METRO RAIL PROJECT CORE STUDY TECHNLCAL MEMORANDUM 87.7.3 TECHNICAL REPORT:
$\angle$ SPECIAL ANALYSIS OF
TRAFFIC IMPACTS OF VERMONT AVENUE AERIAL ALIGMMENT

Prepared for:
Southern California Rapld Translt District

Prepared by:<br>Schimpeler Corradino Associates<br>in association with<br>The Cordoba Corporation Barton Aschman and.Associates The Planning Group Manuel Padron \& Associates

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## SUMMARY

This report presents the results of the spectal analysls of traffic lmpacts of the Vermont Avenue aerlal allgnment under Candidate Allgnment J. Thls allgnment 13 one of four allgnments under evaluation in the Metro Rall Project CORE Study. Traffic lmpacts assoclated with aerlal guldeway systems include a reductlon in capaclty due to placement of structures within street rlghts-of-way, increases in trafflc volumes as vehlcles access statlons, and changes ln trafflc patterns due to restriction of trafflc movements at lntersections affected by the guldeway.

The area selected for this analysis was limlted to the sectlon of Vermont Avenue between Third Street on the south and Santa Monlca Boulevard on the north. The study area includes Vermont Avenue and all cross-street lntersectlons.

The following lssues are addressed in thls study;
o Impacts of restrlction of left turns on Vermont Avenue to signallzed Intersections.

0 Impacts of restrlction of trafflc on cross streets to signalized intersectlons for all but rlght turns.

It should be noted that, although thls study focuses on a speclflc segment of Alignment $J$, the study has Impllcatlons for aerlal segments of the entlre system.

## INVENTORY OF EXISTING CONDITIONS

An inventory of exlsting condltions was conducted along Vermont Avenue between Third Street and Santa Monlca Boulevard. This lnventory included number of traffic lanes, trafflc volumes, locatlon and type of lntersections, and locatlon and number of drlveways to parking facilltles and developments.

In the study area, Vermont Avenue 1 s a seven-lane divided roadway. The roackay Is strlped with three through-trafflc lanes and a center left-turn lane. With the exception of the Hollywood Freeway, all streets intersecting Vermont in the study area are at-grade. At most intersections, the curb lane is marked as a through/right-turn lane. Cross streets along Vermont range from two-lane to seven-lane roadways.

Existing traffic volumes in the southbound direction on Vermont Avenue durlng the afternoon peak hour range from 1,009 vehlcles per hour (VPH) at Santa Monlca Boulevard to 1,979 VPH at Beverly Boulevard, In the northbound directlon, peak hour volumes range from 1,400 to Santa Monlca to 2,078 at Melrose Avenue.

There are signalized and nonslgnallzed intersections In the study area. Ot the nineteen intersectlons in the study area between Third Street and Santa Monica Boulevard, a total of thlrteen intersections are slgnalized. With the exception of the intersectlons wlth the Hollywood Freeway ramps, all of the signals are two-phase signals wlth no protected left-turn phase for trafflc turning left from Vermont, The other six intersectlons are not slgnalized. There are 39 drlveways on Vermont between Thlrd Street and Santa Monlca Boulevard. These
drlveways primarily serve commercial and office developments. Of the 39 driveways, a total of twelve serve parking facillties, ranging in size from less than ten to over 100 spaces. Five parklng facllitles are classlfled as public facilitles, where vehicles are charged a fee for parking. There are seven private parking facilitles reserved for customers or employees of commerclal or office propertles.

## RESULTS OF ANALYSIS

Traffle volumes and street capaclties at signalized Intersectlons along Vermont Avenue were analyzed to determine traffic impacts associated with the aerlal guldeway. Using year 2000 forecasted station access traffic and diverted traffle, changes in levels of service and critical volumes were ldentlfled. The increase in vehicle mlles of travel due to diversion of traffic also was identlfled. The impact of the diverted left turns from Vermont Avenue at drlveways into developments and parking facllitles was analyzed from the standpoint of changes in accesslbillty and effects on capaclty of signalized intersections.

## Assumptions

The assumptions made by the SCRTD General Plannling Consultant (GPC) for the special analysis of traffic lmpacts of the aerlal allgnment on Vermont Avenue are as follows:

- The existing number of lanes would be malntalned on Vermont by reducing the sldewalk wlaths from fifteen to ten feet for the entire length of the allgnment along Vermont.
- Left-turn lanes would be provided at all slgnallzed intersectlons, not just the major slgnallzed Intersections of First, Beverly, Oakwood, Northbound Hollywood Freeway onramp, Melrose, and Santa Monlca.
- Protected left-turn phases would be Installed at slgnalized Intersections where sight-distance problems exist. The sight-distance problems could occur when left-turning vehicles pull into the center of the intersection to walt for a gap in the opposing traffle flow. With the vehicles in the center of the intersection, thelr sight distance could be obstructed by the guldeway support columns. If such problems exist, left-turn phasing will be provided.

The provision of left-turn lanes on Vermont at all signalized intersections would mitigate most of the Impacts assoclated with the aerlal guldeway. The remaining lmpacts on traffic would be llmited to nonslgnallzed cross streets and left turns from Vermont into drlveway und from drlveways.

## Impact on Traffic at Intersections

Vehicles on nonslgnallzed cross streets that want to cross vermont or turn left onto vermont would be diverted to the nearest slgnalized intersection in the downstream trafflc flow where the deslred movements would be permitted. Vehicles wanting to turn left from Vermont at nonslgnallzed intersections also
would be diverted to the next signalized intersection in the downstream trafflc flow.

Based on traffic counts performed by the GPC, diverted traffic volumes were identified for cross streets restrlcted to rlght turns. Speclfically, exlsting traffic crossing Vermont or turning left onto Vermont from cross streets was ldentified for the midday peak (12:00 a.m. to 1:00 p.m.). afternoon peak (5:00 to 6:00 p.m.). and the total midday (9:00 a.m. to 4:00 p.m.). Forecasts of these traffic volumes for the year 2000 (when the aerial guideway would be operational) also were ldentified.

The existing traffic counts show that a total of 905 vehbcles on cross streets would be affected during the mldday period by the location of the aerlal guldeway $i n$ the center of Vermont Avenue. Thls Includes both through traffic and left-turning trafflc from the cross streets of Wlllowbrook, Lockwood, Burns, Marathon, and Councll Streets. Most of the diverted traffic would be left turns -- 862. During the midday peak, a total of 108 vehicles would be diverted, including 101 left-turn and seven through vehlcles. Diverted traffic during the afternoon peak hour would total 139 vehicles. Again, most of the trafflc would consist of left turns -- 133 vehicles. The forecasts of year 2000 trafflc show that a total of 1,050 vehleles would be diverted from cross streets during the midday in year 2000. Diverted traffle during the midday and afternoon peaks would total 125 and 161 vehicles, respectively.

Dlverted left-turn traffic volumes from Vermont also were identlfied from traffic counts at nonsignalized cross streets where left turns would be prohiblted. The exlsting trafflc counts show that a total of 632 vehicles would be affected by the location of the aerlal guideway in the center of Vermont Avenue during the midday perlod. This includes left turns from Vermont at the cross streets at Willowbrook, Lockwood, Burns, Marathon, and Councll Streets. During the midday peak, a total of 73 vehlcles would be diverted. Diverted traffic during the afternoon peak hour would total 152 vehlcles. Forecasted 2000 traffic volumes show that a total of 733 vehlcles would be diverted from Vermont at nonslgnalized cross streets. Diverted trafflc durling the midday and afternoon peaks would total 85 and 176 vehicles, respectively.

## Impact on Vehiele Miles of Traffle

Additlonal vehicle mlles of travel (VMT) Incurred by the diverted trafflc were estlmated based on the number of vehlcles diverted and the additlonal distance traveled by the diverted vehicles. An examination of the routes for the diverted trafilc revealed that only the vehicles crossing vermont would incur increased VMT. Left-turn vehicles alverted to the next signalized intersection in the downstream traffic flow would continue traveling in the same direction of travel; thus, these vehlcles would not Incur any increase In VMT. Left-turn vehicles diverted from Vermont would travel to the next slgnalized intersection in the downstream traffic flow, where they would make a left turn then travel back to their orlglnal cross street. Total VMT Incurred dally In year 2000 by vehicles diverted from cross streets on Vermont would amount to 38 mlles. Total VMT incurred dally in year 2000 by vehlcles diverted from vermont would amount to 363 milies.

## Impact on Left Turns at Driveways

The restriction of ieft turns on Vermont to signalized intersections would eliminate left turns into driveways and from driveways of developments and parking facilities. Left turns from Vermont into drlveways and from drlveways also would be diverted to the next signallzed intersection in the downstream trafflc flow, where they would make a left turn and a U-turn or a serles of two left turns and one rlght turn to complete the desired movement. No estlmate of the number of left turns in and out of driveways could be ldentifled.

## Impact on Levels of Service and Critlcal Volumes

An analysis was conducted of the lmpacts of the diverted cross-street traftic and left turns from Vermont at nonsignallzed intersections on critical volumes and levels of service at intersectlons impacted by the diverted traffic. These Intersections include Vermont at Santa Monica Boulevard. Melrose Avenue, First Street, and Beverly Boulevard.

