# EVALUATION OF OFF-RAMP RIGHT TURN CONTROL AT SINGLE POINT URBAN INTERCHANGES WITHOUT FRONTAGE ROADS

Final Report 556

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16. Abstract

This study focused on the control of the off-ramp right turn movement at SPUIs without frontage roads. The objective of this research project was to evaluate the safety and efficiency of traffic control for off-ramp right turns. For the purposes of this project, two common forms of off-ramp right turn traffic control were investigated: signal control and yield control.

The process followed during this research focused on two main aspects of the off-ramp right turn movement: safety and operations. The project was composed of the following stages: literature review, safety analysis and operation analysis. Literature Review: A literature review was conducted to provide the research team a broader perspective on other studies concerned with this aspect of SPUIs. The review was looking for the various traffic controls and interchange configurations that could particularly affect the safety and operation efficiency of off-ramp right turn movement. Safety Analysis: Long-term trends in crash occurrences and short-term observations of conflicts at six study sites (12 off-ramp locations) were analyzed. Crash rates and conflict rates were determined in order to compare and contrast the two means of assessing safety as well as how they relate to the type of the traffic control used at the off-ramps. Operations Analysis: Detailed traffic data collected at the study sites was used to calculate actual delays for off-ramp right turn movements at the study sites. This field data was also used to conduct simulations of interchange which supplemented the calculations based on the limited sample of study sites. The simulation models provided a means of testing different combinations of off-ramp right turn control types and overall interchange conditions in order to determine the effects of signal and yield control.

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# *SI* (MODERN METRIC) CONVERSION FACTORS*

## APPROXIMATE CONVERSIONS TO SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | **LENGTH** | | | |
| in | Inches | 25.4 | millimeters | mm |
| ft | Feet | 0.305 | meters | m |
| yd | Yards | 0.914 | meters | m |
| mi | Miles | 1.61 | kilometers | km |
| | **AREA** | | | |
| $in^2$ | square inches | 645.2 | square millimeters | $mm^2$ |
| $ft^2$ | square feet | 0.093 | square meters | $m^2$ |
| $yd^2$ | square yards | 0.836 | square meters | $m^2$ |
| ac | Acres | 0.405 | hectares | ha |
| $mi^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| | **VOLUME** | | | |
| fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | Gallons | 3.785 | liters | L |
| $ft^3$ | cubic feet | 0.028 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.765 | cubic meters | $m^3$ |
| | NOTE: Volumes greater than 1000L shall be shown in $m^3$. | | | |
| | **MASS** | | | |
| oz | Ounces | 28.35 | grams | g |
| lb | Pounds | 0.454 | kilograms | kg |
| T | short tons (2000lb) | 0.907 | megagrams (or "metric ton") | mg (or "t") |
| | **TEMPERATURE (exact)** | | | |
| $^{\circ}F$ | Fahrenheit temperature | 5(F-32)/9 or (F-32)/1.8 | Celsius temperature | $^{\circ}C$ |
| | **ILLUMINATION** | | | |
| fc | foot candles | 10.76 | lux | lx |
| fl | foot-Lamberts | 3.426 | candela/$m^2$ | $cd/m^2$ |
| | **FORCE AND PRESSURE OR STRESS** | | | |
| lbf | Poundforce | 4.45 | newtons | N |
| $lbf/in^2$ | poundforce per square inch | 6.89 | kilopascals | kPa |

## APPROXIMATE CONVERSIONS FROM SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | **LENGTH** | | | |
| mm | millimeters | 0.039 | inches | in |
| m | meters | 3.28 | feet | ft |
| m | meters | 1.09 | yards | yd |
| km | kilometers | 0.621 | miles | mi |
| | **AREA** | | | |
| $mm^2$ | Square millimeters | 0.0016 | square inches | $in^2$ |
| $m^2$ | Square meters | 10.764 | square feet | $ft^2$ |
| $m^2$ | Square meters | 1.195 | square yards | $yd^2$ |
| ha | hectares | 2.47 | acres | ac |
| $km^2$ | Square kilometers | 0.386 | square miles | $mi^2$ |
| | **VOLUME** | | | |
| mL | milliliters | 0.034 | fluid ounces | fl oz |
| L | liters | 0.264 | gallons | gal |
| $m^3$ | Cubic meters | 35.315 | cubic feet | $ft^3$ |
| $m^3$ | Cubic meters | 1.308 | cubic yards | $yd^3$ |
| | **MASS** | | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.205 | pounds | lb |
| Mg | megagrams (or "metric ton") | 1.102 | short tons (2000lb) | T |
| | **TEMPERATURE (exact)** | | | |
| $^{\circ}C$ | Celsius temperature | 1.8C + 32 | Fahrenheit temperature | $^{\circ}F$ |
| | **ILLUMINATION** | | | |
| lx | lux | 0.0929 | foot-candles | fc |
| $cd/m^2$ | candela/$m^2$ | 0.2919 | foot-Lamberts | fl |
| | **FORCE AND PRESSURE OR STRESS** | | | |
| N | newtons | 0.225 | poundforce | lbf |
| kPa | kilopascals | 0.145 | poundforce per square inch | $lbf/in^2$ |

SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380

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## INTRODUCTION

Single point urban interchanges (SPUIs) have become an integral part of managing traffic at the critical connections between freeway and arterial roadway systems. Although studies and debates continue as to where and how they should be applied, they do not discount their continued application. Based on this more widespread use, finer aspects of their operation are being considered and studied. This study focused on the control of the off-ramp right turn movement at SPUIs without frontage roads. The objective of this research project was to evaluate the safety and efficiency of traffic control for off-ramp right turns. For the purposes of this project, two common forms of off-ramp right turn traffic control were investigated: signal control and yield control.

## SCOPE OF RESEARCH

The process followed during this research focused on two main aspects of the off-ramp right turn movement: safety and operations. The project was composed of the following stages:

Literature Review: A literature review was conducted to provide the research team a broader perspective on other studies concerned with this aspect of SPUIs. The review was looking for the various traffic controls and interchange configurations that could particularly affect the safety and operation efficiency of off-ramp right turn movement.

Safety Analysis: Long-term trends in crash occurrences and short-term observations of conflicts at six study sites (12 off-ramp locations) were analyzed. Crash rates and conflict rates were determined in order to compare and contrast the two means of assessing safety as well as how they relate to the type of the traffic control used at the off-ramps.

Operations Analysis: Detailed traffic data collected at the study sites was used to calculate actual delays for off-ramp right turn movements at the study sites. This field data was also used to conduct simulations of interchange which supplemented the calculations based on the limited sample of study sites. The simulation models provided a means of testing different combinations of off-ramp right turn control types and overall interchange conditions in order to determine the effects of signal and yield control.

## FINDINGS

The review of relevant literature and research shows that there is some attention devoted to the operation and safety of SPUIs specifically pertaining to the off-ramp right turn movement. The literature review also revealed that there does not appear to be any past or present research/studies investigating the advantages and disadvantages of using one form of control over another for the off-ramp right turn movement. Most of the information reviewed pertained to the advantages and disadvantages of free/uncontrolled off-ramp right turn movements versus some type of control (i.e., stop sign, yield, or signal). Key concepts relating to the types of off-ramp right turn control that were discovered during the literature review and considered throughout the research included the effect of nearby downstream intersections, pedestrian/bicyclist activity at the interchange, increased clearance intervals with signal control, and other issues further discussed within the report.

The data collection effort and details obtained from observations and research allowed for actual calculations to be made concerning operations and safety. Interpretation of that data through the results of the calculations lends itself to determining interchange characteristics that influence operations and/or safety, but is subject to the limited number (6) of study interchanges evaluated. Qualitative observations and conclusions regarding the operations and safety of the study interchanges are presented within this report.

Delays, conflict rates, and crash rates were calculated from the data and observations at the six study sites. Average delays for off-ramp right turn vehicles at signal- controlled locations experienced about 20% to 30% more delay than the vehicles at locations with yield control. The overall conflict rates for the control-type groups were based on a recalculation of the conflict rate using the summed values for each sample site. An overall average of the crash rates calculated for each site was not deemed appropriate given the variability inherent to conflict observations based on the relatively short observation period as compared to crash rate calculations. The average conflict rate for the yield-controlled sites as a group is about 240% greater than the average rate for the signal-controlled group, but the yield-controlled sites have considerable variability in their rates. A statistical t-test indicates that because of this variability and despite the large difference in average rates, there is no significant difference ($t_{calc} = 1.705$, $t_{.05,\ v=10} = 1.812$) in the average conflict rates between the control groups. Overall crash rates for the control-type groups were the averaged values of the three-year average crash rate for each site in the group. The average crash rate for yield-controlled sites as a group is almost double the average crash rate for the signal-controlled sites. This ratio is comparable to the conflict rate relationship between the two groups. A statistical t-test was performed on the average crash rate data for the yield-controlled sites and the signal-controlled sites. All crash rates were considered, which resulted in no significant difference ($t_{calc} = 1.510$, $t_{.05,\ v=10} = 1.812$) in the average rates for each group.

The actual field data from the limited sample of study interchanges was supplemented with model simulation results that considered four control type scenarios—two variations on signal control and two on yield control. The signal control variations concern the

allotment of signal phasing to the off-ramp right turn traffic. One version only gives a green arrow indication to the off-ramp right turn movement during the adjacent cross street left turn phase. This was referred to as "Signal 1-phase" within this report. The other variation of the off-ramp right turn signal control type is when there are two phases that can provide the green arrow indication for the off-ramp right turn movement. This control variation is referred to as "Signal 2-phase" in this report.

The yield control type was split into two versions incorporating vehicle presence detection or just the standard yield sign with no vehicle detection. The off-ramp right turn control that uses yield signs and vehicle detection works similarly to the Signal 1-phase control, but without the signal head indications for the off-ramp right turn vehicles. Essentially the off-ramp right turn traffic would be acting as pseudo cross street left turn traffic. In this report, this control type is called "Yield With Detection."

An iterative analysis process involving a range of off-ramp and interchange volume conditions was used to determine overall operational effectiveness of each control scenario. Data collected at several SPUI sites was used to calibrate a micro-simulation model (CORSIM) that was then used to evaluate numerous combinations of traffic volume conditions and off-ramp control types that would have not been possible to collect at actual SPUI locations. The results of the simulations were used in concert with the safety evaluation and conclusions to develop suggestions on appropriate control types for the off-ramp right turn movement.

The results indicated that in almost all volume scenarios, the "Yield Without Detection" control type (the basis for the comparisons) has the lowest overall interchange control delay. When comparing averaged interchange control delays, the other control type variations resulted in more delay. In the scenarios with one off-ramp right turn lane, the overall interchange delay for the "Yield With Detection" and "Signal 1-Phase" were not much greater (about 4 and 9 % more, respectively). The differences in interchange delay were more prominent in the two-lane off-ramp right turn scenarios due to modeling constraints, which caused the left hand lane of the two lane off-ramp right turn to experience more delay than necessary in the scenarios with signal control. Therefore, the magnitudes of the percent differences for the signal control types in this two-lane group of scenarios are exaggerated, yet they still reflect the same general relationship as the one-lane group of scenarios. Also, note that these percent differences apply for the normal ranges of interchange volumes and turning movements used in this project. Unusual situations may result in different results for each control type.

The efforts executed during this project had the goal of determining which control type would be best to use for off-ramp right turn movements at single-point urban interchanges without frontage roads. The data collected, both in the field and through the crash databases, were very detailed, beneficial, and used to their fullest. However, despite the efforts and underlying goal, the results from the safety and operations analyses appear to be contrary making it necessary to compare the two aspects using a common basis. Safety and operation can be measured in the common term of cost. Estimates of the overall yearly costs of operations and crashes associated with the off-

ramp right turn movement at yield and signal-controlled site were computed as a final means of determining the best control type.

The crash cost for each interchange is calculated from the number of crashes associated with the off-ramp right turn movement only. Thus, the total crash cost values are not representative of the total crash costs per interchange, but are valid for use in the comparison against interchange operational costs since the unknown crash cost component is assumed to be equal for all the interchanges. The costs are composed of several factors: medical costs, property damage loss, lost productivity (market and household), and other related costs. The average costs for crashes involving property damage only was $4,812 (in 2004 dollars). Crashes involving injuries of varying degrees have an average cost of $49,817. Crashes with any fatalities, which are about 75 times less likely to occur as other injury crashes, have an average cost of $1,184,885 associated with them. The average yearly cost of crashes for the study interchanges, grouped by off-ramp right turn control type, indicates that interchanges using yield control for the off-ramp right turn movement are about $384,000 (2004 dollars) more costly than the interchanges using signal control.

The user cost aspect considered in this project was the "value of time" (user delay costs), which accounts for a majority of the user costs in this project's comparison of the control types for off-ramp right turn movements. The value of time is a function of the average hourly wage earned by the persons impacted by the delays (separated by passenger vehicles and trucks), the percentage of the hourly wage considered as the value of time (50% for passenger vehicles, 100% for trucks), and the average passenger occupancy (1.5 for passenger vehicles, 1.05 for trucks). The average yearly cost of delay for the study interchanges, grouped by off-ramp right turn control type, indicates that interchanges using signal control for the off-ramp right turn movement are about $689,000 more costly.

For use in this comparison only, the total average yearly costs (crash costs + delay costs) for interchanges using signal control for the off-ramp right turn movement is estimated at $2,100,000. Interchanges that have yield control for the off-ramp right turn movement have an average yearly cost estimate of $1,800,000. Despite yield control sites appearing to have higher crash rates (although not statistically significant), their overall savings in user cost of delay offsets the increased costs of crashes. However, the difference in total costs does not appear to be substantial, at least not to a degree where the selection of a certain control type would be more convincing than the other.

# CHAPTER 1
# LITERATURE REVIEW: OFF-RAMP RIGHT TURN CONTROL AT SINGLE POINT URBAN INTERCHANGES (SPUI) WITHOUT FRONTAGE ROADS

## OVERVIEW

Although there are extensive studies concerning the effectiveness of single point urban interchanges (SPUIs), especially when compared to other interchange designs, most of this research has focused on the overall operation and safety of the interchange types. However, this investigation did not locate any past or current research specifically focused on the traffic control of the right turn movement from the major roadway associated with the SPUI and how it relates to operation and safety. The literature review did discover there are limited publications guidelines and protocols for how this movement should be controlled in specific conditions.

The SPUI has a unique characteristic, as compared to some other interchanges or intersection designs, where the major roadway right turn movement (hereafter referred to as the "off-ramp" right turn) can be accommodated by a dedicated right turn lane (or lanes) that could be operated without any traffic control (e.g., stop, yield, or signal). In this particular case, the off-ramp right turn is merged into the cross street traffic via a separate additional lane on the cross street. *NCHRP Report 345: Single Point Urban Interchange Design and Operations Analysis* by Messer, et al [1] found in its 1989 field survey that only about 25% of the SPUIs were designed to accommodate a "free" off-ramp right turn movement with a separate acceleration lane along the cross road. This layout for the off-ramp right turn is usually permissible based on the interchange operations, but is not always feasible. The report also states that right turns from the off-ramps are operationally more complex and typically have less capacity per lane.

Without a "free" (uncontrolled) situation, the off-ramp right turn movement has to be governed by some form of traffic control. The most common means of traffic control in these situations are stop control, signal control, merge (with yield), or yield control, which is the most prevalent [1]. The merge-type control is similar to the free right turn discussed above except that a separate additional lane is not provided to receive the off-ramp right turn traffic—instead a short acceleration or drop lane is provided necessitating a yield condition at the merge point. Stop control, yield without a merge situation, and signal control are typically implemented at the point where the right turn lane (or curvature of the right turn lane) starts to intersect with the cross street travel lanes. Yield control and signal control are the focus of this literature search and research as a whole.

## OPERATIONAL ASPECTS

Several of the sources examined in this review provided information on off-ramp right turn control as it related to operational characteristics and effects. Much of the information focused on the advantages and disadvantages of a free/uncontrolled off-ramp right turn versus a controlled situation (e.g., signal or yield/stop control). Although this particular interest is different from the purpose of this research, it does provide some insight into the benefits of one control type over another.

### General Characteristics of Off-Ramp Right Turns

There are several components to the design and operation of the off-ramp right turn movement that are independent of the type of traffic control employed. NCHRP 345 [1] points out a few of these. Geometrically speaking, some overall characteristics that affect off-ramp right turn operations are the magnitude of the turn radius, the presence of an auxiliary acceleration lane at the end of the turn, and whether the off-ramp right turn lane is exclusive. Larger turn radii can promote better off-ramp right turn operations, but at the cost of making the movement more complex and requiring more space. Locations where the off-ramp left turns and right turns do not have exclusive lanes will be inefficient due to the difference in traffic controls (i.e., the respective turn lane queues may block one another), as well as when both movements are signalized.

NCHRP 345 [1] mentions some factors that determine how well an off-ramp right turn movement operates, what its capacity limit is, and its safety. The characteristics include the geometry of the turn path, complexity of the entrance maneuver, capacity of the maneuver, and type of traffic control in place. The report continues by stating, "[the] right turn maneuver is significantly affected by the type of traffic control, e.g., stop, yield, etc., the number of conflicting signalized movements, and the signal timing of the conflicting movements." (p. 24)

The complexity of the entrance maneuver can affect the efficiency and safety of the off-ramp right turn operations. One point of complexity involves the off-ramp right turn driver's perception of potential conflicting traffic. Due to the signal phasing used at SPUIs, off-ramp right turn traffic is faced with alternating sequences of high and low traffic flows where they enter the cross street. This is not all that uncommon at interchanges/intersections, but the distances related to a SPUI layout complicate the decision for the driver. Another characteristic mentioned in NCHRP 345 [1] that complicates the off-ramp right turn movement is the angle of entry and physical requirements necessary to confirm a safe point to enter the cross street traffic stream.

The capacity of an off-ramp right turn movement is dependent on the type of traffic control used. According to NCHRP 345 [1], if a stop or yield control is in place, the off-ramp right turn capacity is dependent on the availability of gaps in the conflicting traffic stream (with most of them being generated artificially by the overall SPUI signal operations). Capacity at signal controlled off-ramp right turn movements is based on the portion of the overall SPUI signal cycle length devoted to the off-ramp right turn movement plus available gaps for right turn on red.

**Free/Uncontrolled Off-Ramp Right Turns**

The *California Single Point Interchange Planning, Design, and Operations Guidelines* [2] mentions off-ramp right turn movements with free control. The *Guidelines* claims that "free right turn moves at the exit ramps are a basic feature of the typical SPI [i.e., SPUI]. Lack of a free right can negatively impact operational efficiency." (p. 9) California views the use of SPUIs (SPIs) as a means to move large volumes of traffic, and therefore they should be designed to allow for free right turns when possible. This preference is reiterated in the *California Highway Design Manual* [3] where it states in Index 504.3(2):

"Where a separate right turn lane is provided at ramp terminals, the turn lane should not continue as a free right unless pedestrian volumes are low, the right turn lane continues as a separate full width lane for at least 60 m [200 ft] prior to merging, and access control is maintained for at least 60 m [200 ft] past the ramp intersection. Provision of the free right should also be precluded if left turn movements of any kind are allowed within 125 m [410 ft] of the ramp intersection."

Despite this foundation of design philosophy, the *Guidelines* also mentions that "often free right turn moves at exit ramps can not be provided due to close proximity of adjacent intersections." (p.3) Close proximity of downstream intersections would not allow for sufficient weave and merge lengths with a free right turn from the off-ramp.

*A Policy on Geometric Design of Highways and Streets* by AASHTO (the "Green Book") [4] provides further support for the use of free off-ramp right turns. On pages 748 and 787 the Green Book states "all right turns into and out of ramp approaches are generally free flow…and only the left turns must pass through the signalized intersection." The Green Book also provides guidance on when free off-ramp right turns should be implemented, "the design of the free right turns should include an additional lane on the cross street beginning at the free right-turn lane for at least 60 m [200 ft] before being merged. Free-flow right turns from the exit ramp to an arterial cross road are not desirable when the nearest intersection on the cross road is within 150 m [500 ft] because there may be inadequate weaving distance between the exit ramp and the adjacent intersection." The California *Guidelines* [2] criteria are quite similar with the additional criterion of access control being maintained for at least 200 feet beyond the ramp intersection. The Green Book still accounts for the possibility of the off-ramp right turn being a controlled movement despite the details pertaining to free right turn situations.

The *Minnesota Department of Transportation Roadway Design Manual* [5] also is a proponent of free off-ramp right turn movements. It states that "left and right turn movements at single point diamond interchanges (SPDI) should be physically separated, and moreover allow the right turns to flow independent of the signal." (p. 6-1(3)) The basis for this statement is that any portion of the signal cycle length devoted to the off-ramp right turn movement increases the overall interchange delay.

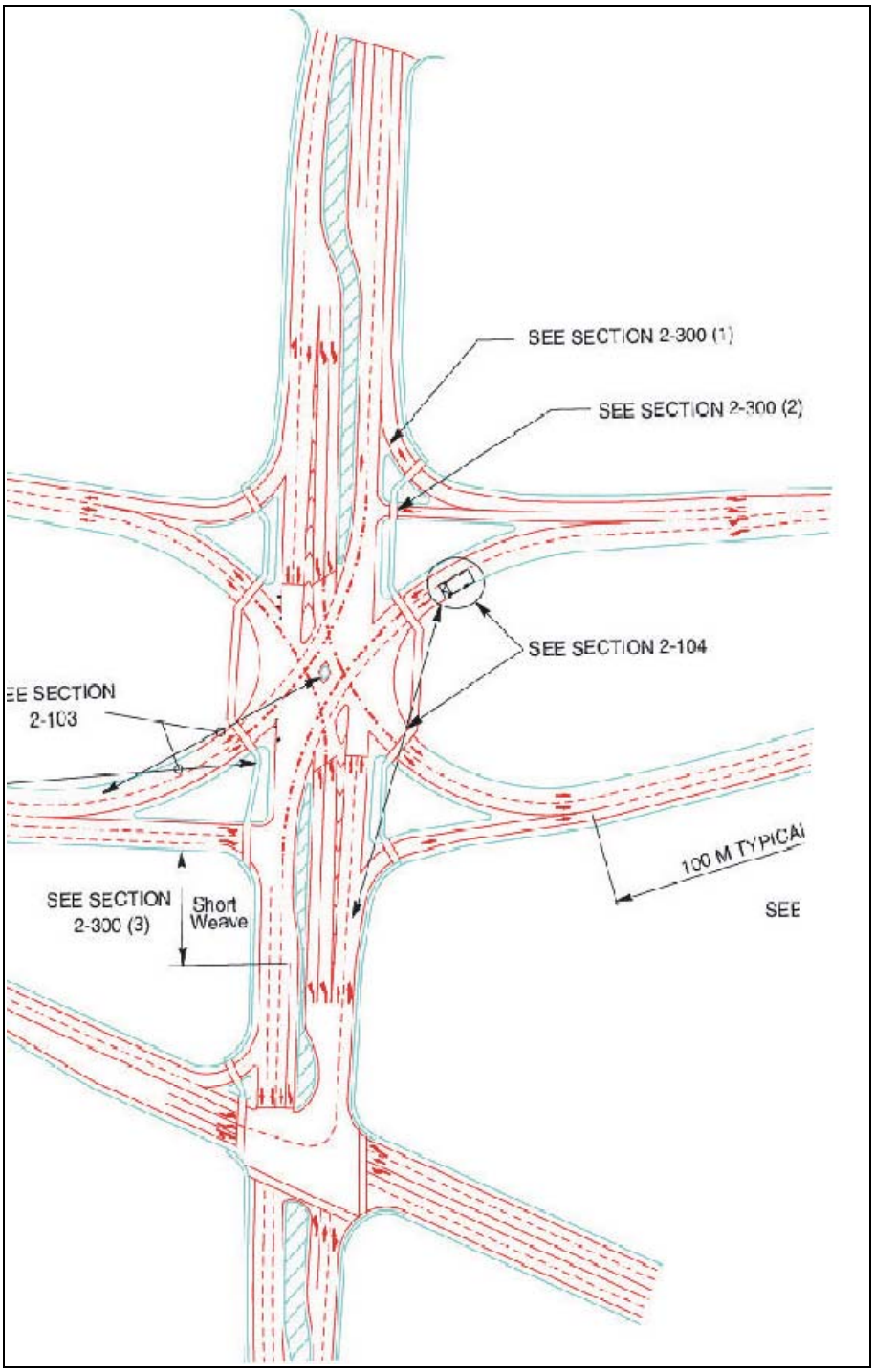



**Figure 1. Common Right Turn Lane Configurations at Exit Ramps**
**(California Single Point Interchange Planning, Design, and Operations Guidelines [2])**

NCHRP 345 [1] states that "in general, the right-turn maneuver will operate more safely and efficiently if a right-turn bay and auxiliary lane are provided" (p. 24) because the traffic flows are physically separated. However, the design guidelines presented in the report state that "an acceleration lane for off-ramp traffic onto the cross arterial is not necessarily recommended unless sufficient distance (greater than 1,200 feet) is available to the next downstream [signalized] intersection. Direct entry merging for this maneuver provides good operation in restricted designs." (p. 99)

**Controlled Off-Ramp Right Turns**

Despite the emphasis placed on free off-ramp right turns by the preceding sources, the same sources as well as others provide some detail pertaining to controlled off-ramp right turns. Primarily, the controlled movement aspect is concerned with signalization, although some discussion is provided as it relates to yield and stop control types.

*Signal Control*

The California *Guidelines* [2] qualify its preference for free right turns with the provision that when volumes are too high for one exit ramp right turn lane it is sometimes reasonable to add and signalize another exit ramp lane exclusively for right turn movements. This situation, as well as other approaches to off-ramp right turn movement control in California, is shown in Figure 1 as Item 2-300(2).

The *Guidelines* also contends "in some situations this configuration of a combination free right/signalized right turn layout can mitigate short weaves and merges related to close spacing of the ramp and adjacent local intersections." (p. 10) According to the Guidelines, signalization of the off-ramp right turn is considered when the spacing between the ramp and the adjacent intersection is too short and/or there is a large proportion of right turn traffic from the exit ramp attempting to weave across the cross street to turn left at the adjacent intersection. This situation is depicted in Figure 1 as Item 2-300(3).

Page 113 of the *NCHRP Report 420: Impacts of Access Management Techniques* by Gluck, et al [6] notes that signalization of the off-ramp right turn can be used to alleviate (to some degree and dependent on progression considerations) congestion at downstream signals sometimes caused by free or yield-controlled off-ramp right turns. The signalization of the off-ramp right turns also can assist motorists with shorter weave/merge lengths or to accommodate a heavy left-turn demand at the downstream location. The report also cautions that the signalization of the off-ramp right turns may cause an increase in the queue length, which must be minimized to avoid spillback onto the freeway mainline. The AASHTO Green Book [4] also provides this same advice, but applies it to possibly blocking access to the off-ramp left turn lanes (or through movement if the SPUI has frontage roads). The Utah Department of Transportation (UDOT) currently has a project in design at this time to signalize most of these off-ramp right turns in Salt Lake County [7]. UDOT cites problems with traffic queues extending back onto the mainlines. They feel that replacing their current stop controls (they do not have yield control) with signal control will allow for traffic to still turn right after

stopping when the signal is red, but will more importantly "flush out" the traffic queue via a green signal indication when no conflicting movements are operating.

When signal control is utilized, the California Guidelines [2] states that right turns on red should be allowed when practical and should have a sign stating they are allowed or not allowed. According to the Guidelines, the use of the sign "will reduce the risk of driver confusion on the nature of this movement and in enforcement." The typical location of the off-ramp right turn movement signals is shown in Figure 2 (Note: "OLA" refers to the phasing being an overlap of the corresponding cross street left turn phase). The Guidelines also points out that U-turns from the cross street are not allowed in this situation since any U-turns would conflict with the off-ramp right turn movement phase that is overlapped with the cross street left turn movement.

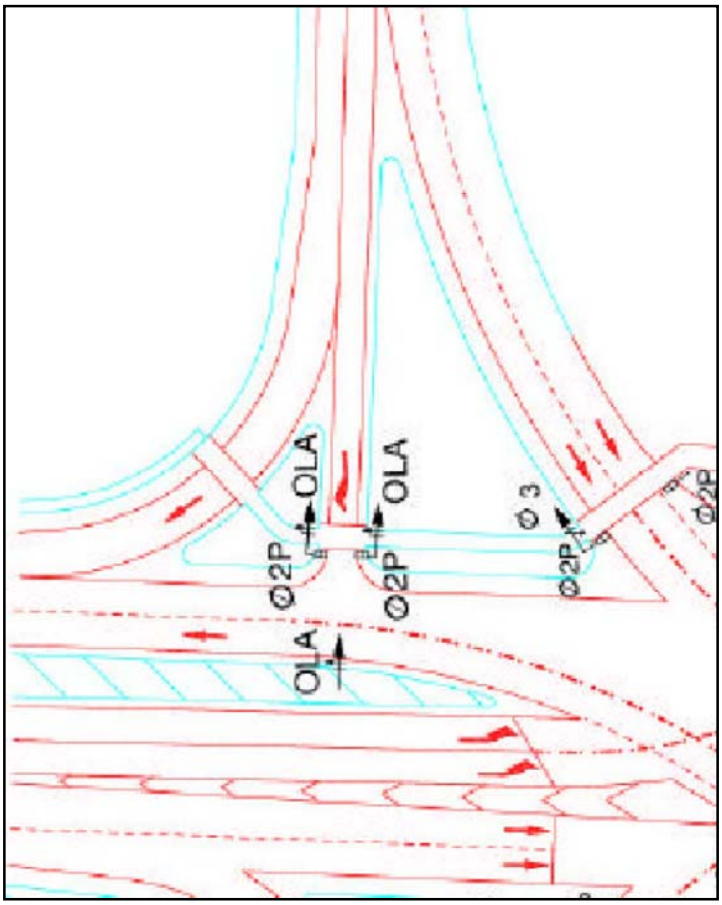



**Figure 2. Signal Head Placement for Exit Ramp Right Turns (California Single Point Interchange Planning, Design, and Operations Guidelines [2])**

It is interesting to note that the California *Guidelines*, as shown in Figure 2, depicts the signalization of the off-ramp right turn movement as a separate lane group apart from the "free" off-ramp right turn movement. One possible reason for this design relates to promoting an efficient operation of the signalized movement and safety of the vehicles involved. By having the signalized off-ramp right turn movement intersect the cross street

at a right angle, the sight distance is not affected by the curvature of the typical off-ramp right turn lane layout. The *Guidelines* suggests that interchange/off-ramp right turn operations are affected by inadequate sight distance because "if drivers in a queue cannot see approaching vehicles, each driver may tend to slow and creep into the intersection, thus reducing the capacity of the ramp and hindering the operation of the intersection." (p. 8)

NCHRP 345 [1] notes that signalized off-ramp right turn movements tend to work quite efficiently during their green phase, but revert to stop-and-go situations for the red phase. During this portion of the signal cycle, the flow rate for the operation is much lower, which highlights the driver's need to verify safe gaps to enter the cross street. Based on observations presented in the report, off-ramp right turns controlled by signals "appeared to operate about as efficiently as yield control." (p. 27) The off-setting efficiencies of the movement during the green and red phases were cited as the reason.

There is a method of addressing insufficient off-ramp right turn capacity without resorting to signalization as detailed in NCHRP 345 [1]. Since the off-ramp right turn movement does not have a "parent" phase to provide a protected entry, sometimes the off-ramp right turns will not have adequate yield-entry merging capacity during high-volume conditions. Usually this will only occur at SPUI sites with only one lane devoted to the off-ramp right turn movement. The report describes the use of a queue detector, located in the off-ramp right turn lane with yield control that is connected to the adjacent (i.e., overlapping) cross street left turn phase:

"This delayed-call queue detector should be located perhaps 50 feet upstream from the stop line (to detect the presence of the second or third vehicle stopped in queue). A delayed call of perhaps 6 seconds would be adequate for a normal 6-foot by 6-foot inductive loop detector design. If the queue remains over the loop for 6 seconds or more during the cross street left turn red, a call is placed for the left turn phase to provide 'protected' right turns. If the left turn phase is already green, the 'delay inhibit' or defeat feature of the detector-controlled system should be used to turn off the delay feature during green, so that the right turn calls are immediately recognized to extend the cross-street left turn phase until gap out. These features will provide additional movement capacity only when needed by just monitoring the queuing status of the right turn. Single vehicles stopping in line to make a right turn will still enter under yield control." (p. 70)

The Design Guidelines presented in NCHRP 345 [1] state that "signalizing the off-ramp right turn operations should be avoided. Delayed-call right turn queue detection should be provided for high-volume conditions having fairly balanced traffic patterns. Right turn volumes from the off-ramp exceeding the complementary cross street volume by 100 vehicles per hour per lane, vphpl, should warrant this detector treatment when the right turn volume exceeds 300 vphpl." (p. 99)

*Yield Control*

NCHRP 345 [1] provides many of the details pertaining to yield controlled off-ramp right turn movements. It states that yield control "has the advantages of being relatively efficient in terms of traffic performance and right-of-way need." (p. 26) The main reason for its efficiency is because it only requires the off-ramp turn traffic to stop when it cannot safely enter the cross street traffic stream. Therefore, the movement is able to make maximum use of opportunities to enter with a minimum amount of delay. The capacity of an off-ramp right turn movement under yield control is highly sensitive to the amount of conflicting traffic. Later in the report, the following statement is made, "observation…suggests that yield control for the off-ramp right turn movement can be an efficient and cost-effective control mode." (p. 27)

## SAFETY ASPECTS

The method of controlling the off-ramp right turn movement at SPUIs can also affect the safety of the interchange. Several sources offered information supporting certain types of off-ramp right turn control from a safety perspective. The safety concern highlighted in the literature usually is associated with pedestrians and bicycles, but the type of off-ramp right turn control can also affect vehicular safety.

## PEDESTRIAN & BICYCLIST SAFETY

Pedestrians and/or bicyclists attempting to cross the off-ramp approach of a SPUI are faced with unique conditions which warrant particular attention to ensuring that there is a mutual understanding of the traffic situations by both the driver and the pedestrian/ bicyclist. The off-ramp right turn movement is of particular concern due to this being one of the first points of potential conflict at the interchange.

The AASHTO Green Book [4] points out that heavy pedestrian traffic can diminish the desirability of free right-turn lanes by adding a potential conflict with non-controlled vehicular traffic. This situation is of particular concern when the off-ramp right turn lane(s) are curved in such a way as to promote a speed sufficient for merging with the cross street and yet obscure the intervisibility between the driver and pedestrian. *NCHRP Synthesis of Highway Practice 139* [8], which provides general information regarding expressway ramps intersecting local streets, states that, "…vehicles are still traveling at a relatively high rate of speed when they pass through the intersection or merge with surface street traffic." (p. 38) The report continues by indicating motorists also may be unaware of pedestrians because they are focused on looking for upstream traffic. This behavior would probably be evident regardless of the traffic control in place since the driver is either anticipating a gap for a right turn on red (or at a stop control) or timing a gap for a yield or free right turn/merge situation. Based on this situation, NCHRP 139 [8] also states that "…pedestrian safety can be severely threatened at intersections where freeway off-ramps intersect with local streets, because of the high-speed traffic mixing with crossing pedestrians." (p. 39)

The report followed up on this idea with the following:

Situations where high-speed expressway ramps intersect with local streets were identified as having lessened adverse effects when:

- pedestrian volumes and local traffic volumes are relatively low and good roadway designs are used
- suitable traffic control devices are used at the local street and/or grade separation (where appropriate)

The conditions listed as possibly harmful include:

- High traffic volumes and/or speeds on the off-ramp
- Moderate to high pedestrian volumes crossing at the intersection
- Insufficient traffic controls at the intersection (e.g., off-ramp traffic controlled by yield signs only)
- High-speed traffic on ramp having poor sight distance and/or an unexpected intersection

The conclusions drawn from the report suggest that the hazards to pedestrians can be mitigated by using proper intersection design, utilizing grade separation, and/or implementing adequate traffic control devices (e.g., signals and signs). The effects of these items are reductions in vehicle speeds and increased pedestrian/motorist awareness. NCHRP 345 [1] suggests that signalizing the off-ramp right turn movements would reduce the capacity of the SPUI as a whole. Also, the capacity of the off-ramp right turn movement would be similar to that of a yield-controlled movement because the increased efficiency of operation during the green phase is partially offset by the reduced efficiency during the red phase. Furthermore, the report mentions observations from its associated field study which showed "pedestrian behavior…indicated that pedestrians were able to cross the ramp junctions safely and with little confusion as to when it was safe to cross during the cycle." (p. 32)

The California *Guidelines* [2] had some limited safety information concerning bicyclists. The *Guidelines* promotes only one lane being dedicated as a free right turn from the exit ramp "so bicyclists need to cross only one lane of uncontrolled traffic." (p. 11) Also, the use of stop control for the exit ramp right turn traffic is mentioned as a means of adequately accommodating bicyclists in some situations. Furthermore, the *Guidelines* states that if an exit ramp right turn lane is anticipated to be signalized in the future or if the SPUI is larger than a "compact" SPUI as defined by the *Guidelines*, then a separate bicycle facility (i.e., overpass or underpass) should be incorporated into the SPUI design.

**Vehicular Safety**

None of the literature sources reviewed had specific information pertaining to the crashes associated with the off-ramp right turn movement. Data and conclusions pertaining to the off-ramp as a whole were evident. The *Minnesota Department of Transportation Roadway Design Manual* [5] states "the predominant crash type at SPDIs [SPUIs] is rear-

end crashes on the off-ramp." (p. 6-1(5)) This conclusion is further supported by the Cheng article, *"Accident Analysis for Single Point Urban Interchange"* [9] which states the predominant type of crash is rear-ends on the off ramps with a reported percentage of at least 40%. This paper advises that improvements in advance warning signs, visibility, location of signal and stop bar, and skid resistance could reduce off-ramp rear-end crashes.

The radius of the off-ramp right turn lanes also contributes to the safety of the movement. NCHRP 345 [1] found that almost all stop, yield, and traffic-signal controlled off-ramp right turn movements had radii of less than 100 feet. Radii of this size or smaller promote better visibility for off-ramp right turn motorists as they look back to their left to assess cross street traffic conditions. However, the assessment of potential vehicular traffic conflicts complicates any off-ramp right turn movement regardless of turn radius or traffic control (except possibly free right/merge). The report emphasizes this with the following statement, "…the greater distance and unique phasing create a complex flow pattern by releasing a second platoon a few seconds after the through phase. This second platoon may surprise right turning drivers who expect to enter freely after the end of the cross-road through phase." (p. 27) The origin and sequencing of the conflicting traffic streams is not consistent with the expectancy of a driver making the off-ramp right turn maneuver. This could be the basis for the right-angle and rear-end collisions associated with the off-ramp right turn. One form of mitigation would be to separate the entry point farther from the interchange via a merge control. Usually, this is not feasible due to space constraints and/or the proximity of a downstream signalized intersection where left turns are permitted.

The California *Guidelines* [2] focuses on safety by describing desirable visibility conditions. The *Guidelines* promotes intervisibility and claims that this will improve safety conditions and operational conditions.

## CONCLUSIONS

The literature and research documented above show that there is some attention devoted to the operation and safety of SPUIs specifically pertaining to the off-ramp right turn movement. The literature also revealed that there does not appear to be any past or present research/studies investigating the advantages and disadvantages of using one form of control over another for the off-ramp right turn movement.

