HOW TO IMPROVE TRAFFIC FLOW ON WEST BROADWAY WITHOUT WIDENING IT

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"How to Improve Traffic Flow on West Broadway Without Widening It," Michael H. Schrader, CE student.

With the increase in development of the west side of Columbia, traffic problems on West Broadway, the major arterial through the area, have worsened. This worsening arises from the fact that Broadway narrows from four alnes to two lanes from Clinkscales Rd. to Garth Avenue. Because the two-lane Broadway cannot handle the traffic demand imposed by the four-lane Broadway, much of Broadway's traffic is bypassing onto parallel street such as Ash and Worley in order to avoid the two-lane segment of Broadway. Compounding the problem is the fact that Broadway cannot be widened because of the passage of Proposition 1 in 1981, which prohibits the widening of Broadway.

There are several ways traffic flow on Broadway can be improved without widening the street. The parameters used for evaluating each of these alternatives concern wheter or not Proposition 1 is violated; the effect of the alternative on Broadway; the effect of the alternative on other streets. It was found that the best way to improve West Broadway is with the use of a reversible centerlane. This method would allow for the centerlane to be used in the lane most needed, would not cause an increase in traffic on other streets, and would increase the capacity of the existing facility. This method is easy to utilize, and is being used in several locations around the state, so that data concerning their use can be obtained.

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SUMMARY

With the ever increasing development of the west side, the traffic demand placed on the two-lane section of Broadway between Clinkscales Rd. and Garth Av. is also ever increasing. However, the two-lane facility can not handle this increased demand efficiently and effectively, as exemplified by the queues along West Broadway during peak traffic hours. The volume of traffic the two lane facility has leveled off in recent years, and is now approximately 18000 vehicles per day. Because of this taffic volume limiting along the two-lane portion, much of the new traffic is diverted from Broadway onto parallel streets such as Ash, Stewart, and Worley, whose traffic flows are increasing perennially.

There are many alternatives in the search for a solution to the capacity and traffic flow problems of West Broadway. Among the most frequently mentioned is the widening of the facility from two to four lanes. However, with the passage of Proposition 1 in 1981, whcih set the width of Broadway at its current pavement width, widening is no longer a viable option. Six differnet alternatives were discussed, and each was evaluated using the following criteria: whether or not the plan violated Proposition 1, the effect the plan would have on other streets, and whether or not the plan would improve the capacity of the facility.

Based on these criteria, a signalized reversible centerlane was found to be the best alternative. Not only does this option allow for two lanes of flow in the direction of maximum flow during peak hours and thus increase Broadway's capacity, it also diverts

traffic away from other facilities by providing this increased capacity. Because of the existance of such a system in other parts of Missouri, data can be obtained to determined the effects of installing the signalized reversible centerlane. These benefits far outweigh its costs, which is more than for any other option because of the high costs of installing the signal poles and the signals.

GLOSSARY

AASHTO--Americna Association of State Highway and Transportation

ADT---Average Daily Traffic

Arterial--street used for the movement of vehicles over long distances (distances greater than one mile). Arterials usually connect the major traffic generators of a city or town.

Collector--street used for feeding vehicles from the local streets to the arterials. Distances traveled on collectors are usually lesss than one mile, and in general, no major traffic generators are located on collectors.

INTRODUCTION

I. COLUMBIA: A HISTORY OF THE GROWTH OF THE WEST BROADWAY CORRIDOR

Smithton

One of the first settlements in the region which was to become Boone County was Smithton. Founded by the Smithton Company in 1819 near the present day intersection of Ash St. and Garth Avenue, (Missouri Historical Society, Historical Marker), Smithton quickly grew in importance. Besides being the economic center of central Boone County, Smithton became the county seat of Boone County when it was created in 1820. However, Smithton was abandoned in 1821, just 18 months after its birth, after three unsuccessful attempts to dig a water well. (Crighton, "A History to Columbia & Boone County").

The "Athens of Missouri"

After the county court said that it would not locate the county seat permanently in Smithton because of the town's inadequate water supply, The Smithton Company scrambled to find another location for the county seat on the company's lands. The Company's search was successful; a new site for the county seat had been found on the Company's expansive holdings. The new site was approximately one-half mile east of Smithton on the east bank of Flat Branch Creek. The residents of Smithton dismantled the town, and then reconstructed it at the new site (at the present day intersection of Fifth Street and Broadway). The new settlement was called Columbia, in honor of Christopher

Columbus (Crighton, "A History to..."). After plans for Columbia were drawn, the town was surveyed and staked. The original town of Columbia that was staked was bounded by First Street, Park Avenue, Eleventh Street (Hitt Street), and Elm Street (Boone County Atlas, 1875).

According to the plans for Columbia, all streets in the town were to be 66' wide, with two exceptions: Broadway, and Water Street (Fourth Street), which were to be 100' wide and serve as the principal thoroughfares through town. (Boone County Atlas, 1875; Crighton, "A History to..."). Broadway was designated as "Main Street" for Columbia, and was to serve as the commercial, cultural, and economic hub of the town (Crighton). In 1826, Columbia was incorporated by the Boone County Court, and soon thereafter became known as the "Athens of Missouri" because of the prevalence of columns in its buildings. (Crighton).

The Boone's Lick (or Booneslick) Road

One of the first acts of the Boone County Court in 1821 was the establishment of a road network throughout the county to link Columbia with the outlying areas of the county. At that time, the existing road system consisted of a few paths that connected Columbia with the population centers of eastern Missouri. Under the 1821 road network of the court, the Old St. Charles Road (the Booneslick Road), which ran westward from St. Charles to Franklin in Howard County, would be realined to the south, so that it would pass through Fulton and Columbia (the alinement at that time was approximately the same as the current alinement of Interstate 70). The new alinement saw the Boonslick road pass through Columbia on Broadway (Crighton; Boone County Atlas, 1875).

As with many present and past roads, many comfort stations began to appear along the Booneslick Road. These comfort stations were in the forms of pubs, restaurants, and boarding houses. Some of these comfort stations were developed along the road just west of Columbia, along what is now West Broadway.