The results of the capaclty analysis of the intersectlons indlate that all are expected to operate at LaS E and FIn year 2000, both with and wlthout the project. Thus. diversion of traffle would have little lmpact on level of service. However, changes in critlcal volumes would occur with the diversion of traffic to other intersections. The change in critical volume was less than 75 vehlcles at three of the four intersections analyzed. A change of less than 75 vehicles is considered to be a minor lmpact on traffleflow. The remalning Intergection was found to have a change in critlcal volume of 130 vehleles. This $1 s$ considered to be a moderate lmpact on trafflc flow because the change in critical volume is between 75 and 150 vehlcles. A change in critical volume greater than 150 vehicles was consldered to be a major Impact on traftic flow at the Intersection. This represents the maximum number of vehleles that can be added to the critical volume wlthout changlng the level of gervice of the intersectlon.

## MITIGATION OF traftic impacts

Based on the results of the analysis of trafflc lmpacts of the aerlal guldeway allgnment on Vermont Avenue, trafflc mitigation measures wlll be neededat Intersections at LOS E or $E$.

Therefore, Improvements will be needed regardless of whether the rall project is completed. Types of mitigation measures that could be consldered for these Intersections lnclude:
o Increase intersection approach capaclty through installatlon of parking restrictlons.
o Restripe Intersection approach to provide an additional through traffic and/or turn lane.

- Install left-turn restrlction/prohlbltion.
o Add ot revise traffic slgnal phase to accommodate the projected traffic movements.
o When intergection approach to provide additional through trafflc and/or turn lane.

The spectilc measure to be applled at each Intersection wlth traffle at $\mathrm{LOS} E$ or F will be ldentifled during Final Design of the Metro Rall project.

## 1. INTRODUCTION

Thls report presents the results of the special analysls of trafflc lmpacts of the Vermont Avenue aerlal allgnment under Candldate Allgnment J. This allgnment is one of four allgnments under evaluation In the Metro Rall Project CORE Study.

The report is organlzed Into four chapters. Thlg chapter serves as an Introduction to the report. Chapter 2 presents the results of an lnventory of existing condltions that was conducted in. the study area. This lnventory dncluded number of traffle lanes, trafflc volumes, location and type of lntersections, and location and number of driveways to parklng facilltles and developments. Chapter 3 describes the approaches used in the analysls of trafflc lmpacts of the aerlal allgnment on Vermont. Chapter 4 presents the results of the analysls of trafflc Impacts. Using forecasted statlon access traffic and diverted trafflc, changes in levels of service and crltal volumes are ldentifled for Intersectlons impacted by the rall allgnment. The Increase In vehicle miles of travel due to dlversion of trafflc also ls ldentlfled. The Impact of the dlverted left turns from Vermont Avenue at drlveways into developments and parking facllltles ls discussed from the standpoint of changes in accessibility and effects on capacity of slgnaldzed Intersectlons. Chapter 5 ldentifles potentlal measures for mitigatlon of trafflc lmpacts at Intersectlons.

### 1.1 PURPOSE OF STUDY

The purpose of this study is to ldentify traffic lmpacts resulting from the location of an aerial guldeway in the center of Vermont Avenue. Trafflc lmpacts under aerlal guldeway systems may include a reduction in capacity due to placement of structures wlthln street rlghts-of-way, increase in trafflc volumes as vehlcles access statlons, or changes in trafflc patterns due to restrlction of traffic movements at lntersections affected by guldeway structures.

### 1.2 STUDY AREA

The area selected for this analysis ls limited to the section of Vermont Avenue between Third Street on the south and Santa Monlca Boulevard on the north. The study area $\downarrow$ ncludes Vermont Avenue and the Intersectlons of all cross streets.

### 1.3 DESCRIPTION OF AERIAL GUIDEWAY AND ISSUES

The Vermont aerlal guldeway $1 s$ one sectlon of Candidate Allgnment J. Thls allgment is a combination of aerlal and subway sections. It would include 13.4 miles of subway with twelve stations and 7.1 mlles of aerjal guldeway with seven statlons, for a total length of 20.5 mlles and nlneteen statlons. Allgnment J would branch near the WIlshlre/Vermont Station. It would Include a transltion to an aerial allgnment that traverses north along Vermont Avenue and west on Hollywood Boulevard, where 1 t would transitlon back to subway and turn north Into the San Fernando Valley. The west portion Includes a subway along Wilshlre Boulevard to the vicinity of Western Avenue, where it would transltion to an aerlal proflle and contlnue in an aerlal conflguration along Wilshlre to Falrfax Avenue.

The lssues to be addressed in this study are as follows:

- Impacts of restriction of left turns on Vermont Avenue to slgnatized Intersections.
- Impacts of restriction of traffic on cross streets to slgnalized intersections for all but right turns.

Although this study is concerned with lssues of a speciflc segnent of Allgnment J, Impllcations for aerlal segments along the entlre system can be derlved from the results documented hereln.

## 2. INVENTORY OF EXISTING CONDITIONS

An inventory of exlsting conditions was conducted in the study area along Vermont Avenue between Third Street and Santa Monlca Boulevard. Thls Inventory Included number of trafflc lanes, trafflc volumes, location and type of intersections, and location and number of drlveways to parking facllitles and developments. This chapter presents the results of the inventory.

### 2.1 TRAFFIC LANES

Information on number of lanes and lane utllizatlon on Vermont Avenue and all major cross streets was ldentlified from strlping pians obtalned from LADOT. A fleld Inventory was conducted by the GPC to verlfy this information, which was subsequently used in capaclty analyses.

Vermont Avenue in the study area is a seven-lane divided roadway. The roadway is striped with three through-traffic lanes and a center left-turn lane in each direction. With the exception of the Hollywood Freeway, all streets intersecting Vermont in the study area are at-grade. At most intersections, the curb lane is marked as a through/right-turn lane. Cross streets along Vermont range from two-lane to seven-lane roadways.

### 2.2 TRAFFIC VOEUMES

Information on traffle volumes was collected from flies malntalned by LADOT and from traffic counts conducted by the GPC. Traffic counts were conducted on all nonslgnallzed cross streets and at the slgnallzed intersectlons of Santa Monlca Boulevard, Cinton, Hollywood Freeway, Beverly, Second, and First Streets. The counts were conducted during the midday, midday peak, and afternoon peak-hours. Appendix A contalns the traffic counts obtalned from LADOT and those conducted by the GPC.

Existing traffic volumes in the southbound direction on Vermont Avenue during the afternoon peak hour range from 1,009 vehlcles per hour (VPH) at Santa Monica Boulevard to 1,970 VPH at Beverly Boulevard. In the northbound direction, peakhour volumes range from 1,400 at Santa Monica to 2.078 at Melrose Avenue.

### 2.3 INTERSECTIONS

Locatlon and types of Intersections along Vermont Avenue in the study area also were inventorled (Figure 2-1). Intersections In the study area conslst of signalized and nonsignalized cross streets. Of the nineteen intersections in the study area between Thlrd Street and Santa Monlca Boulevard, a total of thlrteen intersections are slgnalized. Wlth the exception of Counchl Street to the south of the Hollywood Freeway, all of the nonslgnalized Intersectlons are 'T" Intersections.

### 2.4 DRIVEWAYS

In addition to Intersections, location and types of driveways along vermont Avenue in the study area also were Inventorled. There are 39 driveways on Vermont between Third Street and Santa Monlca Boulevard. These drlveways primarily serve commercial and offlce developments. Of the 39 drlveways, a

Figure 2-1
LOCATION OF INTERSECTIONS


Signalized lntersection: All Movements Permitted
Non-Signalized Intersection:
All Movements But Right Turns from Cross Streets Prohibited
total of twelve serve parklng facilltles, ranging in size from less than ten to over 100 spaces. Five parklng facllltles are classlfled as publlc facllitles, where vehicles are charged a fee for parking. Of the public parking faclilties, three contaln over 100 spaces, one contalns between 25 and 50 spaces, and the remalning facility contalns between 10 and 25 spaces. Private parkling facillties reserved for customers or employees of commerclal or offlce propertles total seven. Four of these facilltles contaln between 25 and 50 spaces, two contain between 10 and 25 spaces, and one less than 10 spaces.

## 3. ANALYSIS APPROACH

This chapter descrlbes the methodology used in the analysis of traffic impacts of the aerlal guldeway aldgnment on Vermont Avenue. The analysls focuses on the following four major areas.

- Establlshment of base trafflc volumes.
- Establishment of station trafflc volumes.
o Diversion of trafflc along the allgnment and from intersectling cross streets.

O Analysls of trafflc volumes and capacitles at intersections impacted by diverted traffic.

### 3.1 BASE TRAFFIC VOLUMES

The traffic lmpacts associated with the aerlal guldeway and Vermont Avenue wlll result from reduction of roadway capacity due to placement of the guldeway structures in the center of the street and from changes in traffic patterns caused by restriction of traffic movements. To provide a base for comparlson of the traffic impacts of the aerial alignment, trafflc volumes were established for year 2000 wlthout the rall system. The base year 2000 traffic volumes were obtalned from plottlngs of network trafflc volumes output from the auto assignments performed for the orlglnal FEIS, as reported In the "Working Paper, Revised 2000 Base Condltion Traffic Volumes," prepared by the Department of Transportation, City of Los Angeles, October, 1982.