With regards to operational/design effects, this research paper should focus on several key points. The intersection downstream of the off-ramp right turn movement is important to the selection of the traffic control used at the off-ramp right turn. The information reviewed showed that free right turns are a common practice, but are constrained by the downstream intersection location. Signal control at the off-ramp right turn can "meter" the off-ramp right turn traffic and help with shorter weaving distances and congestion at the downstream intersection. NCHRP 345 [1] promotes a distance between the SPUI and the downstream intersection that provides enough room to store stopped cross street traffic as well as provide additional room to accommodate lane

changes/weaving in advance of the stopped cross street traffic. The report recommends a desirable downstream signalized intersection separation of at least 1,200 feet from the off-ramp entry point. Spillback from a close downstream signalized intersection can affect the efficiency and safety of the off-ramp right turn movement.

The information reviewed described situations where pedestrian, bicyclist, and motorist safety can be affected by the type of control used for the off-ramp right turn movement. Other factors such as geometric design, sight conditions, pedestrian/bicyclist activity, and vehicle speeds also play significant roles, but the traffic conditions in which these all interact can be exacerbated or enhanced from a safety perspective based on the control type in place for the off-ramp right turn movement.

The review of information also indicated some concepts that will assist in the evaluation tasks of this project. Most of the information from the research papers by Follmer and Janson [10] and Bonneson [11] concern the evaluation of signal operations at SPUIs. For instance, the Follmer/Janson paper proposes an alternative to using the simple Highway Capacity Manual (HCM) estimate for right turn on red (RTOR) capacities. The concept is that a motorist attempting to turn right on red at a signalized intersection from an exclusive right turn lane will encounter similar conflicting traffic flows to a motorist attempting to turn right at an unsignalized intersection.

Another concept related to SPUIs with signalized off-ramp right turn movements is clearance time. The Bonneson paper [11] defines the clearance interval as the "interval [that] follows the yellow warning interval at the end of each signal phase. It is intended to provide sufficient time for those vehicles entering during the yellow to safely clear the intersection conflict area before the start of the next phase." (p. 11) When the off-ramp right turn movement is signalized, essentially the interchange has "grown" to incorporate a larger conflict area. Thus, the clearance time has to be longer based on this increased potential conflict area. As Bonneson [8] puts it, "Longer clearance intervals lead to longer delays for the motorist because all-red time represents time that is not available to serve traffic demand." (p. 6) This important point is emphasized in NCHRP 345 [1] which claims this situation as a "major disadvantage of signal control for the off-ramp right-turn movement." (p. 27) However, this facet of SPUI operation does not preclude the use of a signalized off-ramp right turn movement; it merely means the "…designer's goals should be to minimize the length of the clearance paths while still providing a geometric design that meets or exceeds minimum design standards." [11]

# CHAPTER 2
# EXISTING CONDITIONS AT STUDY SITES: OFF-RAMP RIGHT TURN CONTROL AT SINGLE POINT URBAN INTERCHANGES (SPUI) WITHOUT FRONTAGE ROADS

## INTRODUCTION

This study is concerned with the evaluation of off-ramp right turn control options at single point urban interchanges (SPUIs) without frontage roads. The off-ramp right turn control employed at a SPUI can affect the interchange as a whole as well as the specific off-ramp right turn movement. This study is concerned with operational efficiency (also referred to as "operations" within this report) and safety. The analysis of each component will be compared on equal terms in order to determine the advantages and disadvantages of certain off-ramp right turn traffic controls. The first step in this evaluation process is the data collection effort.

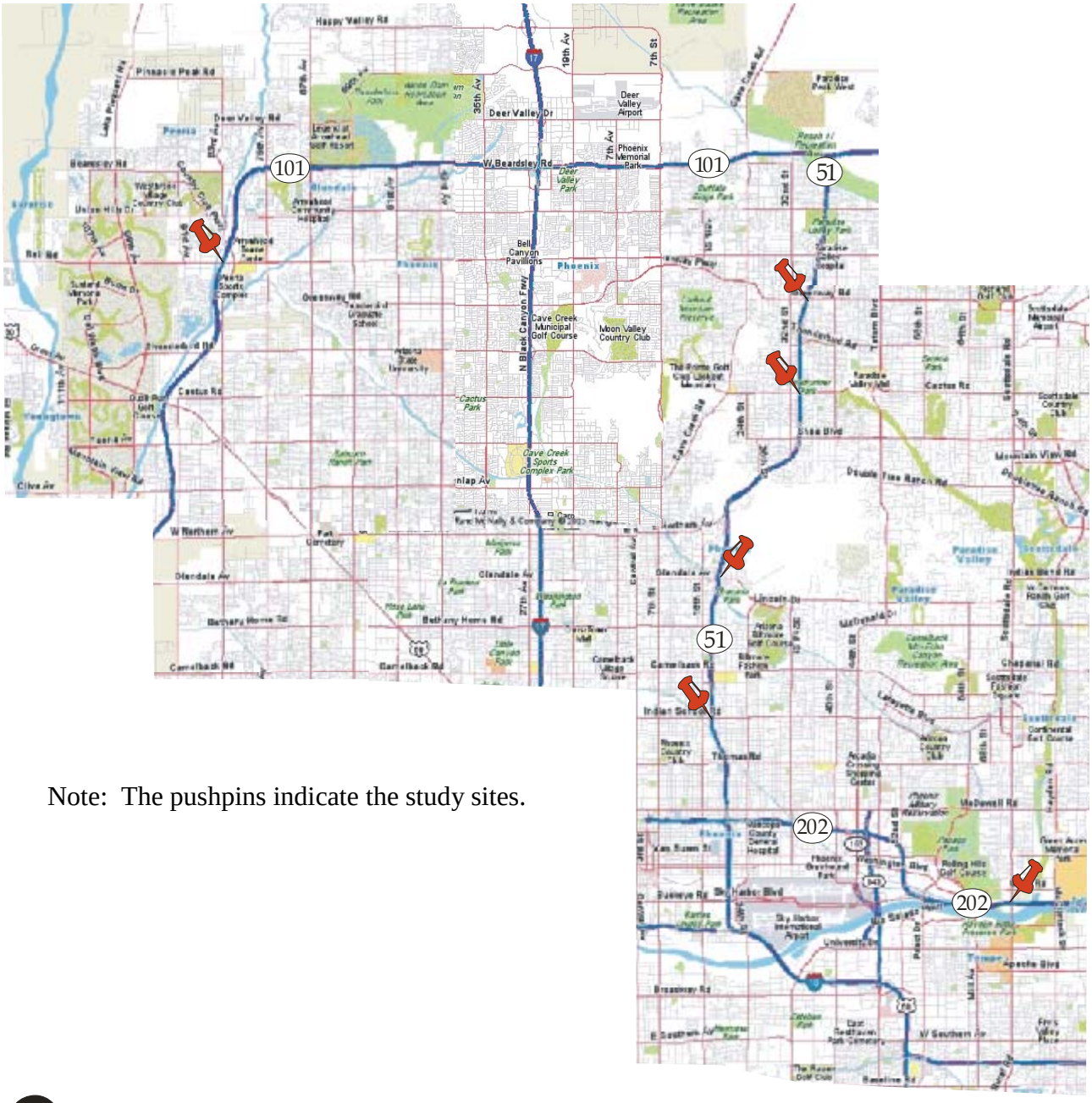
Ideally traffic data relating to volumes, operations, and safety would be readily at-hand for any number of subject sites. Without this luxury, some concessions had to be made in order to conduct this study. The number of interchange sites to be studied was limited by the funding available with acknowledgment that the more sites that were studied, the more useful and applicable the information would be. In order to supplement this constraint, the data collection effort was geared towards providing information that could be used to calibrate a micro-simulation model (CORSIM) that could then be used to evaluate a myriad of hypothetical SPUIs with varied traffic volumes/distributions and off-ramp traffic controls. Although these interchanges technically would not exist, their operation and subsequent evaluation would be a derivative of actual data collected as described in this chapter

## DATA COLLECTION EFFORT

The data collection activities were related to the two main aspects being evaluated in this study: off-ramp right turn operations and safety. All operational data were collected in-field over the course of several weeks in early 2004. Some of the in-field safety data were obtained through engineers' observations and recordings, but a significant portion of the safety-related data was from historical crash records. The following subsections describe the data collection process while subsequent sections report findings and calculations based on the data obtained.

### Study Site Selection

Six SPUI sites were selected for study in this research project. There were several criteria that controlled which sites would be viable. First and foremost, the SPUI had to be a "three-phase" (referring to the signal phasing necessary) configuration meaning it did not have frontage roads incorporated into its operation. The second criterion was that




Note: The pushpins indicate the study sites.

Not to Scale

**Figure 3. Study Sites**

the SPUI had to have sufficient crash history data available, i.e., be fully operational for at least three years. Applying these two criteria resulted in 17 potential sites in the Phoenix metropolitan area. The next level of filtering was based on the type of off-ramp right turn control used at the potential sites. Five of the seventeen sites had signalized off-ramp right turn controls, the remainder used yield control for the off-ramp right turn movement. The final selection of the six study sites was determined by the technical advisory committee (TAC) which relied on lane configuration information, pedestrian/bicycle activity, and local knowledge of the interchanges. The resulting study sites listed below provide a mixture of operation types and configurations commonly found in the Phoenix area:

- State Route 51 (SR 51) & Indian School Road
- State Route 51 (SR 51) & Glendale Avenue
- State Route 51 (SR 51) & Cactus Road
- State Route 51 (SR 51) & Greenway Road
- Loop 101 (Agua Fria Freeway) & Bell Road
- Loop 202 (Red Mountain Freeway) & Rural (Scottsdale) Road

Figure 3 shows the general location of the interchanges while Figures 4 through 9 are aerial photographs of each interchange. Table 1 shows the pertinent characteristic data for each interchange.

There are some important aspects to keep in mind when reviewing data, analysis, and findings concerning the selected study sites. Although a majority of the interchange sites were oriented with the freeway aligned north-south, the Loop 202/Rural Road interchange has the freeway aligned east-west. Also, the Loop 101/Bell Road and SR 51/Greenway Road interchanges have a skewed configuration, although the freeway generally aligns north-south. The freeway alignment could potentially affect driver vision caused by sun glare. Another difference between the interchanges that could factor into inherent interchange characteristics is the method of separating the freeway from the cross road. The interchange could be configured with the freeway passing over the cross road (an overpass interchange) or the freeway passing under the cross road (an underpass interchange). Either configuration may have advantages and disadvantages relating to interchange operations and safety. Half of the study sites selected were of the overpass interchange variety with two of these three sites also having signalized off-ramp right turn movements. Yet another variation was present at the SR 51/Glendale Avenue interchange where the northbound off-ramp right turn movement was controlled by a traffic signal and the southbound off-ramp right turn movement was yield-controlled. This mixture of off-ramp right turn traffic controls prompts particular attention to the analysis of the overall interchange operation while also providing a microcosm to potentially compare the two methods of control. Ideally the study site selection would have attempted to minimize, if not eliminate, these characteristic variables through consistency, but given the availability of potential study sites meeting the primary selection criteria stated previously, this was not possible.


*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

1' = 100'

**Figure 4. State Route 51 & Indian School Road Aerial Photograph**


1' = 100'

*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

**Figure 5. State Route 51 & Glendale Avenue Aerial Photograph**


*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

1' = 100'

**Figure 6. State Route 51 & Cactus Road Aerial Photograph**


*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

1' = 100'

**Figure 7. State Route 51 & Greenway Road Aerial Photograph**

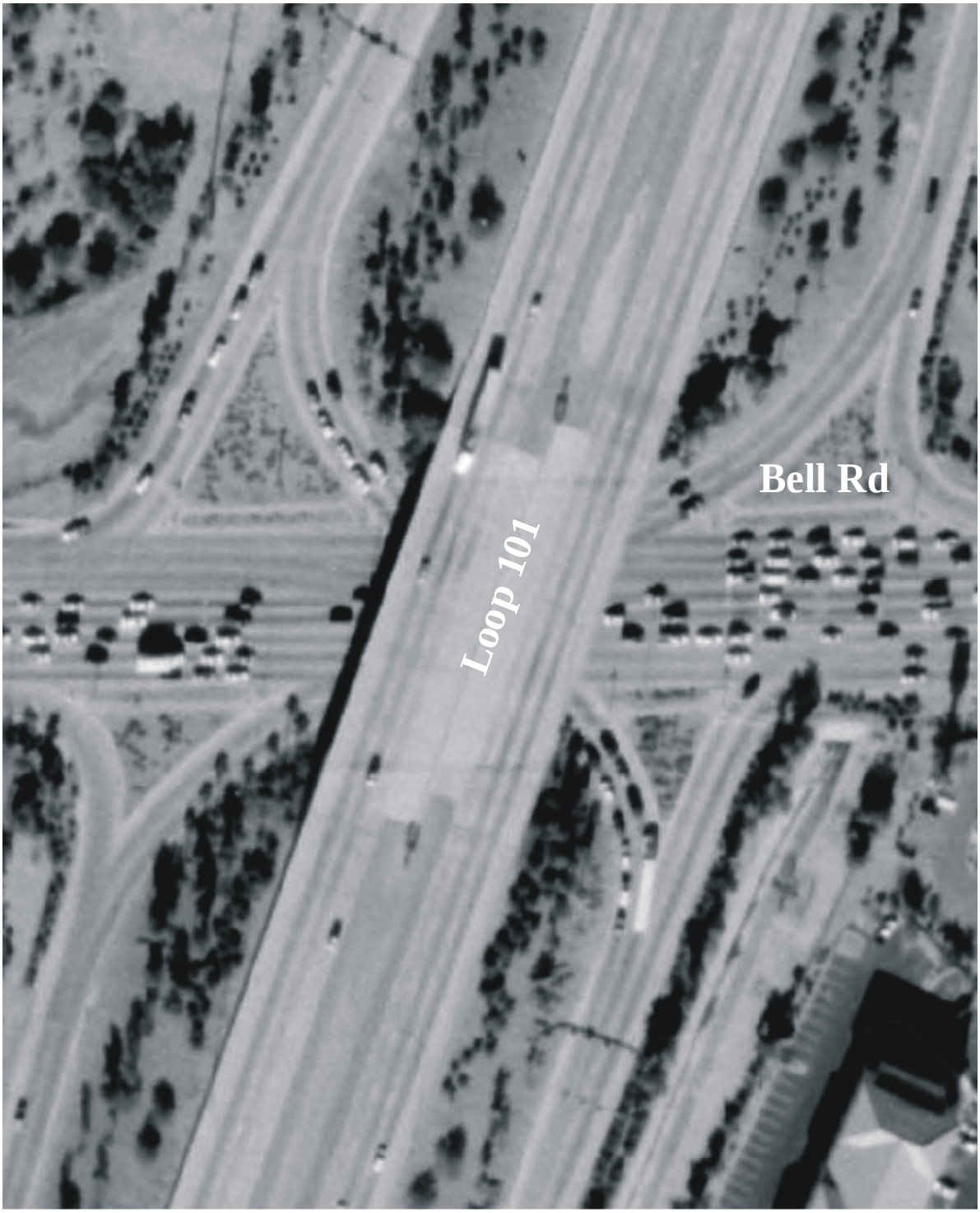
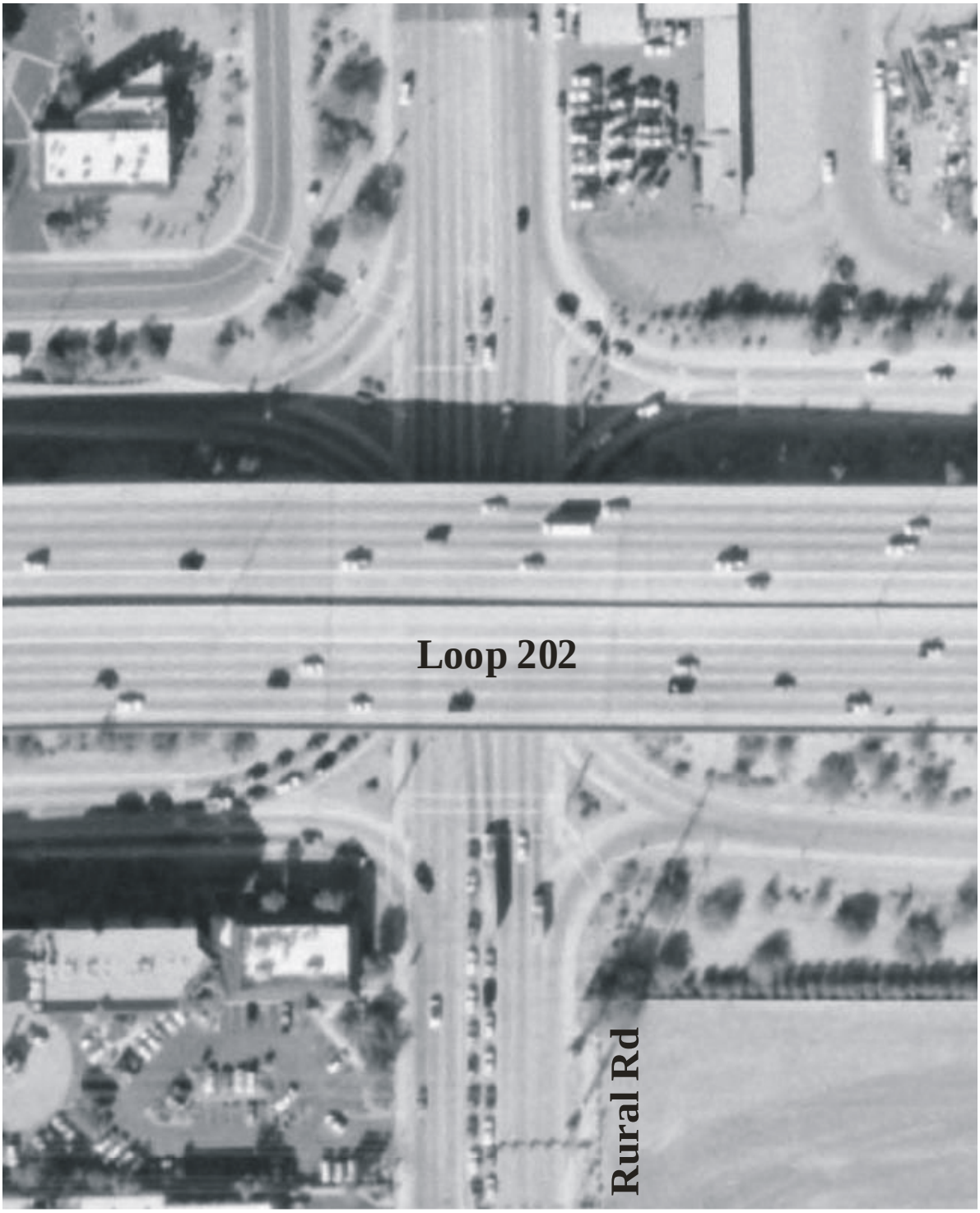



*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

1' = 100'

**Figure 8. Loop 101 (Agua Fria Freeway) & Bell Road Aerial Photograph**




1' = 100'

*Photo source: Maricopa County Assessor's Office*
*Photo date: December 2002*

**Figure 9. Loop 202 (Red Mountain Freeway) & Rural Road Aerial Photograph**

# Table 1. SPUI Study Sites Characteristic Data

| Intersection Location (Freeway Orientation) | Distance Between Cross Road Stop Lines (ft) | Off-Ramp Right Turn Control Type | Speed Limit (mph) | Lane Assignments (Left-Thru-Right) | Turn Bay Lengths (ft) | Right Turn Radius (ft) | Angle of Ramp Approach/Departure to Mainline (degrees) | Cross Road Thru & Off-Ramp Right Turn Loop Detectors | Loop Detector Distance from Stop Line/Crosswalk | Cross Road & Off-Ramp Left Turn Loop Detectors | Loop Detector Distance from Stop Line/Crosswalk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SR 51 and Indian School Rd (Overpass) | 315 | | | | | | | | | | |
| EB Indian School Road | | | 35 | 2-3-1 | L = 300, R = 250 | 60 | 90 | 2 x 40 (10' gap) | 6' downstream | 2 x 30 (10' gap) | 6' downstream |
| WB Indian School Road | | | 35 | 2-3-1 | L = 250, R = 300 | 60 | 90 | 2 x 40 (10' gap) | 6' downstream | 2 x 30 (10' gap) | 6' downstream |
| NB Off-ramp | | Signal | n/a | 2-0-1 | 360 | 75 | 90 | 2 x 30 (10' gap) | 6' downstream | 2 x 30 (10' gap) | 6' downstream |
| SB Off-ramp | | Signal | n/a | 2-0-1 | 325 | 75 | 90 | 2 x 30 (10' gap) | 6' downstream | 2 x 30 (10' gap) | 6' downstream |
| SR 51 and Cactus Rd (Underpass) | 240 | | | | | | | | | | |
| EB Cactus Road | | | 40 | 2-3-0 | L = 200, R= n/a | 70 | 95 | 2 x 40 (10' gap) | 5' upstream | 2 x 40 (10' gap) | 5' upstream |
| WB Cactus Road | | | 40 | 2-3-0 | L = 300, R= n/a | 60 | 95 | 2 x 40 (10' gap) | 5' upstream | 2 x 40 (10' gap) | 5' upstream |
| NB Off-ramp | | Yield | n/a | 2-0-1 | 125+150 | 80 | 90 | n/a | | not detectable | |
| SB Off-ramp | | Yield | n/a | 2-0-1 | 150+125 | 90 | 95 | n/a | | not detectable | |
| SR 51 & Glendale Rd (Underpass) | 215 | | | | | | | | | | |
| EB Glendale Road | | | 40 | 2-2-1 | L = 275, R = 250 | 75 | 85 | 2 x 40 (12' gap) | 6' downstream | 2 x 40 (12' gap) | 6' downstream |
| WB Glendale Road | | | 40 | 2-3-0 | L = 275, R = n/a | 100 | 85 | 2 x 40 (12' gap) | 6' downstream | 2 x 40 (12' gap) | 6' downstream |
| NB Off-ramp | | Signal | n/a | 2-0-1 | 350 | 60 | 90 | 1 x 30 | 5' downstream | 1 x 60* | 10' downstream |
| SB Off-ramp | | Yield | n/a | 2-0-1 | 375 | 125 | 95 | n/a | | 1 x 60* | 10' downstream |
| SR 51 and Greenway Rd (Underpass) | 305 | | | | | | | | | | |
| EB Greenway Road | | | 45 | 2-3-1 | L = 250, R = 225 | 100 | 75 | 2 x 40 (12' gap) | at stop line | 2 x 40 (12' gap) | at stop line |
| WB Greenway Road | | | 45 | 2-3-0 | L = 250, R = n/a | 100 | 75 | 2 x 40 (12' gap) | at stop line | 2 x 40 (12' gap) | at stop line |
| NB Off-ramp | | Yield | n/a | 2-0-1 | 160+100 | 50 | 115 | n/a | | 1 x 40 | at crosswalk |
| SB Off-ramp | | Yield | n/a | 2-0-1 | 200+100 | 65 | 115 | n/a | | 1 x 40 | at crosswalk |
| Loop 101 and Bell Road (Overpass) | 335 | | | | | | | | | | |
| EB Bell Road | | | 40 | 2-3-1 | L = 525, R = 500+ | 80 | 75 | not detectable | | not detectable | |
| WB Bell Road | | | 40 | 2-3-1 | L = 525, R = 100 | 80 | 75 | not detectable | | not detectable | |
| NB Off-ramp | | Signal | n/a | 2-0-2 | I = 200, O = 600 | 30 | 115 | not detectable | | not detectable | |
| SB Off-ramp | | Signal | n/a | 2-0-2 | I = 150, O = 700 | 100 | 120 | not detectable | | not detectable | |
| Loop 202 and Rural Rd (Overpass) | 315 | | | | | | | | | | |
| NB Rural Road | | | 40 | 2-3-1 | L = 250, R = 150 | 60 | 90 | not detectable | | not detectable | |
| SB Rural Road | | | 40 | 2-3-1 | L = 225, R = 150 | 80 | 90 | not detectable | | not detectable | |
| EB Off-ramp | | Yield | n/a | 2-0-2 | 550 | 70 | 90 | n/a | | 3 x 6 (0' gap)** | 10' upstream |
| WB Off-ramp | | Yield | n/a | 2-0-1 | 450 | 120 | 90 | n/a | | not detectable | |

Notes:
1. Lane Assignments - A zero for the right turn lane is a shared through-right turn lane.
2. Turn Bay Lenghts - L=left, R=right, I=inside right turn lane, O=outside right turn lane, XXX + XXX (exclusive right turn storage area + Shared storage area with left turn lane)
3. Loop detectors that were not detectable during field inspections were assumed to be pre-formed installations implemented during roadway construction. Assumed size/configuration was commensurate with other interchange locations

n/a = not applicable

* bridge deck seams interrupt loop pattern - equivalent size shown
** southern LT lane only

## Operations-Related Data

The data on interchange/off-ramp right turn operations has three elements: traffic volume, interchange signal timing/phasing, and off-ramp right turn specific delays. The procedures used to collect data on each of these elements are described below and the resulting information presented accordingly.

*Traffic Volumes*

Data relating to traffic volumes was fundamental to the evaluation of the study sites. Two-way daily traffic volumes were collected at each interchange with a majority of the other data collection efforts occurring simultaneously. The daily traffic volumes were collected using automatic traffic recorders (ATRs) which consist of a counter and pneumatic tube placed at selective locations within the interchange area. Specific volumes for the movements through the interchange were also recorded by data collectors for a one and a half hour period in the morning and evening. The resulting volumes are shown in Figures 10 through 15.

The number of right turns made on red from the off-ramp was recorded. Additionally, the number of heavy trucks was noted and used to calculate truck percentages for the interchange. The raw data from the turning movement and daily traffic collections are contained in the Appendix A.

The traffic volume data was collected in January 2004. Review of Arizona Department of Transportation (ADOT) seasonal adjustment factors revealed that January is one percent higher than the annual average month for the Phoenix area. Therefore, the volumes presented previously were adjusted downward by 1% prior to any computations being performed.

*Interchange Signal Timings*

Even though this study is specifically focused on the operations and safety related to the off-ramp right turn movements at SPUIs, the control employed at the off-ramp right turn can have an effect on the overall interchange efficiency. To account for this, signal timing information was required so that the entire interchange could be evaluated from an operations standpoint.

The overall interchange signal timing/phasing and the specific timing/phasing associated with the off-ramp right turn movement were collected from the governing agencies. Actual signal timing samples were recorded in the field in order to verify, to a certain degree, the information provided by the agencies. Generally, the in-field timing samples concurred with supplied timing information which was then used for calculations relating to delay and overall interchange operations via the CORSIM modeling.

