increased business volume. At first those people who are accustomed to jump

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[3] "How to Find the Practical Capacity of Streets," Public Works, LXXXI (April, 1950), 40-41, 58-59.

in the car and drive to a parking space two to eight blocks from the store will be annoyed at having to park in a lot two or three blocks from the store.

The "parking cruiser"[4] is an irritant to all traffic. He passes a point five to ten times, turns through pedestrian traffic and in general adds to the traffic congestion. Elimination of this pest is not entirely possible since some people will cruise looking for a meter with time on it, when there are parking stalls available.

If the parking fee were increased on Main Street to ten cents an hour (30 minute meters) and on side streets to 5 cents an hour, while using a rate of ten cents for four hours or five cents for two hours or fraction thereof in the parking lots, a maximum parking efficiency could be obtained. Curb parking restrictions would be removed for Sundays and Holidays except around the post office where fifteen minute parking restrictions should be in force seven days a week. The all day parker would find the Main Street and side street meters too expensive while the parking lots would be reasonable in cost and near the work area. Persons who live close to town and now drive three or four blocks to work would be encouraged to leave their cars at home and to walk to work.

Parking on Washington Street in the commercial area on that street reduces its effectiveness. Typical of the string type of commercial development on a narrow street, many of the buildings are sub-standard, and traffic is unnecessarily impeded by parked cars. Parking on Sixth Avenue near its intersection with Washington Street reduces the efficiency of Sixth and increases accident hazard. If the area that has been blighted, by this string development, were turned into an attractive shopping center with adequate internal

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[4] Buttenheim, Op. Cit., p. 9

offstreet parking, business would improve and, with the elimination of curbside parking, traffic congestion will be relieved.

The business district centered near the northeast corner of the campus, has at least partially solved the parking problem by widening in front of the places of business so that cars are not parked in the traffic way on Knoblock. This district shows evidence of blight in run down rooming houses (outside appearance), apartment house development, and the almost complete absence of single family dwellings. The string development extends north from Third Avenue along Knoblock Street a distance of 1500 feet and south of Third Avenue a distance of about 100 feet. This development parallels closely the eastern edge of the main campus.

Earlier planning and localization by zoning would have saved much of the affected area from the incipient blight that is evident in all of the blocks containing commercial establishments. The parking problem in this area is primarily one of lack of parking space rather than one of congestion due to parking. Had localization of this commercial development been resorted to in time, offstreet parking could have been provided without much trouble. The conditions in the area are not yet serious, but the affected merchants should begin thinking in terms of orderly development for the future. Provision of offstreet parking facilities by these merchants will have the effect of extending the trade area they will be called upon to serve.

The parking problem is probably the first internal traffic problem that should be attacked. Its solution will materially reduce the effect of other shortcomings of the traffic system. The solution in residential areas is to require property owners to provide offstreet parking for all cars owned by the persons living in the property, and prohibit parking at the curb; or to require all owners in a block to widen the street, with good paving, to a width of not less than forty feet.

The solution in the commercial downtown area is to provide offstreet parking stations near the area, eliminate angle parking and double parking, and make curb parking unattractive to any but the short term parker. The parking stations may be either privately owned or municipally owned or both and should be made attractive in price to the long term parker.

CHAPTER IV

INTERSECTIONS AND INTERNAL TRAFFIC

The street system of the original city does not perfectly join with the street systems of later additions; neither was the original street system laid out to conform to the section line roads. The result is a series of poor to bad intersections at the lines between the original townsite and additions to the town, and at the lines between adjacent additions. In one addition the architects attempted an organic plan. The intersections in this area lack sight distance, and three and four streets form blind junctions.