The Booneslick Road was one of the major roads used for western migration through Missouri and westward. From its eastern terminus in Saint Charles, the Booneslick Road extended west to Franklin, Missouri, just east of Boonville on the east side of the Missouri River. Crossing the river at Franklin, the road continued west, through Boonville, until its jucntion with the Santa Fe Trail in the western half of Missouri. From its junction with Booneslick Road, the Santa Fe Trail continued west to Independence, Missouri, where it forked off into the California and Oregon Trails.

Although the Booneslick Road was by no means well maintained, as the road was pitted with rocks, ruts, and stumps, it was the best road into Columbia, as evidenced by its heavy use by westward migrants. Most other roads, if they could be called roads, were practically impassable throughout the year, not so much because of the weather, but because they were not maintained at all. Because the Booneslick Road was the best road in Columbia, it would be along this road that the city would expand in future years.

The Columbia-Rocheport Turnpike

At the end of the Civil War, many of Missouri's roads and towns laid in ruins. Among the hardest hit counties as a result of the war was Boone County. The county's financial base was in shambles (Columbia's banks had to burn their cash on several

occasions so that it would not be confiscated by Confederate soldiers), the Union army turned part of the Missouri University into the headquarters for its local garrison, and Centralia was looted by Confederate guerillas and witnessed the massacre of twenty-four unarmed Union soldiers by the same Confederate guerillas (Crighton).

Reconstruction of Boone County was slow and painful. The county road network, bad before the war, was now even worse. With the help of the Missouri General Assembly, which in 1865 passed a law allowing the construction of turnpikes and toll roads in Missouri, the county in 1868 embarked on a plan to improve the county road network by authorizing the construction of three turnpikes in Boone County (Boone County Atlas,,1875). The first turnpike was to proceed east from its western terminus on Broadway at the east corporate limit of Columbia to Cedar Creek (the Callaway County line). The second was the go west from a terminus on Broadway at the west corporate limit of Columbia to Rocheport. The third was to proceed south from the south corporate limit of Columbia, through Ashland, to Claysville,, which was located on the north bank of the Missouri River (Claysville is no longer in existence).

Paved with gravel and well graded, the completed turnpikes were clearly the best roads in the county. The other roads in the county, as well as many in the city, were dirt roads that were poorly graded and impassable during wet weather. Even Broadway was infamous for its mudholes and ruts, and many people refused to cross the 100' street immediately after a rainstorm (Crighton).

The comfort stations along West Broadway that had served travelers on the Booneslick Road several decades prior were now serving travelers on the Columbia-Rocheport Turnpike.

Garth's Addition

After two decades of practically no population growth, Columbia began to grow rather rapidly in the 1890s. One reason for this growth was a construction boom on the campus of Missouri University, a result of the 1892 fire that destroyed Academic Hall, the university's main administrative and classroom building. Because of this population growth, Columbia moved its corporate limit to the west, from Garth Avenue to West Boulevard. This annexation was known as Garth's Addition, as most of the land taken in was owned by J. Garth. Garth's Addition was approximately bounded by Ash Street on the north, Garth Avenue on the east, Stewart Road on the south, and West Boulevard on the west.

Garth's Addition was to be the first of several major westward expansions of Columbia. As Garth's Addition was subdivided, many homes were constructed on West Broadway. In fact, most of the houses along West Broadway were built during this period of subdivision. Despite this construction along West Broadway, the road (turnpike) was kept as a two-lane facility, even though this new stretch of Broadway was much narrower than Broadway was east of Garth through the original town. This inaction and ununiformity would set a precedent for future annexations along West Broadway.

Columbia in the Roaring Twenties

In the 1920s, Columbia found itself in a very enviable position: at the intersection of two major cross country

highways (U.S. 40 & U.S. 63). Because of this strategic and because of the growth of Missouri University itself, Columbia was once again growing. During the twenties, Columbia grew along West Broadway to Clinkscales Road. Once again, however, structures were built along the two-laned West Broadway without taking into conderation Broadway's width in the original town and why it was set as such.

The pattern of westward growth

Beginning after World War II, Columbia once again was growing to the west. Seeing this growth pattern to the west, in the 1960s the Missouri State Highway Department widened Route TT (West Broadway west of Clinkscales Road) from two to four lanes as far west as Fairview Road. At the end of the 1960s, Columbia once again expanded its city limits, as the city increased its size by a third.

1971: The 51' controversy, Part I

In 1971, observing the ever increasing traffic on West Boradway, the city decided to widen the road from two to four lanes. This was justified by the city because Broadway was an arterial, and so it must be built like an arterial, which is how the original town planners had designed Broadway. Most Columbian were in agreement that Broadway needed to be widened, but by how much? Several years prior, the city had widened the stretch between Garth and Aldeah Avenues to 40' (four 10' lanes). This time, however, 40' was not good enough: the city wanted to widen Broadway to 51'.

Several reasons were given for making the street 51' wide.

First, 51' would provide four 12' lanes, with an addition 1½' on each side of the roadway for drainage, which is much safer than the narrower 10' lanes on the older pavement. Second, federal funds could be obtained if the street was widened to 51', but couldn't be obtained for any width narrower than that (Transcript of Public Hearing, 1978).

Local residents thought that both were weak excuses for widening to 51', which they believed to be too excessive. If 40' had been used before, why couldn't it be used again? Residents believed that 51' was overwidening the road, and that the city would spend more to widen it to that width than it would get back from the federal government for widening it to 51'.(Transcript, 1978). Finally, most residents of West Broadway did not want some of their yards taken away, especially since the project couldn't be justified. After elections brought in a new city council, the issue was put into dormancy.

1978: The 51' controversy, Part II

In 1978, the Columbia city council decided to widen Broadway from two to four lanes, to a width of 51'. Cited as justification for such a project was increased traffic due to the Biscayne Mall, Crossroads West Shopping Center, and other developments in the west end of Columbia. Once again, residents of West Broadway stated their protests (Transcript, 1978). However, not only did residents of West Broadway voice their protests, other residents in the vicinity who did not live on Broadway stated opinions, too. This time, the debate would linger on for three years.

Proposition One: The people speak

In 1981, residents of the West Broadway area successfully put an initiative on the ballot called Proposition 1 (Mayhuth, "Broadway...", 1981). Proposition 1 stipulated that West Broadway could not be widened between Garth Ave. and Clinkscales Road, except at intersections, where a third lane could be added. The measure was overwhelmingly approved by the voters in the general election.