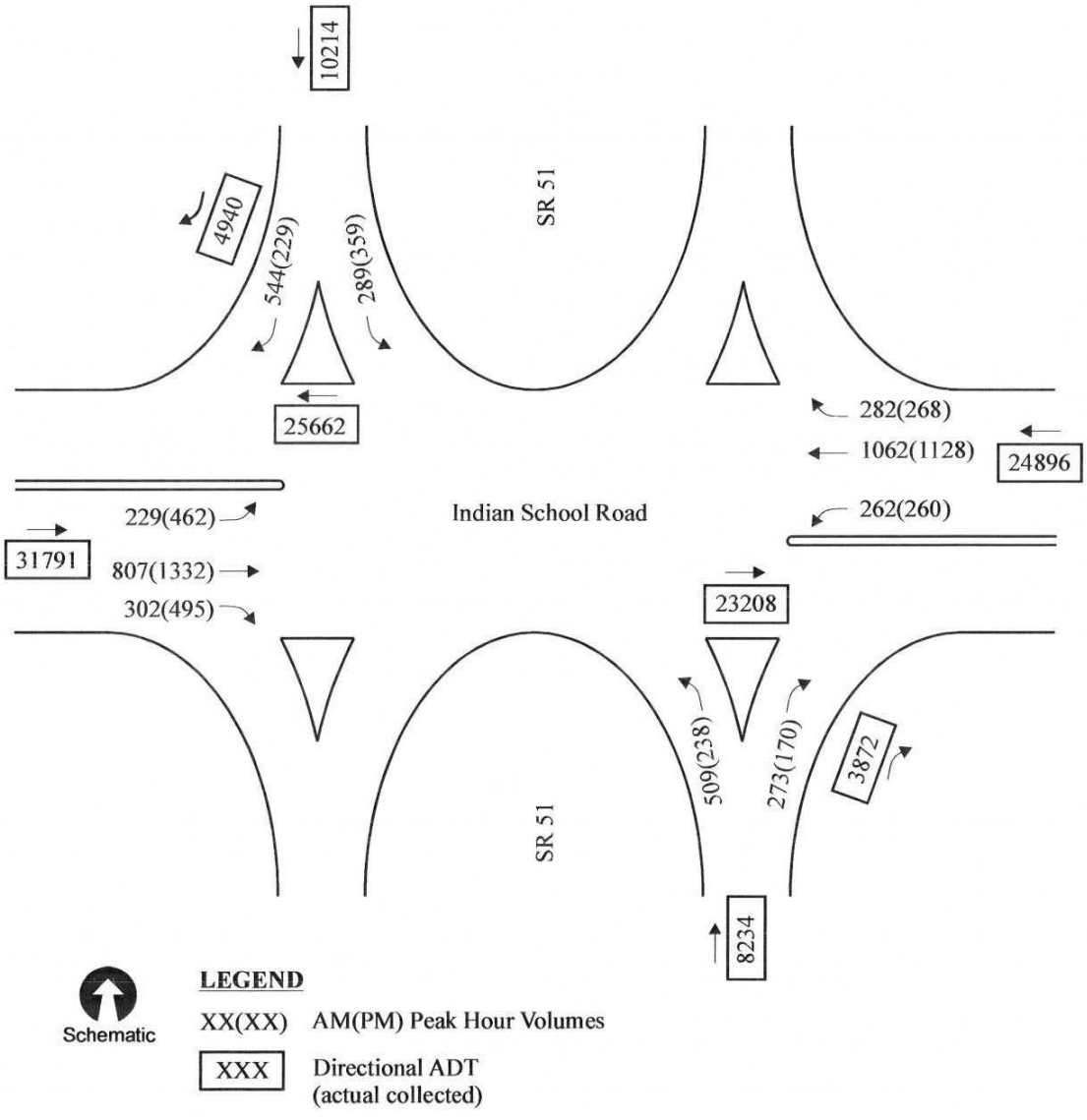



**Figure 10. Existing 2004 Volumes SR 51 & Indian School Road**

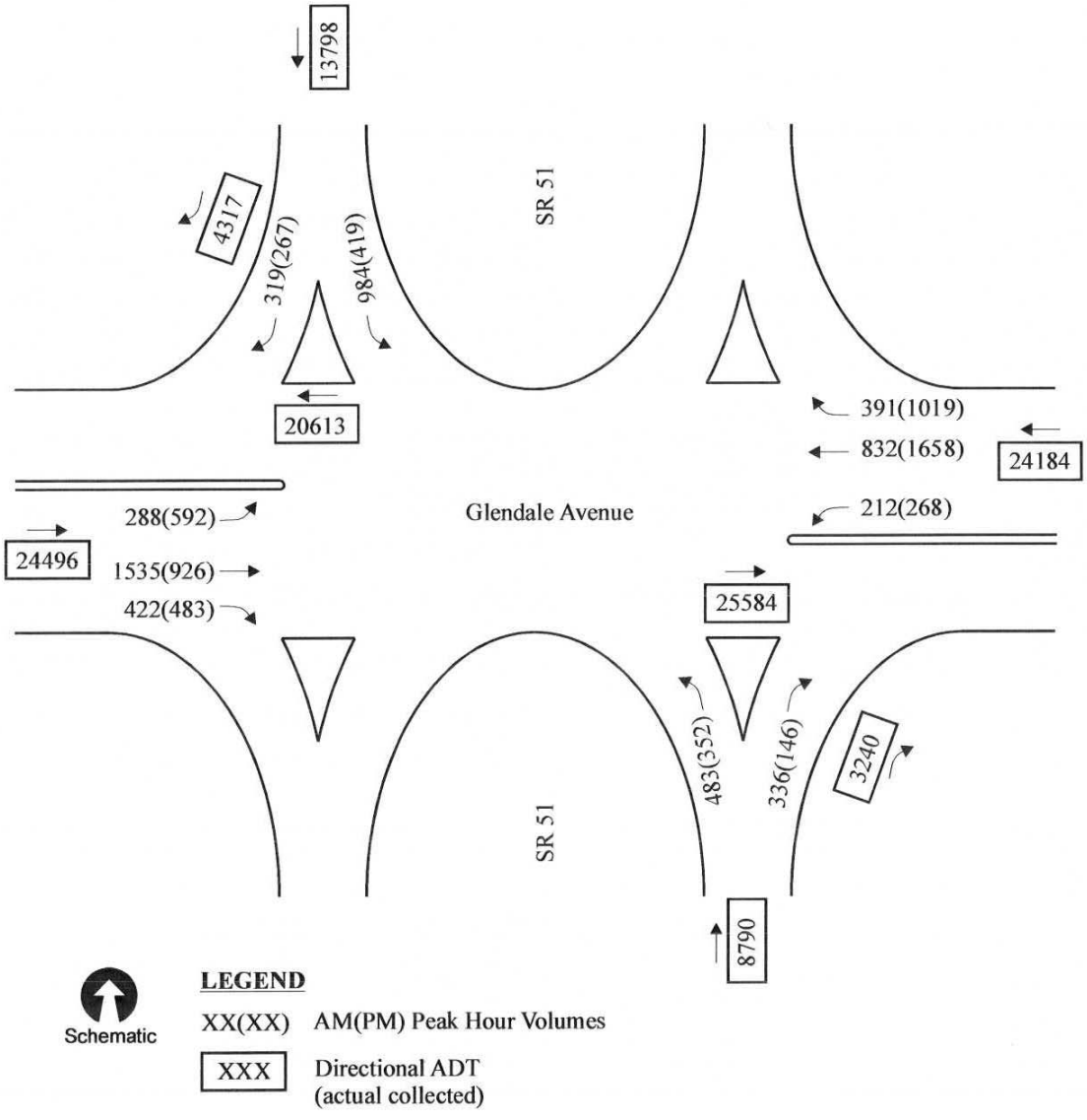



**Figure 11. Existing 2004 Volumes SR 51 & Glendale Avenue**

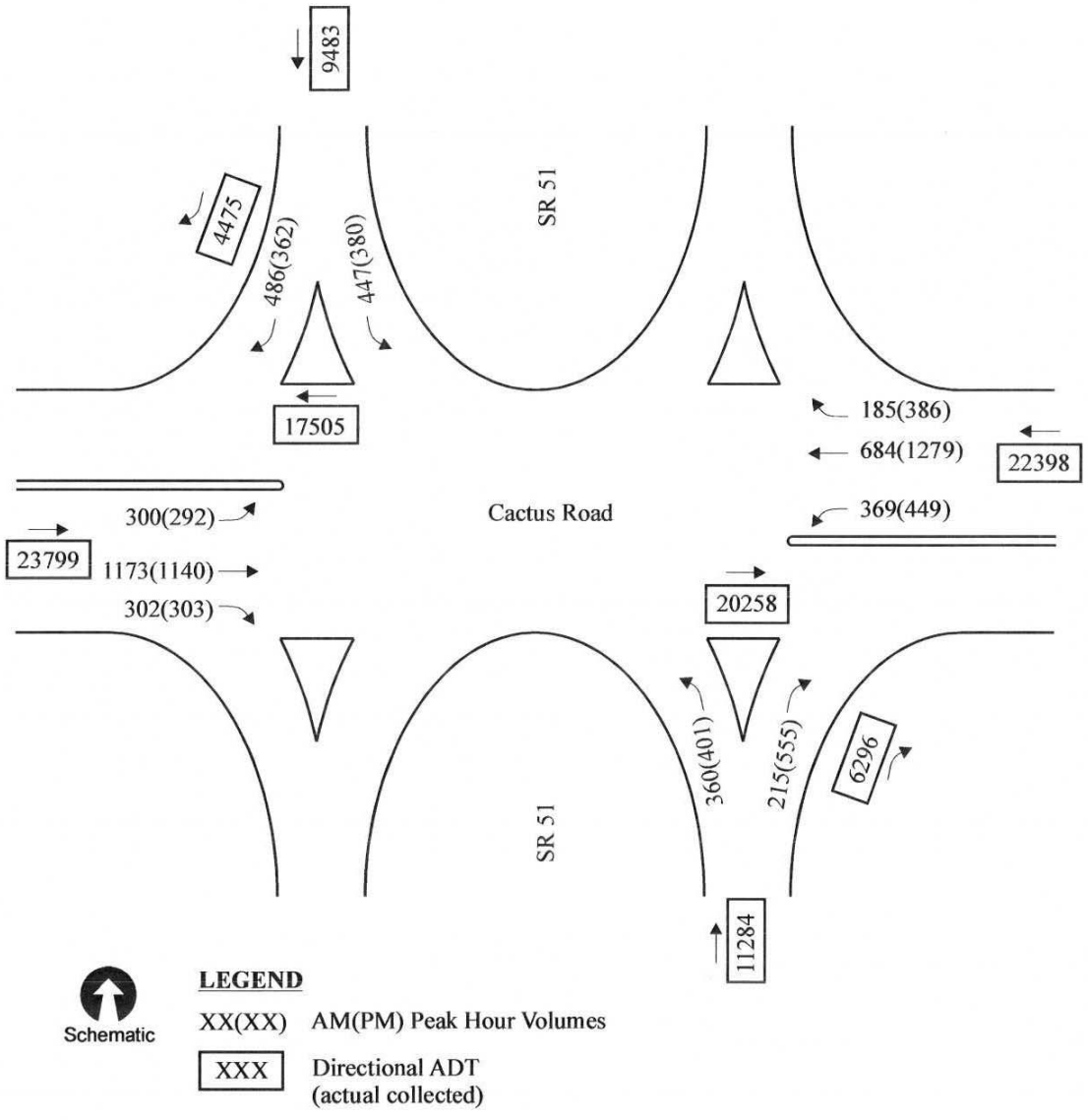



**Figure 12. Existing 2004 Volumes SR 51 & Cactus Road**

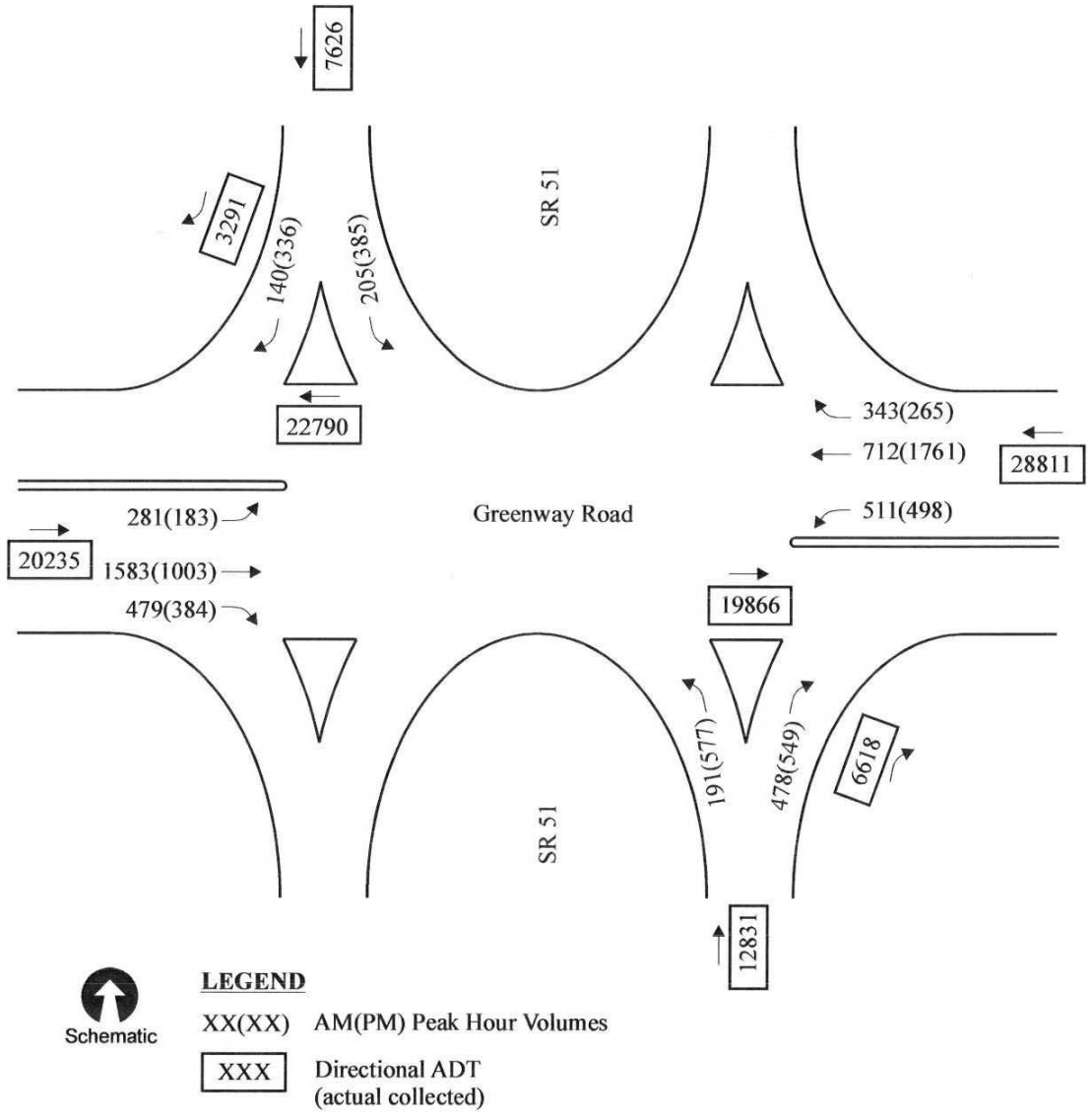



**Figure 13. Existing 2004 VolumesSR 51 & Greenway Road**

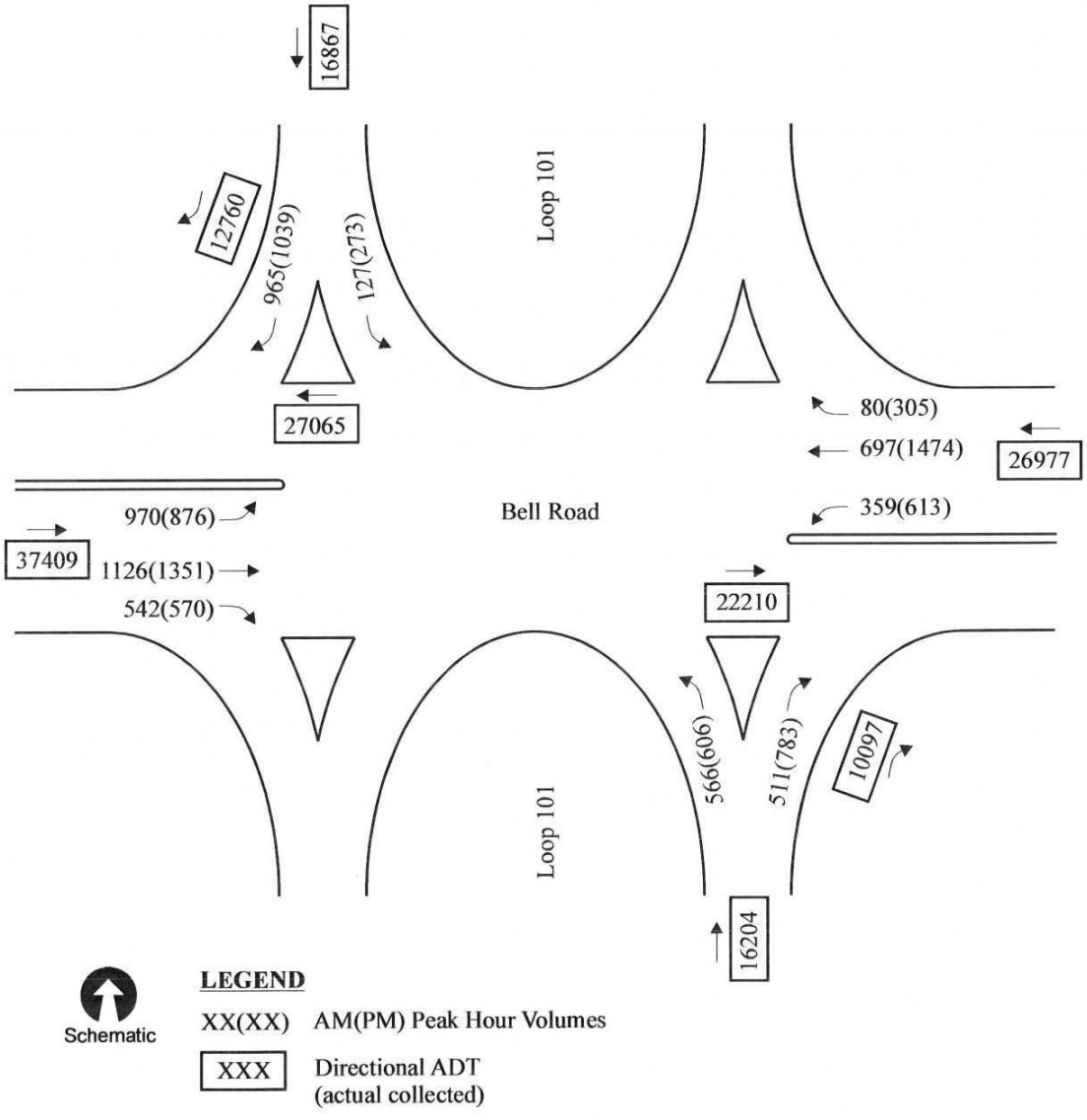



**Figure 14. Existing 2004 Volumes Loop 101 & Bell Road**

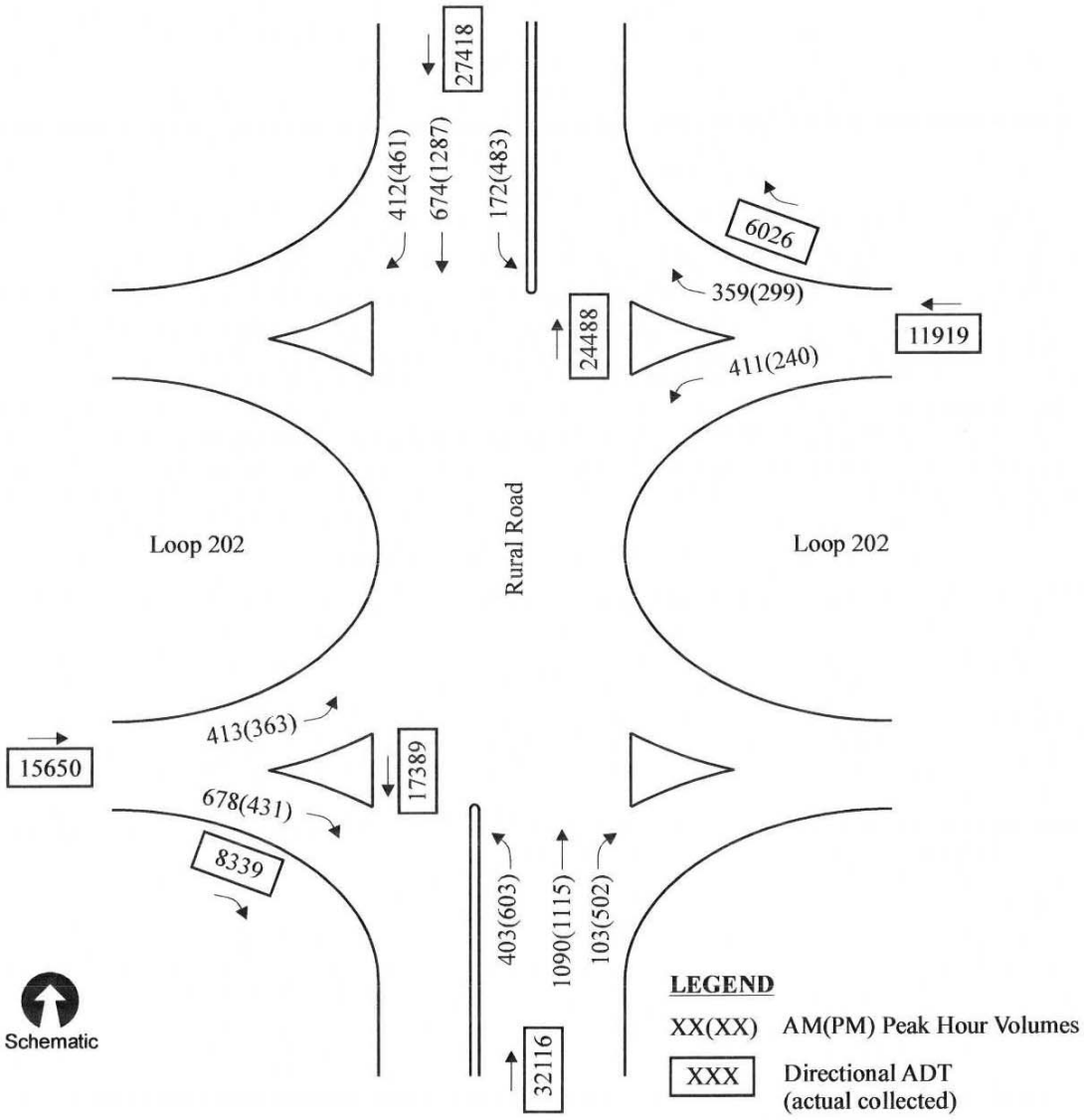



**Figure 15. Existing 2004 Volumes Loop 202 & Rural Road**

*Off-Ramp Right Turn Delay*

Particular attention was devoted to the off-ramp right turn movement operations during the data collection tasks. The primary indication of operational efficiency for the off-ramp right turn movement is the delay incurred by the motorist due to the control device, whether a signal or yield sign, and prevailing traffic conditions. In order to determine this average delay per vehicle, a data collection procedure from the *Highway Capacity Manual* (HCM) [12] was used as a guide. The procedure is primarily dependent on three components of traffic data: volume over a specified period of time, number of vehicles stopping during that time, and number of vehicles considered part of a queue in the off-ramp right turn traffic flow. The data collected was for the one and one-half hour peak periods in the morning and evening.

The traffic volume for the off-ramp right turn movement was collected in conjunction with the turning movements for the entire site. The number of off-ramp right turn vehicles that were counted as a vehicle that stopped was based on observing a vehicle come to a full stop at any point along the length of the off-ramp right turn lane(s) up to and including the junction point with the cross road. If the same vehicle stopped multiple times, it was only recorded as one stopped vehicle in the count total. Vehicles counted as being part of a traffic queue constituted any vehicle within one vehicle length of another vehicle, whether one or both vehicles were moving or stopped. Additionally, one off-ramp right turn vehicle waiting to turn right onto the cross road was considered a queue of one. These vehicle-in-queue determinations were assessed every 19 seconds per the HCM data collection guidelines, which require the interval to be any value up to 20 seconds so long as the interval does not divide evenly into the cycle length for the interchange. Nineteen seconds was selected as the observation interval because this interval value would not divide evenly into any of the signal cycle lengths used at the study sites. Observing/recording the traffic queues in this manner results in a random sample of values, which were then used in the calculation of the control delay for the movement.

**Safety-Related Data**

The analysis of the safety implications related to the off-ramp right turn control type was supported by data collected concerning conflicts observed and crash history investigations. Conflict observations were conducted by experienced traffic engineers, one positioned at each off-ramp right turn area, during the AM and PM peak periods. Crash histories were obtained for each interchange that has the off-ramp right movement only. Each of these data sets were then used in conjunction with the traffic volume data to determine both conflict and crash rates specifically related to the off-ramp right turn movement.

*Conflict Observations*

Although traffic crash records provide the most direct measure of safety for a roadway section, adequate data may not be available for analysis. Moreover, some crashes are not reported or records may be only available for a time period that does not represent current conditions at the study area. Therefore, conflict data specifically pertaining to the off-ramp right turn movements was obtained for the AM and PM peak periods at the study sites.

For the purposes of this study, a conflict was considered to be a traffic event involving two or more road users (i.e., vehicles, pedestrians, bicyclists, etc.), in which one or more user performs an abnormal or unusual action causing another or others to execute an abrupt or evasive maneuver to avoid a collision. The most common avoidance maneuver related to the off-ramp right turn movement is either abrupt braking or swerving to avoid a collision.

The decision concerning what traffic occurrence/situation constitutes a traffic conflict is subjective to some degree. In an attempt to minimize observer subjectivity, only experienced engineers conducted the conflict observations. The same two engineers were used at every study site location. The observation positions were chosen on a site-by-site basis based on whichever position provided the best vantage point to observe conflicts involving off-ramp right turn traffic interacting along the off-ramp or at the ramp junction with the cross road where the cross road traffic could also be involved. The following guidelines were used in identifying traffic conflicts:

- Secondary conflicts caused by an initial or primary conflict were possible at the study sites. If this occurred, a maximum of one secondary conflict was recorded and tabulated as a separate traffic conflict.
- Unusual occurrences due to the presence of ambulances, fire trucks, or police vehicles were identified but not included in the conflict observation tally.
- Example of non-conflict occurrence: a driver performing normal braking due to the presence of a yellow/red signal or resulting traffic queue.
- Example of a conflict occurrence: a driver who brakes abruptly to avoid a collision with a vehicle slowing for a yellow/red signal because they anticipated following the vehicle through the signal.

In order to assist with the observation and recording of traffic conflicts, a schematic key map was developed to identify the location of conflicts. The key map is shown in Figure 16 below. The numbered location areas are intended to be general in nature and to cover all areas of potential conflicts, although observations found that most conflicts were confined to one or two main areas. This same key map was also used for the crash history investigations.

When conflicts were observed, four items of information were recorded: the time, the location (per the key map), the types of road users and their associated movement, the avoidance actions taken, and a more detailed account (if necessary). Observed conflicts were recorded on standardized sheets used at each study site.

The data collected from the conflict observations will be presented in the Calculations section of this chapter in conjunction with the calculated conflict rate values.

*Crash History Investigation*

The crash history investigations used data from ADOT's Accident Location Identification Surveillance System (ALISS) database, which was queried for the most recent three-year

period of crash information (August 1, 2000 through July 31, 2003) at the time of the request. The query consisted of any crashes occurring specifically in the right turn lane(s) on the off-ramp or at the crossroad. Crashes reported as occurring on the cross road involving an off-ramp right turn vehicle were also included in the query request. The effective distance for the query was set at 300 feet from the off-ramp right turn/cross road junction point. The resulting number of crash records returned from the query was about 650 for the six interchanges (twelve off-ramps) for the three-year period.

The listing of crash records was then used to retrieve the actual crash reports from ADOT's Traffic Records Section. The actual crash reports were reviewed by traffic engineers to determine their applicability to the off-ramp right turn movement. Overall, only a small percentage (~2%) were found to be inapplicable and were thus removed from the crash record listing for the respective study site location. During the review of the crash reports, the location of the crash was noted according to the key map shown as Figure 16. This determination was somewhat subjective since the crash reports usually provided a sketch of the crash location relative to geometric aspects of the interchange. Generally, Area 3 was reserved for crashes occurring within one to two vehicle lengths of the junction point with the cross road in addition to crashes involving cross road traffic in the curb lane. Area 4 was reserved for other crashes occurring farther away, bounded by the gore point on the off-ramp. Tables 2-13 present the crash data totals.

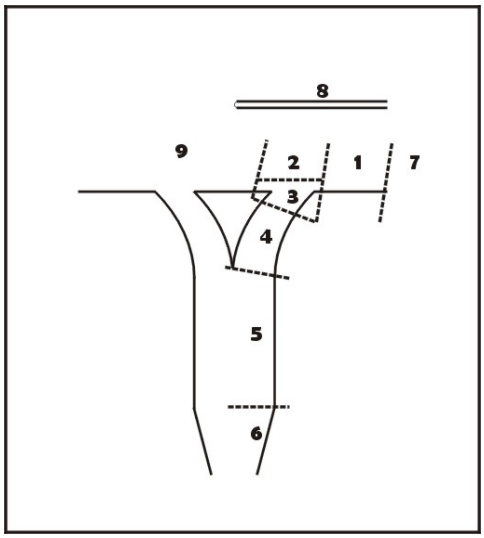



**Figure 16. Schematic Conflict/Crash Location Key Map**

**Table 2. SR 51/Indian School Road - Southbound Off-Ramp Right Turn Related Crashes**

| Signal Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **45** | **8** | **2** | **0** | **0** | **0** |
| **Rear-End** | 45 | 8 | 2 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 45 | 8 | 2 | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 3. SR 51/Indian School Road - Northbound Off-Ramp Right Turn Related Crashes**

| Signal Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **21** | **8** | **0** | **0** | **0** | **0** |
| **Rear-End** | 21 | 8 | 0 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 21 | 8 | | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 4. SR 51/Glendale Avenue - Southbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **55** | **11** | **3** | **0** | **0** | **0** |
| **Rear-End** | 51 | 11 | 2 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 51 | 10 | 1 | | | |
| Location 4 | | 1 | 1 | | | |
| **Sideswipe (same dir.)** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Single Vehicle** | 2 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | | | | |
| Location 4 | 2 | | | | | |
| **Angle** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Pedestrian-Involved** | 0 | 0 | 1 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | 1 | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 5. SR 51/Glendale Avenue - Northbound Off-Ramp Right Turn Related Crashes**

| Signal Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **9** | **1** | **0** | **0** | **0** | **0** |
| **Rear-End** | 9 | 1 | 0 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 8 | | | | | |
| Location 4 | | 1 | | | | |
| Location 6 | 1 | | | | | |

* Locations refer to Figure 16

**Table 6. SR 51/Cactus Road - Southbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **8** | **2** | **0** | **0** | **0** | **0** |
| **Rear-End** | 8 | 2 | 0 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 8 | 2 | | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 7. SR 51/Cactus Road - Northbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **70** | **28** | **2** | **0** | **0** | **0** |
| **Rear-End** | 65 | 28 | 2 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 57 | 24 | 2 | | | |
| Location 4 | 8 | 4 | | | | |
| **Sideswipe (same dir.)** | 2 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 2 | | | | | |
| Location 4 | | | | | | |
| **Single Vehicle** | 2 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 2 | | | | | |
| Location 4 | | | | | | |
| **Backing** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | | | | |
| Location 4 | 1 | | | | | |

* Locations refer to Figure 16

**Table 8. SR 51/Greenway Road - Southbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **3** | **0** | **0** | **0** | **0** | **0** |
| **Rear-End** | 3 | 0 | 0 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 3 | | | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 9. SR 51/Greenway Road - Northbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **46** | **17** | **2** | **0** | **0** | **0** |
| **Rear-End** | 46 | 17 | 2 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 41 | 16 | 1 | | | |
| Location 4 | 5 | 1 | 1 | | | |

* Locations refer to Figure 16

**Table 10. Loop 101/Bell Road - Southbound Off-Ramp Right Turn Related Crashes**

| Signal Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **34** | **7** | **3** | **0** | **0** | **0** |
| **Rear-End** | 30 | 6 | 3 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 27 | 5 | 3 | | | |
| Location 4 | 3 | 1 | | | | |
| **Sideswipe (same dir.)** | 3 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | 2 | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Backing** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Pedestrian-Involved** | 0 | 1 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | 1 | | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 11. Loop 101/Bell Road - Northbound Off-Ramp Right Turn Related Crashes**

| Signal Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **35** | **11** | **5** | **0** | **0** | **0** |
| **Rear-End** | 33 | 11 | 4 | 0 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 27 | 9 | 4 | | | |
| Location 4 | 6 | 2 | | | | |
| **Sideswipe (same dir.)** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Single Vehicle** | 0 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | | | | |
| Location 4 | | | | | | |
| **Backing** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |
| **Bicyclist-Involved** | 0 | 0 | 1 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | 1 | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 12. Loop 202/Rural Road - Westbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **75** | **19** | **2** | **2** | **0** | **1** |
| **Rear-End** | 70 | 19 | 2 | 2 | 0 | 0 |
| * Location 1 | | 1 | | | | |
| Location 2 | | | | | | |
| Location 3 | 67 | 18 | 2 | 2 | | |
| Location 4 | 3 | | | | | |
| **Sideswipe (same dir.)** | 2 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 2 | | | | | |
| Location 4 | | | | | | |
| **Single Vehicle** | 2 | 0 | 0 | 0 | 0 | 1 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 2 | | | | | |
| Location 4 | | | | | | 1 |
| **Angle** | 1 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | | | | | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

**Table 13. Loop 202/Rural Road - Eastbound Off-Ramp Right Turn Related Crashes**

| Yield Controlled (08/01/00 - 07/31/03) | No Injury | Possible Injury | Non-Incapacitating Injury | Incapacitating Injury | Fatality | Unknown |
|---|---|---|---|---|---|---|
| **TOTAL** | **79** | **23** | **4** | **2** | **1** | **0** |
| **Rear-End** | 70 | 22 | 4 | 2 | 0 | 0 |
| * Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 68 | 20 | 4 | 2 | | |
| Location 4 | 2 | 2 | | | | |
| **Sideswipe (same dir.)** | 6 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 5 | | | | | |
| Location 4 | 1 | | | | | |
| **Single Vehicle** | 2 | 0 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | | | | |
| Location 4 | | | | | | |
| Location 8/9 | 2 | | | | | |
| **Angle** | 1 | 1 | 0 | 0 | 0 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | 1 | 1 | | | | |
| Location 4 | | | | | | |
| **Bicyclist-Involved** | 0 | 0 | 0 | 0 | 1 | 0 |
| Location 1 | | | | | | |
| Location 2 | | | | | | |
| Location 3 | | | | | 1 | |
| Location 4 | | | | | | |

* Locations refer to Figure 16

If a particular type of crash was not listed in the above tables, then no crashes of that type were found to have occurred in the three-year assessment period. The crash types listed are based on the information noted by the officer on the actual crash report. The above data was used in conjunction with the volume data (or derivatives thereof) to calculate the crash rates for the off-ramp right turn movements at the study sites. These calculations along with other calculations pertaining to the data described and presented previously are explained and contained in the following section.

## CALCULATIONS

This section presents the calculations performed using the operational and safety data. The operational data collected specifically for the off-ramp right turn movement is used to calculate the control delay (i.e., the portion of overall delay that results when a vehicle slows or stops due to the presence of a traffic control like a signal or yield sign) for the movement in the AM/PM peak periods/hours. Conflict observations are used with volume data to determine conflict rates for existing conditions. The volume data and past projections of volumes are also used with the crash history data to determine off-ramp right turn movement crash rates for the three-year assessment period.

**Control Delay Calculations**

The calculation of the control delay for the off-ramp right turn movement is fairly complicated, relying on several factors and values supplied by tables in the HCM [12]. The general description of the calculation is shown below with the detailed description and an example provided in the Appendix B. The main components which are used to calculate the average control delay value per vehicle are:

**(1)** Time-in-Queue per Vehicle (seconds) =
(Count Interval [19 seconds] * (Sum of Vehicles Observed in Queue / Total Off-Ramp Right Turn Volume)) * 0.9 [HCM correction factor]

**(2)** Number of Vehicles Stopping Per Lane Per Cycle Length (vehicles) =
Number of Vehicles that Stopped One or More Times / (Number of Signal Cycles Observed * Number of Off-Ramp Right Turn Lanes)

**(3)** Acceleration/Deceleration Correction Delay Value (seconds) =
Ratio of Off-Ramp Right Turn Vehicles That Stopped * Acceleration/ Deceleration Factor [from HCM table—either +2 or +5 in this study based on the Equation 2 results and free-flow speed range estimate]

**(4)** Average Control Delay per Vehicle (seconds) =
Equation 1 + Equation 3

These calculation procedures were performed for each off-ramp right turn movement at the study sites regardless of the traffic control in place. Even though there was not a portion of the signal cycle length devoted to the off-ramp right turn movements where yield control was in place, the cycle length value for the interchange was still assumed in the control delay calculations. This assumption is based on the yield control operation being a derivative of gap acceptance in the cross road traffic stream for off-ramp right turn traffic. These gaps are created by the traffic pattern fluctuations and by the cycling of the overall interchange signal control. Control delay calculations for off-ramp right turn movements at signal and yield control sites are similar since most of the delay is generated as a function of gap acceptance: right turn on red at the signal control sites and yielding right-of-way at the yield control sites.

The calculated delay results are shown in Table 14 (p.44). Please note that calculations are provided for the peak *period* and the peak *hour*. Since the data component pertaining to number of vehicles that stopped one or more times was collected only for the peak period (i.e., the 1 ½ hour observation period), the peak hour value was pro-rated based on the proportion of time. Since the peak period and peak hour durations were relatively close, this assumption should not have a significant effect on the peak hour delay calculations. Other data collected and used in the control delay calculation was specified as to whether it pertained to the peak period and peak hour.

# Table 14. Control Delay for Off-Ramp Right Turn Movements

| | Off-Ramp Right Turn Signal Control | | | | | Off-Ramp Right Turn Yield Control | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Indian School Road | | Bell Road | | Glendale Ave | Cactus Road | | Greenway Road | | Rural Road | | Glendale Ave |
| | SB ORRT | NB ORRT | SB ORRT | NB ORRT | NB ORRT | SB ORRT | NB ORRT | SB ORRT | NB ORRT | WB ORRT | EB ORRT | SB ORRT |
| **ORRT Control Type** | Signal | Signal | Signal | Signal | Signal | Yield | Yield | Yield | Yield | Yield | Yield | Yield |
| **Overlap w/ Cross Road LT** | yes | yes | yes | yes | yes | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| **Sum of Vehicles in Queue[1]** | SB ORRT | NB ORRT | SB ORRT | NB ORRT | NB ORRT | SB ORRT | NB ORRT | SB ORRT | NB ORRT | WB ORRT | EB ORRT | SB ORRT |
| AM Period (7-8:30) | 698 | 218 | 1224 | 559 | 1319 | 217 | 412 | 91 | 872 | 296 | 601 | 181 |
| PM Period (4:30-6) | 173 | 175 | 2512 | 1075 | 133 | 424 | 613 | 695 | 488 | 249 | 473 | 306 |
| AM Peak (actual) | 474 | 186 | 874 | 421 | 945 | 159 | 303 | 61 | 716 | 258 | 457 | 119 |
| PM Peak (actual) | 119 | 109 | 1686 | 696 | 85 | 321 | 452 | 509 | 296 | 179 | 250 | 183 |
| **Vehicles That Stopped 1+ Times** | | | | | | | | | | | | |
| AM Period (7-8:30) | 488 | 223 | 674 | 423 | 456 | 230 | 293 | 81 | 413 | 282 | 530 | 223 |
| PM Period (4:30-6) | 141 | 157 | 1194 | 744 | 115 | 298 | 378 | 393 | 476 | 262 | 403 | 293 |
| AM Peak (pro-rated) | 325 | 149 | 449 | 282 | 304 | 153 | 195 | 54 | 275 | 188 | 353 | 149 |
| PM Peak (pro-rated) | 94 | 105 | 796 | 496 | 77 | 199 | 252 | 262 | 317 | 175 | 269 | 195 |
| **Total ORRT Vehicles** | | | | | | | | | | | | |
| AM Period (7-8:30) | 804 | 388 | 1375 | 718 | 486 | 649 | 301 | 203 | 681 | 468 | 987 | 513 |
| PM Period (4:30-6) | 336 | 290 | 1551 | 1167 | 204 | 502 | 805 | 498 | 841 | 458 | 647 | 431 |
| AM Peak | 544 | 273 | 965 | 511 | 336 | 486 | 215 | 140 | 478 | 359 | 678 | 319 |
| PM Peak | 229 | 170 | 1039 | 783 | 146 | 362 | 555 | 336 | 549 | 299 | 431 | 267 |
| **Control Delay/Vehicle Computations** | | | | | | | | | | | | |
| Number of ORRT Lanes | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| Count Interval (s) | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| **Calculations for Peak Period** | SB ORRT | NB ORRT | SB ORRT | NB ORRT | NB ORRT | SB ORRT | NB ORRT | SB ORRT | NB ORRT | WB ORRT | EB ORRT | SB ORRT |
| Control Delay/Total Vehicles (s) AM | 16.50 | 10.68 | 16.91 | 14.79 | 51.57 | 6.35 | 26.01 | 8.52 | 24.33 | 12.02 | 11.57 | 6.70 |
| PM | 9.78 | 11.47 | 30.77 | 17.50 | 12.39 | 16.05 | 14.47 | 26.52 | 11.02 | 10.33 | 13.89 | 13.49 |
| Control Delay/Stopped Vehicles (s) AM | 27.18 | 18.57 | 34.50 | 25.11 | 54.96 | 17.93 | 26.72 | 21.35 | 40.12 | 19.94 | 21.55 | 15.42 |
| PM | 23.31 | 21.18 | 39.97 | 27.45 | 21.97 | 27.03 | 30.81 | 33.60 | 19.48 | 18.06 | 22.30 | 19.84 |
| **Calculations for Peak Hour** | SB ORRT | NB ORRT | SB ORRT | NB ORRT | NB ORRT | SB ORRT | NB ORRT | SB ORRT | NB ORRT | WB ORRT | EB ORRT | SB ORRT |
| Control Delay/Total Vehicles (s) AM | 16.56 | 12.95 | 17.21 | 15.65 | 53.44 | 6.22 | 26.78 | 8.28 | 28.46 | 13.65 | 12.81 | 7.09 |
| PM | 9.87 | 12.18 | 30.83 | 16.89 | 11.06 | 16.85 | 15.47 | 28.78 | 10.24 | 11.37 | 11.02 | 13.02 |
| Control Delay/Stopped Vehicles (s) AM | 27.71 | 23.72 | 36.98 | 28.37 | 59.06 | 19.75 | 29.52 | 21.46 | 49.47 | 26.07 | 24.60 | 15.17 |
| PM | 24.05 | 19.72 | 40.24 | 26.66 | 20.97 | 30.65 | 34.08 | 36.91 | 17.74 | 19.43 | 17.66 | 17.83 |
| Note | Indian School Road | | Bell Road | | Glendale Ave | Cactus Road | | Greenway Road | | Rural Road | | Glendale Ave |

1 - Sum of queued vehicles sampled at 19-second intervals. Vehicle stopped more than 19 seconds would be counted more than once.

**KEY**

**ORRT** - Off-Ramp Right Turn; **OR** - Off-Ramp; **LT** - Left Turn; **NB** - Northbound; **SB** - Southbound; **WB** - Westbound; **EB** - Eastbound

## Conflict Rate Calculations

The conflict rate for the off-ramp right turn movement is the ratio of the number of conflicts occurring and the volume of traffic that could potentially be involved in the conflicts. The volume component is comprised of the cross road traffic (both through volume, and volume generated by the opposing off-ramp left turn movement) and the off-ramp right turn traffic. The conflicts and volume are summed for the same period of time and the resulting ratio is multiplied by 1,000 to equate the value of the rate to typical crash rate values. The calculation is shown below:

$$\textbf{(5)}\ RTCV = (CO / TCV) * 1000$$

where:

RTCV = Rate per thousand conflicting vehicles
CO = Conflicts observed
TCV = Total potentially conflicting vehicle volume

Table 15 presents the conflict data collected, the calculated conflict rates, and details concerning the locations of the conflicts observed.

**Table 15. Conflict Data and Rate Computations for Off-Ramp Right Turn Movements**

| | Interchange/Off-Ramp | Conflicts Observed AM & PM | Period Traffic | | Conflict Rate (RTCV*) | by location (see key map) | | | | Involving | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Off-Ramp | Cross Rd | | 1 | 2 | 3 | 4 | ped/ veh | bike/ veh | veh/ veh | other |
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 1 | 1033 | 3607 | 0.216 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| | Indian School/SR51 NB Off-Ramp | 0 | 558 | 3161 | 0.000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Glendale Road/SR51 NB Off-Ramp | 2 | 690 | 5687 | 0.314 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 |
| | Bell Road/L101(W) SB Off-Ramp | 3 | 2926 | 4843 | 0.386 | 0 | 0 | 2 | 1 | 0 | 0 | 3 | 0 |
| | Bell Road/L101(W) NB Off-Ramp | 4 | 1885 | 4181 | 0.659 | 0 | 0 | 4 | 0 | 1 | 0 | 3 | 0 |
| | **All Signal Control Off-Ramps** | **10** | **7092** | **21479** | **0.350** | **1** | **1** | **7** | **1** | **1** | **1** | **8** | **0** |
| Off-Ramp Right Turn Yield Control | Glendale Road/SR51 SB Off-Ramp | 3 | 944 | 4802 | 0.522 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 |
| | Cactus Road/SR51 SB Off-Ramp | 2 | 848 | 2724 | 0.560 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 0 |
| | Cactus Road/SR51 NB Off-Ramp | 7 | 770 | 3140 | 1.790 | 3 | 0 | 4 | 0 | 0 | 0 | 7 | 0 |
| | Greenway Road/SR51 SB Off-Ramp | 1 | 476 | 3241 | 0.269 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| | Greenway Road/SR51 NB Off-Ramp | 1 | 1027 | 3176 | 0.238 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | Rural Road/L202 WB Off-Ramp | 3 | 658 | 2981 | 0.824 | 1 | 0 | 2 | 0 | 0 | 0 | 3 | 0 |
| | Rural Road/L202 EB Off-Ramp | 7 | 1109 | 2612 | 1.881 | 3 | 0 | 4 | 0 | 0 | 0 | 7 | 0 |
| | **All Yield Control Off-Ramps** | **24** | **5832** | **22676** | **0.842** | **8** | **0** | **16** | **0** | **0** | **0** | **24** | **0** |

* RTCV = rate per thousand conflicting vehicles

Separate conflict rates for the AM and PM periods were not calculated due to limited sample size. Instead, the conflict observation totals were combined and applied against the total volume exposure over that collective duration. The conflict rate for the group of off-ramp right turn movements segregated by control type was based on the aggregate values of conflicts and volume instead of a simple average of the conflict rate values for each individual off-ramp right turn movement. By doing this, the average for the group is not biased as much by the variability of the conflict rate values caused by the relatively small sample sizes.

## Table 16. Crash Data and Rate Computations for Off-Ramp Right Turn Movements

| | Interchange/Off-Ramp | Yearly Crash Rate (per MEV) 8/1/00 to 7/31/01 | 8/1/01 to 7/31/02 | 8/1/02 to 7/31/03 | All Years Mean | Total Crashes |
|---|---|---|---|---|---|---|
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 1.62 | 1.84 | 1.86 | 1.77 | 55 |
| | Indian School/SR51 NB Off-Ramp | 1.26 | 1.21 | 0.74 | 1.07 | 29 |
| | Glendale Road/SR51 NB Off-Ramp | 0.28 | 0.28 | 0.38 | 0.31 | 10 |
| | Bell Road/L101(W) SB Off-Ramp | 1.09 | 0.97 | 1.22 | 1.10 | 44 |
| | Bell Road/L101(W) NB Off-Ramp | 1.64 | 1.20 | 1.86 | 1.57 | 51 |
| | **Mean Yearly Crash Rate, per MEV (All Signal Control, All Years)** | | | | **1.16** | |
| Off-Ramp Right Turn Yield Control | Glendale Road/SR51 SB Off-Ramp | 1.38 | 3.54 | 2.50 | 2.47 | 69 |
| | Cactus Road/SR51 SB Off-Ramp | 0.59 | 0.36 | 0.24 | 0.40 | 10 |
| | Cactus Road/SR51 NB Off-Ramp | 2.91 | 2.87 | 4.14 | 3.31 | 100 |
| | Greenway Road/SR51 SB Off-Ramp | 0.10 | 0.00 | 0.20 | 0.10 | 3 |
| | Greenway Road/SR51 NB Off-Ramp | 1.34 | 1.86 | 3.22 | 2.14 | 65 |
| | Rural Road/L202 WB Off-Ramp | 3.34 | 2.67 | 3.33 | 3.11 | 99 |
| | Rural Road/L202 EB Off-Ramp | 4.43 | 4.64 | 3.40 | 4.16 | 109 |
| | **Mean Yearly Crash Rate, per MEV (All Yield Control, All Years)** | | | | **2.24** | |

| | Interchange/Off-Ramp | Total Crashes | % of Total Crashes Occurring at*: Loc. 1 | Loc. 2 | Loc. 3 | Loc. 4 | Loc. Other |
|---|---|---|---|---|---|---|---|
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 55 | | | 100.0% | | |
| | Indian School/SR51 NB Off-Ramp | 29 | | | 100.0% | | |
| | Glendale Road/SR51 NB Off-Ramp | 10 | | | 80.0% | 10.0% | 10.0% |
| | Bell Road/L101(W) SB Off-Ramp | 44 | | 4.5% | 86.4% | 9.1% | |
| | Bell Road/L101(W) NB Off-Ramp | 51 | | | 84.3% | 15.7% | |
| Off-Ramp Right Turn Yield Control | Glendale Road/SR51 SB Off-Ramp | 69 | | | 94.2% | 5.8% | |
| | Cactus Road/SR51 SB Off-Ramp | 10 | | | 100.0% | | |
| | Cactus Road/SR51 NB Off-Ramp | 100 | | | 85.0% | 13.0% | 2.0% |
| | Greenway Road/SR51 SB Off-Ramp | 3 | | | 100.0% | | |
| | Greenway Road/SR51 NB Off-Ramp | 65 | | | 89.2% | 10.8% | |
| | Rural Road/L202 WB Off-Ramp | 99 | 1.0% | | 92.9% | 4.0% | 1.0% |
| | Rural Road/L202 EB Off-Ramp | 109 | | | 94.5% | 4.6% | 1.8% |

*refer to location key map

| | Interchange/Off-Ramp | Total Crashes | % of Total Crashes by Crash Type: Rear-End | Side-swipe | Single Vehicle | Backing | Angle | Ped/Bike | Other |
|---|---|---|---|---|---|---|---|---|---|
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 55 | 100.0% | | | | | | |
| | Indian School/SR51 NB Off-Ramp | 29 | 100.0% | | | | | | |
| | Glendale Road/SR51 NB Off-Ramp | 10 | 100.0% | | | | | | |
| | Bell Road/L101(W) SB Off-Ramp | 44 | 88.6% | 6.8% | | 2.3% | | 2.3% | |
| | Bell Road/L101(W) NB Off-Ramp | 51 | 94.1% | 2.0% | | 2.0% | | 2.0% | |
| Off-Ramp Right Turn Yield Control | Glendale Road/SR51 SB Off-Ramp | 69 | 91.3% | 2.9% | 1.4% | | 2.9% | 1.4% | |
| | Cactus Road/SR51 SB Off-Ramp | 10 | 100.0% | | | | | | |
| | Cactus Road/SR51 NB Off-Ramp | 100 | 95.0% | 2.0% | 2.0% | 1.0% | | | |
| | Greenway Road/SR51 SB Off-Ramp | 3 | 100.0% | | | | | | |
| | Greenway Road/SR51 NB Off-Ramp | 65 | 100.0% | | | | | | |
| | Rural Road/L202 WB Off-Ramp | 99 | 90.9% | 4.0% | 2.0% | | 1.0% | 1.0% | |
| | Rural Road/L202 EB Off-Ramp | 109 | 90.8% | 5.5% | 1.8% | | 1.8% | 0.9% | |

*Percentages may not add up to 100% within sections due to rounding*

| | Interchange/Off-Ramp | Total Crashes | % of Total Crashes by Injury: None | Possible | NIC | IC | Fatal | Unknown |
|---|---|---|---|---|---|---|---|---|
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 55 | 80.0% | 16.4% | 3.6% | | | |
| | Indian School/SR51 NB Off-Ramp | 29 | 72.4% | 27.6% | | | | |
| | Glendale Road/SR51 NB Off-Ramp | 10 | 90.0% | 10.0% | | | | |
| | Bell Road/L101(W) SB Off-Ramp | 44 | 77.3% | 15.9% | 6.8% | | | |
| | Bell Road/L101(W) NB Off-Ramp | 51 | 68.6% | 21.6% | 9.8% | | | |
| Off-Ramp Right Turn Yield Control | Glendale Road/SR51 SB Off-Ramp | 69 | 79.7% | 15.9% | 4.3% | | | |
| | Cactus Road/SR51 SB Off-Ramp | 10 | 80.0% | 20.0% | | | | |
| | Cactus Road/SR51 NB Off-Ramp | 100 | 70.0% | 28.0% | 2.0% | | | |
| | Greenway Road/SR51 SB Off-Ramp | 3 | 100.0% | | | | | |
| | Greenway Road/SR51 NB Off-Ramp | 65 | 70.8% | 26.2% | 3.1% | | | |
| | Rural Road/L202 WB Off-Ramp | 99 | 75.8% | 19.2% | 2.0% | 2.0% | | 1.0% |
| | Rural Road/L202 EB Off-Ramp | 109 | 72.5% | 21.1% | 3.7% | 1.8% | 0.9% | |

NIC - Non-incapacitating; IC - Incapacitating

### Crash Rate Calculations

The crash rate computations are similar to the conflict rate calculations, but are based on a more robust time and sample. One difference in the rate computations is that the resulting ratio of crashes to exposed volume is multiplied by one million rather than one thousand to account for the greater volume considered over the longer assessment period (in this case three years). Therefore, the crash rate is based on one million "entering" vehicles (MEV) with "entering" constituting off-ramp right turn traffic volumes and the traffic volume on the cross road immediately in front of the off-ramp right turn junction area. Table 16 presents the calculated crash rates and corresponding data summary.