### 3.2 STATION TRAFFIC VOLUMES

The base year trafflc volumes as obtalned from the projected trafflc asslgnment represent "background" volumes wlthout station area or mode-of-access trafflc. Therefore, the base trafflc volumes had to be modifled to Include mode-of-access trafflc generated by the Metro Rall stations on Vermont. The mode of access trafflc includes park-and-ride and klss-and-rlde auto trafflc.

The number of klss-and-rlde trips was derlved from VASSIGN computer outputs for the Vermont/Beverly and Santa Monlca/Vermont Stations as obtained from the travel demand models used by RTD In forecastlag translt patronage. The klss-and-ride trlps were combined with base or background trafflc to establish total traffic for lintersections impacted by the diverted trafflc on vermont.

### 3.3 DIVERTED TRAFFIC

The construction of the aerlal guideway in the center of Vermont Avenue will require that traffic crossing Vermont or turning left onto Vermont be limited to slgnallzed cross streets. Additionally, left turns from Vermont Avenue to all nonsignalized Intersections would be prohlblted. All but one of the nonslgnalized intersections on Vermont Avenue between Third Street and Santa Monlca Boulevard are " $T$ " Intersectlons, and left turns from Vermont Avenue would be from one direction only. New routings were developed to measure the 1 mpact on capacity of thls diversion of trafflc movements. Flgure $3-1$ presents the

$\rightarrow$ Permitted Movement
--- Diverted Movement
(A) Diverted Left Turn Movement from Vermont
(B) Diverted ihrough Movement from Cross street
(C) Diverted Left Turn Movement from Cross Street

Figure 3-1
DIVERSION OF TRAFFIC
(D) Permitted Right Turn Movement rrom Cross street
$X$ Movement Prohibited
schematle used for diverslon of trafflc. Thls schematlc ls for a cross-street Intersection. At "T" intersections, all movements shown on the schematic would not occur. Trafflc reasslgnments were based on the followlng assumptlons:

- Motorists desiring to turn left from Vermont Avenue would be diverted to the next slgnalized intersection in the downstream movement and would then execute a serles of turns to accomplish the desired movement (Movement A on Figure 31).
- Trafflc on nonslgnalized cross streets that desires to cross Vermont Avenue completely would be diverted to the closest signalized intersection, where it would cross Vermont and then travel back to lts orlginal east-west street (Movement $B$ on Flgure 3-1).
- Traffic on a nonslgnalized cross street that deslres to turn left onto Vermont Avenue would also be diverted to the closest street that intersects Vermont at a signalized intersection, and then turn left (Movement $C$ on Flgure $3-1$ ). All cross street movements are permitted at signallzed intersections with Vermont Avenue (Movements $A, B, C$, and $D$ on Figure 3-1).

To execute the traffic diverslon process, turning-movement counts were made at all nonslgnalized intersections along Vermont.

Because dlverted trafflc must travel Increased dlatances, an estimate of the addltional vehlcle miles of travel was computed as follows.

- The extra travel for diverted left turns from Vermont Avenue equals two times the dlstance to the flrst block downstream (dlstance " $X$ " on Figure $3-1$ ) plus two times the distance from Vermont to the nearest north-south street (dlstance " Y " on Figure 3-1). Some additional travel might be created by forcing the left turns to a polnt north or south of the location desired for the left turn. This extra distance was not added to the calculatlons because of an inabllity to determine the driver's final degtination (Movement $A$ on Figure 3-1).
- The additional distance traveled for diverted cross-street through traffic is the distance from the street of origin to the reasslgned cross street, plus the dlstance back to the gtreet of origin (distance " $X$ " on Figure 3-1) (Movement $B$ on Figure 3-1).
- There was no addltional travel assigned to vehlcles desiring to make a left turn from the varlous cross streets along Vermont (Movement C on Elgure 3-1). Although the traffic would move over different streets, It was assumed that no addltlonal travel would occur.


### 3.4 CAPACITY ANALYSIS

Traffle volumes and street capacltles were analyzed to determine Impacts of diverted trafflc on critical Intersections. The method used for calculation of capacity was based on procedure for planning applications as described in Transportation Research Circular 212, "Interlm Materlais on Highway Capacity". published by the Transportatlon Research Board. The capacity procedures descrlbed in the referenced report are referred to as critical movement analysis. Critlcal movement analysls is a procedure which allows for capacity and level-of-service determination for slgnalized Intersections. The analysis Incorporates the effects of Intersection geometry and traffic signal operation, and results in a level-of-service determination of the intersection as an operatling unlt.

For each critlcal Intersection, capaclty analyses were performed using base traffic volumes for the year 2000 as modified to account for the effects of station access traffic and diversion of trafflc. Turning movement percentages as determined from exlsting counts were applled to the modifled volumes to establish trafflc movements for each critical Intersection. The exlsting traffic counts used In thls analysis were obtalned from flles of traffic counts maintalned by LADOT and counts conducted by the GPC. Intersection geometrics identifying number and width of lanes and lane utlilzation were ldentlfled from initial aerlal guldeway and striping plans developed by SCRTD for the vermont aerial alignment (see enclosed Flgure 3-2). These plans represent preliminary conceptual design, rather than flnal design.

Additional capaclty analyses were performed for exlstlag conditions and for year 2000, usling the base trafflc volumes without the transit station access and diverted traffic. Impacts on traffic due to the operation of the rall system were determined by comparing the change in critical volume and level of service between the ideal alignment alternatlve and the base condltion.

## 4. RESULTS OF ANALYSIS

Traffic volumes and street capacitles at signallzed lintersections along Vermont Avenue were analyzed to determlne trafflc lmpacts of the aerlal guldeway. Using forecasted station access traffic and dlverted traffic, changes in levels of service and critlcal volumes were ldentlfled. The increase in vehicle miles of travel due to dlversion of trafflc also was ldentlfied. The lmpact of the diverted left turns from Vermont Avenue at drlveways into developments and parking tuclidties was analyzed from the standpolnt of changes in accesslbllity and effects on capacity of signalized Intersections. The results of the analysis are presented in this chapter.

### 4.1 ANALYSIS ASSUMPTIONS

The assumptions made by the GPC for the speclal analysls of traffic Impacts of the aerlal allgnment on Vermont Avenue are as follows:
o The existing number of lanes would be malntalned on Vermont by reducing the sldewalk widths from fifteen to ten feet for the entlre length of the allgnment along Vermont.
o Left-turn lanes would be provided at all signallzed lntersections; they now exlst at only the major slgnallzed Intersections of First, Beverly, Oakway, Northbound Hollywood Ereeway on-ramp, Melrose, and Santa Monlca.
o Protected left-turn phases would be Installed at slgnalized intersectlons where slght distance problems exlst. The sight distance problems could occur when left-turning vehlcles pull out into the center of the intersection to walt for a gap In the opposing trafflc flow. WIth the vehlcles in the center of the lntersection, their sight distance could be obstructed by the guldeway support columns. Left-turn phasing will be provlded if these problems exist.

The provision of left-turn lanes on Vermont at all signallzed Intersections would mitlgate most of the Impacts. The remalning lmpacts on traffic would be limlted to nonslgnallzed cross streets and left turns from vermont into drlveways.

### 4.2 DIVERSION OF TRAFFIC

Traffic from cross streets along Vermont would be restrlcted to signalized Intersectlons for all but rlght turns. In addltion, left turns from Vermont at nonslgnallzed intersections would be prohiblted. Thls is a result of the obstruction of slght distance to cross-street trafflc turnlng left onto Vermont or crossing Vermont, and trafflc turning left from Vermont, at nonslgnalized intersection. Nonslgnallzed intersections In the study area where turns would be restricted include Wlilowbrook, Lockwood, Burns, Marathon, and Councli. All of these Intersections except Councll are "T" Intersections.

Traffic on cross streets that desires to cross Vermont or turn left onto Vermont would be diverted to the nearest slgnalized intersection in the downstream trafflc flow, where the desired movements would be permitted. Traffic deslring to turn left from Vermont at nonsignalized intersections also would be diverted to the next signallzed intersection in the downstream traffic flow. The location of the cross streets restricted to right turns and routes for diversion of the cross street traffic are identifled in Figure 4-1. Figure 4-2 identifles the location where left turns from Vermont would be prohlbited and the routes for diversion of thls traffic.

### 4.3 DIVERTED CROSS-STREET TRAFFIC VOLUMES AND VEHICLE MILES OF TRAVEL

Bused on traffic counts performed by the GPC, dlverted trafflc volumes were Identifled for cross streets restricted to right turns. Specifically, existing traffic crossing Vermont or turning left onto Vermont from cross streets was Identifled for the midday peak (12:00 a.m. to 1:00 p.m.), afternoon peak (5:00 to 6:00 p.m.), and the total midday (9:00 a.m. to 4:00 p.m.). Forecasts of these traffic volumes for the year 2000 , when the aerlal guldeway would be operational, also were identlfied. The exlsting and forecasted traffic volumes on cross streets that would be diverted to slgnallzed intersectlons are shown in Table 4-1.

The existing traffic counts demonstrate that a total of 905 vehleles would be affected during the midday perlod. Thls includes both through traffic and left turns from the cross streets of WIllowbrook, Lockwood, Burns, Marathon, and Council Streets. Most of the diverted traffic would represent left-turning vehicles (862). Durling the midday peak, a total of 108 vehicles, including 101 left-turn and seven through vehicles. Diverted traffic during the afternoon peak hour would total 139 vehicles. Agaln, most of the traffic would consist of left-turning vehlcles (133).