Currently

Currently, traffic on Broadway has stabilized at an ADT of approximately 18,000. However, due to the Columbia Mall and other new construction on the west side, traffic volumes on parallel roads has been increasing dramatically in recent years. In the last decade, traffic on Ash St. has increased by 14% a year, on Worley St. has increased by 6% a year, and has increased a substantial amount yearly on Stewart Rd. as well (Transcript). At 18,000 ADT, the two-lane Braodway carries as much traffic as some parts of the five-lane Business Loop 70. ("Columbia Traffic Flow and Volume Map", 1984). As development of the west side continues, the capacity problem of Broadway will only worsen.

II. SCOPE

This project's subject is West Broadway between Garth Avenue and Clinkscales Road. It involves the study of other streets in the vicinity only in the evaluation of alternatives in checking whether or not an alternative violates the Columbia Major Thoroughfare Plan. This project does not, nor was it ever intended to, discuss whether or not West Broadway should be widened.

III. GOALS

The goals of this report are:

1) To present alternatives on how to increase the capacity of or improve traffic flow on West Broadway without violating Proposition 1.
2) To examine each of these alternatives and see if its effects on other streets would cause a violation of the Major Thoroughfare Plan.
3) To present the best alternative, and the justification for said alternative.

DISCUSSION

I. PARAMETERS FOR EVALUATION

There are three parameters that were used to evaluate each of the alternatives. First, does it increase the capacity and/or improve traffic flow on West Broadway? Second, does it violate Proposition 1? Third, does it adversely affect other adjacent roads, and cause them to function outside of their designated classification?

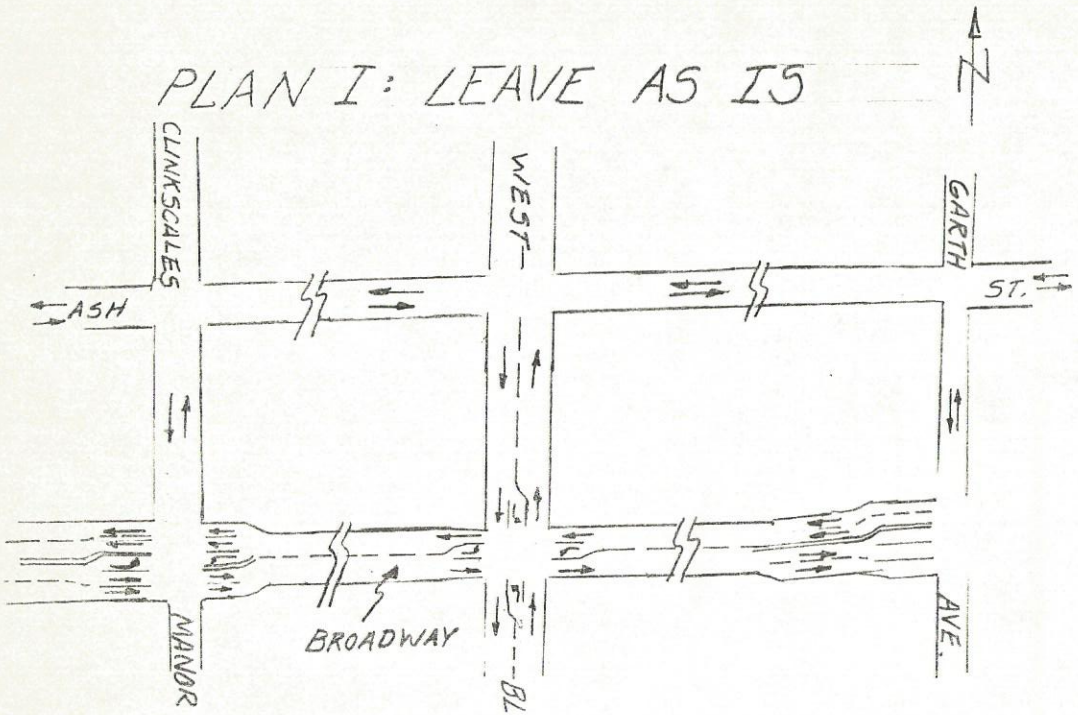
II. THE ALTERNATIVES

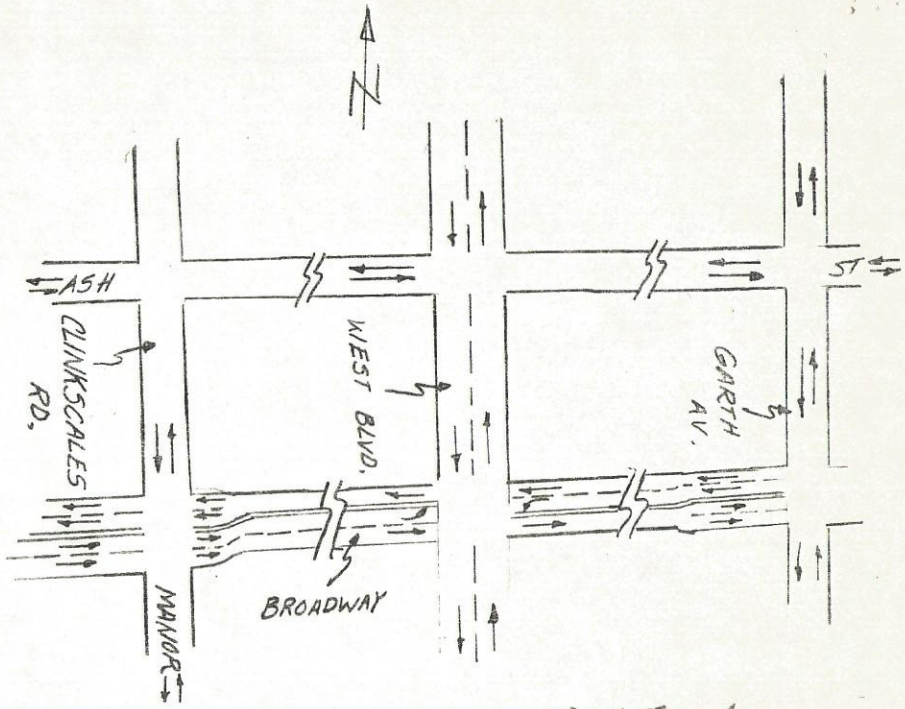
Plan I: Leave As Is

Although this is the plan that is favored by most who live along West Broadway and in the immediate vicinity, this is the worst of the alternatives as it does not satisfy two of the three parameters.