In order to calculate specific yearly crash rates for each off-ramp right turn movement, additional volume data was obtained. Historical average daily traffic (ADT) volumes were researched from governing city and state resources. Usually data was available for the cross road on both sides of the interchange. Occasionally ADT data would only be available for the cross road on one side of the interchange. These data ranged in age from one to five years. All study sites had data pertaining to multiple years and so the most recent years were used to formulate an average growth (or decline) rate. The data collected in-field as part of this project served as the most recent value in the determination.

The calculated growth rates for the study sites ranged from about -3% to about 4% per year. The growth rate was applied to both the off-ramp right turn volume and cross road volume immediately in front of the off-ramp. This included actually increasing the volumes when projecting past yearly volume totals if the growth rate was a negative value. Representations of volumes for previous years were generated from applying the growth or decline rates to the existing volume data collected in 2004.

## CONCLUSIONS

The data collected and the details obtained from observations and research allowed for the calculations to be made concerning operations and safety. The interpretation of that data through the results of the calculations lends itself to determining interchange characteristics that influence operations and/or safety. One of these characteristics is the traffic control for the off-ramp right turn movement and is the focus of this study. Therefore, all of the calculation results have presented values that were grouped by the individual off-ramp traffic control device—either signal or yield. The presentation of the information in this manner allows trends specifically related to the traffic control used to surface. The following subsections provide interpretation of the previously presented data and highlight any trends and perspectives.

### General Operations

Qualitative observations of off-ramp right turn traffic operations were facilitated through the collection of conflict data. Other opportunities to observe and assess traffic operations were possible during the data collection effort for the off-ramp right turn

control delay study. The following list highlights some important points relating to either operation or safety (or both) for the study sites as a group:

- Motorists disregard the requirement to fully stop at a red signal indication when a signal control is used for the off-ramp right turn movement.
- Due to this motorist disregard, the only significant difference in the off-ramp right turn operations between signal control with right-turn-on red and yield control occurs during the limited portion of the overall interchange cycle length when the off-ramp right turn signal has a green arrow indication.
- The advantage of the green arrow phase associated with a signal-controlled off-ramp right turn movement was perceived to be minimal as compared to a yield-controlled off-ramp right turn movement since a fair amount of motorists were observed not paying attention to the green arrow indication either by 1) looking upstream along the cross road (away from the signal indication) or 2) stopping/slowing in advance of the cross road (in preparing to look upstream) despite the green arrow indication.
- Motorists' tendencies to look upstream along the cross road while advancing towards or being at the junction area (for either signal or yield controlled off-ramp right turn movements) causes hardship on pedestrians attempting to cross the off-ramp right turn lane(s), particularly when crossing from the motorist's right side. This is especially evident at sites using dual off-ramp right turn lanes.
- Pedestrian signal indications can be hazardous when the WALK indication is given to a pedestrian crossing the off-ramp right turn lane(s) from the right of the motorist since off-ramp right turn vehicles are either attempting to turn right on red or yield which is dependent on gaps in the cross road traffic flow. To assess these gaps, the motorist must look in the opposite direction from the pedestrian. This is especially evident at signalized off-ramp right turn locations where the WALK indication is given as soon as the cross road traffic receives its green indication. The width of the interchange coupled with start-up time losses for the cross road through traffic results in the creation of a sufficient gap for off-ramp right turn traffic to enter the cross road on red at the same time the pedestrian WALK indication is given.
- Generally, queue lengths for the off-ramp right turn and off-ramp left turn movements were not long enough to block access to either movement's lane(s). If blockage occurred, it was usually the build-up of off-ramp left turn vehicles blocking the off-ramp right-turn vehicles, which could then usually pass the queue by using the paved shoulder area existing outside of the lane line.
- Heavy off-ramp right turn conditions, primarily at signalized off-ramp right turn locations, would prompt frustrated motorists to try to take every opportunity to enter the cross road by turning during the limited change interval duration between interchange signal phases. This would occasionally lead to off-ramp turn vehicles turning onto the cross road during the end of (or after) the change interval time and narrowly in front of an advancing platoon of vehicles from the cross road through movement or opposing off-ramp left turn movement.
- Some motorists showed the tendency to want to follow the actions of the vehicle immediately in front of them which led to or had the potential to lead to the lag vehicle entering the cross road during insufficient gaps and/or without looking upstream along the cross road.

- Data showed that motorists tended to use the outside (curb) lane about twice as much as the inside lane at the study sites that had dual off-ramp right turn lanes.
- There were some observations of motorists blatantly disregarding the red signal indication at signalized off-ramp right turn locations when they approached the junction area immediately after the yellow arrow phase. Perhaps these motorists were taking advantage of the longer clearance interval at the interchange (as compared to a typical intersection).
- Due to the approach angle of some off-ramp right turn lanes, vehicle deflection (and subsequent speed reduction) were not as enhanced leading to motorist tendencies to continue at their off-ramp speed rather than slowing down to assess the cross road traffic conditions.
- Regularly, off-ramp right turn vehicle queuing would block pedestrian access to the crosswalk across the off-ramp right turn lane(s). This is especially evident at sites using dual off-ramp right turn lanes since the outside lane vehicle must pull closer to the cross road in order to try to see around the off-ramp right turn vehicle occupying the inside off-ramp right turn lane.
- U-turns from the cross road left turn lane could and did conflict with some off-ramp right turn vehicles attempting to turn at the same time. Traffic signs explicitly restricting U-turns from the cross road left turn lane were not observed at any of the sites.

**Control Delay**

Review of the information and results shown in Table 14 yields some interesting observations. The following are some of the key points derived from the review of the information when considering the different off-ramp right turn traffic control types:

- No discernable trends of increased control delay per vehicle associated with a particular peak time or particular direction when considering all sites.
- Average Control Delay per Vehicle for the AM & PM Peak Period (and Hour)
  - Number of signalized off-ramp right turn movements with average delay of 30+ seconds: 2 off-ramps (2 off-ramps)
  - Number of yield-control off-ramp right turn movements with average delay of 30+ seconds: 0 off-ramps (0 off-ramps)
- Longest Control Delay per Vehicle by Control Type
  - Northbound Off-Ramp Right Turn at SR 51/Glendale Avenue (signal control)—AM Peak Period (and Hour): 51.57 seconds (53.44 sec.)
  - Southbound Off-Ramp Right Turn at SR 51/Greenway Road (yield control)—PM Peak Period (and Hour): 26.52 seconds (28.78 sec.)
- Non-weighted Traffic Control Group Averages of Control Delays for Combined Peaks
  - Signal Control – per Total Vehicles, Peak Periods (and Hours): 19.24 sec. (19.66 sec.)
  - Signal Control – per Stopped Vehicles, Peak Period (and Hours): 29.42 sec. (30.75 sec.)
  - Yield Control – per Total Vehicles, Peak Periods (and Hours): 14.38 sec. (15.00 sec.)

- Yield Control – per Stopped Vehicles, Peak Periods (and Hours): 23.87 sec. (25.74 sec.)

**Conflict Rate Comparison**

Conflict data was presented in Table 15 which also included the calculated rates. The overall rates for the control type groups were based on a recalculation of the conflict rate using the summed values for each sample site. An overall average of the crash rates calculated for each site was not deemed appropriate given the variability inherent to conflict observations based on the relatively short observation period as compared to crash rate calculations. The following list remarks on the findings:

- Conflict rates for yield-controlled sites as a group are about 240% greater than the overall rate for the signal-controlled group. However, a statistical t-test reveals that this difference is not significant ($t_{calc} = 1.705$, $t_{.05, v=10} = 1.812$) because of the variability of the conflict rates at the yield control sites and the small sample size.
- Thirty-two of the thirty-four total conflicts involved two or more vehicles while the remaining two conflicts involved vehicles and bicycles/ pedestrians, which were only observed at signalized off-ramp right turn sites (representing 20% of the conflicts observed at signalized locations).
- Most conflicts occur in Area 3 (refer to Figure 16) regardless of the off-ramp right turn control type. However one-third of the conflicts observed at yield-controlled sites occurred in Area 1.
- The highest conflict rates (per thousand conflicting vehicles) calculated for the individual sites were for the eastbound off-ramp right turn at Loop 202/Rural Road (1.881) and the northbound off-ramp right turn at SR 51/Cactus Road (1.790). These sites also had the largest number of occurrences outside of Area 3, which were in Area 1.

**Crash Rate Comparison**

Crash data is more robust than the data used to calculate conflict rates. Therefore, the results and conclusions drawn from the crash data should be more indicative of longer-term trends and conditions at the site. The crash data and conflict should be used simultaneously to draw conclusions concerning a particular site and what cause(s) might be contributing to them. The crash information per site was presented in Tables 2 through 13 with a summarization and calculated crash rates shown in Table 16. Overall crash rates for the control type groups were the averaged values of the three-year average crash rate for each site in the group. The following conclusions were developed from the review of this information:

- The average crash rate for yield-controlled sites as a group is almost double the average crash rate for the signal-controlled sites. This ratio is comparable to the conflict rate relationship between the two groups.

- A statistical t-test was performed on the average crash rate data for the yield-controlled sites and the signal-controlled sites. All crash rates were considered, which resulted in no significant difference in the average rates for each group.
- The two sites with the highest average crash rate over the three-year assessment period are also the two sites with the highest conflict rates (eastbound off-ramp right turn at Loop 202/Rural Road and northbound off-ramp right turn at SR 51/Cactus Road).
- The proportion of crashes occurring in Area 3 support the conflict observations that showed this being the most prevalent location for conflict occurrence. However the crash data does show a fair number of more crashes occurring in Area 4 than conflicts observed in the same area.
- The percentage of serious injury crashes (non-incapacitating or worse) for the signal control group (5.3%) is similar to the percentage for the yield-control group (4.0%). However, crashes involving incapacitating injuries and fatalities were found to have occurred at yield-controlled sites only.
- Rear-end crashes are dominant at sites with either control type. There was greater variety of the remaining crash types found to occur at the yield-controlled sites.
- There were a couple of anomalies that were noticed upon reviewing the crash data and rates:
    - The rates on southbound off-ramp right turn movements from SR 51 at Greenway and Cactus Roads were very low when compared to other similar sites (0.10 and 0.40 crashes per million entering vehicles, respectively). It was determined that although these interchanges had been fully operational for three years, the connectivity of SR 51 to the north was limited during this span of time (i.e., the freeway terminated at Bell Road, one mile north of Greenway Road). The crash rates for these sites were calculated on a projection of previous off-ramp right turn traffic using current volume data. However, the current off-ramp right turn volumes are substantially different now as compared to the three-year assessment period since SR 51 extends past Bell Road and connects with Loop 101 today. For the three-year assessment period there was probably very little demand to exit off of southbound SR 51 since the motorist would have just entered onto the freeway one or two miles north of these sites. A sensitivity analysis of the projected off-ramp right turn volume used in the crash rate calculations revealed that drastic reductions in off-ramp right turn volumes to represent the past year conditions only cause minimal increases in the three-year crash rate average for the sites (no change in average at the Greenway interchange and a 0.05 increase at the Cactus interchange).
    - The next anomaly concerns the extreme difference between the average crash rate for the signalized northbound off-ramp right turn at Glendale Avenue and the other signal-controlled off-ramp right turn sites. The average crash rate for the northbound off-ramp right turn site at Glendale Avenue is about 77% lower than the average of the other four signal-controlled off-ramp right turn sites. It does not appear that the lower rate can be attributable to under-reporting of crashes by the responsible law enforcement because the southbound off-ramp right turn crash rate at Glendale Avenue is about

average for the yield-controlled sites. A more likely theory is based on this off-ramp right turn movement being the most congested of all the study sites in the AM peak period. The congestion is caused in part by the cross road only having two eastbound through lanes—the only study site to have such configuration (the others have three through lanes on the cross road). The off-ramp right turn congestion would cause the overall speeds along the off-ramp right turn lane to be reduced due to extensive queuing, which in turn promotes a longer time to react to potential conflicts, namely abrupt braking since all crashes at this site were rear-ends. The cross road congestion also virtually eliminates the opportunities for off-ramp right turn vehicles to turn right on red, so that the off-ramp right turn traffic is usually only turning during times of least potential conflict.

# CHAPTER 3
# OPERATIONAL ASSESSMENT OF DIFFERENT TYPES OF OFF-RAMP RIGHT TURN CONTROL AT SINGLE POINT URBAN INTERCHANGES (SPUI) WITHOUT FRONTAGE ROADS

## INTRODUCTION

This chapter describes the approach, process steps, and analysis results from the operational assessment of different off-ramp right turn controls at SPUIs. The results of this assessment will be used in concert with the safety evaluation and conclusions previously presented to develop suggestions on appropriate control types for off-ramp right turn movement. This information will be presented as a final summarization chapter as part of this report. Four control type scenarios were examined during the process—two variations on signal control and two involving yield control. An iterative analysis process involving a range of off-ramp and interchange volume conditions was used to determine overall operational effectiveness of each control scenario. Data collected at several SPUI sites provided actual data that was used to calibrate a micro-simulation model (CORSIM) that was then used to evaluate numerous combinations of traffic volume conditions and off-ramp control types that would have not been possible to collect at actual SPUI locations.

## CALIBRATION OF CORSIM MODEL

In order to effectively use CORSIM to simulate actual traffic conditions, it is best to use actual data to calibrate the software parameters governing the model so that it returns results in line with actual traffic conditions. The data collection undertaken to provide this data was described in the previous chapter. The base CORSIM model representing a SPUI (without frontage roads) was calibrated to create six new models representing the six study sites. The latest version of CORSIM, version 5.1 [13], was used to simulate the interchange operations because it can produce measures of effectiveness (MOEs), like control delay, for each movement on a particular link of the network representing the SPUI. This was particularly important for this project since the evaluation of signalized off-ramp right turn operations would involve a network link accommodating both the off-ramp left and right turn movements. Previous versions would not produce output results for control delay by movement. To promote subsequent comparisons that will be particularly focused on the effects of the off-ramp right turn control type, all six interchanges were represented by the same arrangement of network links, except for any network components intended to vary in order to represent the particular off-ramp right turn control types.

**Modeling of Off-Ramp Right Turn Lanes**

*Signal Control*

The off-ramp right turn lanes for a particular SPUI model were designed differently depending on the traffic control used for the movement. For signalized off-ramp right turn control, the right turn movement shares a network link with the off-ramp left turn movements. These movements could not be separated onto distinct entry links because CORSIM is limited to five entry links for the single signal controlling the interchange model—separate links for the off-ramp right turn movements would have created six entry links.

*Yield Control*

In the case of yield controlled off-ramp right turn movements, there was another adjustment to the model network that was necessary. CORSIM does not allow yield (or other sign control) and signal controlled movements to operate at the same node (in these models, the interchange signal control is located at the central node for the network where all entry and exit links connect). Therefore, to represent yield control of the off-ramp right turn movement, separate links and nodes were created to represent the off-ramp right turn lane(s). This accommodation then brought about another item to address. A separate link serving the off-ramp right turn movement would not be able to be positioned at its realistic location with respect to the interchange because the relatively close proximity to the center of the interchange would create a short upstream link as part of the cross street. Gap-acceptance movements (e.g., yield and right turn on red) in the simulation are driven by CORSIM's interpretation of acceptable gaps in the traffic immediately upstream from the intersection node—in this case, the off-ramp right turn movement intersection node with the cross street. Very short upstream links are interpreted by CORSIM as a very large gap when no traffic is present on that link. If this is the case, then the off-ramp right turn movement would have an unrealistically high movement rate. The only recourse to solve this issue is to orient the off-ramp right turn movement link so that it intersects with the cross street a sufficient distance away from the central interchange node. A separation distance of 610 feet was used and was determined by calculating the equivalent distance for normal gap acceptance behavior within the CORSIM environment when considering the cross street traffic traveling at 45 miles per hour.

*Dual Off-Ramp Right Turn Movements*

When a dual turn movement is provided in CORSIM, the program attempts to balance traffic volumes between the two lanes making up the turn movement. However, in actual field conditions, drivers may tend to prefer one lane over another based on future downstream turn movements, convenience, or preference for turning right from the right-most lane, especially with right turns on red. Field observations showed that about twice as many drivers tended to use the right-hand lane when turning right from the off-ramp that had two right turn lanes regardless of off-ramp right turn control. To account for this behavior, the two off-ramp right turn lanes were assigned as a "right" lane (for the right-hand lane) and a "through" lane (for the left-hand lane) although both only allowed for a

right turn movement onto the cross street. This convention allowed the proportioning of the right turn traffic volume between the two lanes according to the field data. The drawback to this approach is that the left-hand right turn lane would not be permitted to turn right on red in the signal control scenarios (the yield control scenarios were not adversely affected), which is not too far removed from actual driver behavior when faced with a right on red from the left-hand lane of a two lane approach.

**CORSIM Parameters and Distributions**

For the most part, the default traffic flow parameters used in CORSIM were determined to provide a reasonable representation of traffic flow at the six modeled interchanges. A few changes were implemented to further refine the model operations in their simulation of actual conditions and results. These changes are outlined below.

*Turn Speeds*

Left turn movement speeds at SPUIs typically are fairly high as compared to a normal intersection, so the maximum available speed of 44 feet per second was used as the turning speed for left turn traffic. A right turn speed of 19 feet per second was input for right turns that shared a network link with left turns. The CORSIM-determined right turn speeds for links that only accommodated right turn traffic were not modified.

*Speed Distribution*

A symmetric speed distribution was used in the simulation of the study interchanges in place of the default distribution typically used in the CORSIM software. This alternative distribution was used based on a previous study of single point urban interchanges [14]. The mean speed entered for a particular link of the network comprising the simulated interchange was the 85$^{th}$ percentile speed (posted speed observed in the field review) divided by the previously observed standard deviation:

$$\textbf{(6)} \quad v_{mean} = \frac{v_{85}}{1.13}$$

Using this input information, CORSIM then proceeded to assign speeds to the vehicles in the simulation using the correct 85$^{th}$ percentile speed.

*Traffic Arrival Type*

The arrival type for all vehicles was assumed to be random, which was reasonable for the off-ramp traffic flows. However, the cross street at each interchange is coordinated and thus would tend to have a more predictable arrival pattern. Without specific data available or collected for the upstream traffic signals, it was not possible to make any assumptions about cross street traffic arrival type. Even if an arrival type could be determined, CORSIM would only allow one arrival type for all vehicles in the simulation, which would unrealistically affect the off-ramp traffic flows.

## Field Data Inputs

The field data pertaining to traffic conditions and interchange signal timing obtained from the data collection effort was input into the models to determine how well they simulated actual traffic conditions. The simulation with these inputs was observed and examined in order to determine further adjustments to the model/software to yield realistic results.

### *Traffic Conditions*

Traffic volumes, truck percentages, and turn percentages composed the available data to enter into the interchange simulation. Turn percentages in CORSIM are limited to the nearest percentage, so simulated turn volumes do not exactly match the field observations. Specifically entering the actual turn volumes obtained from the field was possible, but rejected because even with the actual volumes entered the simulated results would not match the field results exactly and because the future application of the models for later stages of analysis would have been made more cumbersome using this method of volume input.

### *Signal Timings and Coordination*

The six study interchanges are all currently part of coordinated signal systems. As a result, each of the six sites has a fixed signal cycle length. Since a fully actuated intersection does not have a fixed cycle length, unless the cycle length is constrained, they were modeled using the time-based coordination feature in CORSIM. The coordination for each simulated interchange was programmed using the phase times and splits from the interchange timing sheets obtained during the overall data collection task for the project. The "offset" value associated with time-based coordination was not applicable and thus set to zero for simplicity since no other data was available for other upstream coordinated traffic signals.

A few adjustments were necessary to allow CORSIM to accept the actual timings and splits used in the field. For example, many movements had no minimum green times shown on the timing sheets, but zero or some very small value (such as one second) could either not be entered or would produce unrealistically short phase durations, respectively. Therefore, for the phases that did not have a specified minimum green time, 8 seconds was used instead and appeared to provide the best compromise between the controller settings and the observed phase durations in the field.

Phases 2 and 6 represented westbound and eastbound through movements, respectively, at five of the six interchanges. However, at the Loop 202/Rural Road interchange the off-ramp movements are oriented westbound and eastbound and thus do not have a through movement nor Phases 2 and 6, which caused a mismatching of phase numbering and inter-change movement type. In order to keep the same phase assignments for all of the inter-changes, the phase structure of the Loop 202/Rural Road interchange was "reassigned" so that Phases 2

and 6 were the through movements on Rural Road rather than Phases 4 and 8. All of the other phases at this interchange were altered accordingly, as shown in Figure 17.

| Original Phases | | | Reassigned Phases | | |
|---|---|---|---|---|---|
| Off-Ramps | Rural Road | | Off-Ramps | Rural Road | |
| 1 | 3 | 4 | 3 | 1 | 2 |
| 5 | 7 | 8 | 7 | 5 | 6 |

**Figure 17. Reassigned Phases for Loop 202/Rural Road Interchange**

The final step in the CORSIM model calibration process was to observe the simulation operations. If the simulated phases did not reasonably match the field observations of green phase duration, then the coordination parameters were further adjusted until either reasonable agreement was obtained or the limits of the other controller settings (e.g., maximum green time) were reached.

## CALIBRATION RESULTS

The calibration process focused on three interchange parameters which were used to adjust the modeled interchange operations and ultimately served as the basis for comparing the model results with the actual field data/results. The three parameters are the off-ramp right turn delay, green phase durations, and percent of off-ramp right turn vehicles stopping. All six interchanges were analyzed for both the morning and evening peak hours.

### Delay

Figure 18 shows the relationship between the off-ramp right turn control delay obtained from the model simulation and the field observations. In general, the predicted off-ramp right turn delay from the model was somewhat less than the observed delay. In part, this is due to CORSIM allowing turns to be completed in shorter gaps than most drivers would typically use and because of the 610-foot spacing between the interchange signal and the yield controlled off-ramp right turn movements. Adjustments to the gap acceptance distribution and the follow-up time for the off-ramp right turn traffic had little effect on the overall tendency of the model to underestimate off-ramp right turn delay. In addition, increasing the follow-up time would randomly cause oversaturation in the off-ramp right turn lane(s) which would result in large variations in simulated delay after only a small change in the follow-up time value. Therefore, the default model values were retained.

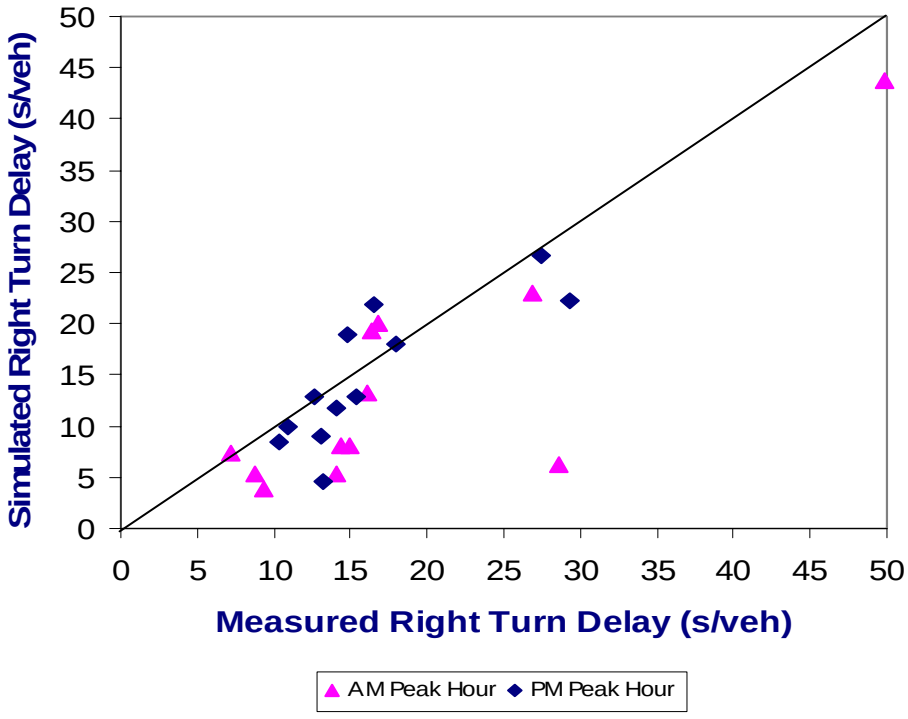



**Figure 18. Comparison of Simulated and Field-Measured Delays for the Off-Ramp Right Turn Movement**

**Green Phase Duration**

The green phase durations for the cross street through and left turn movements as well as the off-ramp left turn (and right turn when signalized) movements observed in the field compared very closely with the simulated values as shown in Figure 19. This agreement is a result of being able to directly manipulate these values as part of the data input process for the model. The green phase durations longer than 30 seconds shown in Figure 19 were all for the cross street through movements. Since these movements were associated with coordinated signal phases, they would acquire any extra green time that was not used by other movements during a particular signal cycle length. Thus, the variation in the green phase duration of the cross street through phases is higher than the other phases.

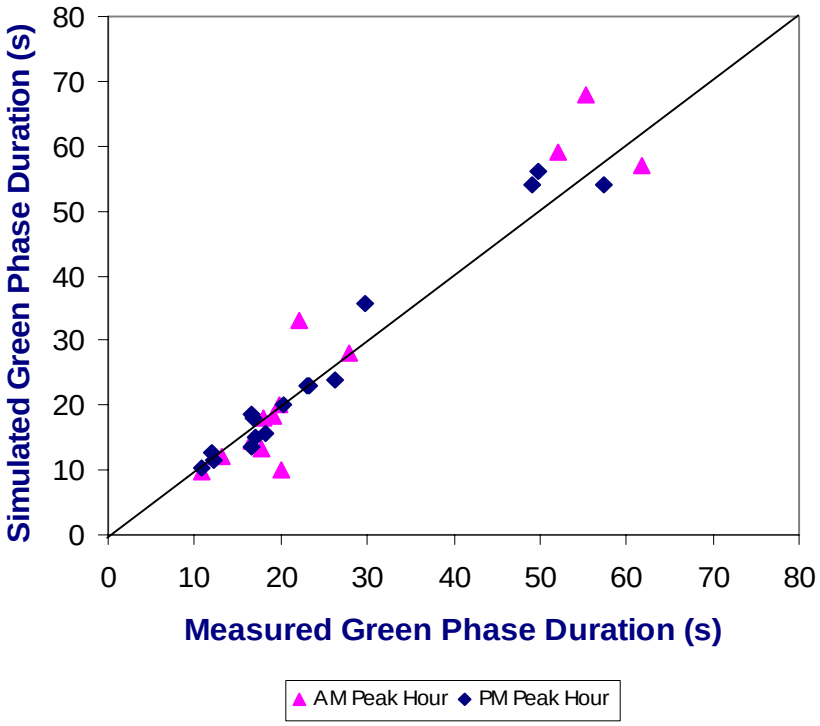



**Figure 19. Comparison of Simulated and Field-Measured Green Phase Durations for the Off-Ramp Right Turn Movement**

**Percentage of Off-Ramp Right Turn Vehicles Stopping**

Figure 20 shows the relationship between the percentage of off-ramp right turn vehicles stopping in the simulations and in field observations. The relationship shown in the figure is not very strong for several reasons. First, the number of vehicles that have to stop when turning right depends on the current signal phase, traffic from other movements, and whether previously arriving off-ramp right turn vehicles have stopped and are in a queue. The simulation will never be able to match field-observed conditions in this regard. Second, the definition of a "stop" in CORSIM is very restrictive, requiring the simulated vehicle to come to a complete stop. A field-observed stop was based on the definition provided in the *Highway Capacity Manual* [12] which only considers a stop to be when a vehicle has come within a vehicle length of a stopped vehicle and intends to stop itself. Simulated vehicles that roll through a yield sign (or a right turn on red) may not be considered as fully stopped but might have been considered differently in the field. Third, CORSIM may be allowing vehicles to make right turns on red at times when actual drivers would not consider such maneuvers. An example is when CORSIM allows a vehicle to turn right on red when a suitable gap is found in the traffic stream on the approaching link even if this approaching traffic is the beginning of a queue discharge.

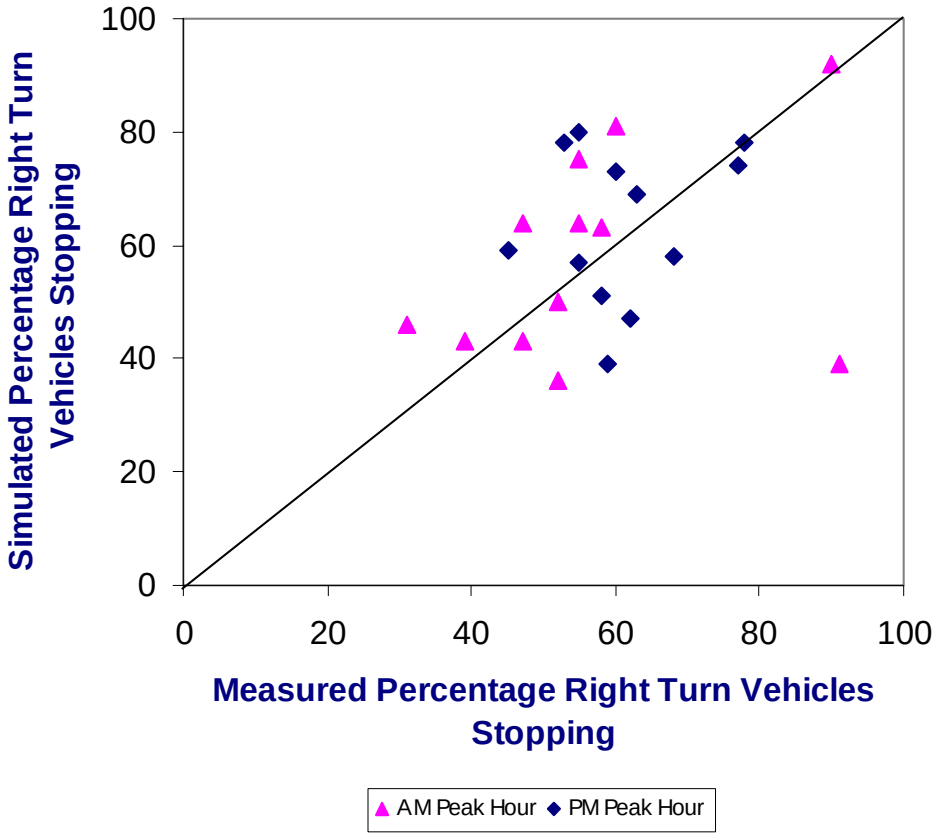



**Figure 20. Comparison of Simulated and Field-Measured Percentage of Vehicles Stopping for the Off-Ramp Right Turn Movement**

## Analysis of Off-Ramp Right Turn Control Types

The previous chapter presented some analysis and results pertaining to off-ramp right turn operations for the actual study sites. Although those results and determinations are based on actual field data, they are limited in scope to only six SPUI sites. In order to draw broader conclusions concerning the effects of different types of control on the off-ramp right turn movement, more samples and data are required. To facilitate this need a massive amount of field data would have to be collected and processed or the limited real data can be used to develop a working model of SPUIs where the off-ramp right turn control could be varied, as is done in this project. The calibration of the model parameters based on actual field data allows for deviation from the replicated field conditions to experimental/hypothetical situations. This then allowed for the testing of other forms of control while having some confidence that the results would be representative of actual traffic conditions under the same conditions. This section explains the process and results of conducting these analyses using the calibrated CORSIM model of a SPUI.

## Off-Ramp Right Turn Control Types

The first step in the analysis process is to determine what control types will be evaluated and contrasted. The two prominent off-ramp right turn traffic control types used in the Phoenix area are signal control and yield control. Therefore, the control types evaluated in the analysis would focus only on these two control types and disregard other options such as stop control or free flow/merge. Within the signal and yield control types, there are other factors that would affect the operation of the off-ramp right turn movement, such as number of right turn lanes, vehicle detection usage/presence, and signal phasing. There are four control types (two variations of signal and yield control) examined in the analysis, which equate to eight control scenarios when considering each control type. Each variation would have two versions for one and two off-ramp right turn lanes. Each control type is described below.

### *Signal Controlled Off-Ramp Right Turn*

The off-ramp right turn movement can be controlled by signal indications much as any other intersection movement is controlled. The signal head(s) will indicate a green right turn arrow during the portion of the signal cycle when the off-ramp right turn movement is considered protected—in other words during the adjacent cross street left turn phase. At all other times, a red indication would be displayed to off-ramp right turn traffic requiring that the right turn traffic stop and check traffic conditions before turning right (unless otherwise posted, although postings of this nature were not present at the study sites).

This control type has two variations that were assessed in the model analyses. The variations concern the allotment of signal phasing to the off-ramp right turn traffic. One version only gives a green arrow indication to the off-ramp right turn movement during the adjacent cross street left turn phase. This is called an overlap phase and the signal control type employing this phasing is referred to as “Signal 1-phase” within this report. An

example of a study site using this control is the SR 51/Indian School Road interchange. The other variation of the off-ramp right turn signal control type is when there are two phases that can provide the green arrow indication for the off-ramp right turn movement. One of the phases is the overlap phase previously described, and the additional phase is when off-ramp traffic demand is high. This additional phase allows off-ramp left turns and right turns in one direction (or both directions in sequence) to be the only actively controlled movement in the interchange. In this situation, the off-ramp right turn movement receives additional green arrow time to accommodate the traffic demands. This control variation is referred to as "Signal 2-phase" in this report. An example of a study site using this control is the Loop 101/Bell Road interchange.

As mentioned previously, these two control variations within the general signal control type can be applied to off-ramp right turn movements with one or two lanes to bring the number of signal control type scenarios to four within the context of this project.

*Yield Controlled Off-Ramp Right Turn*

The yield control type for off-ramp right turn movements seems to be fairly basic with no room for variation. However, this control type was split into two versions incorporating vehicle presence detection or just the standard yield sign with no vehicle detection. The off-ramp right turn control that uses yield signs and vehicle detection works similarly to the Signal 1-phase control, but without the signal head indications for the off-ramp right turn vehicles. Although the off-ramp right turn movement is controlled by the yield signs, a detection loop placed in the right turn lane could be linked to the adjacent cross street left turn phase. If the off-ramp right turn demand exceeded the adjacent cross street left turn demand, then the cross street left turn phase could be prolonged (to a certain degree) to allow additional time where no traffic is conflicting with the off-ramp right turn movement. Essentially the off-ramp right turn traffic would be acting as pseudo cross street left turn traffic. In this report, this control type is called "Yield With Detect." None of the study sites currently use this control variation. The other yield control version does not incorporate the vehicle detection loop and the off-ramp right turn movement relies on gaps in the cross street traffic in order to enter the roadway. They also can take advantage of the "sheltered" effect when the adjacent cross street left turn phase is active, but only so long as the cross street left turn demand is present. This control type variation is referred to as "Yield No Detect." All study sites with unsignalized off-ramp right turns have this basic yield control.

The remaining four control type scenarios are represented by the two yield control type variations applied against off-ramp right turn configurations of one and two lanes.

**Creation of Model Base Files**

The results of the CORSIM calibration process were interchange models functioning similarly to their corresponding field sites. The field sites and their model equivalents represent almost all of the eight control scenarios previously described. However, variations in lane configurations and timing would make comparisons of two interchanges

complicated when attempting to discern the effects of the off-ramp right turn control type. In order to facilitate the comparison of two models where only the off-ramp right turn control type is varying, new base models had to be created representing the eight control type scenarios. These new base models were created so that they only differed with respect to the off-ramp right turn control type and number of off-ramp right turn lanes. Lane configurations for all movements aside from the off-ramp right turn were maintained based on the typical lane configurations present at actual SPUIs: three cross street through lanes in each direction, two cross street left turn lanes, one cross street right turn lane, and two off-ramp left turn lanes. Also, the particular off-ramp right turn control represented by the base model was applied to both off-ramp right turn movements at the interchange (i.e., no mixing of off-ramp right turn control types). The same general signal timing was used for each base model. It is important to realize that even though these newly created base models were alterations from the models developed to represent the study sites, the inherent parameters governing the simulation and results that were calibrated to actual field conditions remain intact and functional.

**Determination of Volume Conditions to Analyze**

Once the calibrated base models were developed representing the eight control scenarios, volume distributions had to be developed to act as input for the model simulations. Various volume magnitude and movement distributions are necessary in order to approximate the effects of one off-ramp control type over a range of possible traffic conditions. By applying the same volume distributions to each of the eight base models, then conclusions can be drawn as to how one control type fares versus the others.

The best and readily available source for volume distribution input values was the turning movement data collected at the actual SPUI sites for the AM and PM peak hours. Since the volumes passing through the particular interchanges are somewhat governed by the interchange capacity—lane configuration—the volumes collected were reduced down to per lane equivalents. This would allow the volumes to be applied back to the generic interchange lane configuration employed in all of the base models. Therefore, in some instances the volume distribution inputs for the base models were not exactly equal to the actual traffic conditions observed in the field. For example, a turning movement count for an off-ramp right turn movement with only one lane would be multiplied by two to determine the equivalent volume to input into the base model scenarios where two-lane off-ramp right turn operations are being examined. Similar adjustments would be made for all movements at the interchange in any case where the actual lane configuration differed from the generic layout of the base models. Moreover, a uniform reduction in volume by 30% was applied to ensure that any and all volume scenarios would be applicable for use (i.e., not lead to oversaturated conditions) under any control type scenario. This data provided twelve volume distributions (2 peak hour conditions times 6 study sites) that were analyzed for each of the eight control scenarios.