Because the analysis of traffic Impacts focused on year 2000 Impacts, It was necessary to forecast to year 2000 the exlsting traffic that would be diverted. The forecasts were developed by the GPC using the 1980 and year 2000 volumes from the base condition traffic asslgnments developed by LADOT for the FEIS. A comparison of changes in traffic on Vermont between 1980 and 2000 showed an average change of slxteen percent. Assuming trafflc on cross streets would increase at the same rate as traffic on Vermont, year 2000 forecasts of diverted traffic from cross streets were prepared by applying this percentage change to the existing traffic volumes. The forecasts show that a total of 1,050 vehicles would be diverted from cross streets durling the midday in year 2000. Diverted traffle durlng the midday and afternoon peaks would total $\mathbf{1 2 5}$ and 161 vehicles, respectively.

Addltional vehicle miles of travel (VMT) Incurred by the diverted traffic were estimated based on the number of vehlcles diverted and the additional distance traveled by the diverted vehicles. An examination of the routes for the diverted traffic revealed that only the vehlcles crossing Vermont would incur Increased VMT. Left-turn vehlcles diverted to the next signalized intersection In the downstream traffic flow would contlnue traveling in the same direction of travel; thus, these vehicles would not Incur any Increase in VMT. Vehlcies incurring additional VMT would be limited to those crossing Vermont from Councll Street. Vehicles diverted from westbound Councll would incur twenty addltional miles of travel dally, whlle vehlcles diverted from eastbound councll would

Figure 4-1
DIVERSION OF CROSS STREET TRAFFIC


Signalized Intersection: All Movements Permitted
meme= Diverted Left Turns from Southbound Vermont

Figure 4-2
dIVERSION OF LEFT TURNS FROM VERMONT



TABLE 4-1
DIVERTED CROSS STREET TRAFFIC VOLUMES

| Cross Street | Directional Movement | Exloting Trafile |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Total Midday (9-4) | $\begin{gathered} \text { Midday } \\ \text { Peak } \\ (12-1) \\ \hline \end{gathered}$ | $\begin{aligned} & \text { Afternoon } \\ & \text { Peak } \\ & (5-6) \\ & \hline \end{aligned}$ |
| WB Willowbrook | Left turn | 65 | 11 | 11 |
|  | Through | - | - | - |
|  | Total | 65 | 11 | 11 |
| EB Willowbrook | Left turn | 30 | 9 | 10 |
|  | Through | -- | - | -- |
|  | Total | 30 | 9 | 10 |
| WB Lockwood | Left turn | 89 | 10 | 16 |
|  | Through | - | -- | - |
|  | Total | 89 | 10 | 16 |
| WB Burns | Left turn | 208 | 21 | 34 |
|  | Through | -- | - | - |
|  | Total | 208 | $\overline{21}$ | 34 |
| WB Marathon | Left turn | 30 | 8 | 4 |
|  | Through | - | - | - |
|  | Total | 30 | 8 | 4 |
| WB Council | Left turn | 273 | 21 | 31 |
|  | Through | 25 | 6 | $\underline{5}$ |
|  | Total | 298 | 27 | 36 |
| EB Council |  | 78 | 11 |  |
|  | Through | 18 | 1 | 1 |
|  | Total | 96 | 12 | 12 |
| All Streets | Left turn | 862 | 101 | 133 |
|  | Through | 43 | 7 | 6 |
|  | Total | 905 | 108 | 139 |

DIVERTED CROSS STREET TRAFFIC VOLUMES

| Cross Street | Directional Movement | Year 2000 Traffle |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & \text { Total } \\ & \text { Midday } \\ & (9-4) \end{aligned}$ | $\begin{gathered} \text { Midday } \\ \text { Peak } \\ (12-1) \end{gathered}$ | $\begin{gathered} \text { Afternoon } \\ \text { Peak } \\ (5-6) \\ \hline \end{gathered}$ |
| WB Willowbrook | Left turn | 75 | 13 | 13 |
|  | Through | - | -- | ニ |
|  | Total | 75 | 13 | 13 |
| EB Wlllowbrook | Left turn | 35 | 10 | 12 |
|  | Through | - | - | - |
|  | Total | 35 | 10 | 12 |
| WB Lockwood | Left turn | 103 | 12 | 19 |
|  | Through | -- | - | - |
|  | Total | 103 | 12 | 19 |
| WB Burns | Left turn | 241 | 24 | 39 |
|  | Through | -- | - | -- |
|  | Total | $\overline{241}$ | 24 | 39 |
| WB Marathon | Left turn | 35 | 9 | 5 |
|  | Through | - | - | - |
|  |  | $\overline{35}$ | 9 | 5 |
| wB Council | Left turn | 317 | 24 | 36 |
|  | Through | 29 | 7 | 6 |
|  | Total | 317 | 24 | 42 |
| EB Councll | Left turn | 90 | 13 | 13 |
|  | Through | $\underline{21}$ | 1 | 1 |
|  | Total | 111 | 14 | 14 |
| All Streets | Left turn | 1,000 | 117 | 154 |
|  | Through |  | 8 | 7 |
|  | Total | 1.050 | 125 | 161 |

incur elghteen mlies of travel dally. Total VMT incurred daily in year 2000 by vehicles diverted from cross streets on Vermont would amount to 38 miles.

## 4.4 diverted left-turn traffic volumes and vehicle miles of travel

In addition to the restriction of nonsignallzed cross streets to right turns only, left turns on Vermont Avenue would be restricted to signalized intersections. Left turns at nonslgnalized cross streets and into drlveways on the opposite slde of the street would be prohlbited.

Based on traffic counts performed by the GPC, diverted left-turn traffic volumes were identified at nonsignalized cross streets where left turns would be prohibited. Speciflcally, exlsting trafflc turning left from vermont at nonsignalized cross streets was identified for the midday peak (12:00 a.m. to 1:00 p.m.), afternoon peak (5:00 to 6:00 p.m.), and the total midday (9:00 a.m. to $4: 00$ p.m.). Forecasts of these traffic volumes for the year 2000, when the aerial guideway would be operational, also were identlfled. The existing and forecasted left-turn traffic volumes on Vermont at nonsignalized cross streets that would be diverted to signalized intersections are shown in Table 4-2.

The existing traffic counts show that a total of 632 vehicles would be affected by the location of the aerial guideway in the center of Vermont Avenue during the midday period. This includes left turns from Vermont at the cross streets of Willowbrook, Lockwood, Burns, Marathon, and Councll Streets. During the midday peak, a total of 73 vehicles would be diverted. Diverted traffic during the afternoon peak hour would total 152 vehlcles.

Forecasted 2000 traffic volumes show that a total of 73 vehlcles would be diverted from Vermont at nonsignalized cross streets. Diverted traffic during the midday and afternoon peaks would total 85 and 176 vehicles, respectively.

Additional vehicle miles of travel (VMT) Incurred by the diverted traffic were estimated based on the number of vehicles diverted and the additional distance traveled by the diverted vehicles. Left-turning vehlcies diverted from Vermont would travel to the next signalized intersection in the downstream traffic flow, where they would make a left turn and then travel back to thelr orlginal cross street. Total VMT incurred daily in year 2000 by vehicles diverted from Vermont would amount to 363 miles.

The restriction of left turns on Vermont to slgnalized intersections would eliminate left turns lnto driveways of developments and parking facllities. The Inventory of existing conditions identifled a total of 39 driveways on vermont. Twelve of the driveways serve parking facilities. Left turns from Vermont Into the driveways also would be diverted to the next signalized intersection in the downstream traffic flow, where they would make a left turn and then a serles of two left turns and one right turn to complete the desired movement. No estlmate of the number of left turns from Vermont into driveways could be ldentlfled without conducting additional trafflc counts or developing estlmates from trip generation factors and information on land use along vermont. Time and budgetary constralnts prevented such an undertaklng for this study. However, it can be stated that the prohlbition of left turns on Vermont will potentially reduce accessibillty to surrounding developments and increase traffic at slgnalized Intersections where left turns are permitted. The Increased number of left turns could further degrade trafflc flow at these Intersections.