Doing nothing will neither increase the capacity of Broadway nor improve traffic flow on Broadway. According the city public works department, the "existing street capacity is in-

PLAN I: LEAVE AS IS





PLAN II, ALTERNATIVE A:

Alternating center lane with exclusive left turn bays at West Blvd.

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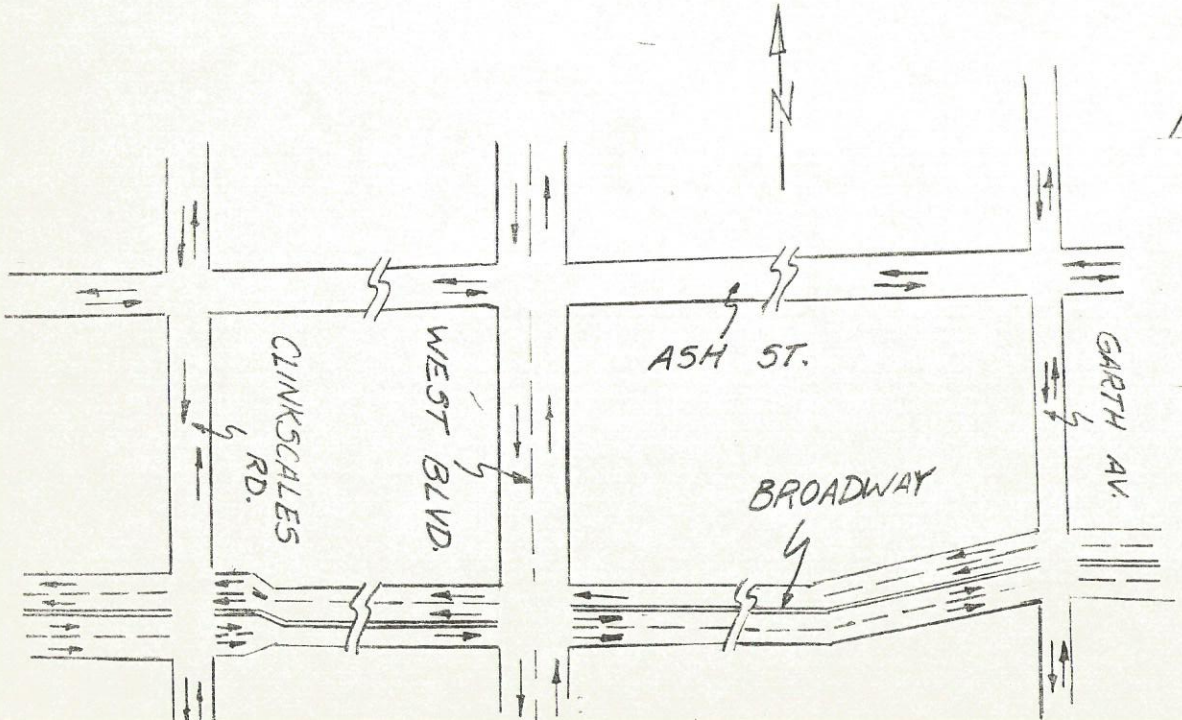


PLAN II, ALTERNATIVE B:

Alternating center lane without exclusive left turn bays at West Blvd.

adequate. Traffic presently backs up for several blocks during peak hours, thereby blocking side streets and driveways with idling cars" (Transcript). Furthermore, Broadway carries an ADT of 18,000, which is higher than the ADT on US 63 south, a four lane facility. In addition, the Missouri Highway Department usually widens to four lanes any two-lane facility with an ADT in excess of 10,000.

Doing nothing causes other parallel facilities to operate outside their classifications, as set by the 1980 Major Thoroughfare Plan. From 1973-1978, Ash St. showed an average increase in traffic of 14% per year. Ash St., which is classified as a local street, carries around 6000 vehicles per day (vpd), which is more than is carried by West Blvd., an arterial. Worley St., classified as a collector, experienced a traffic increase of 6% per year from 1974-1978, and now parts of Worley carry as much traffic as Tandy Av., a four lane arterial.

Plan II: Alternating Centerlane

Although an alternating centerlane does relieve driver tension by providing opportunities to pass, it too is a poor plan. First, an alternating centerlane does not provide an increase in capacity for Broadway, since both directions of flow are still reduced to one lane of traffic at some point along its length. Because both directions are reduced to one lane at some point, the total capacity of the entire length of the roadway is no more than with a two lane road; however, traffic flow will be improved because of the passing opportunities.

There are two different ways that this plan may be executed. (see Figure). The first calls for carrying two lanes through the merge (instead of having two lanes merge into one), and

dropping the left lane at West Blvd. by making it a left turn only lane. There are both advantages and disadvantages to this design.

One advantage is that cars do not have to merge because two lanes of traffic are carried through the merge area. Presently, two lanes of traffic have to merge into one, causing congestion and traffic flow problems. Another advantage is that those wishing to make a left turn onto West have a separate left turn lane, and therefore do not restrict the movement of the through traffic. The disadvantage is that drivers may expect the left lane to be a through lane, and therefore may get trapped in the lane when it becomes the left turn only lane at West.

The second alternative has the two lanes merging into one at both of the taper areas, and then the one lane changing to two at West. The advantage of this design is that when the second lane is added in either direction it is a through lane, and continues into the four lane section. This prevents motorists from getting trapped in the left lane at a drop-off, as in the other design.

However, there are two disadvantages to this second design. First, vehicles still have to merge at the tapers. Second, left-turning vehicles at West are not provided with a separate left turn lane, therefore they can impede the flow of through traffic. In order to avoid this impedance, the traffic signal at West and Broadway would have to be rephased to allow only one direction of flow to travel at a time. (The current phasing allows both directions of flow to travel simultaneously.)