## Model Simulation Process

The process used to simulate the various control/volume scenarios was fairly straightforward in order to promote subsequent comparisons of results. The volume distributions based on the six study sites that were adjusted to conform to the base model interchange layout, including whether the off-ramp movement was in one lane or two lanes, were input into each base model and five simulation runs were conducted. Each of the five runs was initialized with a different random number seed and subsequent trios of simulation runs for other volume/control scenarios were conducted using the same random number seeds. In this manner, an average of the simulations could be computed and said to represent the results of that particular scenario. This average could then be compared against another average knowing that the change in control type/volume distribution was the origin of any differences in results.

In an additional attempt to facilitate meaningful comparisons of control type scenarios, the typical signal timing used in all of the base models was not adjusted in accordance with the particular volume distribution being assessed. Most of the study sites had similar signal timing settings. Even so, some scenarios may be operating under a signal control where the timings are not optimal for the hypothetical conditions. Optimization of the signal timing for each scenario iteration was not conducted since there was no means of optimizing the timing without using some subjective engineering judgment which could bias the simulation outcomes beyond the effects related only to the control type. Since the optimization was not conducted for any of the iterations, all of the results are comparable, albeit skewed towards being inefficient.

## Simulation Results

Each simulation run produces an output file containing numerous measures of effectiveness (MOEs) for the links making up the network representation of the interchange, individual movements, lane-by-lane statistics, and overall network (interchange) performance, as well as others. After each control/volume scenario was input and processed in CORSIM, there were a grand total of 480 output files containing the simulation results. A software package tool was used to extract the pertinent data from the simulation output files and tabulate the results for further processing and assessment.

The most effective way to compare the results given the subtlety of the control types/ scenarios and the range of interchange volumes assessed was to perform a paired comparison of each control type within the two lane configuration groups (i.e., one lane and two lane off-ramp right turn lanes). The control delay (in average seconds of delay per vehicle) for the entire interchange was selected as the measure of effectiveness since this would represent the comprehensive effect of one control type versus another. The comparison of the control type for each volume scenario (12 in all, AM and PM volumes for each interchange location) used the corresponding “Yield No Detection” control type as the basis for comparison. The proportional differences in interchange control delay between control types were statistically insignificant in every case. Table 17 presents the percent difference for each control scenario averaged for the 12 volume scenarios.

**Table 17. Comparison of Simulation Results for Off-Ramp Right Turn Control Type Scenarios**

| Off-Ramp Right Turn Conrol Variation: | | | Signal 1-Phase | | Signal 2-Phase | | Yield With Detection | | Yield Without Detection |
|---|---|---|---|---|---|---|---|---|---|
| | | | I/C Control Delay (sec/veh) | % Difference from Yield Without Detection | I/C Control Delay (sec/veh) | % Difference from Yield Without Detection | I/C Control Delay (sec/veh) | % Difference from Yield Without Detection | I/C Control Delay (sec/veh) |
| One Off-Ramp Right Turn Lane | Bell Rd I/C | AM | 17.21 | 1.42% | 19.84 | 16.91% | 17.74 | 4.51% | 16.97 |
| | Volumes | PM | 21.31 | 2.92% | 24.24 | 17.07% | 21.17 | 2.23% | 20.70 |
| | Cactus Rd I/C | AM | 15.78 | 3.37% | 18.36 | 20.26% | 15.98 | 4.65% | 15.27 |
| | Volumes | PM | 16.14 | 6.39% | 18.81 | 23.98% | 16.05 | 5.79% | 15.17 |
| | Glendale Ave I/C | AM | 21.45 | 1.98% | 24.00 | 14.08% | 21.65 | 2.92% | 21.04 |
| | Volumes | PM | 17.30 | 4.55% | 19.59 | 18.39% | 16.64 | 0.54% | 16.55 |
| | Greenway Rd I/C | AM | 15.55 | 5.85% | 17.92 | 21.96% | 14.99 | 2.01% | 14.69 |
| | Volumes | PM | 20.16 | 21.90% | 20.48 | 23.85% | 17.87 | 8.06% | 16.54 |
| | Indian School Rd I/C | AM | 18.10 | 30.75% | 17.46 | 26.10% | 15.00 | 8.33% | 13.84 |
| | Volumes | PM | 18.01 | 17.77% | 18.11 | 18.41% | 15.73 | 2.81% | 15.29 |
| | Rural Rd I/C | AM | 14.97 | 8.43% | 17.35 | 25.69% | 14.56 | 5.47% | 13.81 |
| | Volumes | PM | 16.45 | 1.66% | 22.93 | 41.70% | 16.46 | 1.70% | 16.18 |
| | Average Percent Difference | | | 8.92% | | 22.37% | | 4.09% | |
| Two Off-Ramp Right Turn Lanes | Bell Rd I/C | AM | 19.85 | 26.61% | 24.36 | 55.34% | 17.58 | 12.12% | 15.68 |
| | Volumes | PM | 25.31 | 30.56% | 30.53 | 57.49% | 22.32 | 15.17% | 19.38 |
| | Cactus Rd I/C | AM | 17.83 | 28.69% | 21.72 | 56.77% | 15.84 | 14.33% | 13.85 |
| | Volumes | PM | 21.01 | 44.87% | 47.09 | 224.73% | 17.25 | 18.93% | 14.50 |
| | Glendale Ave I/C | AM | 28.47 | 43.60% | 32.85 | 65.66% | 22.06 | 11.25% | 19.83 |
| | Volumes | PM | 18.08 | 7.33% | 22.81 | 35.39% | 16.54 | -1.82% | 16.85 |
| | Greenway Rd I/C | AM | 20.40 | 44.62% | 19.50 | 38.20% | 14.93 | 5.83% | 14.11 |
| | Volumes | PM | 32.74 | 106.77% | 23.31 | 47.20% | 20.85 | 31.69% | 15.83 |
| | Indian School Rd I/C | AM | 18.56 | 44.75% | 21.90 | 70.86% | 14.85 | 15.86% | 12.82 |
| | Volumes | PM | 16.73 | 22.14% | 20.82 | 51.99% | 15.34 | 11.98% | 13.70 |
| | Rural Rd I/C | AM | 18.52 | 42.98% | 21.16 | 63.36% | 14.14 | 9.20% | 12.95 |
| | Volumes | PM | 18.25 | 20.88% | 22.30 | 47.72% | 16.16 | 7.03% | 15.09 |
| | Average Percent Difference | | | 38.65% | | 67.89% | | 12.63% | |

The results shown in Table 17 indicate that in almost all volume scenarios, the "Yield Without Detection" control type (the basis for the comparisons) has the lowest overall interchange control delay. When averaged interchange control delays were compared, the other control type variations resulted in more delay. In the scenarios with one off-ramp right turn lane, the overall interchange delay for the "Yield With Detection" and "Signal 1-Phase" were not much greater (about 4 and 9 percent more, respectively). The differences in interchange delay were more prominent in the two-lane off-ramp right turn scenarios due to modeling constraints previously discussed, which caused the left hand lane of the two lane off-ramp right turn to experience more delay than necessary in the scenarios with signal control. Therefore, the magnitudes of the percent differences for the signal control types in this two-lane group of scenarios are exaggerated, yet they still reflect the same general relationship as the one-lane group of scenarios. Also, note that these percent differences apply for the normal ranges of interchange volumes and turning movements used in this project. Unusual situations may result in different results for each control type.

# CHAPTER 4
# CONCLUSIONS

## INTRODUCTION

This study intends to draw conclusions regarding right turn control types for off-ramp right turn movements at single point urban interchanges (SPUIs) without frontage roads. The two characteristics of this movement that provided the basis for any determinations were safety and operation. Each of these components is critical to effectively controlling and processing the off-ramp right turn movement at a SPUI. The following information provides a summary of the results and conclusions developed from the preceding procedures and analysis.

## SAFETY

The safety evaluation of the six SPUI sites was based on two characteristics, the established three-year crash history for the particular interchange (relating to off-ramp right turn movements only) and the short-term observations of conflicts that occurred during the data collection phase of the project. Although the two sets of results correlate well, there is still room for speculation as to whether the off-ramp right turn control type is the impetus for the particular trends. Extensive safety evaluations of other factors present at the study interchanges were not conducted nor were they possible to conduct within the context of this project.

### Crash History Analysis

The crash history investigations were facilitated by ADOT's Accident Location Identification Surveillance System (ALISS) database, which was queried for the most recent three-year period of crash information (August 1, 2000 through July 31, 2003) at the time of the request. The query consisted of any crashes occurring specifically in the right turn lane(s) on the off-ramp or at the cross road. Crashes reported as occurring on the cross road involving an off-ramp right turn vehicle were also included in the query request. The effective distance for the query was set at 300 feet from the off-ramp right turn/cross road junction point. The resulting number of crash records returned from the query was about 650 for the six interchanges (twelve off-ramps) for the three-year period.

The analysis yielded that the SPUI sites (off-ramps) with signal control tended to have a lower crash rate than the SPUI sites (off-ramps) with yield control over the three-year evaluation period. The mean crash rate for the five off-ramps with signal control was 1.16 crashes per million entering vehicles (entering vehicles were considered off-ramp right turn traffic, conflicting cross street through traffic, and opposing off-ramp left turn traffic). The mean crash rate for the off-ramp right turn movements with yield control was 2.24. Some of the crash rates at selected locations were very low (southbound off-ramp at the Greenway Road and Cactus Road interchanges and the northbound off-ramp at the Glendale Avenue interchange). After confirming that the crash statistics were accurately reported, a sensitivity analysis was conducted on the estimated daily off-ramp traffic

volumes used in the calculations. The analysis indicated that if the daily off-ramp volumes used in the calculation were overestimates (which would yield a lower crash rate), then exaggerated reductions in the volume estimates (yielding higher crash rates) would either have no effect on the overall three-year mean or would have a minimal effect (i.e., the three-year means may be at most 10% more than reported). Therefore, the relatively low mean crash rates were considered valid for inclusion in the assessment of crash rates based on the control type. A statistical t-test reveals that when all average crash rates within each off-ramp right turn control group are considered, there is no significant difference ($t_{calc}$ = 1.510, $t_{.05, v=10}$ = 1.812) between the two group averages.

When considering crash data alone, the results seem to indicate that for this limited sample of SPUI off-ramp right turn sites, there is an inclination that signal control tends to be safer, although not to a statistical significance. There are other factors that were not quantified in this study that could be contributing to the crash rates aside from the associated type of off-ramp right turn control. One of these potential substantial factors is the sight distance afforded to the driver of an off-ramp right turn vehicle. Off-ramp right turn drivers actually have too much sight distance when approaching the cross street and may be more focused on looking for gaps in the cross street traffic than on the vehicle(s) in front of them. This condition would lead to a good proportion of rear-end collisions occurring in the off-ramp right turn lanes near the cross street intersection. Crashes occurring due to this situation would be particularly evident at off-ramp right turn lanes controlled by a yield control since anticipating gaps in the cross street traffic would allow the off-ramp right turn vehicle to only slow down rather than stop at the yield line. Other factors that are not accounted for in the mean crash rate determinations include, but are not limited to, off-ramp/cross street intersection angle, potential site-specific hindrances, and the presence or absence of a freeway overpass/underpass.

**Conflict Observations & Analysis**

As a supplement to the crash history investigations, conflict observations and analyses were conducted for the off-ramp right turn movements at the study sites. Although traffic crash records provide the most direct measure of safety for a roadway location, adequate data may not be available for analysis. Moreover, some crashes are not reported or records may be only available for a time period which may not represent current conditions at the study area. Therefore, conflict data specifically pertaining to the off-ramp right turn movements was collected for the AM and PM peak periods at the study sites.

For the purposes of this study, a conflict was considered to be a traffic event involving two or more road users (e.g., vehicles, pedestrians, bicyclists), in which one or more user performs an abnormal or unusual action causing another or others to execute an abrupt or evasive maneuver to avoid a collision. The most common avoidance maneuver related to the off-ramp right turn movement is either abrupt braking or swerving to avoid a collision.

The results from the conflict rate computations show the same trend as the crash history data. The mean conflict rate for the off-ramp locations with signal control was 0.350 conflicts per one thousand potentially conflicting vehicles. The mean conflict rate for the off-ramp

locations with yield control was more than double at 0.842. Again, the inherent interchange factors described above could also be contributing to the differences in conflict rates in addition to the off-ramp right turn control type. A statistical t-test revealed that this difference in the mean conflict rates was not significant ($t_{calc} = 1.705$, $t_{.05, v=10} = 1.812$).

### Safety Conclusions

Although there may be other contributing factors to the crash/conflict rates for off-ramp right turns controlled by signals and yield signs, it does appear that the difference in rates is cause enough to consider that signal control at SPUI off-ramp right turns may be safer. However, safety is only one of two main components that were evaluated to determine the effectiveness of different control types for the off-ramp right turns. The following section will provide the summarization for the operations analysis of the off-ramp right turns at the study sites.

## OPERATIONS

Controlling traffic is a delicate balance of weighing safety concerns against operational efficiencies. Each component has real costs associated with poor performance. The off-ramp right turn operations for the study sites in this project were evaluated in two ways: 1) calculated delays based on actual field-collected data, and 2) simulated operation and delay based on the CORSIM model.

### Field Measurements & Calculations

The data collected included interchange turning movement volumes and other aspects of operation specifically related to the off-ramp right turn movement. This collection process and detailed calculations were presented in chapter 2. The collected field data was used to calculate time-in-queue per off-ramp right turn vehicle and number of vehicles stopping per lane per signal cycle length. These values, coupled with information from the HCM [12], were used to calculate the average control delay per off-ramp right turn vehicle.

These calculation procedures were performed for each off-ramp right turn movement at the study sites regardless of the traffic control in place. Even though there was not a portion of the signal cycle length devoted to the off-ramp right turn movements where yield control was used, the cycle length value for the interchange was still considered in the control delay calculations. This assumption is based on the yield control operation being a derivative of gap acceptance in the cross road traffic stream for off-ramp right turn traffic. These gaps are created by the traffic pattern fluctuations and by the cycling of the overall interchange signal control. Since right turn on red is allowed and executed by motorists at all study sites with off-ramp right turn signalization, the differences in the traffic control types from the perspective of off-ramp right turn control delay calculations are subtle.

The calculated delay results are shown in Table 18 (p.70). Since the data component pertaining to number of vehicles that stopped one or more times was collected only for the peak period (i.e., the 1 ½ hour observation period), the peak hour value was pro-rated based on the proportion of time. Since the peak period and peak hour durations were relatively close, this assumption should not have a prominent effect on the peak hour delay calculations.

## Table 18. Calculated Peak Hour Control Delay for Off-Ramp Right Turn Movements at Study Sites

| | Off-Ramp Right Turn Signal Control | | | | | | Off-Ramp Right Turn Yield Control | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Indian School Road | | Bell Road | | Glendale Ave | | Cactus Road | | Greenway Road | | Rural Road | | Glendale Ave | |
| | SB ORRT | NB ORRT | SB ORRT | NB ORRT | NB ORRT | | SB ORRT | NB ORRT | SB ORRT | NB ORRT | WB ORRT | EB ORRT | SB ORRT | |
| **ORRT Control Type** | Signal | Signal | Signal | Signal | Signal | | Yield | Yield | Yield | Yield | Yield | Yield | Yield | |
| **Sum of Vehicles in Queue** [1] | **SB ORRT** | **NB ORRT** | **SB ORRT** | **NB ORRT** | **NB ORRT** | | **SB ORRT** | **NB ORRT** | **SB ORRT** | **NB ORRT** | **WB ORRT** | **EB ORRT** | **SB ORRT** | |
| AM Peak Hour (actual) | 474 | 186 | 874 | 421 | 945 | | 159 | 303 | 61 | 716 | 258 | 457 | 119 | |
| PM Peak Hour (actual) | 119 | 109 | 1686 | 696 | 85 | | 321 | 452 | 509 | 296 | 179 | 250 | 183 | |
| **Vehicles That Stopped 1+ Times** | | | | | | | | | | | | | | |
| AM Peak Hour (pro-rated from peak period data) | 325 | 149 | 449 | 282 | 304 | | 153 | 195 | 54 | 275 | 188 | 353 | 149 | |
| PM Peak Hour (pro-rated from peak period data) | 94 | 105 | 796 | 496 | 77 | | 199 | 252 | 262 | 317 | 175 | 269 | 195 | |
| **Total ORRT Vehicles** | | | | | | | | | | | | | | |
| AM Peak Hour | 544 | 273 | 965 | 511 | 336 | | 486 | 215 | 140 | 478 | 359 | 678 | 319 | |
| PM Peak Hour | 229 | 170 | 1039 | 783 | 146 | | 362 | 555 | 336 | 549 | 299 | 431 | 267 | |
| **Control Delay/Vehicle Computations** | | | | | | | | | | | | | | |
| Number of ORRT Lanes | 1 | 1 | 2 | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 2 | 1 | |
| Count Interval (s) | 19 | 19 | 19 | 19 | 19 | | 19 | 19 | 19 | 19 | 19 | 19 | 19 | |
| **Calculations for Peak Hour** | **SB ORRT** | **NB ORRT** | **SB ORRT** | **NB ORRT** | **NB ORRT** | *Avg.* | **SB ORRT** | **NB ORRT** | **SB ORRT** | **NB ORRT** | **WB ORRT** | **EB ORRT** | **SB ORRT** | *Avg.* |
| Control Delay/Total Vehicles (s) AM | 16.56 | 12.95 | 17.21 | 15.65 | 53.44 | 23.16 | 6.22 | 26.78 | 8.28 | 28.46 | 13.65 | 12.81 | 7.09 | 14.75 |
| PM | 9.87 | 12.18 | 30.83 | 16.89 | 11.06 | 16.17 | 16.85 | 15.47 | 28.78 | 10.24 | 11.37 | 11.02 | 13.02 | 15.25 |
| | Indian School Road | | Bell Road | | Glendale Ave | | Cactus Road | | Greenway Road | | Rural Road | | Glendale Ave | |

Note
1 - Sum of queued vehicles sampled at 19-second intervals. Vehicle stopped more than 19 seconds would be counted more than once.

**KEY**
**ORRT** - Off-Ramp Right Turn; **OR** - Off-Ramp; **LT** - Left Turn; **NB** - Northbound; **SB** - Southbound; **WB** - Westbound; **EB** - Eastbound

The averages for the control type groups suggest that the signal control type may cause more delay to the off-ramp right turn movement. However, when the atypical AM peak conditions for the northbound off-ramp right turn at Glendale Avenue are excluded, there is very little difference in control delay between the two control types (a difference of about 8 seconds for the AM conditions changes to a difference of less than one second). The exclusion of the Glendale data for the AM peak seems reasonable because eastbound Glendale Avenue is the only cross street direction amongst the study sites that has two through lanes—although it still accommodates volume levels commensurate with other sites. The similarity in average delays, further supported by the results for the PM conditions, is despite the inherent characteristic interchange differences which could bias the results.

**Model/Simulation Analysis**

The interchange and off-ramp right turn movement data collected in the field was limited in scope and thus discounted any conclusions drawn directly from the field data. In order to supplement this data, the field-measured interchange/movement characteristics were used to develop a model of each study site. The simulation of the model was then calibrated to conform to the actual interchange operations, resulting in reasonable approximations of in-field interchange operations. This process allowed the rather limited sample of field data to form the basis for examining a variety of interchange/ traffic situations through the use of the model.

The calibrated model/simulation parameters resulting from the field data inputs were applied to new generic base models of SPUIs that were developed for the express purpose of testing different off-ramp right turn control types. By maintaining as many aspects of the interchange as possible between the base models, aside from the off-ramp right turn control type being evaluated, the results could be interpreted to be directly related to the off-ramp right turn control type being simulated. Base models were created to represent eight different control/interchange scenarios according to control type (signal or yield), the number of off-ramp right turn lanes (1 or 2), and the phasing/detection assumed (phasing for signal control and vehicle detection for yield control). The results of the model simulations were presented in chapter 3. They indicated that the overall interchange control delay was lowest for the simulations associated with the “Yield No Detection” off-ramp right turn control type. The off-ramp right turn control of “Yield With Detection” had the next lowest associated average interchange control delay while the “Signal Two Phase” control type had the highest associated interchange control delay.

**Operations Conclusions**

Examination of the simulation results shows that yield control (either with or without vehicle detection) for the off-ramp right turn movement is associated with lower average interchange control delays. An assertion for why this trend is evident in the simulation results is that average interchange control delay increases when the off-ramp right turn movement is signalized because the interchange clearance interval/time has to be increased to account for the expanse of the interchange area to include the off-ramp right turn location. The increase in clearance time detracts from the efficiency of the interchange

since it represents time when no traffic movements should be initiating. Other movements at the interchange are also subject to proper clearance times, but because those conflicting movements are occurring closer to the interchange center, the times do not have to be excessive. The off-ramp right turn lanes at SPUIs are purposefully removed from central interchange area and thus when they are signalized they prompt an even more pronounced clearance interval associated with the interchange.

## OVERALL CONCLUSIONS

The efforts executed during this project had the intended goal of determining which control type would be best to use for off-ramp right turn movements at single-point urban interchanges without frontage roads. The data collection effort, both in the field and through the crash databases, resulted in very detailed and beneficial information that was used to its fullest. However, despite the efforts and underlying goal, the results from the safety and operations analyses appear to be contrary, making it necessary to compare the two characteristics using a common basis. Safety and operation can be measured in terms of cost, so the following describes the procedure for estimating the overall yearly costs associated with yield and signal control based on off-ramp right turn data.

### Crash Costs

Table 19 shows data and calculations pertaining to crash costs at five of the six study sites. (The Glendale Avenue interchange was not included in the assessment since its crash data pertained to off-ramps with different types of control and thus could not be integrated with the overall interchange operation/delay computations). The crash cost calculations for each interchange are represented by the number of crashes associated with the off-ramp right turn movement only. Thus, the total crash cost values are not representative of the total crash costs per interchange, but are valid for use in the comparison against interchange operational costs since the unknown crash cost component is assumed to be equal for all the interchanges.

**Table 19. Summarized Crash Data and Estimated Annual Costs at the Study Sites**

| | Interchange/Off-Ramp | 3-Year Crash History | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Crashes | No Injuries | Injuries* | Fatal | No Injury Crash Costs per Year | Injury Crash Costs per Year | Fatal Crash Costs per Year | Total Crash Costs per Year |
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 55 | 45 | 10 | 0 | $ 72,180 | $ 166,057 | $ - | $ 238,237 |
| | Indian School/SR51 NB Off-Ramp | 29 | 21 | 8 | 0 | $ 33,684 | $ 132,845 | $ - | $ 166,529 |
| | Bell Road/L101(W) SB Off-Ramp | 44 | 34 | 10 | 0 | $ 54,536 | $ 166,057 | $ - | $ 220,593 |
| | Bell Road/L101(W) NB Off-Ramp | 51 | 35 | 16 | 0 | $ 56,140 | $ 265,691 | $ - | $ 321,831 |
| | | | | | | | | *Interchange Avg.* | $ 473,595 |
| Off-Ramp Right Turn Yield Control | Cactus Road/SR51 SB Off-Ramp | 10 | 8 | 2 | 0 | $ 12,832 | $ 33,211 | $ - | $ 46,043 |
| | Cactus Road/SR51 NB Off-Ramp | 100 | 70 | 30 | 0 | $ 112,280 | $ 498,170 | $ - | $ 610,450 |
| | Greenway Road/SR51 SB Off-Ramp | 3 | 3 | 0 | 0 | $ 4,812 | $ - | $ - | $ 4,812 |
| | Greenway Road/SR51 NB Off-Ramp | 65 | 46 | 19 | 0 | $ 73,784 | $ 315,508 | $ - | $ 389,292 |
| | Rural Road/L202 WB Off-Ramp | 99 | 75 | 24 | 0 | $ 120,300 | $ 398,536 | $ - | $ 518,836 |
| | Rural Road/L202 EB Off-Ramp | 109 | 79 | 29 | 1 | $ 126,716 | $ 481,564 | $ 394,962 | $ 1,003,242 |
| | | | | | | | | *Interchange Avg.* | $ 857,558 |

** includes crashes involving possible injuries*

The estimated cost of a single crash depends on whether injuries/fatalities were involved. The National Highway Traffic Safety Administration has published *The Economic Impact of Motor Vehicle Crashes 2000* [15] which provides details on the average costs of crashes depending on injuries. The costs are composed of several factors: medical costs, property damage loss, lost productivity (market and household), and other related costs. The average cost for crashes involving property damage only was $4,812 (in 2004 dollars). Crashes involving injuries of varying degrees have an average cost of $49,817. Crashes with any fatalities, which are about 75 times less likely to occur as other injury crashes, have an average cost of $1,184,885 associated with them. The crash costs presented in Table 19 have been averaged to obtain the yearly estimate since the number of crashes shown is for a three-year period. The average yearly cost of crashes for the study interchanges, grouped by off-ramp right turn control type, indicates that interchanges using yield control for the off-ramp right turn movement are about $384,000 more costly than the interchanges using signal control.

**Operations Costs**

Table 20 (p.74) presents the operations cost data for the same five study sites where crash data was considered in Table 19. Operational delay data were only available with respect to peak period/hour for this project. Since these delays are only evident for a limited period of the day (assumed to be four hours for the purpose of this exercise), the other portion of the day must be accounted for in order to estimate the daily user costs of delay and equivalent average yearly costs of delay. Based on a similar procedure employed in *Evaluation of Operational Efficiencies, Cost and Accident Experience of Four Phase Single Point Urban Interchanges* [16], average user control delays associated with the off-peak period (eight hours) are estimated to be two-thirds of the peak period average value. Also, the volume processed at an interchange during the eight-hour off-peak period is about 38% greater than the volume processed during the four-hour peak period. The sum of the two is assumed to be representative of the daily traffic total.

Typically, road user costs are based on the 1977 *Manual on User Benefit Analysis* published by AASHTO (updated as of August 2003) [17]. The manual provides user cost information for a number of aspects including “value of time” data (user delay costs), which accounts for a majority of the user costs in this project’s comparison of the contro types for off-ramp right turn movements. The value of time is a function of the average hourly wage earned by the persons impacted by the delays (separated by passenger vehicles and trucks), the percentage of the hourly wage considered as the value of time (50% for passenger vehicles, 100% for trucks), and the average passenger occupancy (1.5 for passenger vehicles, 1.05 for trucks). The hourly wages associated with passenger vehicles is $18.56 per hour and the hourly compensation associated with trucks is $20.23 per hour. These values are then adjusted by the value of time factors (50% and 100%, respectively for passenger vehicles and trucks) and vehicle occupancy to arrive at value of time figures,l in 2000 dollars, of $13.92 and $21.24 for passenger vehicles and trucks, respectively. In order to apply these delay cost figures to the calculated delay results from the project, the figures are converted to 2004 dollars using consumer price index (CPI) conversion factors.

## Table 20. Summarized Operations Data and Estimated Annual Costs at the Study Sites

| | Interchange/Off-Ramp | Avg. Interchange Control Delay - Peak Hours (2 hr) [sec/veh] | Avg. Peak Period (4 hr) Volume | Avg. Peak Period (4 hr) Vehicle-Hours of Delay | Avg. Peak Period (4 hr) Delay Costs | Avg. Interchange Control Delay - Off-Peak Period (8 hr) [sec/veh] | Off-Peak Period (8 hr) Volume | Off Peak Period (8 hr) Vehicle-Hours of Delay | Off-Peak Period (8 hr) Delay Costs | Average User Delay Costs per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Off-Ramp Right Turn Signal Control | Indian School/SR51 SB Off-Ramp | 17.78 | 19000 | 93.86 | $ 1,432 | 11.86 | 26239 | 86.42 | $ 1,319 | $ 1,004,121 |
| | Indian School/SR51 NB Off-Ramp | | | | | | | | | |
| | Bell Road/L101(W) SB Off-Ramp | 27.44 | 27668 | 210.92 | $ 3,219 | 18.30 | 38210 | 194.19 | $ 2,963 | $ 2,256,438 |
| | Bell Road/L101(W) NB Off-Ramp | | | | | | | | | |
| | | | | | | | | | *Interchange Avg.* | $ 1,630,279 |
| Off-Ramp Right Turn Yield Control | Cactus Road/SR51 SB Off-Ramp | 15.22 | 20136 | 85.13 | $ 1,299 | 10.15 | 27808 | 78.38 | $ 1,196 | $ 910,754 |
| | Cactus Road/SR51 NB Off-Ramp | | | | | | | | | |
| | Greenway Road/SR51 SB Off-Ramp | 15.62 | 21728 | 94.25 | $ 1,438 | 10.41 | 30006 | 86.78 | $ 1,324 | $ 1,008,317 |
| | Greenway Road/SR51 NB Off-Ramp | | | | | | | | | |
| | Rural Road/L202 WB Off-Ramp | 14.51 | 21000 | 84.64 | $ 1,292 | 9.67 | 29001 | 77.92 | $ 1,189 | $ 905,422 |
| | Rural Road/L202 EB Off-Ramp | | | | | | | | | |
| | | | | | | | | | *Interchange Avg.* | $ 941,498 |

The result is a factor of 1.08, which is applied to the user delay costs of $13.92 and $21.24 to obtain $15.10 (passenger vehicles) and $23.04 (trucks) in terms of 2004 dollars. A weighted average user delay cost of $15.26 is calculated based on truck traffic representing 2% (as derived from the collected field data) of the traffic volume.

User cost of delay is selected as the point of comparison between the study interchanges due to its substantial contribution to the overall road user cost. User costs of idling, stopping, and operating speed are all assumed to be equal between the interchanges as well as minimal when compared to the user cost of delay.

The average interchange control delay values presented in Table 20 are based on the average result generated by the multiple models runs (as previously shown in Table 17) for the associated control scenario matching the actual study site configuration. The average yearly cost of delay for the study interchanges, grouped by off-ramp right turn control type, indicates that interchanges using signal control for the off-ramp right turn movement are about $689,000 more costly.

For use in this comparison only, the total average yearly costs (crash costs + delay costs) for interchanges using signal control for the off-ramp right turn movement are estimated at $2,100,000. Interchanges that have yield control for the off-ramp right turn movement have an average yearly cost estimate of $1,800,000. Despite yield control sites appearing to have higher crash rates (although not statistically significant), their overall savings in user cost of delay offsets the increased costs of crashes. However, the difference in total costs does not appear to be substantial, at least not to a degree where the selection of a certain control type would be more convincing than the other. The notes presented from the observations conducted during this project could be used to further refine the operation and safety of the off-ramp right turn movement at SPUIs in lieu of dramatic changes in policies governing type of control since this research concludes that, for all intents and purposes, the signal and yield control types are essentially equal when considering the combined aspects of crashes, operations, and costs.

## IMPLEMENTATION

This research project and its associated analysis have determined that neither signal nor yield control has an overwhelming advantage over the other with respect to the combined safety, operations, and costs associated with off-ramp right turn movements at SPUIs without frontage roads. Therefore, suggested implementation of one control over the other is unwarranted. A more extensive research study with an expanded sample of interchanges may yield more detailed conclusions which might suggest changes to current traffic control protocols.

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## Appendix A

**Raw Traffic Volume Data Collected**
(Interchange Turning Movement Counts,
Automatic Traffic Recorder Counts, &
Queuing Data)

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/20/2004
Start Time: 07:00 AM
Site Code: 4001