TABLE 4-2
DIVERTED MAIN LINE TRAFFIC VOLUMES

| Cross Street | Directional Movement | Existing Traffic |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Total <br> Midday <br> (9-4) | $\begin{gathered} \text { Midday } \\ \text { Peak } \\ (12-1) \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { Afternoon } \\ \text { Peak } \\ (5-6) \\ \hline \end{gathered}$ |
| WB Wlllowbrook | Left turn | 187 | 11 | 60 |
| WB Willowbrook | Left turn | 77 | 14 | 1 |
| EB Lockwood | Left turn | 88 | 15 | 25 |
| EB Burns | Left turn | 150 | 17 | 36 |
| EB Marathon | Left turn | 18 | 3 | 3 |
| WB Councll | Left turn | 79 | 9 | 19 |
| EB Councll | Left turn | 33 | 4 | 8 |
| All Streets | Left turn | 632 | 73 | 152 |


| Cross Street |  | Year 2000 Trafflc |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Directional Movement | Total <br> MIdday <br> (9-4) | Midday Peak (12-1) | Afternoon Peak (5-6) |
| WB Wlllowbrook | Left turn | 217 | 13 | 70 |
| EB Wlllowbrook | Left turn | 89 | 16 | 1 |
| EB Lockwood | Left turn | 102 | 17 | 29 |
| Eb Burns | Left turn | 174 | 20 | 42 |
| EB Marathon | Left turn | 21 | 3 | 3 |
| WB Council | Left turn | 92 | 11 | 22 |
| EB Council | Left turn | 39 | 4 | 9 |
| All Streets | Left turn | 733 | 85 | 176 |


| Cross Street | Addltional Distance | Dlverted Dally VMT |
| :--- | :---: | :---: |
|  | .19 | 132 |
| WB Willowbrook | .46 | 5 |
| EB Willowbrook | .28 | 81 |
| EB Lockwood | .14 | 58 |
| EB Burns | .14 | 5 |
| EB Marathon | .25 | 55 |
| WB Councll | .28 | 26 |
| EB Council | -- | 363 |

### 4.5 IMPACT DF DIVERTED TRAFFIC ON VOLUME/CAPACITY AT INTERSECTIONS

An analysis was conducted of the impacts of the diverted cross-street traffic and left turns from vermont at nonsignallzed intersectlons on critical volumes and levels of service at intersections impacted by the diverted traffic. These Intersections include:

| - Santa Monsca Boulevard/Vermont Avenue |  |
| :--- | :--- |
| - Melrose Avenue/Vermont Avenue |  |
| O | Flrst Street/Vermont Avenue |
| O | Beverly Boulevard/Vermont Avenue |

The analysis of each intersection was conducted both under existing and future conditions. The analysis of exlsting condltions was performed uslng traffic counts conducted by the GPC and traffle count data obtalned from flles malntalned by LADOT. The analysls of future condltions was performed under base year 2000 condltions both with and without the rall project. Traffic volumes for the year 2000 with the rall project Include diverted cross-street traffic and the trafflc generated by the Metro Rail stations at Beverly and Santa Monica Boulevards.

Figures 4-3 through 4-6 depict peak-hour traffic movements at the intersections Impacted by the diverted traffic under exlsting and future conditions with and Wlthout the rail project. Levels of services were determined from the capacity analysis of the intersections and used to make judgments of the Impacts. LOS D was considered to be acceptable. At thls service level, delays will occur, but only for limited duration. A change In level of service from the 2000 base condition to a LOS E or $F$ with the project was considered to be a major limpact and an Indication of the need for improvement.

Levels of service and critical volumes from the capacity analyses of Intersections impacted by the diverted traffic are shown in Table 4-3. Appendix B contains computer printouts of the capaclty analyses. The results indlcate that all intersections are expected to operate at LOS E and F In year 2000 both with and wlthout the project. Thus, diversion of traffic would have llttle Impact on level of service.

However, Changes in critical volumes would occur with the diversion of traffic to other intersections. The change in critlcal volume was less than 75 vehicles at three of the four intersections analyzed. A change of less than 75 vehlcles $1 s$ considered to be a minor Impact on traffic flow. The remaining intersection was found to have a change in critical volume of 130 vehlcles. This is consldered to be a moderate impact on trafflc flow, because the change in critical volume is between 75 and 150 vehlcles. A change in critical volume greater than 150 vehlcles was consldered to be a major impact on trafflc flow at the intersection. As noted, none of the intersections analyzed would experience a major Impact on traffic flow as a result of the diversion of traffle on Vermont. This rating of traffic impacts based on changes in critlcal volumes was derived from threshold levels of critical volumes for levels of service $A$ through $F$ for flanning applications as described In Transportation Research Circular 212. A review of the critical volumes by level of service revealed that a change in critical volume of 150 vehlcies per hour would produce a change in service level from one level to the next. This represents the maximum number of vehicles that can be added to the critical volume without changing the level


LANE UTILIZATION


## 2000 BASE

 CONDITION


Figure 4-3


LANE UTILIZATION


2000 BASE CONDITION


Flgure 4-4
DIVERTED TRAFFIC INTERSECTION ANALYSIS VERMONT/MELROSE PM PEAK HOUR


Figure 4-5
DIVERTED TRAFFIC INTERSECTION ANALYSIS VERMONT/FIRST PM PEAK HOUR


LANE UTILIZATION


## 2000 BASE CONDITION



Figure 4-6
DIVERTED TRAFFIC INTERSECTION ANALYSIS VERMONT/BEVERLY PM PEAK HOUR

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of service of the lntersection.
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TABLE 4-3
IMPACT OF DIVERTED CROSS STREET AND STATION ACCESS TRAFFIC ON CRITICAL VOLUMES AND LEVELS OF SERVICE

| Santa Monica/Vermont$\qquad$ Intersection | Existino |  | 2000 Base |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Crltical volume | Level of Service | Crltlcal volume | Level of Service |
| Santa Monica/Vermont | 943 | B | 1,446 | $F$ |
| Melrose/Vermont | 1,340 | E | 1,724 | F |
| First/Vermont | 1,149 | D | 1,333 | E |
| Beverly/Vermont | 1,814 | $F$ | 2,288 | F |


| Santa Monica/Vermont$\qquad$ | With Project |  |  |
| :---: | :---: | :---: | :---: |
|  | Critical volume | Absolute Change | Level of Service |
| Santa Monica/Vermont | 1,462 | 16 | $F$ |
| Melrose/Vermont | 1,748 | 24 | $F$ |
| Beverly/Vermont | 2,418 | 130 | $F$ |

## 5. MITIGATION OF TRAFFIC IMPACTS

Based on the results of the analysls of trafflc lmpacts of the derlal guldeway alignment on Vermont Avenue, traffic mitigation measures wlll be needed at intersections at LOS E or $F$. These Intersections lnclude:

- Santa Monica Boulevard/Vermont Avenue
- Melrose Avenue/Vermont Avenue
- Flrst Street/Vermont Avenue
o Beverly Boulevard/Vermont Avenue
Each of these Intersectlons was found to operate at LOS E or $F$ both with and without the project. Therefore, Improvements wlll be needed regardless of whether the rail project is completed. Types of mltigatlon measures that could be consldered for these lntersectlons lnclude:
o Increase intersection approach capaclty through lnstallation of parking restrictions.
o Restripe intersection approach to provlde an addltional through traffic and/or turn lane.
o Install left-turn restriction/prohlbltlon.
o Add or revise traffic slgnal phase to accommodate the projected traffic movements.
o Widen intersectlon approach to provide additional through traffic and or turn lane.

The specific measure to be applied at each intersection whth traffic at LOS $E$ or $F$ will be identlfled during Flnal Design of the Metro Rall project. Factors to be consldered in the selection of the approprlate mitigation measure to be applied at an intersection include costs, publlc acceptance, effectlveness, and responslbillty for funding and or enforcement. SCRTD Is responslble for certaln speciflc mitigation measures, pramarily those within the lmmediate viclnity of statlons, and these will be lmplemented as part of station construction. Other measures not in the imediate vlcinlty of stations would probably not quallfy for project funding. These measures could be implemented elther by the LADOT or by the County Road Department through thelr Capltal Improvement Program. Implementation of such measures would be subject to avallabllity of adequate clty or county capltal Improvement funds.

APPENDIX A


PM PEAK HOUR


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| $\therefore 9: 30-10: 00$ | $\underline{-1 \cdot 6} \quad 18$ | \%\% |  | $\cdots$ |
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| 10:30-11:00 | 21 | 97 | $\because 6$ | $\because$ |
| 11:00-11:30 | $\therefore$ | 14 | \%? | $1 \%$ |
| 11:30-12:00 | 17 | $1 \%$ | $\cdots$ | 18 |
| 12:00-12:30 | is | 333 | 139 | $\%$ |
| 12:30-1:00 | $1 \%$ | $9, \therefore$ | 351 | 14 |
| 1:00-1:30 | 15 | $2 \%$ | -1i.0. | 37 |
| 1:30-2:00 | -1.. 29 | - $1.18 \%$ | 89 |  |
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| 11:00-11:30 | 39 | 70 | . |  |
| 11:30-12:00 | 49 | 105 | - |  |
| 12:00-12:30 | 24 | $10^{4}$ | - |  |
| 12:30-1:00 | 46 | 110 | - |  |
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| 2:00-2:30 | 4 | \% | 2. | $\cdots$ \#... |
| 2:30-3:00 | 4 if. 2 | \% | 4 | $\cdots$ - $\quad$ : |
| 3:00-3:30 | 2 | $\cdots$ | I | ,- $\quad \cdots$ |
| 3:30-4:00 | 3 | , | $\because$ | $\cdots \quad \therefore \quad \therefore$ |
| 4:00-4:30 | 7 | $\cdots$ | 17 | $\cdots$ |
| 4:30-5:00 | ? | $\because$ | 4 | $\cdots \cdots$ |
| 5:00-5:30 | 8 | $\therefore$ | $\therefore$ | $\because \cdot 1$ |
| 5:30-6:00 | 1 | - | $\because$ | , … |