Many of the poor intersections of the city are of the offset type. One of the worst intersections of this type is the intersection of Sixth Avenue and Lowry Street (see Map 1 or Map 2 for location). Lowry is a low density street from a traffic standpoint, but Sixth Avenue is a high density street. At the present time Sixth Avenue serves in a dual role: as the route into and across the city, for traffic on Highway 51, and as the carrier of traffic between the east and west parts of town. With increasing land utilization east of the twin dams, the traffic load carried by Sixth Avenue will increase, until the loop route is in operation. With the loop in operation, traffic should level off at a volume about equal to the present traffic volume. At the present time the traffic pattern within and near this intersection is very complex. Attempts were made to prepare a drawing which would illustrate the interferences caused by the present design of the intersection. The drawing became such a maze of almost indistinguishable lines, that the idea of including such a drawing was abandoned. A few of the undesirable characteristics of this intersection are: (1) poor visibility for vehicles approaching the intersection; (2) a bus station from which buses enter directly into the intersection and turn north or south on Lowry, or go east on Sixth, taxis operating from the bus station may enter the intersection by way of the bus drive, and patrons cars parked on the east side of the station back directly into the intersection from a parking lot located west of Lowry Street and almost on the centerline of Sixth Avenue; (3) a filling station located east of Lowry Street and south of sixth, its driveway discharging into the intersection of both streets; (4) a motor company is located across Sixth from the filling station and cars leaving the motor company may be headed into the traffic stream or backed into it on Sixth but on Lowry they must be backed into the traffic stream; (5) a lumber company on the east side of Lowry is on the center line of Sixth Avenue west of the intersection and customers back directly into the intersection; (6) channelization of traffic is by painted line only, allowing cars to weave on the center line as they pass through the intersection.

No evidence of congestion due to traffic load has been observed by the writer. Records of the police department indicate the intersection to have high accident potentialities. The lack of safety seems to be about equally attributable to lack of visibility, center line weaving, and traffic producing buildings within the intersection. There were at least three serious accidents within the intersection in 1949; one of which was practically head-on, and caused by weaving. Safety and not traffic load is to be considered in determining the design of the intersection. An elliptical traffic circle is the recommended design. Plate 4 is a drawing showing the present street as solid lightweight lines, the existing buildings in light dashed lines, and the recommended circle in heavy solid lines. Not shown are residence buildings that might be affected and a fruit stand south of Sixth across from the west end of the bus station. The circulatory intersection will have the effect of eliminating all of the undersirable characteristics of the existing intersection, since the traffic producing business buildings will have to be removed to make