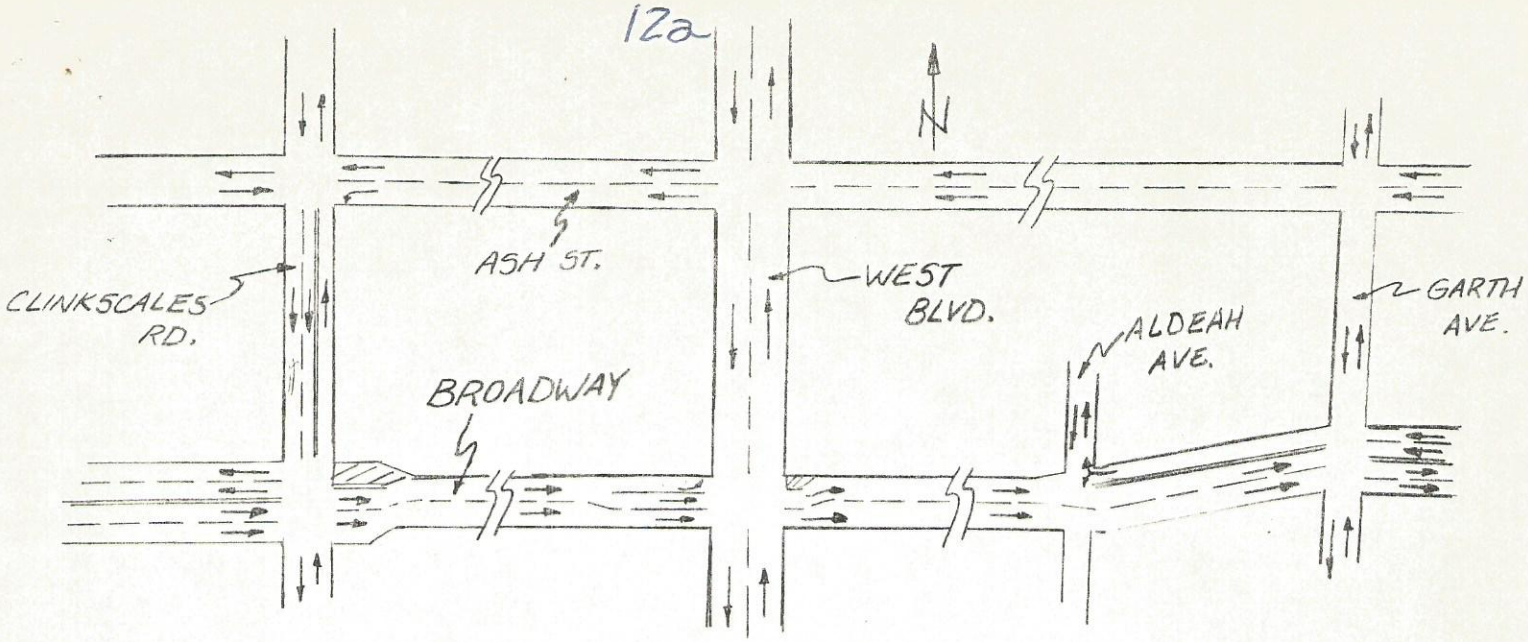
Plan III: Broadway-Ash one-way couple

This alternative will increase the capacity of Broadway by having Broadway serve as the two eastbound lanes, and Ash st. serve as the two westbound lanes. Thus the two streets combined will

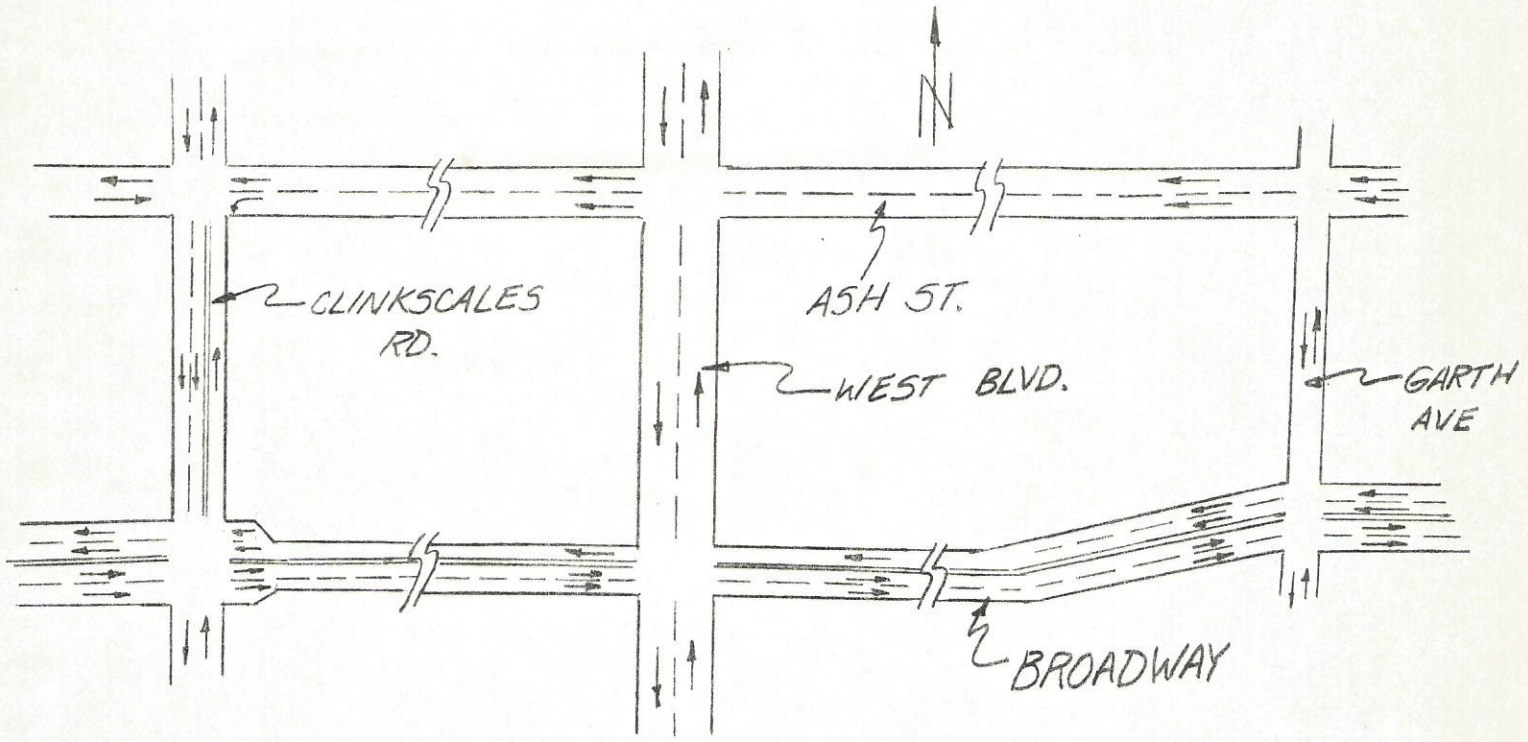
have the capacity of one four lane facility. A one-way couple is better than having two parallel, two-lane, two-way streets because it allows for the passing of slower vehicles, the capacity of the entire facility is increased by having two lanes in the same direction, and left-turning vehicles will not significantly impede through traffic because left turns are in a separate lane and are not impeded, since there is no opposing volume.