| | From North | | | | From East | | | | From South | | | | From West | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SR-51 (SB) OFF RAMP | | | | INDIAN SCHOOL RD | | | | SR-51 (NB) OFF RAMP | | | | INDIAN SCHOOL RD | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | RTOR | Left | Thru | Right | | Left | Thru | Right | RTOR | Left | Thru | Right | | TOTAL | TOTAL |
| 7:00 AM | 4 | 0 | 8 | 2 | 0 | 12 | 2 | 0 | 16 | 0 | 2 | 2 | 0 | 16 | 4 | 0 | 64 | |
| 7:01 AM | 0 | 0 | 14 | 5 | 1 | 17 | 4 | 0 | 0 | 0 | 4 | 2 | 5 | 7 | 2 | 0 | 54 | |
| 7:02 AM | 4 | 0 | 7 | 2 | 9 | 6 | 4 | 0 | 7 | 0 | 1 | 1 | 7 | 8 | 6 | 0 | 59 | |
| 7:03 AM | 4 | 0 | 12 | 3 | 0 | 11 | 4 | 0 | 12 | 0 | 7 | 2 | 0 | 10 | 3 | 0 | 63 | |
| 7:04 AM | 0 | 0 | 5 | 0 | 3 | 24 | 4 | 0 | 1 | 0 | 6 | 2 | 3 | 10 | 0 | 0 | 56 | |
| 7:05 AM | 6 | 0 | 8 | 1 | 2 | 0 | 5 | 0 | 25 | 0 | 7 | 3 | 6 | 8 | 7 | 0 | 74 | |
| 7:06 AM | 3 | 0 | 7 | 2 | 1 | 22 | 5 | 0 | 9 | 0 | 5 | 0 | 0 | 8 | 3 | 0 | 63 | |
| 7:07 AM | 0 | 0 | 9 | 2 | 3 | 22 | 5 | 0 | 0 | 0 | 1 | 1 | 7 | 15 | 4 | 0 | 66 | |
| 7:08 AM | 6 | 0 | 11 | 4 | 4 | 0 | 3 | 0 | 8 | 0 | 4 | 6 | 9 | 12 | 5 | 0 | 62 | |
| 7:09 AM | 6 | 0 | 4 | 1 | 0 | 18 | 2 | 0 | 10 | 0 | 5 | 2 | 0 | 4 | 10 | 0 | 59 | |
| 7:10 AM | 6 | 0 | 8 | 3 | 3 | 26 | 4 | 0 | 0 | 0 | 0 | 0 | 7 | 13 | 2 | 0 | 69 | |
| 7:11 AM | 2 | 0 | 8 | 1 | 6 | 0 | 3 | 0 | 21 | 0 | 3 | 2 | 4 | 2 | 9 | 0 | 58 | |
| 7:12 AM | 5 | 0 | 7 | 5 | 2 | 20 | 0 | 0 | 10 | 0 | 4 | 4 | 2 | 14 | 4 | 0 | 68 | |
| 7:13 AM | 1 | 0 | 9 | 5 | 0 | 11 | 5 | 0 | 0 | 0 | 5 | 4 | 14 | 6 | 6 | 0 | 57 | |
| 7:14 AM | 6 | 0 | 12 | 5 | 1 | 10 | 3 | 0 | 9 | 0 | 0 | 0 | 3 | 15 | 5 | 0 | 64 | |
| 7:15 AM | 4 | 0 | 13 | 5 | 0 | 11 | 1 | 0 | 12 | 0 | 5 | 5 | 0 | 3 | 4 | 0 | 53 | |
| 7:16 AM | 5 | 0 | 12 | 2 | 9 | 18 | 4 | 0 | 0 | 0 | 3 | 1 | 5 | 10 | 0 | 0 | 66 | |
| 7:17 AM | 1 | 0 | 7 | 2 | 7 | 0 | 5 | 0 | 15 | 0 | 2 | 2 | 6 | 2 | 4 | 0 | 49 | |
| 7:18 AM | 4 | 0 | 7 | 2 | 0 | 17 | 4 | 0 | 8 | 0 | 2 | 1 | 0 | 17 | 5 | 0 | 64 | |
| 7:19 AM | 1 | 0 | 8 | 3 | 9 | 28 | 6 | 0 | 0 | 0 | 4 | 2 | 4 | 14 | 2 | 0 | 76 | |
| 7:20 AM | 5 | 0 | 13 | 0 | 10 | 0 | 5 | 0 | 15 | 0 | 2 | 0 | 4 | 2 | 3 | 0 | 59 | |
| 7:21 AM | 4 | 0 | 12 | 2 | 0 | 16 | 3 | 0 | 12 | 0 | 4 | 4 | 0 | 6 | 2 | 0 | 59 | |
| 7:22 AM | 1 | 0 | 12 | 3 | 5 | 23 | 4 | 0 | 0 | 0 | 5 | 3 | 4 | 13 | 3 | 0 | 70 | |
| 7:23 AM | 1 | 0 | 7 | 2 | 6 | 6 | 4 | 0 | 13 | 0 | 5 | 0 | 6 | 8 | 4 | 0 | 60 | |
| 7:24 AM | 3 | 0 | 9 | 1 | 0 | 21 | 1 | 0 | 13 | 0 | 8 | 8 | 0 | 8 | 4 | 0 | 67 | |
| 7:25 AM | 1 | 0 | 6 | 3 | 7 | 22 | 8 | 0 | 5 | 0 | 2 | 1 | 10 | 13 | 4 | 0 | 78 | |
| 7:26 AM | 2 | 0 | 4 | 2 | 3 | 16 | 5 | 0 | 4 | 0 | 7 | 5 | 2 | 14 | 8 | 0 | 65 | |
| 7:27 AM | 7 | 0 | 7 | 5 | 0 | 9 | 7 | 0 | 11 | 0 | 5 | 5 | 1 | 2 | 4 | 0 | 53 | |
| 7:28 AM | 0 | 0 | 7 | 2 | 7 | 28 | 4 | 0 | 0 | 0 | 7 | 3 | 5 | 13 | 3 | 0 | 74 | |
| 7:29 AM | 7 | 0 | 7 | 3 | 6 | 0 | 4 | 0 | 20 | 0 | 0 | 0 | 8 | 2 | 6 | 0 | 60 | |
| 7:30 AM | 4 | 0 | 3 | 2 | 0 | 22 | 2 | 0 | 13 | 0 | 2 | 1 | 0 | 16 | 6 | 0 | 68 | |
| 7:31 AM | 0 | 0 | 5 | 2 | 12 | 28 | 5 | 0 | 1 | 0 | 2 | 0 | 8 | 22 | 3 | 0 | 86 | |
| 7:32 AM | 3 | 0 | 11 | 2 | 9 | 0 | 5 | 0 | 11 | 0 | 4 | 4 | 6 | 0 | 5 | 0 | 54 | |
| 7:33 AM | 7 | 0 | 5 | 1 | 0 | 30 | 4 | 0 | 8 | 0 | 7 | 1 | 0 | 20 | 3 | 0 | 84 | |
| 7:34 AM | 6 | 0 | 6 | 1 | 5 | 31 | 4 | 0 | 0 | 0 | 2 | 1 | 7 | 27 | 3 | 0 | 91 | |
| 7:35 AM | 0 | 0 | 11 | 5 | 8 | 0 | 2 | 0 | 17 | 0 | 4 | 2 | 9 | 1 | 5 | 0 | 57 | |
| 7:36 AM | 7 | 0 | 10 | 7 | 0 | 22 | 3 | 0 | 6 | 0 | 7 | 6 | 0 | 16 | 5 | 0 | 76 | |
| 7:37 AM | 4 | 0 | 5 | 0 | 0 | 41 | 10 | 0 | 0 | 0 | 3 | 3 | 0 | 26 | 7 | 0 | 96 | |
| 7:38 AM | 1 | 0 | 6 | 4 | 11 | 0 | 2 | 0 | 14 | 0 | 7 | 7 | 9 | 0 | 13 | 0 | 63 | |
| 7:39 AM | 10 | 0 | 5 | 2 | 0 | 21 | 5 | 0 | 16 | 0 | 8 | 4 | 0 | 24 | 2 | 0 | 91 | |
| 7:40 AM | 0 | 0 | 9 | 3 | 5 | 27 | 7 | 0 | 0 | 0 | 5 | 2 | 9 | 30 | 8 | 0 | 100 | |
| 7:41 AM | 1 | 0 | 8 | 2 | 0 | 5 | 6 | 0 | 10 | 0 | 7 | 7 | 3 | 26 | 8 | 0 | 74 | |
| 7:42 AM | 7 | 0 | 10 | 1 | 0 | 28 | 3 | 0 | 16 | 0 | 4 | 1 | 0 | 0 | 5 | 0 | 73 | |
| 7:43 AM | 7 | 0 | 8 | 3 | 11 | 24 | 9 | 0 | 0 | 0 | 3 | 0 | 11 | 18 | 4 | 0 | 95 | |
| 7:44 AM | 5 | 0 | 10 | 4 | 8 | 0 | 4 | 0 | 14 | 0 | 10 | 7 | 2 | 1 | 7 | 0 | 61 | |
| 7:45 AM | 9 | 0 | 8 | 0 | 0 | 34 | 4 | 0 | 12 | 0 | 4 | 4 | 0 | 18 | 3 | 0 | 92 | |
| 7:46 AM | 4 | 0 | 9 | 6 | 11 | 25 | 5 | 0 | 0 | 0 | 6 | 2 | 5 | 15 | 7 | 0 | 87 | |
| 7:47 AM | 4 | 0 | 9 | 2 | 13 | 0 | 2 | 0 | 18 | 0 | 12 | 7 | 4 | 0 | 7 | 0 | 69 | |
| 7:48 AM | 6 | 0 | 9 | 4 | 4 | 28 | 9 | 0 | 8 | 0 | 1 | 1 | 6 | 18 | 3 | 0 | 92 | |
| 7:49 AM | 5 | 0 | 11 | 6 | 7 | 46 | 4 | 0 | 0 | 0 | 1 | 1 | 0 | 32 | 7 | 0 | 113 | |
| 7:50 AM | 4 | 0 | 8 | 3 | 6 | 0 | 9 | 0 | 20 | 0 | 3 | 3 | 9 | 0 | 8 | 0 | 67 | |
| 7:51 AM | 3 | 0 | 8 | 1 | 0 | 29 | 0 | 0 | 8 | 0 | 5 | 3 | 0 | 21 | 7 | 0 | 81 | |
| 7:52 AM | 0 | 0 | 11 | 3 | 3 | 35 | 7 | 0 | 0 | 0 | 9 | 6 | 5 | 17 | 4 | 0 | 91 | |
| 7:53 AM | 8 | 0 | 9 | 0 | 5 | 3 | 6 | 0 | 13 | 0 | 6 | 4 | 4 | 13 | 5 | 0 | 72 | |
| 7:54 AM | 5 | 0 | 9 | 3 | 0 | 28 | 4 | 0 | 10 | 0 | 2 | 2 | 5 | 6 | 5 | 0 | 74 | |
| 7:55 AM | 0 | 0 | 9 | 4 | 2 | 35 | 4 | 0 | 0 | 0 | 4 | 0 | 1 | 16 | 6 | 0 | 77 | |
| 7:56 AM | 10 | 0 | 9 | 0 | 9 | 0 | 4 | 0 | 18 | 0 | 10 | 5 | 7 | 0 | 6 | 0 | 73 | |
| 7:57 AM | 5 | 0 | 8 | 2 | 1 | 27 | 1 | 0 | 20 | 0 | 4 | 4 | 0 | 12 | 4 | 0 | 82 | |
| 7:58 AM | 0 | 0 | 13 | 5 | 8 | 24 | 12 | 0 | 0 | 0 | 4 | 0 | 3 | 19 | 5 | 0 | 88 | |
| 7:59 AM | 9 | 0 | 13 | 5 | 5 | 0 | 3 | 0 | 17 | 0 | 5 | 2 | 4 | 0 | 8 | 0 | 64 | 4280 |
| 8:00 AM | 4 | 0 | 8 | 5 | 2 | 25 | 7 | 0 | 9 | 0 | 1 | 1 | 4 | 22 | 2 | 0 | 84 | 4300 |
| 8:01 AM | 6 | 0 | 12 | 8 | 0 | 24 | 5 | 0 | 0 | 0 | 3 | 3 | 0 | 33 | 6 | 0 | 89 | 4335 |
| 8:02 AM | 1 | 0 | 13 | 4 | 8 | 0 | 4 | 0 | 18 | 0 | 5 | 5 | 10 | 1 | 4 | 0 | 64 | 4340 |
| 8:03 AM | 7 | 0 | 8 | 4 | 0 | 19 | 4 | 0 | 8 | 0 | 2 | 2 | 0 | 18 | 4 | 0 | 70 | 4347 |
| 8:04 AM | 0 | 0 | 11 | 5 | 1 | 28 | 5 | 0 | 9 | 0 | 5 | 4 | 7 | 19 | 6 | 0 | 91 | 4382 |
| 8:05 AM | 8 | 0 | 8 | 6 | 6 | 17 | 1 | 0 | 0 | 0 | 1 | 1 | 3 | 21 | 7 | 0 | 72 | 4380 |
| 8:06 AM | 12 | 0 | 5 | 3 | 0 | 11 | 4 | 0 | 17 | 0 | 8 | 4 | 0 | 1 | 1 | 0 | 59 | 4376 |
| 8:07 AM | 4 | 0 | 12 | 4 | 12 | 22 | 3 | 0 | 0 | 0 | 1 | 0 | 4 | 15 | 1 | 0 | 74 | 4384 |
| 8:08 AM | 7 | 0 | 7 | 6 | 5 | 5 | 4 | 0 | 12 | 0 | 7 | 2 | 6 | 15 | 3 | 0 | 71 | 4393 |
| 8:09 AM | 5 | 0 | 10 | 5 | 5 | 10 | 2 | 0 | 3 | 0 | 10 | 6 | 0 | 3 | 5 | 0 | 53 | 4387 |
| 8:10 AM | 2 | 0 | 9 | 6 | 3 | 21 | 4 | 0 | 0 | 0 | 2 | 3 | 0 | 17 | 10 | 0 | 68 | 4386 |
| 8:11 AM | 4 | 0 | 10 | 6 | 11 | 0 | 3 | 0 | 17 | 0 | 6 | 3 | 13 | 1 | 11 | 0 | 76 | 4404 |
| 8:12 AM | 6 | 0 | 8 | 3 | 0 | 25 | 5 | 0 | 18 | 0 | 4 | 4 | 0 | 22 | 7 | 0 | 95 | 4431 |
| 8:13 AM | 1 | 0 | 8 | 0 | 8 | 23 | 8 | 0 | 0 | 0 | 6 | 1 | 2 | 21 | 6 | 0 | 83 | 4457 |
| 8:14 AM | 9 | 0 | 9 | 3 | 5 | 0 | 7 | 0 | 8 | 0 | 3 | 1 | 11 | 15 | 5 | 0 | 72 | 4465 |
| 8:15 AM | 11 | 0 | 9 | 0 | 0 | 19 | 2 | 0 | 15 | 0 | 7 | 3 | 0 | 6 | 6 | 0 | 75 | 4487 |
| 8:16 AM | 0 | 0 | 11 | 3 | 8 | 25 | 5 | 0 | 0 | 0 | 4 | 2 | 6 | 16 | 3 | 0 | 78 | 4499 |
| 8:17 AM | 9 | 0 | 12 | 5 | 7 | 0 | 7 | 0 | 12 | 0 | 2 | 2 | 3 | 0 | 2 | 0 | 54 | 4504 |
| 8:18 AM | 12 | 0 | 9 | 0 | 0 | 24 | 3 | 0 | 12 | 0 | 7 | 7 | 0 | 18 | 4 | 0 | 89 | 4529 |
| 8:19 AM | 4 | 0 | 16 | 6 | 5 | 23 | 2 | 0 | 0 | 0 | 1 | 0 | 9 | 15 | 2 | 0 | 77 | 4530 |
| 8:20 AM | 0 | 0 | 15 | 4 | 6 | 0 | 3 | 0 | 9 | 0 | 5 | 1 | 3 | 6 | 3 | 0 | 50 | 4521 |
| 8:21 AM | 5 | 0 | 11 | 2 | 0 | 25 | 8 | 0 | 8 | 0 | 3 | 1 | 0 | 7 | 4 | 0 | 71 | 4533 |
| 8:22 AM | 3 | 0 | 7 | 2 | 1 | 31 | 7 | 0 | 0 | 0 | 1 | 1 | 6 | 15 | 1 | 0 | 72 | 4535 |
| 8:23 AM | 4 | 0 | 16 | 4 | 9 | 0 | 2 | 0 | 13 | 0 | 10 | 6 | 5 | 5 | 5 | 0 | 69 | 4544 |
| 8:24 AM | 5 | 0 | 5 | 2 | 0 | 26 | 6 | 0 | 18 | 0 | 3 | 2 | 0 | 12 | 3 | 0 | 78 | 4555 |
| 8:25 AM | 6 | 0 | 12 | 4 | 3 | 16 | 9 | 0 | 0 | 0 | 0 | 0 | 3 | 19 | 4 | 0 | 72 | 4549 |
| 8:26 AM | 1 | 0 | 10 | 5 | 3 | 5 | 4 | 0 | 11 | 0 | 2 | 1 | 5 | 12 | 2 | 0 | 55 | 4539 |
| 8:27 AM | 10 | 0 | 7 | 2 | 0 | 10 | 5 | 0 | 5 | 0 | 5 | 5 | 3 | 5 | 4 | 0 | 54 | 4540 |
| 8:28 AM | 0 | 0 | 6 | 2 | 4 | 31 | 6 | 0 | 3 | 0 | 6 | 4 | 3 | 27 | 4 | 0 | 90 | 4556 |
| 8:29 AM | 9 | 0 | 5 | 2 | 7 | 4 | 2 | 0 | 14 | 0 | 2 | 1 | 6 | 6 | 8 | 0 | 63 | 4559 |
| Approach Total | 1192 | | | | 2242 | | | | 1153 | | | | 1861 | | | | | |
| Grand Total | 388 | 0 | 804 | 272 | 366 | 1476 | 400 | 0 | 765 | 0 | 388 | 237 | 351 | 1082 | 428 | 0 | 6448 | |
| Approach % | 32.6% | 0.0% | 67.4% | 22.8% | 16.3% | 65.8% | 17.8% | 0.0% | 66.3% | 0.0% | 33.7% | 20.6% | 18.9% | 58.1% | 23.0% | 0.0% | | |
| Total % | 6.0% | 0.0% | 12.5% | 4.2% | 5.7% | 22.9% | 6.2% | 0.0% | 11.9% | 0.0% | 6.0% | 3.7% | 5.4% | 16.8% | 6.6% | 0.0% | | |
| **Begin Peak Hour:** | **7:30** | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **289** | **0** | **544** | **194** | **262** | **1062** | **282** | **0** | **509** | **0** | **273** | **166** | **229** | **807** | **302** | **0** | **4559** | 4559 |

| HOUR TOTAL | | | |
|---|---|---|---|
| 4280 | 7:00 AM | to | 8:00 AM |
| 4300 | 7:01 AM | to | 8:01 AM |
| 4335 | 7:02 AM | to | 8:02 AM |
| 4340 | 7:03 AM | to | 8:03 AM |
| 4347 | 7:04 AM | to | 8:04 AM |
| 4382 | 7:05 AM | to | 8:05 AM |
| 4380 | 7:06 AM | to | 8:06 AM |
| 4376 | 7:07 AM | to | 8:07 AM |
| 4384 | 7:08 AM | to | 8:08 AM |
| 4393 | 7:09 AM | to | 8:09 AM |
| 4387 | 7:10 AM | to | 8:10 AM |
| 4386 | 7:11 AM | to | 8:11 AM |
| 4404 | 7:12 AM | to | 8:12 AM |
| 4431 | 7:13 AM | to | 8:13 AM |
| 4457 | 7:14 AM | to | 8:14 AM |
| 4465 | 7:15 AM | to | 8:15 AM |
| 4487 | 7:16 AM | to | 8:16 AM |
| 4499 | 7:17 AM | to | 8:17 AM |
| 4504 | 7:18 AM | to | 8:18 AM |
| 4529 | 7:19 AM | to | 8:19 AM |
| 4530 | 7:20 AM | to | 8:20 AM |
| 4521 | 7:21 AM | to | 8:21 AM |
| 4533 | 7:22 AM | to | 8:22 AM |
| 4535 | 7:23 AM | to | 8:23 AM |
| 4544 | 7:24 AM | to | 8:24 AM |
| 4555 | 7:25 AM | to | 8:25 AM |
| 4549 | 7:26 AM | to | 8:26 AM |
| 4539 | 7:27 AM | to | 8:27 AM |
| 4540 | 7:28 AM | to | 8:28 AM |
| 4556 | 7:29 AM | to | 8:29 AM |
| 4559 | 7:30 AM | to | 8:30 AM |
| 4559 | 7:30 AM | to | 8:30 AM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/20/2004
Start Time: 04:30 PM
Site Code: 4001

| Street Name | From North SR-51 (SB) OFF RAMP | | | | From East INDIAN SCHOOL RD | | | | From South SR-51 (NB) OFF RAMP | | | | From West INDIAN SCHOOL RD | | | | INTSEC TOTAL | HOUR TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | RTOR | Left | Thru | Right | | Left | Thru | Right | RTOR | Left | Thru | Right | | | | | |
| 4:30 PM | 5 | 0 | 3 | 2 | 14 | 26 | 0 | 0 | 0 | 0 | 5 | 2 | 13 | 25 | 7 | 0 | 98 | | | |
| 4:31 PM | 13 | 0 | 5 | 3 | 3 | 11 | 12 | 0 | 6 | 0 | 4 | 3 | 5 | 27 | 5 | 0 | 91 | | | |
| 4:32 PM | 3 | 0 | 3 | 1 | 0 | 15 | 6 | 0 | 2 | 0 | 5 | 2 | 0 | 16 | 10 | 0 | 60 | | | |
| 4:33 PM | 10 | 0 | 4 | 3 | 9 | 25 | 7 | 0 | 0 | 0 | 2 | 1 | 11 | 27 | 9 | 0 | 104 | | | |
| 4:34 PM | 4 | 0 | 6 | 4 | 5 | 1 | 10 | 0 | 8 | 0 | 5 | 3 | 6 | 2 | 5 | 0 | 52 | | | |
| 4:35 PM | 0 | 0 | 5 | 4 | 3 | 26 | 11 | 0 | 0 | 0 | 3 | 2 | 4 | 24 | 11 | 0 | 87 | | | |
| 4:36 PM | 14 | 0 | 3 | 1 | 0 | 34 | 5 | 0 | 0 | 0 | 5 | 4 | 0 | 32 | 6 | 0 | 99 | | | |
| 4:37 PM | 5 | 0 | 5 | 3 | 9 | 0 | 9 | 0 | 9 | 0 | 5 | 3 | 19 | 1 | 8 | 0 | 70 | | | |
| 4:38 PM | 0 | 0 | 0 | 0 | 2 | 25 | 6 | 0 | 3 | 0 | 3 | 3 | 8 | 20 | 12 | 0 | 79 | | | |
| 4:39 PM | 12 | 0 | 6 | 1 | 3 | 26 | 8 | 0 | 0 | 0 | 5 | 5 | 1 | 27 | 12 | 0 | 100 | | | |
| 4:40 PM | 5 | 0 | 5 | 4 | 2 | 0 | 10 | 0 | 11 | 0 | 3 | 0 | 10 | 0 | 6 | 0 | 52 | | | |
| 4:41 PM | 0 | 0 | 1 | 1 | 5 | 24 | 6 | 0 | 5 | 0 | 4 | 3 | 11 | 23 | 7 | 0 | 86 | | | |
| 4:42 PM | 6 | 0 | 7 | 1 | 7 | 30 | 1 | 0 | 0 | 0 | 1 | 1 | 6 | 49 | 7 | 0 | 114 | | | |
| 4:43 PM | 4 | 0 | 4 | 3 | 4 | 1 | 1 | 0 | 10 | 0 | 0 | 0 | 8 | 19 | 4 | 0 | 55 | | | |
| 4:44 PM | 0 | 0 | 1 | 1 | 0 | 19 | 4 | 0 | 2 | 0 | 3 | 3 | 4 | 15 | 13 | 0 | 61 | | | |
| 4:45 PM | 4 | 0 | 5 | 0 | 8 | 29 | 2 | 0 | 0 | 0 | 6 | 5 | 16 | 34 | 6 | 0 | 110 | | | |
| 4:46 PM | 13 | 0 | 3 | 2 | 2 | 1 | 6 | 0 | 7 | 0 | 3 | 1 | 10 | 0 | 4 | 0 | 49 | | | |
| 4:47 PM | 0 | 0 | 0 | 0 | 6 | 21 | 10 | 0 | 6 | 0 | 0 | 0 | 1 | 26 | 15 | 0 | 85 | | | |
| 4:48 PM | 0 | 0 | 2 | 0 | 0 | 40 | 3 | 0 | 0 | 0 | 3 | 3 | 12 | 52 | 6 | 0 | 118 | | | |
| 4:49 PM | 6 | 0 | 3 | 1 | 7 | 14 | 7 | 0 | 4 | 0 | 3 | 2 | 10 | 18 | 5 | 0 | 77 | | | |
| 4:50 PM | 8 | 0 | 7 | 5 | 1 | 19 | 5 | 0 | 5 | 0 | 4 | 2 | 6 | 8 | 13 | 0 | 76 | | | |
| 4:51 PM | 0 | 0 | 4 | 2 | 5 | 28 | 3 | 0 | 0 | 0 | 2 | 2 | 3 | 30 | 6 | 0 | 81 | | | |
| 4:52 PM | 9 | 0 | 5 | 4 | 4 | 16 | 3 | 0 | 8 | 0 | 1 | 1 | 11 | 24 | 10 | 0 | 91 | | | |
| 4:53 PM | 13 | 0 | 4 | 4 | 0 | 26 | 4 | 0 | 3 | 0 | 6 | 2 | 0 | 8 | 5 | 0 | 69 | | | |
| 4:54 PM | 1 | 0 | 5 | 3 | 8 | 15 | 2 | 0 | 0 | 0 | 1 | 1 | 9 | 22 | 4 | 0 | 67 | | | |
| 4:55 PM | 11 | 0 | 2 | 2 | 4 | 14 | 4 | 0 | 4 | 0 | 4 | 4 | 6 | 25 | 11 | 0 | 85 | | | |
| 4:56 PM | 1 | 0 | 1 | 1 | 0 | 18 | 2 | 0 | 4 | 0 | 8 | 5 | 1 | 8 | 16 | 0 | 59 | | | |
| 4:57 PM | 0 | 0 | 0 | 0 | 14 | 31 | 2 | 0 | 0 | 0 | 2 | 2 | 14 | 33 | 9 | 0 | 105 | | | |
| 4:58 PM | 11 | 0 | 8 | 2 | 7 | 0 | 13 | 0 | 7 | 0 | 1 | 1 | 11 | 10 | 6 | 0 | 74 | | | |
| 4:59 PM | 8 | 0 | 4 | 4 | 0 | 23 | 7 | 0 | 6 | 0 | 2 | 2 | 4 | 19 | 6 | 0 | 79 | | | |
| 5:00 PM | 0 | 0 | 7 | 5 | 5 | 13 | 2 | 0 | 0 | 0 | 3 | 3 | 9 | 26 | 5 | 0 | 70 | | | |
| 5:01 PM | 8 | 0 | 4 | 0 | 1 | 0 | 4 | 0 | 11 | 0 | 1 | 1 | 11 | 22 | 8 | 0 | 70 | | | |
| 5:02 PM | 9 | 0 | 1 | 1 | 0 | 37 | 5 | 0 | 8 | 0 | 3 | 1 | 0 | 12 | 7 | 0 | 82 | | | |
| 5:03 PM | 0 | 0 | 5 | 0 | 12 | 27 | 3 | 0 | 4 | 0 | 5 | 0 | 13 | 27 | 9 | 0 | 105 | | | |
| 5:04 PM | 8 | 0 | 5 | 2 | 5 | 0 | 10 | 0 | 5 | 0 | 0 | 1 | 12 | 9 | 7 | 0 | 61 | | | |
| 5:05 PM | 9 | 0 | 2 | 1 | 0 | 23 | 6 | 0 | 11 | 0 | 0 | 0 | 0 | 14 | 12 | 0 | 77 | | | |
| 5:06 PM | 0 | 0 | 6 | 2 | 10 | 31 | 4 | 0 | 0 | 0 | 1 | 0 | 4 | 28 | 2 | 0 | 86 | | | |
| 5:07 PM | 3 | 0 | 5 | 2 | 4 | 9 | 7 | 0 | 3 | 0 | 2 | 1 | 14 | 27 | 11 | 0 | 85 | | | |
| 5:08 PM | 4 | 0 | 1 | 1 | 0 | 25 | 6 | 0 | 7 | 0 | 2 | 1 | 11 | 11 | 14 | 0 | 81 | | | |
| 5:09 PM | 0 | 0 | 8 | 3 | 6 | 28 | 2 | 0 | 4 | 0 | 3 | 3 | 7 | 28 | 10 | 0 | 96 | | | |
| 5:10 PM | 9 | 0 | 6 | 1 | 7 | 0 | 5 | 0 | 2 | 0 | 3 | 3 | 15 | 16 | 8 | 0 | 71 | | | |
| 5:11 PM | 9 | 0 | 6 | 2 | 0 | 28 | 5 | 0 | 0 | 0 | 1 | 0 | 7 | 14 | 9 | 0 | 79 | | | |
| 5:12 PM | 0 | 0 | 2 | 2 | 11 | 21 | 6 | 0 | 7 | 0 | 4 | 2 | 3 | 27 | 6 | 0 | 87 | | | |
| 5:13 PM | 14 | 0 | 3 | 0 | 4 | 0 | 5 | 0 | 7 | 0 | 4 | 0 | 11 | 0 | 9 | 0 | 57 | | | |
| 5:14 PM | 8 | 0 | 3 | 1 | 4 | 24 | 7 | 0 | 7 | 0 | 3 | 0 | 0 | 24 | 13 | 0 | 93 | | | |
| 5:15 PM | 0 | 0 | 4 | 2 | 1 | 35 | 1 | 0 | 0 | 0 | 3 | 2 | 8 | 41 | 6 | 0 | 99 | | | |
| 5:16 PM | 7 | 0 | 2 | 1 | 7 | 1 | 6 | 0 | 3 | 0 | 7 | 1 | 13 | 16 | 10 | 0 | 72 | | | |
| 5:17 PM | 8 | 0 | 3 | 0 | 2 | 31 | 5 | 0 | 2 | 0 | 1 | 1 | 9 | 31 | 13 | 0 | 105 | | | |
| 5:18 PM | 0 | 0 | 4 | 4 | 1 | 23 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 41 | 5 | 0 | 77 | | | |
| 5:19 PM | 12 | 0 | 6 | 4 | 8 | 0 | 1 | 0 | 7 | 0 | 1 | 1 | 15 | 18 | 7 | 0 | 75 | | | |
| 5:20 PM | 5 | 0 | 7 | 3 | 3 | 15 | 5 | 0 | 3 | 0 | 2 | 2 | 12 | 21 | 5 | 0 | 78 | | | |
| 5:21 PM | 0 | 0 | 6 | 5 | 1 | 34 | 4 | 0 | 0 | 0 | 2 | 2 | 1 | 38 | 4 | 0 | 90 | | | |
| 5:22 PM | 14 | 0 | 5 | 2 | 12 | 3 | 7 | 0 | 6 | 0 | 1 | 1 | 8 | 6 | 5 | 0 | 67 | | | |
| 5:23 PM | 0 | 0 | 3 | 1 | 0 | 25 | 1 | 0 | 5 | 0 | 3 | 0 | 0 | 28 | 12 | 0 | 77 | | | |
| 5:24 PM | 11 | 0 | 4 | 2 | 7 | 22 | 1 | 0 | 1 | 0 | 1 | 0 | 9 | 24 | 7 | 0 | 87 | | | |
| 5:25 PM | 16 | 0 | 1 | 1 | 5 | 0 | 5 | 0 | 4 | 0 | 3 | 1 | 14 | 11 | 8 | 0 | 67 | | | |
| 5:26 PM | 8 | 0 | 3 | 3 | 0 | 27 | 2 | 0 | 2 | 0 | 0 | 0 | 7 | 25 | 9 | 0 | 83 | | | |
| 5:27 PM | 0 | 0 | 4 | 2 | 10 | 30 | 1 | 0 | 4 | 0 | 2 | 1 | 3 | 43 | 6 | 0 | 103 | | | |
| 5:28 PM | 13 | 0 | 3 | 3 | 8 | 0 | 4 | 0 | 3 | 0 | 3 | 2 | 21 | 31 | 9 | 0 | 95 | | | |
| 5:29 PM | 9 | 0 | 2 | 0 | 0 | 26 | 1 | 0 | 4 | 0 | 1 | 1 | 11 | 16 | 10 | 0 | 80 | 4888 | 4:30 PM to | 5:30 PM |
| 5:30 PM | 0 | 0 | 7 | 4 | 6 | 29 | 2 | 0 | 0 | 0 | 3 | 1 | 0 | 47 | 6 | 0 | 100 | 4890 | 4:31 PM to | 5:31 PM |
| 5:31 PM | 10 | 0 | 4 | 0 | 7 | 0 | 6 | 0 | 9 | 0 | 2 | 0 | 13 | 16 | 9 | 0 | 76 | 4875 | 4:32 PM to | 5:32 PM |
| 5:32 PM | 9 | 0 | 2 | 2 | 0 | 21 | 3 | 0 | 6 | 0 | 3 | 0 | 0 | 13 | 7 | 0 | 64 | 4879 | 4:33 PM to | 5:33 PM |
| 5:33 PM | 0 | 0 | 4 | 1 | 11 | 37 | 4 | 0 | 0 | 0 | 6 | 3 | 8 | 32 | 11 | 0 | 113 | 4888 | 4:34 PM to | 5:34 PM |
| 5:34 PM | 6 | 0 | 2 | 1 | 9 | 0 | 4 | 0 | 5 | 0 | 6 | 2 | 15 | 7 | 7 | 0 | 61 | 4897 | 4:35 PM to | 5:35 PM |
| 5:35 PM | 14 | 0 | 1 | 1 | 0 | 28 | 2 | 0 | 6 | 0 | 3 | 1 | 0 | 21 | 19 | 0 | 94 | 4904 | 4:36 PM to | 5:36 PM |
| 5:36 PM | 0 | 0 | 3 | 1 | 5 | 25 | 2 | 0 | 0 | 0 | 7 | 4 | 15 | 31 | 7 | 0 | 95 | 4900 | 4:37 PM to | 5:37 PM |
| 5:37 PM | 11 | 0 | 5 | 4 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 10 | 14 | 5 | 0 | 61 | 4891 | 4:38 PM to | 5:38 PM |
| 5:38 PM | 11 | 0 | 4 | 2 | 0 | 34 | 4 | 0 | 3 | 0 | 2 | 2 | 9 | 19 | 8 | 0 | 94 | 4906 | 4:39 PM to | 5:39 PM |
| 5:39 PM | 0 | 0 | 3 | 2 | 4 | 36 | 7 | 0 | 0 | 0 | 1 | 0 | 5 | 35 | 8 | 0 | 99 | 4905 | 4:40 PM to | 5:40 PM |
| 5:40 PM | 9 | 0 | 2 | 0 | 3 | 0 | 10 | 0 | 9 | 0 | 3 | 0 | 13 | 18 | 6 | 0 | 73 | 4926 | 4:41 PM to | 5:41 PM |
| 5:41 PM | 11 | 0 | 6 | 1 | 0 | 31 | 8 | 0 | 5 | 0 | 2 | 2 | 4 | 12 | 11 | 0 | 90 | 4930 | 4:42 PM to | 5:42 PM |
| 5:42 PM | 0 | 0 | 3 | 1 | 5 | 40 | 3 | 0 | 0 | 0 | 6 | 4 | 7 | 24 | 8 | 0 | 96 | 4912 | 4:43 PM to | 5:43 PM |
| 5:43 PM | 6 | 0 | 4 | 1 | 8 | 0 | 4 | 0 | 6 | 0 | 7 | 1 | 8 | 12 | 2 | 0 | 57 | 4914 | 4:44 PM to | 5:44 PM |
| 5:44 PM | 7 | 0 | 4 | 0 | 0 | 32 | 3 | 0 | 9 | 0 | 4 | 1 | 0 | 20 | 8 | 0 | 87 | 4940 | 4:45 PM to | 5:45 PM |
| 5:45 PM | 0 | 0 | 3 | 1 | 4 | 12 | 5 | 0 | 1 | 0 | 4 | 1 | 11 | 30 | 10 | 0 | 80 | 4910 | 4:46 PM to | 5:46 PM |
| 5:46 PM | 13 | 0 | 6 | 3 | 4 | 0 | 9 | 0 | 8 | 0 | 4 | 2 | 8 | 23 | 5 | 0 | 80 | 4941 | 4:47 PM to | 5:47 PM |
| 5:47 PM | 3 | 0 | 7 | 0 | 0 | 30 | 0 | 0 | 5 | 0 | 9 | 4 | 4 | 18 | 8 | 0 | 84 | 4940 | 4:48 PM to | 5:48 PM |
| 5:48 PM | 2 | 0 | 0 | 0 | 3 | 30 | 8 | 0 | 5 | 0 | 6 | 5 | 12 | 33 | 6 | 0 | 105 | 4927 | 4:49 PM to | 5:49 PM |
| 5:49 PM | 1 | 0 | 4 | 3 | 4 | 19 | 4 | 0 | 6 | 0 | 2 | 2 | 2 | 22 | 4 | 0 | 68 | 4918 | 4:50 PM to | 5:50 PM |
| 5:50 PM | 9 | 0 | 2 | 2 | 0 | 7 | 6 | 0 | 6 | 0 | 5 | 2 | 0 | 14 | 4 | 0 | 53 | 4895 | 4:51 PM to | 5:51 PM |
| 5:51 PM | 1 | 0 | 1 | 1 | 3 | 19 | 6 | 0 | 8 | 0 | 2 | 2 | 13 | 22 | 7 | 0 | 82 | 4896 | 4:52 PM to | 5:52 PM |
| 5:52 PM | 6 | 0 | 4 | 3 | 6 | 0 | 6 | 0 | 8 | 0 | 6 | 3 | 9 | 14 | 7 | 0 | 66 | 4871 | 4:53 PM to | 5:53 PM |
| 5:53 PM | 7 | 0 | 5 | 1 | 0 | 23 | 3 | 0 | 7 | 0 | 5 | 3 | 4 | 16 | 14 | 0 | 84 | 4886 | 4:54 PM to | 5:54 PM |
| 5:54 PM | 0 | 0 | 3 | 1 | 5 | 30 | 5 | 0 | 1 | 0 | 3 | 0 | 7 | 36 | 9 | 0 | 99 | 4918 | 4:55 PM to | 5:55 PM |
| 5:55 PM | 6 | 0 | 2 | 2 | 6 | 1 | 8 | 0 | 5 | 0 | 7 | 1 | 9 | 14 | 0 | 0 | 58 | 4891 | 4:56 PM to | 5:56 PM |
| 5:56 PM | 6 | 0 | 5 | 3 | 0 | 21 | 2 | 0 | 7 | 0 | 4 | 3 | 0 | 10 | 4 | 0 | 59 | 4891 | 4:57 PM to | 5:57 PM |
| 5:57 PM | 0 | 0 | 4 | 1 | 3 | 31 | 5 | 0 | 0 | 0 | 4 | 4 | 8 | 19 | 11 | 0 | 85 | 4871 | 4:58 PM to | 5:58 PM |
| 5:58 PM | 11 | 0 | 4 | 2 | 11 | 0 | 4 | 0 | 7 | 0 | 3 | 3 | 7 | 5 | 5 | 0 | 57 | 4854 | 4:59 PM to | 5:59 PM |
| 5:59 PM | 5 | 0 | 0 | 0 | 0 | 27 | 2 | 0 | 7 | 0 | 2 | 2 | 5 | 21 | 9 | 0 | 78 | 4853 | 5:00 PM to | 6:00 PM |
| Approach Total | 850 | | | | 2467 | | | | 663 | | | | 3306 | | | | | | | |
| Grand Total | 514 | 0 | 336 | 162 | 377 | 1659 | 431 | 0 | 373 | 0 | 290 | 158 | 674 | 1917 | 715 | 0 | 7286 | | | |
| Approach % | 60.5% | 0.0% | 39.5% | 19.1% | 15.3% | 67.2% | 17.5% | 0.0% | 56.3% | 0.0% | 43.7% | 23.8% | 20.4% | 58.0% | 21.6% | 0.0% | | | | |
| Total % | 7.1% | 0.0% | 4.6% | 2.2% | 5.2% | 22.8% | 5.9% | 0.0% | 5.1% | 0.0% | 4.0% | 2.2% | 9.3% | 26.3% | 9.8% | 0.0% | | | | |
| **Begin Peak Hour:** | **16:47** | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **359** | **0** | **229** | **109** | **260** | **1128** | **268** | **0** | **238** | **0** | **170** | **83** | **462** | **1332** | **495** | **0** | **4941** | 4941 | 4:47 PM to | 5:47 PM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 2/3/2004
Start Time: 07:00 AM
Site Code: 4001