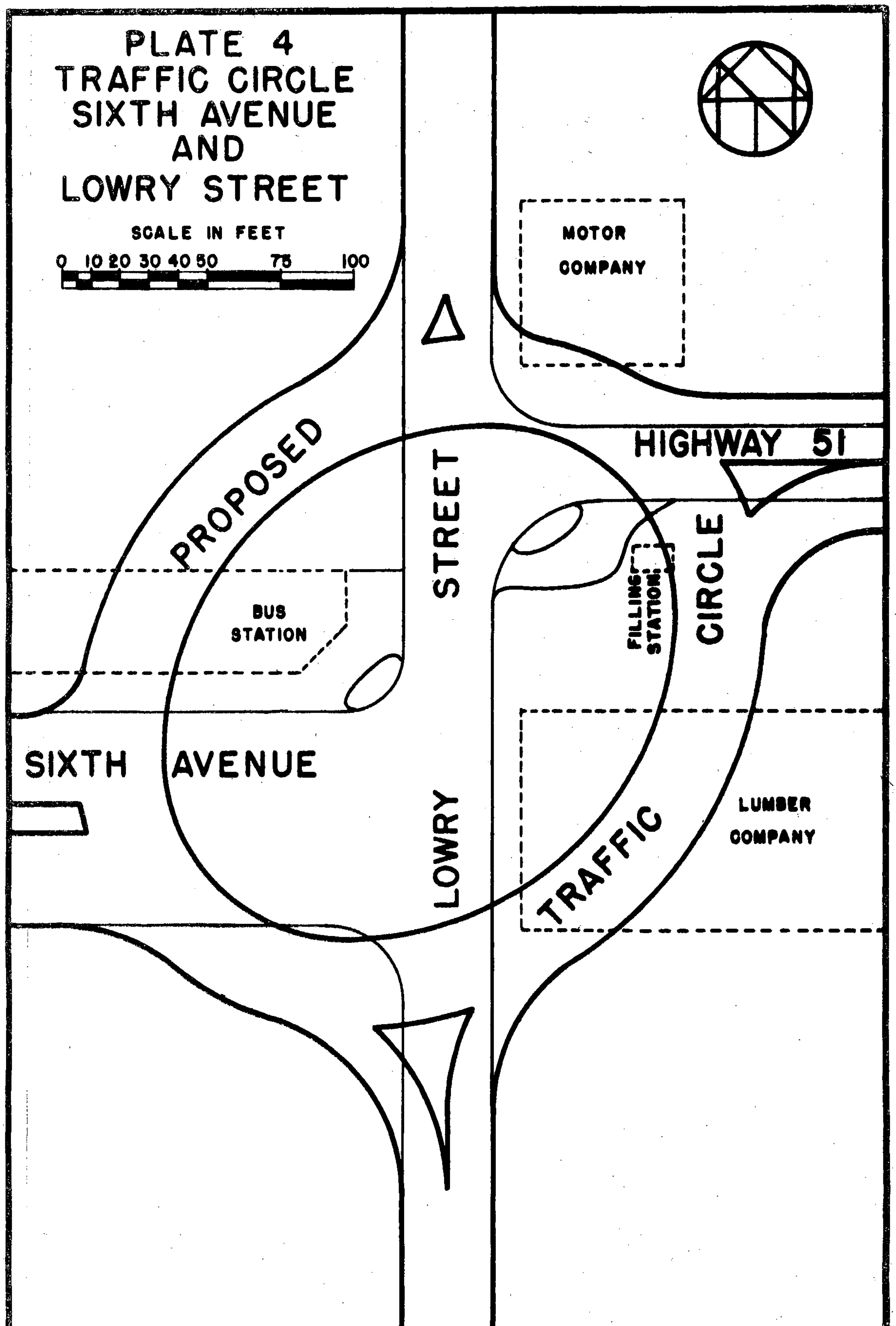
PLATE 4
TRAFFIC CIRCLE
SIXTH AVENUE
AND
LOWRY STREET
SCALE IN FEET
0 10 20 30 40 50 75 100
MOTOR
COMPANY
HIGHWAY 51
PROPOSED
STREET
CIRCLE
BUS
STATION
FILLING
STATION
SIXTH AVENUE
LOWRY
TRAFFIC
LUMBER
COMPANY

room for the traffic circle, and since all traffic moves in the same direction there is no opportunity to meet traffic head-on. Channelization of traffic, by means of raised islands, should begin at least 50 feet ahead of entry to the circle on all four approaches.

More elaborate methods of correction could be devised but they would be too costly and could not be justified by loads or by additional safety. Simpler methods, such as closing Lowry Street, would cost less than the circle but would not correct the faults of the intersection.

Other offset intersections in the city, with the exception of the intersections at Sixth and Washington and Washington and Fourth, will not require as extensive a redevelopment as the ones described above. There is a grade school located at the intersection of Washington and Sixth Avenue in addition to extensive commercial development which gives this intersection traffic characteristics similar to the traffic characteristics of the intersection at Lowry Street and Sixth Avenue. The traffic on both Washington Street and Sixth Avenue is relatively heavy, and the large volume of grade school age pedestrian traffic would alter the conditions in favor of more costly means of correction. Four way stop signs have, so far, prevented this intersection from producing serious accidents. Congestion is apparent all along Washington Street and especially at this intersection. A large portion of the drivers are in the teen-age group because of the proximity of this intersection to Fraternity Row and to the college. Published figures show that this class of drivers had nearly twice as many serious accidents as any other age group of comparable size. Personal observation of the students of Oklahoma A. and M. College, driving cars, has given me no reason to believe they are careful drivers. The accident potential, at Washington and Sixth Avenue, coupled with the cost of congestion would probably justify a more elaborate and costly correction than could be justified for Lowry and Sixth.