Under this plan, Ash Street would be made one-way westbound from Sixth St. on the east to Clinlscales Rd. on the west. Since Ash is already one-way westbound from Tenth to Sixth, Ash would become a two-lane one-way westbound street from its beginning at the Wabash Station on the east, for a distance of approximately 1½ miles to the county fairgrounds on the west. Since this one-way through street would be connected to the downtown loop, vehicles coming form East Broadway and using the loop would be inclined to continue west on the one-way Ash instead of returning to Broadway.

The major problem with this plan, however, is that it would force Ash St., a local street, to act like an arterial (since it would be one-half of Broadway, and Broadway is an arterial). Thus, Ash St. would be functioning outside of its classification. This is not desirable not only because it violates one of the three parameters being used for evaluation, but also because Ash St. was not designed to function like anything but a local street. From Garth to Stadium, Ash is at its widest 32' (Columbia Public Works Dept.). This width corresponds to the width of a local street. (The width of a collector is set at 38', and the width of an arterial is 51'). Not only is Ash too narrow to serve as an arterial, its pavement was designed for the loads of a local



PLAN III: BROADWAY-ASH ONE-WAY COUPLE



PLAN IV: HYBRID (One-way Ash & 3-lane Broadway)

street, not for the heavier and more frequent loads of an arterial.

Plan IV: Hybrid

The hybrid plan calls for a three-lane Broadway, with two lanes eastbound and one lane westbound, and a one-way westbound Ash. The capacity of Broadway would be increased with the second eastbound through lane, but most of this capacity increase would be for eastbound traffic. Since there would be only one westbound lane, left-turning vehicles at West would restrict to flow of through traffic since the left turning vehicles would not have a separate left-turn lane in which to wait.

Because of the existance of the one through westbound lane on Broadway, the demand on the one-way Ash St. would not be as great as under Plan III. However, there would still be a demand by westbound vehicles to use Ash as a through street, causing it to function like an arterial, albiet a more minor arterial because the traffic would not be as heavy because of the lack of eastbound traffic and the diversion of some westbound traffic to Broadway.

Both Plan III, the one-way couple, and Plan IV, the hybrid, would require turning Clinkscales Rd. between Ash and Broadway into a three-lane facility (one lane northbound, two lanes southbound), so that westbound traffic can be diverted from Ash back onto Broadway. Thus Clinkscales, a collector, would be functioning as an arterial, and would be functioning outside of its design classification.

Plan V: Continuous dual left-turn centerlane

A dual left turn lane is being used in many urban areas to help alleviate traffic flow problems on congested two-lane facilities. Although this option would satisfy all of the

parameters used in the evaluation, its use would not be applicable in this instance. A dual left is used when there is a high volume of left turns that severely impede the through traffic flow, as it provides a protected lane where left-turning vehicles can wait outside of the through traffic lane. There are very few left turns from Broadway outside of the West Blvd. intersection. The traffic flow problems are not being caused by impedance of through traffic by left turns, as is the case where most dual lefts are installed, but by the high volume of through vehicles, a volume which is too larege for the road to adequately handle.

Plan VI: Reversible centerlane

The reversible centerlane provides three through lanes on Broadway, thereby increasing the capacity of the street. Furthermore, it provides for an additional lane to be provided where it is needed, that is in the direction of peak flow. This is accomplished using a system of overhead signals, which by using green arrows and red x's, can tell motorists in which direction the additional lane is flowing. The reversible centerlane has been used on several bridges in Missouri to increase their capacity (since bridges cannot easily be widened), most notably the U.S. 54-63 over the Missouri River into Jefferson City, and the U.S. 40 bridge over the Missouri River, from St. Charles County to the Gumbo flats of St. Louis County.

Reversible lanes have also been used on several urban arterials to increase their flow during peak hours. In Missouri, Gravois Avenue in St. Louis is such an arterial. Gravois has three permanent lanes in each direction, plus two reversible lanes, so that during peak hours, five lanes can be provided in

the direction of heaviest flow.

RECOMMENDATION

Plan IV, the reversible centerlane, is the best way to improve Broadway without violating Proposition 1. First, the capacity of Broadway can be increased, since there will be three through lanes, instead of two. Second, traffic flow on Broadway will be improved since the direction of peak flow will have two lanes of through traffic, thereby easing congestion. In the morning, the eastbound (towards downtown) traffic can be given two lanes, and in the afternoon two lanes can be provided for westbound (away from downtown) traffic.

By improving traffic flow on West Broadway, many motorists who now use parallel routes such as Ash, Worley, and Stewart will be inclined to use Broadway. Thus the net effect will be a reduction in traffic on these parallel routes. Unlike Plans III & IV, which would increase traffic on Ash and adversely effect the street, the reversible centerlane would provide a net beneficial effect throughout west-central Columbia, as each street would function within its classification.

Because it would not require any widening of Broadway, it would not require any other streets to take additional loads, and because it improves traffic flow on and icnreases the capacity of Broadway, Plan IV is the best plan. In fact, it is the only one of the six alternatives that satisfied all three of the above parameters.

Design

Because only one lane is provided for the low-volume direction, left-turns at West would have to wait in this one lane, and thus would restrict the through moverment.. However, the traffic signal at West Blvd. and Broadway could be re-phased (See Appendix A) so that each direction of flow on Broadway would move individually and separately, and not simultaneously as under the present phasing.

The length of this project is approximately 1.5 miles. The first overhead signal would be positioned 600' west of Clinkscales Rd. to provide ample opportunity for eastbound motorists to get into the appripriate lane(s). The first signal on the east side of the project would be place 720' west of Garth (600' east of the taper), again to provide ample time for (westbound) motorists to get into the appropriate lane(s). Signals would be placed at 300' intervals throughout the length of the project. (see Appendix A).