| Street Name | From North SR-51 (SB) OFF RAMP | | | | | From East GLENDALE RD | | | | From South SR-51 (NB) OFF RAMP | | | | | From West GLENDALE RD | | | | INTSEC | HOUR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Yield | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL | | |
| 7:00 AM | 0 | 0 | 11 | 0 | 0 | 0 | 4 | 5 | 0 | 1 | 0 | 2 | 0 | 0 | 11 | 23 | 7 | 0 | 64 | | | |
| 7:01 AM | 30 | 0 | 12 | 0 | 0 | 7 | 13 | 2 | 0 | 11 | 0 | 2 | 2 | 0 | 0 | 8 | 5 | 0 | 90 | | | |
| 7:02 AM | 1 | 0 | 10 | 0 | 0 | 0 | 10 | 4 | 0 | 3 | 0 | 6 | 1 | 0 | 3 | 14 | 2 | 0 | 53 | | | |
| 7:03 AM | 28 | 0 | 8 | 0 | 0 | 9 | 16 | 1 | 0 | 5 | 0 | 2 | 2 | 0 | 0 | 25 | 4 | 0 | 98 | | | |
| 7:04 AM | 3 | 0 | 6 | 0 | 0 | 0 | 3 | 7 | 0 | 10 | 0 | 8 | 1 | 3 | 10 | 8 | 2 | 0 | 57 | | | |
| 7:05 AM | 19 | 0 | 4 | 0 | 0 | 2 | 6 | 6 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 31 | 4 | 0 | 77 | | | |
| 7:06 AM | 15 | 0 | 5 | 0 | 0 | 0 | 12 | 3 | 0 | 7 | 0 | 9 | 2 | 0 | 17 | 4 | 5 | 0 | 77 | | | |
| 7:07 AM | 17 | 0 | 10 | 0 | 0 | 5 | 0 | 9 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 32 | 9 | 1 | 87 | | | |
| 7:08 AM | 20 | 0 | 5 | 0 | 0 | 0 | 17 | 5 | 0 | 9 | 0 | 5 | 3 | 0 | 15 | 2 | 8 | 0 | 86 | | | |
| 7:09 AM | 11 | 0 | 7 | 0 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 6 | 0 | 94 | | | |
| 7:10 AM | 26 | 0 | 6 | 0 | 0 | 0 | 20 | 3 | 0 | 9 | 0 | 9 | 5 | 0 | 3 | 0 | 9 | 0 | 85 | | | |
| 7:11 AM | 3 | 0 | 5 | 0 | 0 | 10 | 0 | 6 | 1 | 0 | 0 | 3 | 3 | 0 | 0 | 52 | 6 | 1 | 85 | | | |
| 7:12 AM | 25 | 0 | 5 | 0 | 0 | 0 | 11 | 5 | 0 | 21 | 0 | 7 | 2 | 0 | 9 | 1 | 7 | 1 | 91 | | | |
| 7:13 AM | 0 | 0 | 5 | 0 | 0 | 8 | 1 | 3 | 0 | 0 | 0 | 4 | 1 | 1 | 0 | 53 | 3 | 0 | 77 | | | |
| 7:14 AM | 34 | 0 | 9 | 0 | 0 | 0 | 23 | 7 | 0 | 13 | 0 | 3 | 0 | 3 | 7 | 5 | 9 | 0 | 110 | | | |
| 7:15 AM | 0 | 0 | 6 | 0 | 0 | 3 | 0 | 8 | 0 | 0 | 0 | 10 | 4 | 0 | 0 | 49 | 11 | 0 | 87 | | | |
| 7:16 AM | 31 | 0 | 4 | 0 | 0 | 1 | 17 | 5 | 1 | 16 | 0 | 4 | 4 | 0 | 3 | 9 | 6 | 0 | 96 | | | |
| 7:17 AM | 0 | 0 | 11 | 0 | 0 | 0 | 3 | 10 | 1 | 0 | 0 | 11 | 3 | 0 | 3 | 40 | 6 | 0 | 84 | | | |
| 7:18 AM | 35 | 0 | 5 | 0 | 0 | 7 | 20 | 2 | 3 | 10 | 0 | 5 | 5 | 0 | 0 | 11 | 9 | 0 | 104 | | | |
| 7:19 AM | 0 | 0 | 4 | 0 | 0 | 0 | 2 | 9 | 2 | 0 | 0 | 12 | 5 | 0 | 8 | 34 | 7 | 1 | 76 | | | |
| 7:20 AM | 35 | 0 | 7 | 0 | 0 | 11 | 27 | 9 | 3 | 16 | 0 | 3 | 3 | 0 | 0 | 22 | 6 | 0 | 136 | | | |
| 7:21 AM | 0 | 0 | 8 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 13 | 4 | 0 | 3 | 29 | 10 | 0 | 70 | | | |
| 7:22 AM | 34 | 0 | 5 | 0 | 0 | 6 | 21 | 10 | 2 | 19 | 0 | 3 | 4 | 0 | 0 | 21 | 5 | 0 | 124 | | | |
| 7:23 AM | 0 | 0 | 4 | 0 | 0 | 0 | 3 | 8 | 0 | 0 | 0 | 11 | 2 | 0 | 10 | 23 | 10 | 0 | 69 | | | |
| 7:24 AM | 37 | 0 | 4 | 0 | 0 | 3 | 16 | 3 | 0 | 15 | 0 | 1 | 1 | 1 | 0 | 30 | 8 | 0 | 117 | | | |
| 7:25 AM | 0 | 0 | 6 | 0 | 0 | 0 | 6 | 8 | 1 | 3 | 0 | 12 | 5 | 1 | 13 | 17 | 7 | 0 | 72 | | | |
| 7:26 AM | 38 | 0 | 9 | 0 | 0 | 8 | 18 | 0 | 0 | 9 | 0 | 1 | 1 | 0 | 0 | 36 | 6 | 0 | 125 | | | |
| 7:27 AM | 1 | 0 | 5 | 0 | 0 | 0 | 8 | 2 | 1 | 0 | 0 | 10 | 2 | 1 | 12 | 13 | 10 | 0 | 61 | | | |
| 7:28 AM | 27 | 0 | 8 | 0 | 0 | 6 | 16 | 5 | 1 | 8 | 0 | 3 | 3 | 0 | 0 | 41 | 7 | 0 | 121 | | | |
| 7:29 AM | 6 | 0 | 4 | 0 | 0 | 0 | 11 | 2 | 1 | 10 | 0 | 8 | 1 | 0 | 11 | 7 | 8 | 0 | 67 | | | |
| 7:30 AM | 18 | 0 | 3 | 0 | 0 | 5 | 5 | 4 | 0 | 1 | 0 | 2 | 2 | 0 | 0 | 42 | 12 | 0 | 92 | | | |
| 7:31 AM | 15 | 0 | 4 | 0 | 0 | 0 | 24 | 3 | 1 | 5 | 0 | 4 | 3 | 0 | 8 | 10 | 1 | 0 | 74 | | | |
| 7:32 AM | 17 | 0 | 9 | 0 | 0 | 9 | 0 | 14 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 57 | 10 | 1 | 117 | | | |
| 7:33 AM | 21 | 0 | 8 | 0 | 0 | 0 | 31 | 12 | 0 | 16 | 0 | 5 | 1 | 1 | 10 | 3 | 15 | 0 | 121 | | | |
| 7:34 AM | 8 | 0 | 5 | 0 | 0 | 4 | 0 | 5 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 60 | 9 | 0 | 92 | | | |
| 7:35 AM | 25 | 0 | 3 | 0 | 0 | 0 | 37 | 8 | 0 | 10 | 0 | 7 | 2 | 2 | 3 | 0 | 7 | 0 | 100 | | | |
| 7:36 AM | 6 | 0 | 7 | 0 | 0 | 9 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 59 | 12 | 0 | 95 | | | |
| 7:37 AM | 28 | 0 | 5 | 0 | 0 | 0 | 25 | 6 | 0 | 10 | 0 | 7 | 3 | 0 | 11 | 2 | 3 | 0 | 97 | | | |
| 7:38 AM | 0 | 0 | 3 | 0 | 0 | 6 | 1 | 8 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 50 | 4 | 0 | 77 | | | |
| 7:39 AM | 33 | 0 | 8 | 0 | 0 | 0 | 40 | 7 | 0 | 19 | 0 | 6 | 3 | 0 | 8 | 7 | 12 | 0 | 140 | | | |
| 7:40 AM | 0 | 0 | 7 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | 9 | 4 | 0 | 1 | 46 | 5 | 1 | 73 | | | |
| 7:41 AM | 35 | 0 | 6 | 0 | 0 | 0 | 33 | 10 | 0 | 16 | 0 | 4 | 2 | 0 | 6 | 8 | 8 | 0 | 126 | | | |
| 7:42 AM | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 4 | 1 | 0 | 0 | 9 | 1 | 0 | 5 | 40 | 6 | 0 | 67 | | | |
| 7:43 AM | 32 | 0 | 7 | 0 | 0 | 7 | 13 | 11 | 1 | 24 | 0 | 1 | 1 | 0 | 0 | 15 | 5 | 0 | 115 | | | |
| 7:44 AM | 0 | 0 | 5 | 0 | 0 | 0 | 2 | 5 | 0 | 0 | 0 | 12 | 3 | 0 | 8 | 33 | 4 | 0 | 69 | | | |
| 7:45 AM | 34 | 0 | 2 | 0 | 0 | 9 | 48 | 7 | 1 | 15 | 0 | 4 | 4 | 1 | 0 | 24 | 7 | 0 | 150 | | | |
| 7:46 AM | 0 | 0 | 4 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 4 | 0 | 1 | 8 | 30 | 5 | 0 | 61 | | | |
| 7:47 AM | 34 | 0 | 5 | 0 | 0 | 10 | 44 | 7 | 0 | 20 | 0 | 1 | 1 | 2 | 0 | 26 | 13 | 0 | 160 | | | |
| 7:48 AM | 0 | 0 | 7 | 0 | 1 | 0 | 4 | 9 | 0 | 0 | 0 | 12 | 3 | 0 | 7 | 24 | 8 | 0 | 71 | | | |
| 7:49 AM | 35 | 0 | 4 | 0 | 0 | 8 | 17 | 8 | 1 | 10 | 0 | 2 | 2 | 0 | 0 | 25 | 7 | 0 | 116 | | | |
| 7:50 AM | 0 | 0 | 4 | 0 | 0 | 0 | 3 | 5 | 1 | 0 | 0 | 12 | 4 | 0 | 9 | 20 | 7 | 0 | 60 | | | |
| 7:51 AM | 34 | 0 | 5 | 0 | 0 | 11 | 23 | 4 | 0 | 15 | 0 | 2 | 2 | 0 | 0 | 37 | 9 | 0 | 140 | | | |
| 7:52 AM | 0 | 0 | 3 | 0 | 0 | 0 | 11 | 2 | 0 | 8 | 0 | 9 | 1 | 0 | 6 | 12 | 8 | 0 | 59 | | | |
| 7:53 AM | 29 | 0 | 4 | 0 | 0 | 12 | 20 | 3 | 1 | 8 | 0 | 4 | 4 | 0 | 0 | 43 | 8 | 0 | 131 | | | |
| 7:54 AM | 5 | 0 | 11 | 0 | 0 | 0 | 15 | 9 | 2 | 15 | 0 | 10 | 1 | 0 | 9 | 9 | 3 | 0 | 86 | | | |
| 7:55 AM | 23 | 0 | 5 | 0 | 0 | 5 | 8 | 5 | 0 | 4 | 0 | 2 | 2 | 0 | 0 | 43 | 5 | 1 | 100 | | | |
| 7:56 AM | 13 | 0 | 5 | 0 | 0 | 0 | 14 | 7 | 0 | 15 | 0 | 7 | 2 | 0 | 9 | 0 | 9 | 0 | 79 | | | |
| 7:57 AM | 13 | 0 | 2 | 0 | 0 | 9 | 7 | 5 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 51 | 4 | 0 | 94 | | | |
| 7:58 AM | 17 | 0 | 6 | 0 | 0 | 0 | 23 | 7 | 0 | 17 | 0 | 11 | 2 | 0 | 7 | 0 | 5 | 0 | 93 | | | |
| 7:59 AM | 10 | 0 | 2 | 0 | 0 | 5 | 0 | 11 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 55 | 9 | 0 | 95 | 5590 | 7:00 AM to | 8:00 AM |
| 8:00 AM | 25 | 0 | 5 | 0 | 0 | 0 | 35 | 5 | 0 | 22 | 0 | 9 | 2 | 2 | 4 | 0 | 6 | 0 | 111 | 5637 | 7:01 AM to | 8:01 AM |
| 8:01 AM | 3 | 0 | 9 | 0 | 0 | 6 | 0 | 5 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 55 | 6 | 1 | 89 | 5636 | 7:02 AM to | 8:02 AM |
| 8:02 AM | 32 | 0 | 4 | 0 | 0 | 0 | 19 | 9 | 0 | 20 | 0 | 5 | 3 | 0 | 13 | 1 | 6 | 0 | 109 | 5692 | 7:03 AM to | 8:03 AM |
| 8:03 AM | 1 | 0 | 4 | 0 | 0 | 6 | 0 | 4 | 1 | 0 | 0 | 6 | 3 | 0 | 1 | 46 | 14 | 0 | 82 | 5676 | 7:04 AM to | 8:04 AM |
| 8:04 AM | 32 | 0 | 10 | 0 | 0 | 1 | 29 | 12 | 1 | 8 | 0 | 3 | 0 | 1 | 6 | 5 | 5 | 0 | 111 | 5730 | 7:05 AM to | 8:05 AM |
| 8:05 AM | 0 | 0 | 3 | 0 | 0 | 4 | 5 | 9 | 0 | 0 | 0 | 8 | 5 | 0 | 0 | 43 | 12 | 0 | 84 | 5737 | 7:06 AM to | 8:06 AM |
| 8:06 AM | 36 | 0 | 6 | 0 | 0 | 0 | 28 | 9 | 1 | 14 | 0 | 5 | 3 | 0 | 5 | 7 | 8 | 0 | 118 | 5778 | 7:07 AM to | 8:07 AM |
| 8:07 AM | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 8 | 1 | 0 | 7 | 42 | 2 | 0 | 75 | 5766 | 7:08 AM to | 8:08 AM |
| 8:08 AM | 44 | 0 | 5 | 0 | 0 | 8 | 23 | 12 | 2 | 3 | 0 | 1 | 0 | 1 | 0 | 19 | 6 | 0 | 121 | 5801 | 7:09 AM to | 8:09 AM |
| 8:09 AM | 0 | 0 | 2 | 0 | 0 | 0 | 4 | 5 | 0 | 8 | 0 | 8 | 3 | 1 | 14 | 30 | 5 | 0 | 76 | 5783 | 7:10 AM to | 8:10 AM |
| 8:10 AM | 29 | 0 | 9 | 0 | 0 | 7 | 14 | 4 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 19 | 6 | 0 | 90 | 5788 | 7:11 AM to | 8:11 AM |
| 8:11 AM | 0 | 0 | 6 | 0 | 0 | 0 | 3 | 8 | 0 | 16 | 0 | 5 | 4 | 1 | 11 | 24 | 8 | 0 | 81 | 5784 | 7:12 AM to | 8:12 AM |
| 8:12 AM | 30 | 0 | 7 | 0 | 0 | 4 | 17 | 10 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 22 | 5 | 1 | 97 | 5790 | 7:13 AM to | 8:13 AM |
| 8:13 AM | 1 | 0 | 3 | 0 | 0 | 0 | 5 | 5 | 2 | 16 | 0 | 9 | 5 | 0 | 10 | 21 | 2 | 0 | 72 | 5785 | 7:14 AM to | 8:14 AM |
| 8:14 AM | 28 | 0 | 5 | 0 | 0 | 7 | 13 | 4 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 24 | 3 | 0 | 102 | 5777 | 7:15 AM to | 8:15 AM |
| 8:15 AM | 0 | 0 | 2 | 0 | 0 | 0 | 5 | 8 | 1 | 4 | 0 | 10 | 4 | 0 | 18 | 18 | 11 | 0 | 76 | 5766 | 7:16 AM to | 8:16 AM |
| 8:16 AM | 34 | 0 | 4 | 0 | 0 | 8 | 17 | 6 | 1 | 13 | 0 | 2 | 2 | 0 | 0 | 31 | 4 | 0 | 119 | 5789 | 7:17 AM to | 8:17 AM |
| 8:17 AM | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 10 | 1 | 8 | 0 | 11 | 3 | 1 | 15 | 12 | 4 | 0 | 72 | 5777 | 7:18 AM to | 8:18 AM |
| 8:18 AM | 24 | 0 | 8 | 0 | 0 | 15 | 12 | 11 | 3 | 7 | 0 | 2 | 2 | 0 | 0 | 37 | 8 | 0 | 124 | 5797 | 7:19 AM to | 8:19 AM |
| 8:19 AM | 2 | 0 | 7 | 0 | 0 | 0 | 7 | 4 | 0 | 18 | 0 | 11 | 1 | 0 | 19 | 9 | 4 | 0 | 81 | 5802 | 7:20 AM to | 8:20 AM |
| 8:20 AM | 20 | 0 | 6 | 0 | 0 | 9 | 2 | 5 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 38 | 6 | 0 | 87 | 5753 | 7:21 AM to | 8:21 AM |
| 8:21 AM | 9 | 0 | 4 | 0 | 0 | 0 | 21 | 4 | 0 | 15 | 0 | 9 | 3 | 1 | 17 | 5 | 7 | 0 | 91 | 5774 | 7:22 AM to | 8:22 AM |
| 8:22 AM | 13 | 0 | 6 | 0 | 0 | 4 | 0 | 6 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 40 | 5 | 0 | 76 | 5726 | 7:23 AM to | 8:23 AM |
| 8:23 AM | 14 | 0 | 6 | 0 | 0 | 0 | 31 | 11 | 2 | 15 | 0 | 4 | 1 | 0 | 14 | 8 | 6 | 0 | 109 | 5766 | 7:24 AM to | 8:24 AM |
| 8:24 AM | 8 | 0 | 7 | 0 | 0 | 5 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 47 | 2 | 2 | 81 | 5730 | 7:25 AM to | 8:25 AM |
| 8:25 AM | 22 | 0 | 2 | 0 | 0 | 0 | 31 | 4 | 2 | 8 | 0 | 8 | 2 | 1 | 8 | 0 | 3 | 0 | 86 | 5744 | 7:26 AM to | 8:26 AM |
| 8:26 AM | 5 | 0 | 7 | 0 | 0 | 7 | 0 | 4 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 47 | 11 | 0 | 82 | 5701 | 7:27 AM to | 8:27 AM |
| 8:27 AM | 24 | 0 | 3 | 0 | 0 | 0 | 35 | 7 | 1 | 20 | 0 | 5 | 2 | 1 | 9 | 0 | 4 | 0 | 107 | 5747 | 7:28 AM to | 8:28 AM |
| 8:28 AM | 0 | 0 | 11 | 0 | 0 | 8 | 3 | 6 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 50 | 7 | 2 | 87 | 5713 | 7:29 AM to | 8:29 AM |
| 8:29 AM | 31 | 0 | 4 | 0 | 0 | 0 | 14 | 5 | 0 | 11 | 0 | 6 | 3 | 0 | 8 | 4 | 3 | 0 | 86 | 5732 | 7:30 AM to | 8:30 AM |
| Approach Total | 1941 | | | | | 2010 | | | | 1153 | | | | | 3268 | | | | | | | |
| Grand Total | 1428 | 0 | 513 | 0 | 1 | 306 | 1147 | 557 | 46 | 667 | 0 | 486 | 203 | 30 | 433 | 2234 | 601 | 13 | 8372 | | | |
| Approach % | 73.6% | 0.0% | 26.4% | 0.0% | 0.1% | 15.2% | 57.1% | 27.7% | 2.3% | 57.8% | 0.0% | 42.2% | 17.6% | 2.6% | 13.2% | 68.4% | 18.4% | 0.4% | | | | |
| Total % | 17.1% | 0.0% | 6.1% | 0.0% | 0.0% | 3.7% | 13.7% | 6.7% | 0.5% | 8.0% | 0.0% | 5.8% | 2.4% | 0.4% | 5.2% | 26.7% | 7.2% | 0.2% | | | | |
| **Begin Peak Hour:** | **7:20** | | | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **984** | **0** | **319** | **0** | **1** | **212** | **832** | **391** | **32** | **483** | **0** | **336** | **133** | **18** | **288** | **1535** | **422** | **5** | **5802** | 5802 | 7:20 AM to | 8:20 AM |

| Left | Thru | Right | Yield | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Left | Thru | Right | Trucks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 984 | 0 | 319 | 0 | 212 | 832 | 391 | 32 | 483 | 0 | 336 | 133 | 288 | 1535 | 422 | 5 |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 2/3/2004
Start Time: 04:30 PM
Site Code: 4001

| | From North | | | | | From East | | | | From South | | | | | From West | | | | INTSEC | HOUR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SR-51 (SB) OFF RAMP | | | | | GLENDALE RD | | | | SR51 (NB) OFF RAMP | | | | | GLENDALE RD | | | | | | | |
| Start Time | Left | Thru | Right | Yield | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL | | |
| 4:30 PM | 6 | 0 | 0 | | 0 | 5 | 29 | 14 | 0 | 6 | 0 | 5 | 5 | 0 | 8 | 9 | 11 | 0 | 93 | | | |
| 4:31 PM | 9 | 0 | 7 | | 0 | 5 | 12 | 14 | 2 | 8 | 0 | 2 | 2 | 0 | 0 | 15 | 6 | 0 | 78 | | | |
| 4:32 PM | 0 | 0 | 3 | | 0 | 0 | 31 | 22 | 0 | 0 | 0 | 1 | 1 | 0 | 11 | 25 | 9 | 0 | 102 | | | |
| 4:33 PM | 7 | 0 | 5 | | 0 | 8 | 34 | 20 | 0 | 14 | 0 | 4 | 4 | 0 | 0 | 2 | 8 | 0 | 102 | | | |
| 4:34 PM | 10 | 0 | 3 | | 0 | 0 | 5 | 21 | 0 | 12 | 0 | 2 | 1 | 0 | 12 | 17 | 6 | 0 | 88 | | | |
| 4:35 PM | 2 | 0 | 4 | | 0 | 7 | 36 | 16 | 1 | 0 | 0 | 2 | 1 | 0 | 16 | 23 | 10 | 0 | 116 | | | |
| 4:36 PM | 3 | 0 | 5 | | 0 | 5 | 35 | 17 | 0 | 11 | 0 | 4 | 2 | 0 | 0 | 1 | 8 | 0 | 89 | | | |
| 4:37 PM | 13 | 0 | 0 | | 0 | 0 | 9 | 17 | 0 | 6 | 0 | 3 | 2 | 0 | 11 | 16 | 10 | 0 | 85 | | | |
| 4:38 PM | 2 | 0 | 7 | | 0 | 11 | 34 | 13 | 1 | 2 | 0 | 3 | 0 | 0 | 10 | 29 | 7 | 0 | 118 | | | |
| 4:39 PM | 13 | 0 | 7 | | 0 | 5 | 31 | 23 | 0 | 10 | 0 | 5 | 0 | 0 | 9 | 2 | 6 | 0 | 111 | | | |
| 4:40 PM | 13 | 0 | 5 | | 0 | 4 | 8 | 24 | 0 | 17 | 0 | 0 | 0 | 0 | 1 | 20 | 9 | 0 | 101 | | | |
| 4:41 PM | 0 | 0 | 5 | | 0 | 0 | 35 | 21 | 0 | 1 | 0 | 4 | 3 | 0 | 13 | 16 | 9 | 0 | 104 | | | |
| 4:42 PM | 5 | 0 | 6 | | 0 | 9 | 24 | 11 | 0 | 9 | 0 | 3 | 3 | 0 | 17 | 22 | 8 | 0 | 114 | | | |
| 4:43 PM | 13 | 0 | 4 | | 0 | 0 | 7 | 25 | 0 | 10 | 0 | 4 | 4 | 0 | 0 | 2 | 4 | 0 | 69 | | | |
| 4:44 PM | 1 | 0 | 3 | | 0 | 0 | 46 | 15 | 0 | 0 | 0 | 2 | 2 | 0 | 11 | 25 | 9 | 0 | 112 | | | |
| 4:45 PM | 4 | 0 | 0 | | 0 | 16 | 32 | 18 | 0 | 11 | 0 | 3 | 2 | 0 | 15 | 9 | 5 | 0 | 113 | | | |
| 4:46 PM | 7 | 0 | 4 | | 0 | 3 | 15 | 9 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 16 | 10 | 0 | 71 | | | |
| 4:47 PM | 0 | 0 | 5 | | 0 | 0 | 51 | 16 | 0 | 0 | 0 | 3 | 2 | 0 | 15 | 21 | 11 | 0 | 122 | | | |
| 4:48 PM | 13 | 0 | 5 | | 0 | 6 | 47 | 16 | 0 | 17 | 0 | 1 | 0 | 0 | 10 | 0 | 10 | 1 | 125 | | | |
| 4:49 PM | 15 | 0 | 6 | | 0 | 5 | 9 | 23 | 2 | 11 | 0 | 0 | 0 | 0 | 1 | 15 | 12 | 0 | 97 | | | |
| 4:50 PM | 0 | 0 | 2 | | 0 | 1 | 44 | 22 | 0 | 0 | 0 | 3 | 1 | 0 | 14 | 19 | 7 | 0 | 112 | | | |
| 4:51 PM | 16 | 0 | 9 | | 1 | 16 | 24 | 18 | 1 | 6 | 0 | 2 | 2 | 0 | 11 | 3 | 2 | 0 | 107 | | | |
| 4:52 PM | 13 | 0 | 9 | | 0 | 0 | 10 | 25 | 0 | 9 | 0 | 2 | 2 | 0 | 1 | 29 | 4 | 0 | 102 | | | |
| 4:53 PM | 2 | 0 | 4 | | 0 | 0 | 36 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 27 | 13 | 0 | 118 | | | |
| 4:54 PM | 17 | 0 | 1 | | 0 | 5 | 30 | 18 | 0 | 6 | 0 | 3 | 3 | 0 | 17 | 1 | 6 | 0 | 104 | | | |
| 4:55 PM | 12 | 0 | 5 | | 1 | 6 | 7 | 18 | 0 | 4 | 0 | 2 | 2 | 0 | 0 | 19 | 10 | 0 | 83 | | | |
| 4:56 PM | 2 | 0 | 4 | | 0 | 0 | 38 | 17 | 0 | 0 | 0 | 2 | 0 | 0 | 14 | 22 | 8 | 0 | 107 | | | |
| 4:57 PM | 1 | 0 | 5 | | 0 | 8 | 28 | 18 | 1 | 8 | 0 | 3 | 2 | 0 | 17 | 9 | 5 | 0 | 102 | | | |
| 4:58 PM | 9 | 0 | 6 | | 0 | 10 | 20 | 20 | 0 | 6 | 0 | 3 | 3 | 0 | 0 | 17 | 8 | 0 | 99 | | | |
| 4:59 PM | 3 | 0 | 4 | | 0 | 0 | 38 | 14 | 0 | 0 | 0 | 1 | 1 | 0 | 17 | 23 | 4 | 0 | 104 | | | |
| 5:00 PM | 0 | 0 | 5 | | 0 | 3 | 38 | 10 | 0 | 10 | 0 | 5 | 4 | 0 | 14 | 4 | 9 | 0 | 98 | | | |
| 5:01 PM | 13 | 0 | 5 | | 0 | 7 | 5 | 17 | 0 | 6 | 0 | 3 | 3 | 0 | 0 | 10 | 4 | 0 | 70 | | | |
| 5:02 PM | 0 | 0 | 6 | | 0 | 0 | 43 | 17 | 0 | 0 | 0 | 2 | 0 | 0 | 20 | 23 | 15 | 0 | 126 | | | |
| 5:03 PM | 5 | 0 | 6 | | 0 | 11 | 22 | 15 | 0 | 11 | 0 | 0 | 0 | 0 | 20 | 1 | 9 | 0 | 100 | | | |
| 5:04 PM | 5 | 0 | 3 | | 0 | 8 | 20 | 8 | 0 | 7 | 0 | 5 | 4 | 0 | 0 | 20 | 8 | 0 | 84 | | | |
| 5:05 PM | 3 | 0 | 5 | | 0 | 0 | 37 | 20 | 1 | 0 | 0 | 4 | 3 | 0 | 18 | 25 | 12 | 0 | 124 | | | |
| 5:06 PM | 15 | 0 | 8 | | 0 | 4 | 46 | 19 | 1 | 17 | 0 | 2 | 2 | 1 | 16 | 3 | 8 | 0 | 138 | | | |
| 5:07 PM | 14 | 0 | 8 | | 0 | 9 | 19 | 19 | 0 | 6 | 0 | 1 | 1 | 0 | 0 | 16 | 11 | 0 | 103 | | | |
| 5:08 PM | 4 | 0 | 3 | | 0 | 0 | 31 | 15 | 0 | 0 | 0 | 2 | 2 | 0 | 13 | 23 | 10 | 0 | 101 | | | |
| 5:09 PM | 12 | 0 | 3 | | 0 | 4 | 32 | 17 | 1 | 7 | 0 | 1 | 0 | 1 | 17 | 1 | 7 | 0 | 101 | | | |
| 5:10 PM | 11 | 0 | 4 | | 0 | 10 | 8 | 24 | 0 | 5 | 0 | 2 | 2 | 0 | 0 | 22 | 9 | 0 | 95 | | | |
| 5:11 PM | 6 | 0 | 3 | | 0 | 1 | 43 | 13 | 0 | 0 | 0 | 1 | 0 | 0 | 14 | 19 | 8 | 0 | 108 | | | |
| 5:12 PM | 5 | 0 | 7 | | 0 | 18 | 42 | 15 | 0 | 5 | 0 | 5 | 5 | 0 | 1 | 1 | 13 | 0 | 112 | | | |
| 5:13 PM | 8 | 0 | 3 | | 0 | 0 | 5 | 18 | 1 | 7 | 0 | 1 | 1 | 0 | 4 | 18 | 7 | 0 | 71 | | | |
| 5:14 PM | 3 | 0 | 5 | | 0 | 8 | 31 | 21 | 0 | 0 | 0 | 2 | 1 | 0 | 18 | 25 | 7 | 0 | 120 | | | |
| 5:15 PM | 2 | 0 | 4 | | 0 | 2 | 39 | 13 | 0 | 7 | 0 | 3 | 1 | 0 | 21 | 16 | 4 | 0 | 111 | | | |
| 5:16 PM | 9 | 0 | 2 | | 0 | 4 | 10 | 14 | 0 | 9 | 0 | 7 | 4 | 0 | 0 | 23 | 8 | 0 | 84 | | | |
| 5:17 PM | 5 | 0 | 1 | | 0 | 0 | 32 | 14 | 1 | 0 | 0 | 2 | 1 | 0 | 16 | 31 | 8 | 0 | 109 | | | |
| 5:18 PM | 6 | 0 | 0 | | 0 | 6 | 46 | 17 | 1 | 7 | 0 | 2 | 2 | 0 | 15 | 10 | 8 | 0 | 117 | | | |
| 5:19 PM | 4 | 0 | 6 | | 0 | 4 | 5 | 18 | 0 | 5 | 0 | 5 | 5 | 0 | 0 | 18 | 11 | 0 | 76 | | | |
| 5:20 PM | 4 | 0 | 5 | | 0 | 0 | 40 | 14 | 0 | 0 | 0 | 2 | 2 | 0 | 12 | 19 | 6 | 0 | 102 | | | |
| 5:21 PM | 15 | 0 | 3 | | 0 | 5 | 42 | 19 | 0 | 11 | 0 | 1 | 0 | 0 | 20 | 1 | 5 | 0 | 122 | | | |
| 5:22 PM | 13 | 0 | 10 | | 1 | 7 | 8 | 19 | 0 | 9 | 0 | 4 | 3 | 0 | 2 | 25 | 11 | 0 | 108 | | | |
| 5:23 PM | 5 | 0 | 5 | | 0 | 0 | 32 | 12 | 0 | 0 | 0 | 2 | 1 | 0 | 15 | 27 | 7 | 1 | 105 | | | |
| 5:24 PM | 3 | 0 | 2 | | 0 | 1 | 34 | 15 | 0 | 4 | 0 | 3 | 2 | 0 | 17 | 10 | 14 | 0 | 103 | | | |
| 5:25 PM | 14 | 0 | 5 | | 0 | 5 | 4 | 18 | 0 | 12 | 0 | 3 | 3 | 0 | 0 | 11 | 1 | 0 | 73 | | | |
| 5:26 PM | 5 | 0 | 1 | | 0 | 0 | 45 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 25 | 8 | 0 | 109 | | | |
| 5:27 PM | 5 | 0 | 5 | | 0 | 8 | 32 | 12 | 0 | 9 | 0 | 1 | 1 | 0 | 14 | 6 | 10 | 0 | 102 | | | |
| 5:28 PM | 7 | 0 | 4 | | 1 | 9 | 5 | 15 | 0 | 6 | 0 | 2 | 2 | 0 | 0 | 24 | 7 | 0 | 79 | | | |
| 5:29 PM | 3 | 0 | 6 | | 0 | 0 | 40 | 11 | 0 | 0 | 0 | 2 | 2 | 0 | 15 | 24 | 10 | 0 | 111 | 6110 | 4:30 PM to | 5:30 PM |
| 5:30 PM | 10 | 0 | 1 | | 0 | 4 | 46 | 17 | 0 | 7 | 0 | 4 | 3 | 0 | 18 | 0 | 6 | 0 | 113 | 6130 | 4:31 PM to | 5:31 PM |
| 5:31 PM | 7 | 0 | 7 | | 0 | 4 | 7 | 11 | 0 | 3 | 0 | 1 | 0 | 0 | 1 | 18 | 3 | 0 | 62 | 6114 | 4:32 PM to | 5:32 PM |
| 5:32 PM | 4 | 0 | 5 | | 0 | 0 | 37 | 18 | 1 | 0 | 0 | 1 | 3 | 0 | 14 | 21 | 5 | 0 | 105 | 6117 | 4:33 PM to | 5:33 PM |
| 5:33 PM | 3 | 0 | 4 | | 0 | 4 | 40 | 17 | 0 | 9 | 0 | 2 | 2 | 0 | 18 | 10 | 6 | 0 | 113 | 6128 | 4:34 PM to | 5:34 PM |
| 5:34 PM | 19 | 0 | 9 | | 0 | 5 | 5 | 14 | 1 | 8 | 0 | 2 | 2 | 0 | 0 | 19 | 4 | 0 | 85 | 6125 | 4:35 PM to | 5:35 PM |
| 5:35 PM | 6 | 0 | 7 | | 0 | 0 | 42 | 14 | 2 | 0 | 0 | 2 | 2 | 0 | 20 | 19 | 4 | 0 | 114 | 6123 | 4:36 PM to | 5:36 PM |
| 5:36 PM | 5 | 0 | 4 | | 1 | 6 | 24 | 16 | 0 | 0 | 0 | 1 | 1 | 0 | 15 | 13 | 10 | 0 | 94 | 6128 | 4:37 PM to | 5:37 PM |
| 5:37 PM | 14 | 0 | 7 | | 0 | 2 | 8 | 19 | 1 | 6 | 0 | 2 | 1 | 0 | 0 | 6 | 5 | 0 | 69 | 6112 | 4:38 PM to | 5:38 PM |
| 5:38 PM | 6 | 0 | 2 | | 0 | 0 | 39 | 13 | 0 | 0 | 0 | 1 | 1 | 0 | 15 | 23 | 12 | 0 | 111 | 6105 | 4:39 PM to | 5:39 PM |
| 5:39 PM | 2 | 0 | 6 | | 0 | 7 | 33 | 20 | 1 | 6 | 0 | 5 | 3 | 0 | 14 | 7 | 6 | 0 | 106 | 6100 | 4:40 PM to | 5:40 PM |
| 5:40 PM | 7 | 0 | 9 | | 0 | 6 | 16 | 15 | 0 | 4 | 0 | 1 | 1 | 0 | 0 | 17 | 10 | 0 | 85 | 6084 | 4:41 PM to | 5:41 PM |
| 5:41 PM | 7 | 0 | 5 | | 0 | 0 | 44 | 19 | 0 | 0 | 0 | 2 | 2 | 0 | 11 | 24 | 5 | 0 | 117 | 6097 | 4:42 PM to | 5:42 PM |
| 5:42 PM | 4 | 0 | 4 | | 0 | 4 | 49 | 21 | 0 | 8 | 0 | 2 | 2 | 0 | 12 | 10 | 6 | 0 | 120 | 6103 | 4:43 PM to | 5:43 PM |
| 5:43 PM | 9 | 0 | 7 | | 0 | 4 | 7 | 27 | 0 | 7 | 0 | 3 | 3 | 0 | 0 | 17 | 2 | 0 | 83 | 6117 | 4:44 PM to | 5:44 PM |
| 5:44 PM | 4 | 0 | 2 | | 0 | 1 | 46 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 30 | 4 | 0 | 118 | 6123 | 4:45 PM to | 5:45 PM |
| 5:45 PM | 2 | 0 | 3 | | 0 | 5 | 44 | 19 | 0 | 5 | 0 | 1 | 1 | 0 | 11 | 14 | 10 | 0 | 114 | 6124 | 4:46 PM to | 5:46 PM |
| 5:46 PM | 11 | 0 | 2 | | 0 | 4 | 9 | 22 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 13 | 4 | 0 | 69 | 6122 | 4:47 PM to | 5:47 PM |
| 5:47 PM | 7 | 0 | 3 | | 0 | 0 | 41 | 19 | 0 | 0 | 0 | 3 | 2 | 0 | 17 | 22 | 11 | 0 | 123 | 6123 | 4:48 PM to | 5:48 PM |
| 5:48 PM | 3 | 0 | 5 | | 0 | 8 | 34 | 17 | 0 | 4 | 0 | 3 | 3 | 0 | 16 | 16 | 3 | 0 | 109 | 6107 | 4:49 PM to | 5:49 PM |
| 5:49 PM | 11 | 0 | 13 | | 0 | 3 | 13 | 19 | 0 | 6 | 0 | 2 | 2 | 0 | 0 | 10 | 8 | 0 | 85 | 6095 | 4:50 PM to | 5:50 PM |
| 5:50 PM | 7 | 0 | 4 | | 0 | 0 | 37 | 19 | 2 | 0 | 0 | 2 | 2 | 0 | 15 | 17 | 10 | 1 | 111 | 6094 | 4:51 PM to | 5:51 PM |
| 5:51 PM | 5 | 0 | 7 | | 0 | 1 | 41 | 18 | 1 | 8 | 0 | 5 | 1 | 0 | 9 | 1 | 7 | 0 | 102 | 6089 | 4:52 PM to | 5:52 PM |
| 5:52 PM | 8 | 0 | 9 | | 0 | 5 | 5 | 19 | 0 | 5 | 0 | 1 | 1 | 0 | 0 | 26 | 6 | 0 | 84 | 6071 | 4:53 PM to | 5:53 PM |
| 5:53 PM | 6 | 0 | 3 | | 0 | 0 | 46 | 23 | 1 | 0 | 0 | 0 | 0 | 0 | 13 | 25 | 4 | 0 | 120 | 6073 | 4:54 PM to | 5:54 PM |
| 5:54 PM | 2 | 0 | 5 | | 0 | 2 | 41 | 22 | 1 | 3 | 0 | 0 | 0 | 0 | 13 | 15 | 9 | 0 | 112 | 6081 | 4:55 PM to | 5:55 PM |
| 5:55 PM | 9 | 0 | 8 | | 0 | 2 | 3 | 19 | 1 | 9 | 0 | 6 | 5 | 0 | 0 | 10 | 6 | 0 | 72 | 6070 | 4:56 PM to | 5:56 PM |
| 5:56 PM | 9 | 0 | 7 | | 0 | 0 | 39 | 25 | 0 | 0 | 0 | 1 | 0 | 0 | 6 | 22 | 5 | 0 | 114 | 6077 | 4:57 PM to | 5:57 PM |
| 5:57 PM | 3 | 0 | 8 | | 0 | 1 | 44 | 20 | 0 | 5 | 0 | 1 | 1 | 0 | 13 | 23 | 8 | 0 | 126 | 6101 | 4:58 PM to | 5:58 PM |
| 5:58 PM | 6 | 0 | 5 | | 1 | 0 | 6 | 22 | 1 | 0 | 0 | 1 | 0 | 0 | 5 | 3 | 7 | 0 | 55 | 6057 | 4:59 PM to | 5:59 PM |
| 5:59 PM | 5 | 0 | 4 | | 0 | 0 | 44 | 18 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 23 | 6 | 0 | 106 | 6059 | 5:00 PM to | 6:00 PM |
| Approach Total | 1047 | | | | | 4454 | | | | 661 | | | | | 2945 | | | | | | | |
| Grand Total | 616 | 0 | 431 | 0 | 6 | 347 | 2531 | 1576 | 27 | 457 | 0 | 204 | 153 | 2 | 856 | 1409 | 680 | 3 | 9107 | | | |
| Approach % | 58.8% | 0.0% | 41.2% | 0.0% | 0.6% | 7.8% | 56.8% | 35.4% | 0.6% | 69.1% | 0.0% | 30.9% | 23.1% | 0.3% | 29.1% | 47.8% | 23.1% | 0.1% | | | | |
| Total % | 6.8% | 0.0% | 4.7% | 0.0% | 0.1% | 3.8% | 27.8% | 17.3% | 0.3% | 5.0% | 0.0% | 2.2% | 1.7% | 0.0% | 9.4% | 15.5% | 7.5% | 0.0% | | | | |
| **Begin Peak Hour:** | **16:31** | | | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **419** | **0** | **267** | **0** | **4** | **268** | **1658** | **1019** | **14** | **352** | **0** | **146** | **105** | **2** | **592** | **926** | **483** | **2** | **6139** | 6130 | 4:31 PM to | 5:31 PM |

| Left | Thru | Right | Yield | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Left | Thru | Right | Trucks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 419 | 0 | 267 | 0 | 268 | 1658 | 1019 | 14 | 352 | 0 | 146 | 105 | 592 | 926 | 483 | 2 |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/27/2004
Start Time: 07:00 AM
Site Code: 4001