Working Notes

subtask CORE STUDK
Subjert TRAFFIC COUNTS
WEATHER: $\qquad$



Working Notes
RTD


| Hourl/count | TRAFFIC Movíments |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NTHBD | WSTED. RIGHT(k) | $\begin{aligned} & \operatorname{EsT} 30 \\ & \operatorname{lent}(m) \end{aligned}$ | $R G M T(C)$ | $\begin{aligned} & S T H B D \\ & L F T(e) \end{aligned}$ | $\begin{aligned} & E 3 \pi B D \\ & \operatorname{Rant}(0) \end{aligned}$ | $\begin{aligned} & \text { WSTBD } \\ & \text { LETT (i) } \end{aligned}$ | STHBD RIGUT(G) |
|  | $L E T(a)$ | RIGHT(k) | $\operatorname{LET}(m)$ | RGMT(C) |  |  |  |  |
| 9:00-9:30\% - |  |  |  |  |  |  |  |  |
| .9:30-10:00 | 62 |  | 95 |  | 31 |  | 112 |  |
| 10:00-10:30 |  |  |  |  |  |  |  |  |
| 10:30-11:00 |  |  |  |  |  |  |  |  |
| 11:00-11:30 |  |  |  |  |  |  |  |  |
| 11:30-12:00 |  |  |  |  |  |  |  |  |
| 12:00-12:30 |  |  |  |  |  |  |  |  |
| 12:30-1:00 |  |  |  |  |  |  |  |  |
| 1:00-1:30 |  |  |  |  |  |  |  |  |
| : 1:30-2:00 |  |  |  |  |  |  |  |  |
| 2:00-2:30 |  |  |  |  |  |  |  |  |
| 2:30-3:00 |  |  |  |  |  |  |  |  |
| 3:00-3:30) |  |  |  |  |  |  |  |  |
| 3:30-4:00 | 10.5 |  | 131 |  | 41 |  | 131 |  |
| 4:00-4:30 |  |  |  |  |  |  |  |  |
| 4:30-5:00 | 114 |  | 27 |  | 57 |  | 11.6 |  |
| 5:00-5:30 |  |  |  |  |  |  |  |  |
| 5:30-6:00 | 135 |  | 99 |  | 64 |  | 116 |  |

Working Notes




| TIME | TRAFFIC MOVEMENTS |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | So.191] bown Cintit |  | $\begin{aligned} & \text { Rostar } \\ & R+i t \end{aligned}$ | $\begin{gathered} 6 \times 5 \% \\ i+r \end{gathered}$ |
|  | $\frac{187}{55}$ | ¢0 | 63 | A0) '6ET ? |
| $9: 00-9: 30$ $.9 .30-10: 00$ | 35 | 30 | 分 | - |
| $9: 30-10: 00$ $10: 00-10: 30$ | 5 | 76 | 68 | $\cdot$ |
| 10:30-11:00 | 41 | 27 | 90 | $\cdots$ |
| 11:00-11:30 | 36 | $5: 5$ | 78 | .. |
| 11:30-12:00 | 37 | $\sim$ | 93 |  |
| 12:00-12:30 | , | 9 | 97 | 41 |
| 12:30-1:00 | 45 | 9 | 93 | $\therefore$ ) |
| 1:00-1:30 | \% | $1 \sim$ | 51 | 11 |
| 1:30-2:00 | 82 | 26 | 115 | 1 |
| 2:00-2:30 | $5 こ$ | 54 | 104 | ' |
| 2:30-3:00 | 67 | 45 | 1.01 | 1 |
| 3:00-3:30 | 17 | 18 | 108 | $\cdots$ |
| 3:30-4:00 | (-0) | 45 | -116 | .. |
| 4:00-4:30 | 71 | 54 | $1 \%$ | ${ }^{\prime}$ |
| -4:30-5:00 | 96 | $\because 6$ | 17 | -' |
| 5:00-5:30 | 8 B | 43 | 37 | , |
| 5:30-6:00 | 48 | $\ddot{>}$ | 1 r | $\because$ |

MKTG 9 REV 8/84


WEATHER: $\qquad$


TIME


13, 7\%,

TRAFFIC MOVEMENTS


## Rosec.000

WEATHER: $\qquad$



| TIME | TRAFFLC MOVEMENTS |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & \text { wet ioxmij } \\ & \text { heff } \end{aligned}$ |  |  |
| 9:00-9:30 | 2. | 3 |  |  |
| .9:30-10:00 | 2 | ? |  |  |
| 10:00-10:30 | 1 | 1 |  |  |
| 10:30-11:00 | 1 | 1 |  |  |
| 11:00-11:30 | 0 | 3 |  |  |
| 11:30-12:00 | 3 | 1 |  |  |
| 12:00-12:30 | -2 | 5 |  |  |
| 12:30-1:00 | 3 | 3 |  |  |
| 1:00-1:30 | 0 | 2 |  |  |
| - 1:30-2:00 | 3 | 4 |  |  |
| 12:00-2:30 | 0 | 2 |  |  |
| 2:30-3:00 | 1 | 2. |  |  |
| 3:00-3:30 | 1 | 3 |  | -.- |
| $3: 30-4: 00$ | 1 | 2 |  |  |
| 4:00-4:30 | 0 | 0 |  |  |
| 4:30-5:00 | 1 | 1 |  |  |
| 5:00-5:30 | 1 | ? |  |  |
| 5:30-6:00 | 2 | . |  |  |

Working Notes


TFAFFIC MOVEMENTS

| TIME |
| :--- |
| $9: 00-9: 30$ |
| $9: 30-10: 00$ |
| $10: 00-10: 30$ |
| $10: 30-11: 00$ |
| $11: 00-11: 30$ |
| $11: 30-12: 00$ |
| $12: 00-12: 30$ |
| $12: 30-1: 00$ |
| $1: 00-1: 30$ |
| $1: 30-2: 00$ |
| $2: 00-2: 30$ |
| $2: 30-3: 00$ |
| $3: 00-3: 30$ |
| $3: 30-4: 00$ |
| $4: 00-4: 30$ |
| $4: 30-5: 00$ |
| $5: 00-5: 30$ |
| $5: 30-6: 00$ |


| $\operatorname{sonkn}_{i x . t} \text { Eoser. }$ | $\begin{aligned} & \text { Northr Bowion } \\ & \text { LCft } \end{aligned}$ |  |
| :---: | :---: | :---: |
| 6 | 11 |  |
| 8 | 6 |  |
| 7 | 11 |  |
| 11 | 15 |  |
| 8 | 18 |  |
| 10 | 17 |  |
| 9 | 15 |  |
| 9 | 24 |  |
| 7 | 20 |  |
| 12 | 2.0 |  |
| 16 | 10 |  |
| 9 | -14 |  |
| 6 | 20 | - |
| 17 | 12 |  |
| 7 | 23 |  |
| 13 | 15 |  |
| S | 17 |  |
| 14 | 29 |  |



WEATHER: $\qquad$



Working Notes

WEATHER: $\qquad$
suluet Trap Fic Counts
Preparer


## ,



## WEATHER:

$\qquad$



APPENDIX B

CAPACITY ANALYSES

CAPACITY ANALYSES
EXISTING CONDITIONS

15T 15T
ANY LAY F.M. FEAK, HUUR 1966

VOLUIAE ALLOCATION TO LANES

| TRAFFIC FFOM | LANE 1 |  |  | LANE 2 |  |  | LANE 3 |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NOFTH | 106 | 0 | 0 | 0 | 476 | 0 | 0 | 476 | 0 | 0 | 389 | 87 |
| EAST | 92 | 0 | 0 | 0 | 281 | 0 | 0 | 227 | 54 | 0 | 0 | 0 |
| SOUTH | E5 | 0 | 0 | 0 | 592 | 0 | 0 | 552 | 0 | 0 | 519 | 73 |
| WEST | 170 | 0 | 0 | 0 | 344 | 0 | 0 | 260 | 84 | 0 | 0 | 0 |

LEFT TUFN CHECK

| TRAFFIC | LEFT TUFN | FHASE |  |
| :---: | :---: | :---: | :---: |
| FFOM | CAFACITY | VOLUHE | NEELIED? |

CYCLE LENGTH : 60 SECONLIS

```
G/C FATID : NOFTH/SUUTH 0.61
    EAST/WEST 0.39
```

FLANNING

| FHASE | Triaffic FRidM | MOVE MENT | CRITICAL valume | FEFiCENT <br> CAFACITY USEI | EFFECTIVE GFEEN TIME | AVERGGE deLay |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | NORTH/SOUTH | ALL | 698 | 49.0 | 32 | 16 |
| 2 | WEST | ALL | 170 | 11.9 | B | 43 |
| 3 | EAST/ WEST | ALL | 281 | 19.7 | 13 | 33 |
|  | LEVEL OF S | TALS VICE | $\begin{gathered} 1149 \\ 0 \end{gathered}$ | 80.6 | 53 |  |

## VOLUME ALLOCATION TO LANES



LEFT TURN CHECK

| TRAFFIC | LEFT TURN |  | PHASE |
| :---: | :---: | :---: | :---: |
| FROM | CAPACITY | VOLUME | NEEDED? |

YCLE LENGTH : 60 SECONDS

| G/C RATIO : NORTH/SOUTH | 0.31 |  |
| :--- | :--- | :--- |
|  | EAST/WEST | 0.69 |

PLANNING

| PHASE | TRAFFIC <br> FROM | MOVE <br> MENT | CRITICAL <br> VOLUME | PERCENT <br> CAPACITY USED | EFFECTIVE <br> GREEN TIME | AVERAGE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DELAY |  |  |  |  |  |  |