The lane width along Broadway would vary from 12' just west of Pershing Rd.. to 10' at the West Blvd. intersection. Although the AASHTO Green Book recommends a lane width of 12', it says that 10' is acceptable in urban areas.on "low speed facilities" such as Broadway, where the speed limit is 30. (AASHTO, p. 361). Typical cross sections of the three-laned Broadway are given in Appendix A.

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APPENDIX A. DESIGNS AND SPECS.

I. Widths of key streets in west-central Columbia

STREET	FROM	TO	WIDTH	YEAR COMPLETED
BROADWAY	Clinkscales	Pershing	38'	1954
	Pershing	West Bl.	30' to 33'	1936
	West Bl.	Aldeah	31' to 33'	1916
	Aldeah	Garth	40'	1961
ASH	Stadium	Anderson	32'	1963
	Anderson	Aldeah	22'	1955
	Aldeah	Garth	32'	1963
WORLEY	Stadium	West Bl.	37'	1964-1967
	West Bl.	McBaine	33'	1945
	McBaine	Garth	37'	1963
CLINKSCALES	Broadway	Ash	32'	1964
	Ash	Worley	32'	1959

II. Dimensions and specs

LENGTH OF PROJECT= 1.5 miles

S, SPACING BETWEEN SUCCESSIVE SIGNALS= 300'

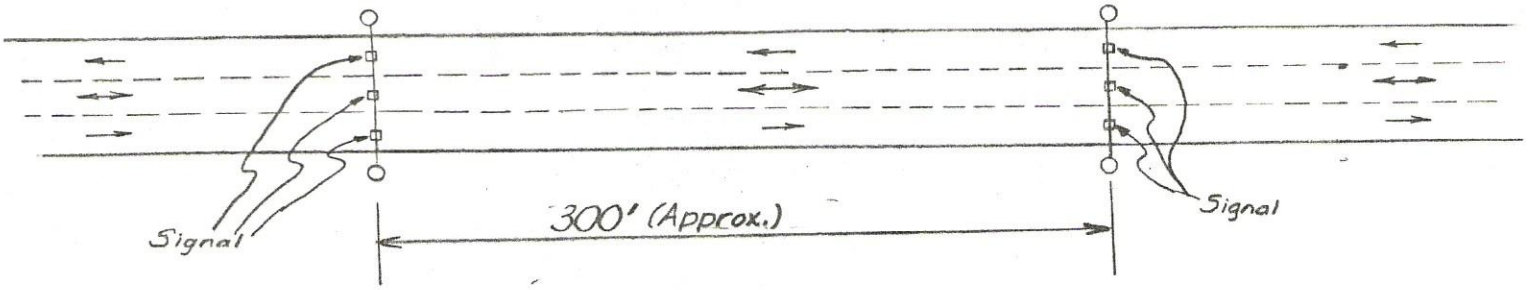
H, HEIGHT OF SIGNALS ABOVE PAVEMENT= 18'

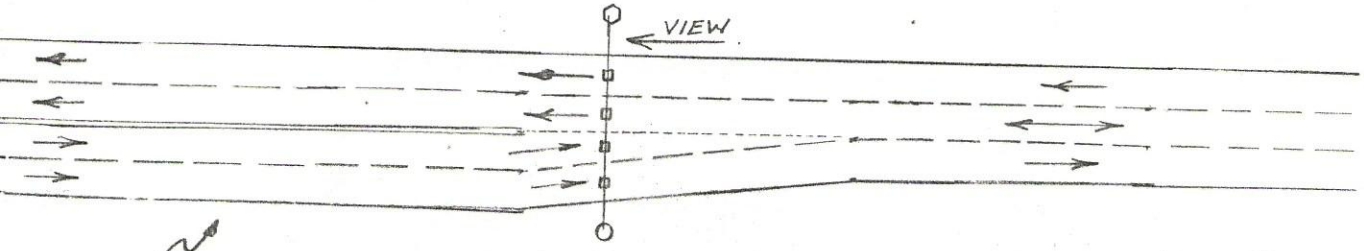
III. Alternatives and criteria

PLAN	Violates Proposition One	Effect on other streets	Effect on traffic flow on Broadway	Conveniece to user
I	No	increased traffic	no improvement	Somewhat. Merge is inconvenient.
II	No	negligible	no net improvement; local improvement	Much. B'way through in both directions
III	No	Increased traffic	improvement	Inconvenient
IV	No	Inc. tr.	improved	somewhat.
V	No	negligible	Improved	convenient
VI	No	reduced tr.	improved	very convenient

PLAN V: CONTINUOUS DUAL LEFT TURN LANE

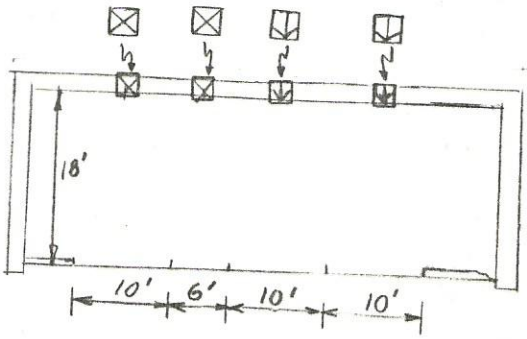
PLAN VI: SIGNALIZED REVERSIBLE CENTERLANE