Another intersection requiring special mention is also on Sixth Avenue at its intersection with Duck Street. Through this intersection must pass a heavy load of traffic from four directions. Duck Street, at this point, is four lanes with a center parkway dividing northbound from southbound traffic. On the east side of Duck Street are two filling stations, one on the corner north of Sixth Avenue and one on the corner south of Sixth. The parkways have been cut back from the intersection far enough to allow cars leaving or entering the filling stations to cut across traffic and the curb has been removed sufficiently to allow cars to leave diagonally into the intersection, without regard for the stop sign or other traffic. In one week I observed five near accidents at this corner and the same type corner just a block east. These observations convinced me that, at least some drivers will dash out against traffic, without regard for other people. Traffic congestion is primarily on Duck Street, often lining up for a block in each direction from the intersection before traffic on Sixth Avenue thins sufficiently for some of the cars to cross. The long wait frequently causes drivers to become impatient, and to force their way into the cross traffic. To rectify the existing condition at Duck and Sixth I would recommend a complete re-design of the intersection, beginning with the filling stations. They should be required to replace the curbs at the corner and for a sufficient distance back from the corner so that cars leaving them could not enter directly into the intersection. Replace, or require the filling stations to replace, the parkways to the original curb lines of the block. Channelize traffic through the intersection and on Sixth Avenue; the left turn lanes being clearly marked. Install a 105 second light; 45 seconds green, 15 seconds amber, and 45 seconds red. It may be found that too much greentime has been allotted to Duck Street, in which case the Duck Street green should be shortened and the total period reduced by that amount. The principal turning movement off of Duck is to the left so it quite likely will be found advantageous to allow left turns on amber only, with a 40-25-40 distribution. A mounted officer should be assigned to the corner for sixty to ninety days to arrest everyone attempting to leave a filling station counter to traffic, making a turn from the improper lane or failing to make a left turn on amber from the left turn lane if he has it blocked for cars behind him that might want to make such a turn.

Another type of intersection is the so-called "dead end" intersection. The one of this type that has come most forcibly to my attention is the intersection of West Street and College Avenue. This intersection is about 200 feet east of a taxi stand. College Avenue ends at this intersection. There is at present no stop sign on College Avenue at this intersection. West Street in this area is less than 30 feet wide and parking is allowed on the east side of the street. College Avenue is also narrow and parking is allowed on the south side only. Two way traffic is allowed on both streets. In addition to the congestion that frequently exists on these streets there is the ever present danger, to cars traveling north on West Street, that a taxi or some other car driven by a wild driver will dash out of College Avenue and hit head-on the northbound car. The traffic entering West Street from College Avenue is usually traveling at too high a speed to negotiate a right turn without swinging across West Street into the northbound lane, just missing the cars parked at the curb on the east side of the street. The city has only recently prohibited parking at the curb on the west side of the street.

There are three solutions for this problem that might be used: (1) widen West Street to 65 feet, dividing traffic with a center parkway 16 feet wide; (2) make College Avenue a one way street, for the block between West Street and Knoblock Street, for traffic traveling west from West Street; (3) close, destroy and relinquish a sufficient amount of the east end of that block of College Avenue to prevent its further use as a street.

As pointed out in Chapter II, widening of West Street or complete elimination of parking is necessary, but a divided street 65 feet wide is not required. The present street width is sufficient if parking is eliminated and the College Avenue intersection is closed or made a one way turn off of West Street.

The one way street would cost the least, but would create a hazard from wrong way drivers, who are all too numerous around the campus.

Closing the half block, or slightly less, of College Avenue would not be overly expensive and in view of benefit to be derived, from elimination of an accident potential, is the desirable method of correction.

Main Street traffic has already been discussed from the standpoint of the parking problem. In that discussion the practical load potential was computed assuming that left turns would be permitted. Elimination of left turns on Main Street, coupled with the elimination of angle parking and double parking, would increase the capacity to about 1350 cars per hour. Elimination of traffic lights at alternate intersections with an increase in green time on Main Street would increase movement, and with left turns prohibited, a street capacity of 1800 cars per hour could be expected.

There are other streets, other intersections, and many other problems not discussed in this study. One problem which I should like to see studied in greater detail, than I have found evidence of, is the problem of a method of analysis of operation for a traffic network under varying conditions of loading.

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