TOTALS $1814 \quad 127.3$
LEVEL OF SERVICE FAILURE

## VOLUME ALLOCATION TO LANES

| TRAFFIC FROM | Lane 1 |  |  | LANE 2 |  |  | LANE 3 |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NORTH | 30 | 480 | 0 | 0 | 589 | 71 | 0 | 0 | 0 | 0 | 0 | 0 |
| EAST | 65 | 325 | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOUTH | 200 | 0 | 0 | 0 | 690 | 0 | 0 | 589 | 101 | 0 | 0 | 0 |
| WEST | 75 | 153 | 0 | 0 | 210 | 92 | 0 | 0 | 0 |  | 0 | 0 |

## LEFT TURN CHECK

| TRAFFIC | LEFT TURN |  | PHASE |
| :--- | :---: | ---: | :---: |
| FROM | CAPACITY | VOLUME | NEEDED? |

## YCLE LENGTH : 60 SECONDS

G/C RATIO : NORTH/SOUTH 0.64

PLANNING

| PHASE | TRAFFIC FROM | $\begin{aligned} & \text { MOVE } \\ & \text { MENT } \end{aligned}$ | CRITICAL VOLUME | PERCENT CAPACITY USED | EFFECTIVE GREEN TIME | AVERAGE DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | SOUTH | ALL | 200 | 14.0 | 8 | 62 |
| 2 | NORTH/SOUTH | ALL | 660 | 46.3 | 26 | 28 |
| 3 | EAST/ WEST | ALL | 480 | 33.7 | 19 | 36 |


| TOTALS | 1340 | 94.0 |
| :---: | :---: | :---: |

53
LEVEL OF SERVICE E

## VOLUME ALLOCATION TO LANES

| TRAFFIC FROM | Lane 1 |  |  | LANE 2 |  |  | L | LANE 3 |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NORTH | 110 | 0 | 0 | 0 | 300 | 0 | 0 | 300 | 0 | 0 | 236 | 64 |
| EAST | 99 | 0 | 0 | 0 | 297 | 0 | 0 | 245 | 52 | 0 | 0 | 0 |
| SOUTH | 135 | 0 | 0 | 0 | 422 | 0 | 0 | 422 | 0 | 0 | 289 | 133 |
| WEST | 116 | 0 | 0 | 0 | 409 | 0 | 0 | 279 | 130 | 0 | 0 | - |

LEFT TURN CHECK

| TRAFFIC | LEFT TURN |  | PHASE |
| :---: | :---: | :---: | :---: |
| FROM | CAPACITY | VOLUME | NEEDED? |



PLANNING

| PHASE | TRAFFIC FROM | MOVE MENT | CRITICAL VOLUME | PERCENT CAPACITY USED | EFFECTIVE GREEN TIME | AVERAGE DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | SOUTH | ALL | 135 | 9.5 | 7 | 40 |
| 2 | NORTH/SOUTH | ALL | 300 | 21.1 | 17 | 23 |
| 3 | EAST/ WEST | ALL | 508 | 35.6 | 28 | 15 |


| TOTALS | 943 | 66.2 | 52 |
| ---: | :---: | :---: | :---: |
| LEVEL OF SERVICE | $B$ |  |  |

## CAPACITY ANALYSES

YEAR 2000 BASE CONDITIONS

## CAPACITY ANALYSES

WITH PROJECT

| $\begin{gathered} \text { TRAFF IC } \\ \text { FRDM } \end{gathered}$ | VOLUME ALLOCATION TO LANES |  |  |  |  |  |  |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | LANE 1 |  |  | LANE E |  |  | LANE 3 |  |  |  |  |  |
|  | L | 5 | $R$ | L | 5 | R | L | 5 | R | L | 5 | R |
| NORTH | $13 \pm$ | 0 | 0 | 0 | 558 | 0 | 0 | 5 | 0 | 0 | 457 | 181 |
| EAST | 143 | 0 | 0 | 0 | 3こ6 | 0 | $\square$ | E65 | ES | 0 | 0 | 0 |
| SOUTH | 97 | 8 | 0 | 0 | 693 | 0 | 0 | 693 | 0 | 0 | E08 | 85 |
| WEST | 197 | 0 | 0 | 0 | 48101 | 0 | 0 | 303 | 97 | 0 | $\square$ | 0 |

## LEFT TURN CHECK

| TRAFFIC FROM | $\begin{array}{r} \text { LEFT } \\ \text { CAF'ACITY } \end{array}$ | TURN VOLUME | FHASE NEEDED？ |
| :---: | :---: | :---: | :---: |
| NORTH | 120 | 1コこ | Y |
| EAST | 1こ0 | 143 | $Y$ |
| SOUTH | $1 こ 0$ | 79 | N |
| WEST | 120 | 197 | Y |

## CYCLE LENGTH ：E® SECONDS

```
G/C RATIO : NORTH/SOUTH
    0. 60
                        EAST/WEST
                            0.40
```

FLANNING

| FHASE | TRAFFIC FROM | MOVE MENT | CRITICAL VOLUME | FERCENT CAF＇ACITY USED | EFFECTIVE GREEN TIME | AVERAGE DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\pm$ | NORTH | ALL | 13 E | 9.6 |  |  |
| $\varepsilon$ | NORTH／SOUTH | ALL | 693 | 50.4 |  |  |
| 3 | EAST／WEST | LEFT | 143 | 10.4 |  |  |
| 4 | WEST | ALL | 54 | 3.9 |  |  |
| 5 | EAST／WEST | ALL | 34E | ※5． |  |  |

TOTALS
1368
97． 5
LEVEL OF SERVICE E

- VERMONT VERMONT E/16/8E FEVERLY EEVERLY ANY DAY F.M FEAK HOUR EQUQ
volume allocation to Lanes

| TRAFFIC | LANE 1 |  |  | LANE e |  |  | LANE 3 |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L |  | R |  |  |  |  |  |  |  |  |  |
| NORTH | 147 | - | $\square$ | 0 | 564 | 0 | 0 | 564 | \% | 0 | 482 | $18 E$ |
| EAST | 162 | 0 | 0 | 0 | 1416 | 179 | 0 | 0 | 0 | 0 | a | (1) |
| SOUTH | 139 | 0 | 0 | (1) | $5 E 5$ | (2) | 0 | EES | 0 | 0 | 4E'1 | 144 |
| WEST | 117 | 0 | 0 | (1) | 1878 | 127 | $\square$ | 0 | $\square$ | 0 | $\square$ | $\square$ |

LEFT TURN CHECK

| TRAFFIC | LEFT | TURN | FHASE |
| :---: | :---: | :---: | :---: |
| FROM | CAEREITY | VOLUME | NEEDED? |
|  |  |  | - |
| NORTH | $1 E Q$ | 143 | $Y$ |
| EAST | $1 E Q$ | $1 E E$ | $Y$ |
| SOUTH | $1 E Q$ | 139 | $Y$ |
| WEST | $1 E 0$ | 117 | N |

CyCLE LENGTH : EQ SECONDS
G/E RATIO : NORTH/SOUTH
ロ.
EAST/WEST
®. 68

| PrASE | PLANNING |  |  |  | EFFECTIVE GREEN TIME | AVERAGE DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | TRAFFIC FROM | MOVE MENT | CRITICAL VOLLME | FERCENT CAF'RCITY USED |  |  |
| 1 | NORTH/SOUTH | LEFT | 139 | 10.1 |  |  |
| e | NORTH | ALL | 10 | 0.7 |  |  |
| 3 | NORTH/SOUTH | ALL | E54 | 47.6 |  |  |
| 4 | EAST | ALL | 162 | 11.8 |  |  |
| 5 | EAST/ WEST | ALL | 1453 | 1215.7 |  |  |
|  | Level of S | $\begin{aligned} & \text { OTALS } \\ & \text { GUCE } \end{aligned}$ | $\begin{gathered} 2418 \\ \text { FAILURE } \end{gathered}$ | 175.7 |  |  |

VEFMORT

## volume allacatidon to lanes

| TFAFFFIC | Lfive 1. |  |  | Lfine 2 |  |  | LAINE 3 |  |  | LAINE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| FROM | 1 | 5 | F | L | 5 | R | L | 5 | F: | 1 |  | F: |
| NORTH | 39 | 635 | 0 | 0 | 766 | 105 | 0 | 0 | 0 | 0 | 0 | 0 |
| EAST | 95 | 449 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOUTH | 206 | 0 | 0 | 0 | 949 | 0 | 0 | 815 | 135 | 0 | 0 | 0 |
| WEST | 113 | 200 | 0 | 0 | 300 | 126 | 0 | 0 | 0 | 0 | 0 | 0 |

## LEFT TURN CHECK

| TRAFFIC FROM | $\begin{array}{r} \text { LEFT } \\ \text { CAFGIDITY } \end{array}$ | TUF:N voldime | FHASE NEEDED? |
| :---: | :---: | :---: | :---: |
| NOF:TH | 120 | 59 | N |
| EAST | 120 | 95 | N |
| SOUTH | 120 | 206 | Y |
| WEST | 120 | 113 | N |