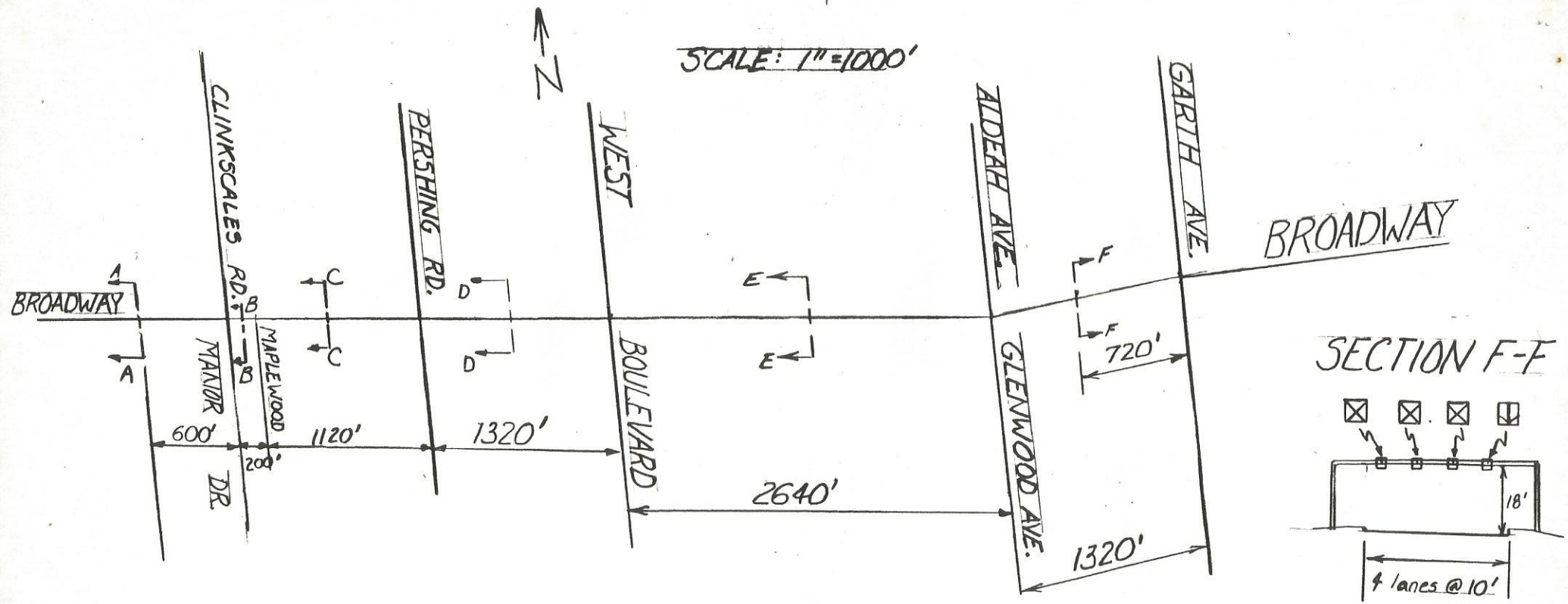




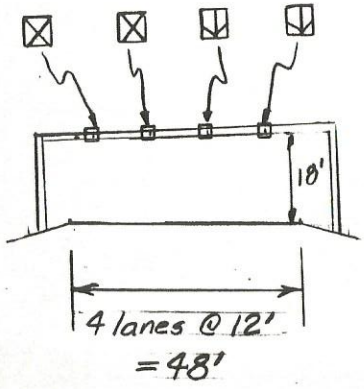
PLAN VIEW OF TAPER

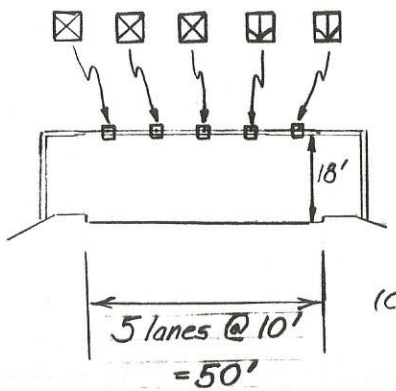
SIDE VIEW OF SIGNAL @ TAPER

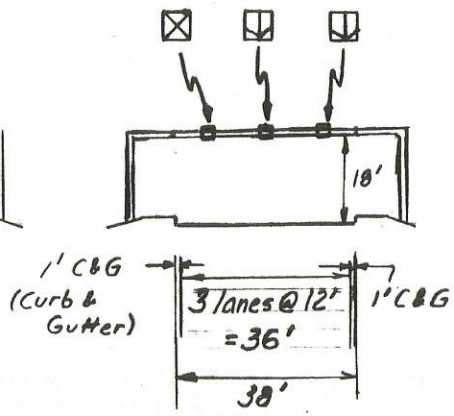


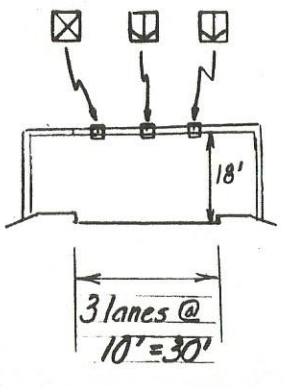

SCALE: 1" = 1000'
N
CLINKSCALES RD.
PERSHING RD.
WEST
ALDEAH AVE.
GARTH AVE.
BROADWAY
BROADWAY
MANOR
DR.
MAPLEWOOD
BOULEVARD
GLENWOOD AVE.
A
B
C
D
E
F
600'
200'
1120'
1320'
2640'
1320'
720'

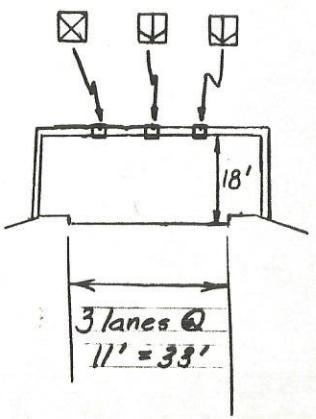
SECTION F-F
18'
4 lanes @ 10'
= 40'


SECTION A-A
18'
4 lanes @ 12'
= 48'


SECTION B-B
18'
5 lanes @ 10'
= 50'


SECTION C-C
18'
1' C&G
(Curb & Gutter)
3 lanes @ 12'
= 36'
1' C&G
38'


SECTION D-D
18'
3 lanes @
10' = 30'


SECTION E-E
18'
3 lanes @
11' = 33'

PROPOSED REPHASING of TRAFFIC SIGNAL @ W. BROADWAY & WEST BOULEVARD

Current Phasing

C = 86 sec

1A	1B	2A	2B
			
G = 0-5 s	G = 40-49 s	G = 0-5 s	G = 20-29 s
Y+R = 4 s	Y+R = 4 s	Y+R = 4 s	Y+R = 4 s

Proposed Phasing

C = 120 sec

1A	1B	2A	2B
			
G = 40 s	G = 40 s	G = 0-5 s	G = 20-28 s
Y+R = 4 s	Y+R = 4 s	Y+R = 3 s	Y+R = 4 s

18C