FYCLE LENGTH: bo sECONDS

G/C FATIO : NDRTH/EOUTH | $\mathbf{~ E A S T / W E S T ~}$ | 0.61 |
| :---: | :---: |
| .39 |  |

FLANNANG

| FHASE | TRAFFIC FFOM | move MENT | ERITICAL VOLUME | FERECENT CAFACITY LSED | EFFECTIVE GREEN TIME | Average DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | SOUTH | ALL | 206 | 14.5 |  |  |
| 2 | NOETH/SQUTH | ALL | 867 | 61.0 |  |  |
| $\Xi$ | EAST/ WEST | ALL | 673 | 47.2 |  |  |

totals
LEVEL OF SEFVICE

1749
FAILUFE
122.7
volume allocation to lanes

| TEAFFIC | Lane 1. |  |  | LAINE 2 |  |  | Larse 3 |  |  | LAINE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| FROM | $L$ | 5 | F | L | 5 | Fi | $L$ | 5 | F | L | 5 | F |
| NORTH | 164 | 0 | 0 | 0 | 452 | 0 | 0 | 452 | 0 | 0 | 557 | 95 |
| EAST | 140 | 0 | 0 | 0 | 430 | 0 | 0 | 556 | 74 | 0 | 0 | 0 |
| SOUTH | 244 | 0 | 0 | 0 | 549 | 0 | 0 | 548 | 0 | 0 | 377 | 171 |
| WEST | 185 | 0 | 0 | 0 | 610 | 0 | 0 | 419 | 191 | 0 | 0 | 0 |

## LEFT TUFN CHECK

| TRAFFIC FROM |  |  |  |
| :---: | :---: | :---: | :---: |
|  | LEFT | TUFEN | Fhase |
|  | CAPACITY | volume | NEEDED? |
| NORTH | 120 | 164 | Y |
| EAST | 120 | 140 | $Y$ |
| SDUTH | 120 | 244 | $Y$ |
| WEST | 120 | 135 | Y |

CYCLE LENGTH : 60 seconds

```
G/C FATIO : NDRTH/SOUTH 0.4?
                EAST/WEST 0.51
```


## FLAINNING

| FHASE | TRAFFIC FRDM | MOVE MENT | CRITICAL VOLLIME | FEERCENT CAFACITY USED | EFFECTIS'E GREEN TIME | AVERAGE DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | NORTH/SOUTH | LEFT | 164 | 11.9 |  |  |
| 2 | squth | ALL | 30 | 5.8 |  |  |
| 3 | NORTH/SOUTH | ALL | 463 | 34.0 |  |  |
| 4 | EAST/ WEST | LEFT | 140 | 10.2 |  |  |
| 5 | WEST | ALL | 43 | 5.1 |  |  |
| 6 | EAST/ WEST | ALL | 567 | 41.2 |  |  |
|  | LEVEL DF 3 | Tats <br> FVICE | $\begin{aligned} & 1462 \\ & \text { FAILURE } \end{aligned}$ | 106.2 |  |  |

```
NO EUILD
- VERMONT VERMONT
1ST 15T
ANY LAY P.M. FEAK HOUR 2000
```

VOLUME ALLOCATION TO LANES

| TRAFFIC | LANE 1 |  |  | LANE 2 |  |  | LANE 3 |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| FROM | L | 5 | F | L | 5 | F | L | 5 | F | L | 5 | F |
| NOETH | 123 | 0 | 0 | 0 | 553 | 0 | 0 | 553 | 0 | 0 | 452 | 101 |
| EAST | 107 | 0 | 0 | 0 | 326 | 0 | 0 | 263 | 63 | 0 | 0 | 0 |
| SOUTH | 99 | 0 | 0 | 0 | 687 | 0 | 0 | 687 | 0 | 0 | 602 | 85 |
| WEST | 197 | 0 | 0 | 0 | 399 | 0 | 0 | 302 | 97 | 0 | 0 | 0 |

## LEFT TUFN CHECK

| TRAFFIC | LEFT TUFN | PHASE |  |
| :---: | :---: | :---: | :---: |
| FROM | CAFACITY | VOLUME | NEELEI? |
| - |  |  | - |
| NOFTH | 120 | 123 | $Y$ |
| EAST | 120 | 107 | N |
| SOUTH | 120 | 99 | N |
| WEST | 120 | 197 | $Y$ |

CYCLE LENGTH : 60 SECONIIS

```
G/C RATIO : NORTH/SOUTH 0.61
                EAST/WEST 0.39
```

PLANNING

| PHASE | TRAFFIC <br> FFiDM | MOVE <br> MENT | CRITICAL <br> VOLUME | FERCENT <br> CAFACITY USED | EFFECTIVE <br> GREEN TIME | AVERAGE <br> DELAY |
| :---: | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | NORTH | ALL | 123 | 8.9 | 5 | B1 |
| 2 | NORTH/SOUTH | ALL | 687 | 50.0 | 26 | 32 |
| 3 | WEST | ALL | 197 | 14.3 | 7 | 155 |
| 4 | EAST/ WEST | ALL | 326 | 23.7 | 12 | 71 |

LEVEL OF SERVICE E


VOLUME ALLOCATION TO LANES

| TRAFFIC FROM | L | S 1 | R | L | $\begin{gathered} \text { ANE } 2 \\ S \end{gathered}$ | $R$ | L | $\stackrel{\text { ANE }}{ }$ | R | L | $\begin{array}{r} \text { ANE } \\ S \end{array}$ | R |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NORTH | 149 | 0 | 0 | 0 |  | 0 | 0 | 660 | 0 | 0 | 478 | 182 |
| EAST | 162 | 0 | 0 | 0 | 1379 | 199 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOUTH | 117 | 0 | 0 | 0 | 561 | 0 | 0 | 561 | 0 | 0 | 417 | 144 |
| HEST | 104 | 0 | 0 | 0 | 1039 | 127 | 0 | , | 0 | - | 0 | 0 |

## LEFT TURN CHECX

| TRAFFIC | LEFT TURN | PHASE |  |
| :---: | :---: | :---: | :---: |
| FROM | CAPACITY | VOLUME | NEEDED? |
| -- |  |  |  |
| NORTH | 120 | 149 | $Y$ |
| EAST | 120 | 162 | $Y$ |
| SOUTH | 120 | 117 | N |
| WEST | 120 | 104 | N |

:YCLE LENGTH : 60 SECONDS

```
G/C RATIO : NORTH/SOUTH 0.32
    EAST/WEST 0.68
```


## PLANNING

| PHASE | TRAFFIC <br> FROM | MOVE <br> MENT | CRITICAL <br> VOLUME | PERCENT <br> CAPACITY USED | EFFECTIVE <br> GREEN TIME | AVERAGE <br> DELAY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| -2 | $-\cdots--$ | NORTH | ALL | 149 | 10.8 |  |
| 2 | NORTH/SOUTH | ALL | 561 | 40.8 |  |  |
| 3 | EAST | ALL | 162 | 11.8 |  |  |
| 4 | EAST/ WEST | ALL | 1416 | 103.0 |  |  |

$$
\begin{array}{rcc}
\text { TOTALS } & 2288 & 166.4 \\
\text { LEVEL OF SERVICE } & \text { FAILURE } &
\end{array}
$$

volume allocation to lanes

| $\begin{aligned} & \text { TRAFFIC } \\ & \text { FROM } \end{aligned}$ | LANE 1 |  |  | LANE 2 |  |  | LANE 3 |  |  | LANE 4 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NORTH | 36 | 639 | 0 | 0 | 762 | 93 | 0 | 0 | 0 | 0 | 0 | 0 |
| EAST | 90 | 449 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOUTH | 206 | 0 | 0 | 0 | 948 | 0 | 0 | 813 | 135 | 0 | 0 | 0 |
| WEST | 103 | 210 | 0 | 0 | 290 | 126 | 0 | 0 | 0 | 0 | 0 | 0 |


| LEFT TURN CHECK |  |  |  |
| :---: | :---: | :---: | :---: |
| TRAFFIC FROM | LEFT <br> CAPACITY | TURN VOLUME | PHASE NEEDED? |
|  |  |  |  |
| NORTH | 120 | 36 | $N$ |
| EAST | 120 | 90 | N |
| SOUTH | 120 | 206 | Y |
| WEST | 120 | 103 | N |



PLANNING

| PHASE | TRAFFIC <br> FROM | MOVE <br> MENT | CRITICAL <br> VOLUME | PERCENT <br> CAPACITY USED | EFFECTIVE <br> GREEN TIME | AVERAGE <br> DELAY |
| :---: | :--- | :---: | :---: | :---: | :---: | :---: |
| 1 | SOUTH | ALL | 206 | 14.5 |  |  |
| 2 | NORTH/SOUTH | ALL | 855 | 60.0 |  |  |
| 3 | EAST/ WEST | ALL | 663 | 46.5 |  |  |

TOTALS $1724 \quad 121.0$
( LEVEL OF SERVICE FAILURE
volume allocation to lanes


## LEFT TURN CHECK

| TRAFFIC | LEFT |  |  |
| :---: | :---: | :---: | :---: |
| FROM | CAPACITY | VOLUME | PHASE |
| NEEDED? |  |  |  |

YCLE LENGTH : 60 SECONDS
$\begin{array}{lll}\text { G/C RATIO }: & \text { NORTH/SOUTH } & 0.49 \\ \text { EAST/WEST } & 0.51\end{array}$

PLANNING