| Street Name | From North SR-51 (SB) OFF PAMP | | | | From East GREENWAY RD | | | | From South SR-51 (NB) OFF PAMP | | | | From West GREENWAY RD | | | | INTSEC | HOUR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Trucks | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | Trucks | TOTAL | TOTAL | | |
| 7:00 AM | 4 | 0 | 1 | 2 | 24 | 13 | 4 | 0 | 0 | 0 | 6 | 0 | 0 | 27 | 11 | 0 | 90 | | | |
| 7:01 AM | 0 | 0 | 0 | 0 | 1 | 18 | 0 | 0 | 6 | 0 | 5 | 0 | 9 | 6 | 4 | 0 | 49 | | | |
| 7:02 AM | 4 | 0 | 2 | 0 | 24 | 1 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 32 | 19 | 0 | 89 | | | |
| 7:03 AM | 0 | 0 | 1 | 0 | 0 | 16 | 8 | 0 | 6 | 0 | 3 | 0 | 7 | 7 | 7 | 0 | 55 | | | |
| 7:04 AM | 4 | 0 | 3 | 1 | 22 | 4 | 6 | 0 | 0 | 0 | 7 | 0 | 42 | 0 | 21 | 0 | 109 | | | |
| 7:05 AM | 0 | 0 | 1 | 0 | 0 | 9 | 10 | 0 | 2 | 0 | 6 | 0 | 7 | 1 | 10 | 0 | 46 | | | |
| 7:06 AM | 0 | 0 | 0 | 0 | 32 | 3 | 6 | 0 | 0 | 0 | 10 | 0 | 0 | 24 | 4 | 0 | 79 | | | |
| 7:07 AM | 0 | 0 | 0 | 0 | 0 | 14 | 2 | 0 | 0 | 0 | 9 | 0 | 4 | 2 | 8 | 0 | 39 | | | |
| 7:08 AM | 7 | 0 | 3 | 0 | 17 | 6 | 3 | 0 | 0 | 0 | 9 | 0 | 0 | 38 | 18 | 0 | 101 | | | |
| 7:09 AM | 0 | 0 | 0 | 0 | 0 | 12 | 8 | 0 | 2 | 0 | 8 | 0 | 7 | 9 | 14 | 0 | 60 | | | |
| 7:10 AM | 0 | 0 | 1 | 0 | 28 | 6 | 8 | 0 | 0 | 0 | 17 | 0 | 0 | 38 | 12 | 0 | 110 | | | |
| 7:11 AM | 4 | 0 | 5 | 1 | 0 | 12 | 8 | 0 | 0 | 0 | 6 | 0 | 8 | 10 | 6 | 0 | 59 | | | |
| 7:12 AM | 0 | 0 | 2 | 0 | 32 | 9 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 23 | 15 | 0 | 91 | | | |
| 7:13 AM | 12 | 0 | 1 | 0 | 0 | 18 | 14 | 0 | 3 | 0 | 7 | 0 | 5 | 9 | 9 | 0 | 78 | | | |
| 7:14 AM | 0 | 0 | 0 | 0 | 18 | 2 | 4 | 0 | 0 | 0 | 6 | 0 | 1 | 34 | 17 | 0 | 82 | | | |
| 7:15 AM | 7 | 0 | 4 | 0 | 0 | 23 | 7 | 0 | 7 | 0 | 9 | 0 | 13 | 13 | 9 | 0 | 92 | | | |
| 7:16 AM | 0 | 0 | 1 | 0 | 27 | 0 | 7 | 0 | 0 | 0 | 3 | 0 | 2 | 39 | 11 | 0 | 90 | | | |
| 7:17 AM | 6 | 0 | 6 | 0 | 0 | 23 | 7 | 0 | 0 | 0 | 10 | 0 | 11 | 4 | 5 | 0 | 72 | | | |
| 7:18 AM | 0 | 0 | 2 | 1 | 24 | 3 | 4 | 0 | 0 | 0 | 3 | 0 | 0 | 40 | 9 | 0 | 85 | | | |
| 7:19 AM | 5 | 0 | 4 | 0 | 0 | 35 | 9 | 0 | 5 | 0 | 10 | 0 | 7 | 0 | 3 | 1 | 78 | | | |
| 7:20 AM | 0 | 0 | 0 | 0 | 15 | 9 | 7 | 0 | 0 | 0 | 6 | 0 | 0 | 50 | 8 | 0 | 95 | | | |
| 7:21 AM | 5 | 0 | 0 | 0 | 0 | 11 | 13 | 0 | 7 | 0 | 7 | 0 | 5 | 13 | 8 | 0 | 69 | | | |
| 7:22 AM | 0 | 0 | 4 | 0 | 21 | 8 | 4 | 0 | 0 | 0 | 8 | 0 | 0 | 44 | 7 | 1 | 96 | | | |
| 7:23 AM | 9 | 0 | 3 | 0 | 0 | 10 | 7 | 0 | 5 | 0 | 5 | 0 | 13 | 13 | 10 | 0 | 75 | | | |
| 7:24 AM | 0 | 0 | 1 | 0 | 13 | 2 | 2 | 0 | 3 | 0 | 7 | 0 | 0 | 51 | 6 | 1 | 85 | | | |
| 7:25 AM | 4 | 0 | 7 | 0 | 0 | 21 | 9 | 0 | 5 | 0 | 4 | 0 | 12 | 11 | 3 | 0 | 76 | | | |
| 7:26 AM | 0 | 0 | 2 | 0 | 14 | 0 | 6 | 0 | 0 | 0 | 3 | 0 | 0 | 39 | 11 | 0 | 75 | | | |
| 7:27 AM | 8 | 0 | 5 | 1 | 0 | 23 | 7 | 0 | 4 | 0 | 7 | 0 | 9 | 11 | 6 | 0 | 80 | | | |
| 7:28 AM | 0 | 0 | 1 | 0 | 9 | 0 | 5 | 0 | 0 | 0 | 6 | 0 | 1 | 50 | 5 | 0 | 77 | | | |
| 7:29 AM | 6 | 0 | 2 | 0 | 0 | 21 | 7 | 0 | 7 | 0 | 8 | 0 | 7 | 1 | 2 | 0 | 61 | | | |
| 7:30 AM | 0 | 0 | 3 | 0 | 20 | 4 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 42 | 7 | 0 | 84 | | | |
| 7:31 AM | 4 | 0 | 1 | 0 | 0 | 15 | 6 | 0 | 10 | 0 | 11 | 0 | 11 | 4 | 6 | 0 | 68 | | | |
| 7:32 AM | 0 | 0 | 0 | 0 | 13 | 7 | 4 | 0 | 0 | 0 | 8 | 0 | 0 | 40 | 7 | 1 | 79 | | | |
| 7:33 AM | 10 | 0 | 3 | 0 | 0 | 25 | 5 | 0 | 1 | 0 | 6 | 0 | 10 | 21 | 3 | 0 | 84 | | | |
| 7:34 AM | 0 | 0 | 2 | 0 | 16 | 1 | 5 | 0 | 0 | 0 | 8 | 0 | 0 | 48 | 4 | 0 | 84 | | | |
| 7:35 AM | 5 | 0 | 3 | 0 | 0 | 20 | 8 | 0 | 4 | 0 | 9 | 0 | 8 | 20 | 6 | 0 | 83 | | | |
| 7:36 AM | 0 | 0 | 3 | 0 | 22 | 16 | 5 | 0 | 0 | 0 | 12 | 0 | 0 | 37 | 8 | 0 | 103 | | | |
| 7:37 AM | 6 | 0 | 1 | 0 | 0 | 14 | 0 | 0 | 11 | 0 | 10 | 0 | 8 | 6 | 6 | 0 | 62 | | | |
| 7:38 AM | 0 | 0 | 3 | 0 | 12 | 0 | 2 | 0 | 0 | 0 | 6 | 0 | 3 | 45 | 9 | 0 | 80 | | | |
| 7:39 AM | 17 | 0 | 1 | 0 | 0 | 20 | 4 | 0 | 5 | 0 | 7 | 0 | 4 | 17 | 3 | 0 | 78 | | | |
| 7:40 AM | 0 | 0 | 2 | 0 | 7 | 1 | 4 | 0 | 0 | 0 | 9 | 0 | 1 | 46 | 12 | 0 | 82 | | | |
| 7:41 AM | 9 | 0 | 4 | 0 | 0 | 23 | 5 | 0 | 5 | 0 | 6 | 0 | 9 | 12 | 9 | 0 | 82 | | | |
| 7:42 AM | 0 | 0 | 3 | 0 | 16 | 2 | 6 | 0 | 0 | 0 | 13 | 0 | 0 | 42 | 8 | 1 | 90 | | | |
| 7:43 AM | 8 | 0 | 3 | 0 | 0 | 34 | 3 | 0 | 8 | 0 | 5 | 0 | 7 | 18 | 4 | 0 | 90 | | | |
| 7:44 AM | 0 | 0 | 2 | 0 | 8 | 9 | 6 | 0 | 0 | 0 | 8 | 0 | 0 | 57 | 13 | 0 | 103 | | | |
| 7:45 AM | 6 | 0 | 4 | 0 | 0 | 8 | 8 | 0 | 7 | 0 | 9 | 0 | 9 | 16 | 5 | 0 | 72 | | | |
| 7:46 AM | 0 | 0 | 2 | 0 | 10 | 8 | 4 | 0 | 0 | 0 | 14 | 0 | 0 | 45 | 12 | 0 | 95 | | | |
| 7:47 AM | 4 | 0 | 3 | 0 | 0 | 16 | 6 | 0 | 6 | 0 | 10 | 0 | 10 | 13 | 5 | 0 | 73 | | | |
| 7:48 AM | 0 | 0 | 0 | 0 | 23 | 1 | 6 | 0 | 0 | 0 | 16 | 0 | 0 | 43 | 9 | 0 | 98 | | | |
| 7:49 AM | 8 | 0 | 4 | 0 | 0 | 35 | 3 | 0 | 10 | 0 | 8 | 0 | 7 | 7 | 5 | 0 | 87 | | | |
| 7:50 AM | 0 | 0 | 3 | 0 | 13 | 4 | 5 | 0 | 0 | 0 | 13 | 0 | 0 | 45 | 10 | 0 | 93 | | | |
| 7:51 AM | 12 | 0 | 3 | 0 | 0 | 21 | 15 | 0 | 10 | 0 | 8 | 0 | 6 | 10 | 7 | 0 | 92 | | | |
| 7:52 AM | 0 | 0 | 4 | 0 | 13 | 1 | 1 | 0 | 0 | 0 | 12 | 0 | 0 | 42 | 4 | 0 | 77 | | | |
| 7:53 AM | 5 | 0 | 1 | 0 | 0 | 16 | 7 | 0 | 10 | 0 | 7 | 0 | 12 | 13 | 8 | 0 | 79 | | | |
| 7:54 AM | 0 | 0 | 2 | 0 | 18 | 0 | 6 | 0 | 0 | 0 | 8 | 0 | 7 | 46 | 14 | 0 | 101 | | | |
| 7:55 AM | 4 | 0 | 5 | 1 | 0 | 25 | 2 | 0 | 6 | 0 | 7 | 0 | 6 | 3 | 8 | 1 | 66 | | | |
| 7:56 AM | 2 | 0 | 0 | 0 | 10 | 3 | 2 | 0 | 0 | 0 | 7 | 0 | 0 | 68 | 8 | 0 | 100 | | | |
| 7:57 AM | 6 | 0 | 2 | 0 | 0 | 11 | 8 | 0 | 3 | 0 | 11 | 0 | 14 | 12 | 6 | 0 | 73 | | | |
| 7:58 AM | 0 | 0 | 2 | 0 | 13 | 3 | 3 | 0 | 0 | 0 | 3 | 0 | 1 | 44 | 13 | 0 | 82 | | | |
| 7:59 AM | 3 | 0 | 4 | 0 | 0 | 22 | 6 | 0 | 7 | 0 | 10 | 0 | 8 | 7 | 7 | 0 | 74 | 4857 | 7:00 AM to | 8:00 AM |
| 8:00 AM | 0 | 0 | 0 | 0 | 16 | 7 | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 29 | 10 | 0 | 76 | 4843 | 7:01 AM to | 8:01 AM |
| 8:01 AM | 4 | 0 | 4 | 0 | 0 | 11 | 2 | 0 | 12 | 0 | 9 | 0 | 8 | 10 | 3 | 0 | 63 | 4857 | 7:02 AM to | 8:02 AM |
| 8:02 AM | 0 | 0 | 3 | 0 | 24 | 0 | 4 | 0 | 0 | 0 | 9 | 0 | 1 | 32 | 10 | 0 | 83 | 4851 | 7:03 AM to | 8:03 AM |
| 8:03 AM | 2 | 0 | 5 | 0 | 0 | 26 | 13 | 0 | 7 | 0 | 5 | 0 | 12 | 12 | 6 | 1 | 88 | 4884 | 7:04 AM to | 8:04 AM |
| 8:04 AM | 0 | 0 | 0 | 0 | 24 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 34 | 12 | 0 | 76 | 4851 | 7:05 AM to | 8:05 AM |
| 8:05 AM | 9 | 0 | 1 | 1 | 0 | 20 | 5 | 0 | 8 | 0 | 5 | 0 | 5 | 2 | 7 | 1 | 62 | 4867 | 7:06 AM to | 8:06 AM |
| 8:06 AM | 0 | 0 | 0 | 0 | 15 | 2 | 5 | 0 | 0 | 0 | 10 | 0 | 4 | 52 | 7 | 0 | 95 | 4883 | 7:07 AM to | 8:07 AM |
| 8:07 AM | 8 | 0 | 0 | 0 | 0 | 25 | 5 | 0 | 13 | 0 | 12 | 0 | 9 | 3 | 4 | 0 | 79 | 4923 | 7:08 AM to | 8:08 AM |
| 8:08 AM | 0 | 0 | 5 | 0 | 12 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 35 | 14 | 0 | 72 | 4894 | 7:09 AM to | 8:09 AM |
| 8:09 AM | 8 | 0 | 2 | 0 | 0 | 13 | 9 | 0 | 7 | 0 | 5 | 0 | 9 | 6 | 4 | 0 | 63 | 4897 | 7:10 AM to | 8:10 AM |
| 8:10 AM | 0 | 0 | 2 | 0 | 16 | 2 | 6 | 0 | 0 | 0 | 12 | 0 | 0 | 38 | 10 | 1 | 86 | 4873 | 7:11 AM to | 8:11 AM |
| 8:11 AM | 8 | 0 | 3 | 0 | 0 | 23 | 4 | 0 | 0 | 0 | 7 | 0 | 5 | 6 | 4 | 0 | 60 | 4874 | 7:12 AM to | 8:12 AM |
| 8:12 AM | 0 | 0 | 0 | 0 | 26 | 0 | 5 | 0 | 0 | 0 | 7 | 0 | 0 | 18 | 14 | 0 | 70 | 4853 | 7:13 AM to | 8:13 AM |
| 8:13 AM | 7 | 0 | 4 | 1 | 2 | 25 | 6 | 0 | 11 | 0 | 7 | 0 | 2 | 7 | 3 | 0 | 74 | 4849 | 7:14 AM to | 8:14 AM |
| 8:14 AM | 0 | 0 | 3 | 0 | 11 | 1 | 3 | 0 | 0 | 0 | 3 | 0 | 3 | 29 | 9 | 0 | 62 | 4829 | 7:15 AM to | 8:15 AM |
| 8:15 AM | 8 | 0 | 5 | 0 | 0 | 26 | 2 | 0 | 4 | 0 | 7 | 0 | 5 | 8 | 9 | 0 | 74 | 4811 | 7:16 AM to | 8:16 AM |
| 8:16 AM | 0 | 0 | 0 | 0 | 13 | 3 | 7 | 0 | 0 | 0 | 8 | 0 | 0 | 48 | 8 | 0 | 87 | 4808 | 7:17 AM to | 8:17 AM |
| 8:17 AM | 9 | 0 | 3 | 0 | 0 | 24 | 8 | 0 | 4 | 0 | 3 | 0 | 6 | 6 | 1 | 0 | 64 | 4800 | 7:18 AM to | 8:18 AM |
| 8:18 AM | 0 | 0 | 1 | 0 | 27 | 1 | 6 | 0 | 0 | 0 | 6 | 0 | 0 | 27 | 12 | 1 | 80 | 4795 | 7:19 AM to | 8:19 AM |
| 8:19 AM | 9 | 0 | 3 | 0 | 4 | 14 | 6 | 0 | 10 | 0 | 6 | 0 | 8 | 5 | 13 | 0 | 78 | 4795 | 7:20 AM to | 8:20 AM |
| 8:20 AM | 0 | 0 | 2 | 0 | 16 | 5 | 1 | 0 | 0 | 0 | 6 | 0 | 0 | 34 | 14 | 1 | 78 | 4778 | 7:21 AM to | 8:21 AM |
| 8:21 AM | 9 | 0 | 2 | 0 | 0 | 22 | 9 | 0 | 6 | 0 | 10 | 0 | 8 | 4 | 5 | 0 | 75 | 4784 | 7:22 AM to | 8:22 AM |
| 8:22 AM | 0 | 0 | 2 | 0 | 25 | 1 | 2 | 0 | 0 | 0 | 12 | 0 | 0 | 46 | 6 | 0 | 94 | 4782 | 7:23 AM to | 8:23 AM |
| 8:23 AM | 15 | 0 | 3 | 0 | 0 | 21 | 9 | 0 | 12 | 0 | 7 | 0 | 6 | 4 | 9 | 0 | 86 | 4793 | 7:24 AM to | 8:24 AM |
| 8:24 AM | 0 | 0 | 1 | 0 | 13 | 0 | 4 | 0 | 0 | 0 | 13 | 0 | 4 | 54 | 10 | 1 | 99 | 4807 | 7:25 AM to | 8:25 AM |
| 8:25 AM | 12 | 0 | 3 | 0 | 1 | 36 | 6 | 0 | 3 | 0 | 6 | 0 | 4 | 9 | 3 | 0 | 83 | 4814 | 7:26 AM to | 8:26 AM |
| 8:26 AM | 0 | 0 | 1 | 0 | 27 | 0 | 7 | 0 | 0 | 0 | 6 | 0 | 0 | 33 | 14 | 0 | 88 | 4827 | 7:27 AM to | 8:27 AM |
| 8:27 AM | 14 | 0 | 4 | 0 | 0 | 19 | 5 | 0 | 7 | 0 | 6 | 0 | 6 | 5 | 9 | 1 | 75 | 4822 | 7:28 AM to | 8:28 AM |
| 8:28 AM | 0 | 0 | 2 | 0 | 15 | 6 | 5 | 0 | 0 | 0 | 9 | 0 | 1 | 33 | 19 | 0 | 90 | 4835 | 7:29 AM to | 8:29 AM |
| 8:29 AM | 11 | 0 | 4 | 0 | 0 | 19 | 1 | 0 | 4 | 0 | 1 | 0 | 3 | 1 | 10 | 1 | 54 | 4828 | 7:30 AM to | 8:30 AM |
| Approach Total | 530 | | | | 2366 | | | | 954 | | | | 3321 | | | | | | | |
| Grand Total | 327 | 0 | 203 | 9 | 822 | 1051 | 493 | 0 | 273 | 0 | 681 | 0 | 420 | 2138 | 763 | 14 | 7171 | | | |
| Approach % | 61.7% | 0.0% | 38.3% | 1.7% | 34.7% | 44.4% | 20.8% | 0.0% | 28.6% | 0.0% | 71.4% | 0.0% | 12.6% | 64.4% | 23.0% | 0.4% | | | | |
| Total % | 4.6% | 0.0% | 2.8% | 0.1% | 11.5% | 14.7% | 6.9% | 0.0% | 3.8% | 0.0% | 9.5% | 0.0% | 5.9% | 29.8% | 10.6% | 0.2% | | | | |
| **Begin Peak Hour:** | **7:08** | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **205** | **0** | **140** | **5** | **511** | **712** | **343** | **0** | **191** | **0** | **478** | **0** | **281** | **1583** | **479** | **8** | **4923** | 4923 | 7:08 AM to | 8:08 AM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/27/2004
Start Time: 04:30 PM
Site Code: 4001

| | From North | | | | From East | | | | From South | | | | From West | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SR-51 (SB) OFF RAMP | | | | GREENWAY RD | | | | SR-51 (NB) OFF RAMP | | | | GREENWAY RD | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | Trucks | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | Trucks | TOTAL | TOTAL |
| 4:30 PM | 5 | 0 | 6 | 1 | 18 | 8 | 1 | 0 | 4 | 0 | 15 | 0 | 7 | 26 | 10 | 0 | 100 | |
| 4:31 PM | 0 | 0 | 8 | 0 | 7 | 54 | 2 | 0 | 16 | 0 | 4 | 0 | 2 | 4 | 14 | 0 | 111 | |
| 4:32 PM | 18 | 0 | 7 | 0 | 14 | 2 | 2 | 0 | 0 | 0 | 4 | 0 | 1 | 26 | 6 | 0 | 80 | |
| 4:33 PM | 0 | 0 | 5 | 0 | 0 | 53 | 8 | 0 | 20 | 0 | 11 | 0 | 0 | 0 | 9 | 0 | 106 | |
| 4:34 PM | 7 | 0 | 4 | 1 | 13 | 2 | 0 | 0 | 1 | 0 | 11 | 0 | 9 | 28 | 6 | 0 | 81 | |
| 4:35 PM | 0 | 0 | 3 | 0 | 2 | 47 | 10 | 0 | 21 | 0 | 12 | 0 | 3 | 1 | 9 | 0 | 108 | |
| 4:36 PM | 11 | 0 | 10 | 0 | 21 | 7 | 4 | 0 | 0 | 0 | 11 | 0 | 0 | 26 | 5 | 0 | 95 | |
| 4:37 PM | 0 | 0 | 3 | 0 | 0 | 56 | 6 | 0 | 19 | 0 | 10 | 0 | 6 | 1 | 9 | 0 | 110 | |
| 4:38 PM | 17 | 0 | 7 | 0 | 16 | 1 | 1 | 0 | 0 | 0 | 7 | 0 | 3 | 38 | 4 | 0 | 94 | |
| 4:39 PM | 0 | 0 | 6 | 0 | 0 | 49 | 2 | 0 | 19 | 0 | 12 | 0 | 4 | 1 | 3 | 0 | 96 | |
| 4:40 PM | 8 | 0 | 5 | 0 | 22 | 2 | 1 | 0 | 0 | 0 | 16 | 0 | 0 | 39 | 11 | 0 | 104 | |
| 4:41 PM | 0 | 0 | 4 | 0 | 0 | 51 | 2 | 0 | 14 | 0 | 11 | 0 | 7 | 2 | 8 | 0 | 99 | |
| 4:42 PM | 16 | 0 | 7 | 0 | 22 | 2 | 2 | 0 | 0 | 0 | 9 | 0 | 2 | 46 | 5 | 0 | 111 | |
| 4:43 PM | 0 | 0 | 7 | 0 | 0 | 65 | 6 | 0 | 15 | 0 | 9 | 0 | 0 | 1 | 4 | 0 | 107 | |
| 4:44 PM | 8 | 0 | 6 | 0 | 18 | 5 | 1 | 0 | 2 | 0 | 13 | 0 | 6 | 27 | 1 | 0 | 87 | |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 58 | 8 | 0 | 21 | 0 | 8 | 0 | 0 | 4 | 5 | 0 | 104 | |
| 4:46 PM | 0 | 0 | 9 | 0 | 18 | 0 | 1 | 0 | 6 | 0 | 12 | 0 | 6 | 35 | 8 | 0 | 95 | |
| 4:47 PM | 15 | 0 | 4 | 0 | 8 | 62 | 6 | 0 | 19 | 0 | 6 | 0 | 0 | 4 | 5 | 0 | 129 | |
| 4:48 PM | 0 | 0 | 6 | 0 | 13 | 4 | 2 | 0 | 3 | 0 | 6 | 0 | 8 | 29 | 5 | 0 | 76 | |
| 4:49 PM | 13 | 0 | 5 | 0 | 2 | 49 | 4 | 0 | 20 | 0 | 14 | 0 | 0 | 0 | 5 | 0 | 112 | |
| 4:50 PM | 1 | 0 | 2 | 0 | 11 | 4 | 0 | 0 | 4 | 0 | 7 | 0 | 5 | 45 | 2 | 0 | 81 | |
| 4:51 PM | 14 | 0 | 8 | 0 | 0 | 41 | 8 | 0 | 11 | 0 | 8 | 0 | 6 | 1 | 8 | 0 | 105 | |
| 4:52 PM | 0 | 0 | 3 | 0 | 15 | 4 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 30 | 5 | 0 | 67 | |
| 4:53 PM | 7 | 0 | 6 | 0 | 0 | 34 | 2 | 0 | 15 | 0 | 11 | 0 | 0 | 3 | 11 | 0 | 89 | |
| 4:54 PM | 0 | 0 | 5 | 0 | 18 | 24 | 1 | 0 | 0 | 0 | 8 | 0 | 0 | 26 | 3 | 0 | 85 | |
| 4:55 PM | 18 | 0 | 4 | 0 | 0 | 33 | 2 | 0 | 19 | 0 | 10 | 0 | 0 | 4 | 7 | 0 | 97 | |
| 4:56 PM | 0 | 0 | 3 | 0 | 19 | 2 | 4 | 0 | 1 | 0 | 9 | 0 | 10 | 25 | 5 | 0 | 78 | |
| 4:57 PM | 12 | 0 | 7 | 1 | 1 | 60 | 1 | 0 | 19 | 0 | 8 | 0 | 4 | 5 | 4 | 0 | 121 | |
| 4:58 PM | 0 | 0 | 5 | 0 | 13 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 31 | 5 | 0 | 60 | |
| 4:59 PM | 11 | 0 | 6 | 0 | 0 | 47 | 9 | 0 | 23 | 0 | 6 | 0 | 0 | 1 | 6 | 0 | 109 | |
| 5:00 PM | 0 | 0 | 5 | 0 | 10 | 1 | 1 | 0 | 2 | 0 | 7 | 0 | 4 | 40 | 7 | 0 | 77 | |
| 5:01 PM | 13 | 0 | 7 | 2 | 0 | 68 | 3 | 0 | 22 | 0 | 6 | 0 | 0 | 4 | 4 | 0 | 127 | |
| 5:02 PM | 0 | 0 | 5 | 0 | 13 | 0 | 0 | 0 | 4 | 0 | 6 | 0 | 4 | 20 | 6 | 0 | 58 | |
| 5:03 PM | 15 | 0 | 6 | 0 | 0 | 47 | 8 | 0 | 10 | 0 | 8 | 0 | 5 | 2 | 6 | 0 | 107 | |
| 5:04 PM | 0 | 0 | 0 | 0 | 15 | 0 | 3 | 0 | 0 | 0 | 6 | 0 | 0 | 38 | 10 | 0 | 72 | |
| 5:05 PM | 19 | 0 | 8 | 0 | 0 | 59 | 10 | 0 | 21 | 0 | 6 | 0 | 3 | 1 | 3 | 0 | 130 | |
| 5:06 PM | 0 | 0 | 4 | 0 | 22 | 2 | 1 | 0 | 0 | 0 | 8 | 0 | 3 | 31 | 7 | 0 | 78 | |
| 5:07 PM | 10 | 0 | 8 | 0 | 5 | 47 | 3 | 0 | 15 | 0 | 8 | 0 | 7 | 3 | 8 | 0 | 114 | |
| 5:08 PM | 0 | 0 | 2 | 0 | 12 | 1 | 3 | 0 | 0 | 0 | 14 | 0 | 0 | 26 | 3 | 0 | 61 | |
| 5:09 PM | 13 | 0 | 8 | 0 | 0 | 51 | 4 | 0 | 18 | 0 | 7 | 0 | 0 | 2 | 11 | 0 | 114 | |
| 5:10 PM | 0 | 0 | 7 | 0 | 13 | 0 | 2 | 0 | 0 | 0 | 11 | 0 | 6 | 33 | 0 | 0 | 72 | |
| 5:11 PM | 15 | 0 | 9 | 0 | 0 | 54 | 6 | 0 | 19 | 0 | 6 | 0 | 5 | 2 | 6 | 0 | 122 | |
| 5:12 PM | 0 | 0 | 5 | 0 | 25 | 3 | 1 | 0 | 0 | 0 | 12 | 0 | 3 | 39 | 8 | 0 | 96 | |
| 5:13 PM | 19 | 0 | 8 | 0 | 0 | 70 | 7 | 0 | 21 | 0 | 4 | 0 | 0 | 1 | 10 | 0 | 140 | |
| 5:14 PM | 0 | 0 | 4 | 0 | 9 | 0 | 0 | 0 | 3 | 0 | 13 | 0 | 5 | 31 | 10 | 0 | 75 | |
| 5:15 PM | 11 | 0 | 4 | 0 | 0 | 60 | 12 | 0 | 15 | 0 | 8 | 0 | 2 | 1 | 5 | 0 | 118 | |
| 5:16 PM | 0 | 0 | 9 | 0 | 17 | 5 | 0 | 0 | 0 | 0 | 9 | 0 | 5 | 41 | 8 | 0 | 94 | |
| 5:17 PM | 8 | 0 | 3 | 0 | 0 | 69 | 8 | 0 | 21 | 0 | 10 | 0 | 0 | 2 | 5 | 0 | 126 | |
| 5:18 PM | 0 | 0 | 11 | 0 | 14 | 2 | 0 | 0 | 2 | 0 | 3 | 0 | 4 | 18 | 3 | 0 | 57 | |
| 5:19 PM | 13 | 0 | 9 | 0 | 12 | 70 | 9 | 0 | 11 | 0 | 8 | 0 | 2 | 3 | 5 | 0 | 142 | |
| 5:20 PM | 0 | 0 | 8 | 0 | 6 | 13 | 3 | 0 | 0 | 0 | 9 | 0 | 0 | 27 | 5 | 0 | 71 | |
| 5:21 PM | 13 | 0 | 5 | 1 | 0 | 47 | 8 | 0 | 19 | 0 | 7 | 0 | 5 | 1 | 9 | 0 | 114 | |
| 5:22 PM | 0 | 0 | 7 | 0 | 18 | 1 | 1 | 0 | 0 | 0 | 6 | 0 | 2 | 50 | 4 | 0 | 89 | |
| 5:23 PM | 14 | 0 | 10 | 0 | 0 | 50 | 7 | 0 | 20 | 0 | 8 | 0 | 2 | 2 | 8 | 0 | 121 | |
| 5:24 PM | 0 | 0 | 8 | 0 | 23 | 4 | 1 | 0 | 0 | 0 | 12 | 0 | 5 | 36 | 4 | 0 | 93 | |
| 5:25 PM | 13 | 0 | 6 | 0 | 3 | 62 | 10 | 0 | 21 | 0 | 8 | 0 | 0 | 3 | 7 | 1 | 133 | |
| 5:26 PM | 0 | 0 | 2 | 0 | 12 | 4 | 2 | 0 | 0 | 0 | 9 | 0 | 4 | 26 | 8 | 0 | 67 | |
| 5:27 PM | 11 | 0 | 8 | 0 | 0 | 34 | 8 | 0 | 23 | 0 | 12 | 0 | 1 | 4 | 13 | 0 | 114 | |
| 5:28 PM | 0 | 0 | 7 | 0 | 19 | 1 | 3 | 0 | 1 | 0 | 15 | 0 | 4 | 22 | 3 | 0 | 75 | |
| 5:29 PM | 4 | 0 | 5 | 0 | 1 | 55 | 3 | 0 | 18 | 0 | 7 | 0 | 0 | 4 | 11 | 0 | 108 | 5862 |
| 5:30 PM | 0 | 0 | 7 | 0 | 14 | 33 | 3 | 0 | 0 | 0 | 8 | 0 | 0 | 28 | 3 | 0 | 96 | 5858 |
| 5:31 PM | 16 | 0 | 6 | 0 | 0 | 41 | 10 | 0 | 10 | 0 | 13 | 0 | 5 | 0 | 6 | 1 | 107 | 5854 |
| 5:32 PM | 0 | 0 | 2 | 0 | 18 | 9 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 34 | 6 | 0 | 73 | 5847 |
| 5:33 PM | 13 | 0 | 7 | 0 | 0 | 62 | 7 | 0 | 18 | 0 | 8 | 0 | 1 | 2 | 2 | 0 | 120 | 5861 |
| 5:34 PM | 0 | 0 | 3 | 0 | 16 | 0 | 1 | 0 | 1 | 0 | 8 | 0 | 6 | 46 | 7 | 0 | 88 | 5868 |
| 5:35 PM | 13 | 0 | 4 | 0 | 0 | 60 | 7 | 0 | 21 | 0 | 7 | 0 | 0 | 2 | 5 | 0 | 119 | 5879 |
| 5:36 PM | 0 | 0 | 1 | 0 | 21 | 1 | 2 | 0 | 0 | 0 | 10 | 0 | 6 | 26 | 8 | 0 | 75 | 5859 |
| 5:37 PM | 15 | 0 | 7 | 1 | 0 | 64 | 7 | 0 | 12 | 0 | 7 | 0 | 7 | 2 | 5 | 0 | 126 | 5875 |
| 5:38 PM | 0 | 0 | 2 | 0 | 15 | 7 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 21 | 6 | 0 | 60 | 5841 |
| 5:39 PM | 11 | 0 | 5 | 0 | 0 | 56 | 10 | 0 | 22 | 0 | 12 | 0 | 4 | 0 | 6 | 0 | 126 | 5871 |
| 5:40 PM | 0 | 0 | 1 | 0 | 14 | 6 | 3 | 0 | 0 | 0 | 17 | 0 | 1 | 37 | 7 | 0 | 86 | 5853 |
| 5:41 PM | 11 | 0 | 7 | 0 | 0 | 46 | 4 | 0 | 16 | 0 | 15 | 0 | 8 | 3 | 8 | 0 | 118 | 5872 |
| 5:42 PM | 0 | 0 | 3 | 0 | 10 | 3 | 2 | 0 | 0 | 0 | 7 | 0 | 10 | 29 | 1 | 0 | 65 | 5826 |
| 5:43 PM | 12 | 0 | 7 | 0 | 0 | 53 | 7 | 0 | 18 | 0 | 11 | 0 | 7 | 2 | 8 | 0 | 125 | 5844 |
| 5:44 PM | 0 | 0 | 7 | 0 | 13 | 2 | 3 | 0 | 0 | 0 | 9 | 0 | 1 | 35 | 11 | 0 | 81 | 5838 |
| 5:45 PM | 17 | 0 | 5 | 1 | 0 | 67 | 9 | 0 | 22 | 0 | 11 | 0 | 0 | 1 | 14 | 0 | 146 | 5880 |
| 5:46 PM | 0 | 0 | 4 | 0 | 22 | 0 | 2 | 0 | 1 | 0 | 15 | 0 | 4 | 40 | 4 | 0 | 92 | 5877 |
| 5:47 PM | 11 | 0 | 8 | 0 | 0 | 40 | 13 | 0 | 17 | 0 | 7 | 0 | 3 | 2 | 4 | 0 | 105 | 5853 |
| 5:48 PM | 0 | 0 | 1 | 0 | 19 | 3 | 3 | 0 | 0 | 0 | 11 | 0 | 2 | 33 | 7 | 0 | 79 | 5856 |
| 5:49 PM | 17 | 0 | 5 | 0 | 0 | 70 | 6 | 0 | 25 | 0 | 9 | 0 | 0 | 3 | 5 | 0 | 140 | 5884 |
| 5:50 PM | 0 | 0 | 3 | 0 | 13 | 1 | 0 | 0 | 0 | 0 | 16 | 0 | 9 | 21 | 11 | 0 | 74 | 5877 |
| 5:51 PM | 9 | 0 | 5 | 0 | 0 | 49 | 11 | 0 | 16 | 0 | 14 | 0 | 4 | 4 | 12 | 0 | 124 | 5896 |
| 5:52 PM | 0 | 0 | 5 | 0 | 20 | 1 | 2 | 0 | 0 | 0 | 8 | 0 | 2 | 28 | 4 | 0 | 70 | 5899 |
| 5:53 PM | 11 | 0 | 4 | 0 | 0 | 45 | 3 | 0 | 31 | 0 | 10 | 0 | 0 | 2 | 5 | 0 | 111 | 5921 |
| 5:54 PM | 0 | 0 | 9 | 0 | 17 | 2 | 0 | 0 | 3 | 0 | 12 | 0 | 6 | 25 | 8 | 0 | 82 | 5918 |
| 5:55 PM | 15 | 0 | 9 | 0 | 4 | 51 | 7 | 0 | 15 | 0 | 13 | 0 | 0 | 2 | 4 | 0 | 120 | 5941 |
| 5:56 PM | 0 | 0 | 7 | 0 | 6 | 13 | 4 | 0 | 0 | 0 | 10 | 0 | 0 | 25 | 4 | 0 | 69 | 5932 |
| 5:57 PM | 13 | 0 | 7 | 0 | 0 | 31 | 16 | 0 | 14 | 0 | 13 | 0 | 8 | 3 | 6 | 0 | 111 | 5922 |
| 5:58 PM | 0 | 0 | 5 | 0 | 11 | 2 | 0 | 0 | 0 | 0 | 9 | 0 | 2 | 28 | 9 | 0 | 66 | 5928 |
| 5:59 PM | 15 | 0 | 3 | 0 | 0 | 33 | 9 | 0 | 14 | 0 | 5 | 0 | 0 | 1 | 6 | 0 | 86 | 5905 |
| Approach Total | 1069 | | | | 3686 | | | | 1695 | | | | 2352 | | | | | |
| Grand Total | 571 | 0 | 498 | 8 | 753 | 2557 | 376 | 0 | 854 | 0 | 841 | 0 | 268 | 1507 | 577 | 2 | 8802 | |
| Approach % | 53.4% | 0.0% | 46.6% | 0.7% | 20.4% | 69.4% | 10.2% | 0.0% | 50.4% | 0.0% | 49.6% | 0.0% | 11.4% | 64.1% | 24.5% | 0.1% | | |
| Total % | 6.5% | 0.0% | 5.7% | 0.1% | 8.6% | 29.1% | 4.3% | 0.0% | 9.7% | 0.0% | 9.6% | 0.0% | 3.0% | 17.1% | 6.6% | 0.0% | | |
| **Begin Peak Hour:** | **16:56** | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **385** | **0** | **336** | **6** | **498** | **1761** | **265** | **0** | **577** | **0** | **549** | **0** | **183** | **1003** | **384** | **2** | **5941** | 5941 |

| | |
|---|---|
| 5:00 PM to | 6:00 PM |
| 4:30 PM to | 5:30 PM |
| 4:31 PM to | 5:31 PM |
| 4:32 PM to | 5:32 PM |
| 4:33 PM to | 5:33 PM |
| 4:34 PM to | 5:34 PM |
| 4:35 PM to | 5:35 PM |
| 4:36 PM to | 5:36 PM |
| 4:37 PM to | 5:37 PM |
| 4:38 PM to | 5:38 PM |
| 4:39 PM to | 5:39 PM |
| 4:40 PM to | 5:40 PM |
| 4:41 PM to | 5:41 PM |
| 4:42 PM to | 5:42 PM |
| 4:43 PM to | 5:43 PM |
| 4:44 PM to | 5:44 PM |
| 4:45 PM to | 5:45 PM |
| 4:46 PM to | 5:46 PM |
| 4:47 PM to | 5:47 PM |
| 4:48 PM to | 5:48 PM |
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| 4:54 PM to | 5:54 PM |
| 4:55 PM to | 5:55 PM |
| 4:56 PM to | 5:56 PM |
| 4:57 PM to | 5:57 PM |
| 4:58 PM to | 5:58 PM |
| 4:59 PM to | 5:59 PM |
| 5:00 PM to | 6:00 PM |
| 4:56 PM to | 5:56 PM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/21/2004
Start Time: 07:00 AM
Site Code: 4001

| Street Name | From North SR-51 (SB) OFF RAMP | | | | From East CACTUS RD | | | | From South SR-51 (NB) OFF RAMP | | | | From West CACTUS RD | | | | INTSEC | HOUR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | | TOTAL | TOTAL | | |
| 7:00 AM | 0 | 0 | 1 | 0 | 0 | 14 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 25 | 6 | 0 | 53 | | | |
| 7:01 AM | 12 | 0 | 3 | 0 | 15 | 2 | 0 | 0 | 7 | 0 | 5 | 0 | 11 | 2 | 2 | 0 | 59 | | | |
| 7:02 AM | 0 | 0 | 7 | 0 | 5 | 23 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 22 | 9 | 0 | 75 | | | |
| 7:03 AM | 3 | 0 | 4 | 0 | 13 | 1 | 2 | 0 | 6 | 0 | 4 | 0 | 9 | 4 | 2 | 0 | 48 | | | |
| 7:04 AM | 0 | 0 | 3 | 0 | 0 | 11 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 23 | 9 | 0 | 50 | | | |
| 7:05 AM | 5 | 0 | 3 | 0 | 15 | 2 | 4 | 0 | 3 | 0 | 3 | 0 | 7 | 3 | 7 | 0 | 52 | | | |
| 7:06 AM | 0 | 0 | 3 | 0 | 0 | 15 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 29 | 8 | 0 | 63 | | | |
| 7:07 AM | 10 | 0 | 6 | 0 | 18 | 3 | 3 | 0 | 4 | 0 | 7 | 0 | 7 | 0 | 4 | 0 | 62 | | | |
| 7:08 AM | 0 | 0 | 8 | 0 | 0 | 12 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 29 | 6 | 0 | 62 | | | |
| 7:09 AM | 7 | 0 | 7 | 0 | 16 | 1 | 2 | 0 | 8 | 0 | 5 | 0 | 6 | 8 | 8 | 0 | 68 | | | |
| 7:10 AM | 0 | 0 | 1 | 0 | 2 | 13 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 26 | 3 | 0 | 53 | | | |
| 7:11 AM | 6 | 0 | 1 | 0 | 16 | 2 | 1 | 0 | 4 | 0 | 8 | 0 | 13 | 6 | 5 | 0 | 62 | | | |
| 7:12 AM | 0 | 0 | 2 | 0 | 3 | 17 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 30 | 6 | 0 | 61 | | | |
| 7:13 AM | 8 | 0 | 2 | 0 | 17 | 1 | 1 | 0 | 3 | 0 | 6 | 0 | 7 | 9 | 8 | 0 | 62 | | | |
| 7:14 AM | 0 | 0 | 8 | 0 | 1 | 16 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 26 | 5 | 0 | 60 | | | |
| 7:15 AM | 8 | 0 | 6 | 0 | 16 | 3 | 3 | 0 | 7 | 0 | 5 | 0 | 9 | 4 | 9 | 0 | 70 | | | |
| 7:16 AM | 0 | 0 | 2 | 0 | 0 | 19 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 29 | 10 | 0 | 63 | | | |
| 7:17 AM | 7 | 0 | 8 | 0 | 6 | 1 | 4 | 0 | 9 | 0 | 7 | 0 | 17 | 1 | 6 | 0 | 66 | | | |
| 7:18 AM | 0 | 0 | 6 | 0 | 0 | 17 | 6 | 0 | 8 | 0 | 0 | 0 | 0 | 34 | 4 | 0 | 75 | | | |
| 7:19 AM | 5 | 0 | 8 | 0 | 23 | 0 | 1 | 0 | 5 | 0 | 4 | 0 | 10 | 3 | 8 | 0 | 67 | | | |
| 7:20 AM | 0 | 0 | 6 | 0 | 1 | 29 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 10 | 3 | 0 | 58 | | | |
| 7:21 AM | 5 | 0 | 9 | 0 | 13 | 1 | 1 | 0 | 5 | 0 | 4 | 0 | 11 | 2 | 10 | 0 | 61 | | | |
| 7:22 AM | 0 | 0 | 5 | 0 | 0 | 28 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 27 | 3 | 0 | 70 | | | |
| 7:23 AM | 9 | 0 | 14 | 0 | 10 | 0 | 5 | 0 | 8 | 0 | 7 | 0 | 6 | 8 | 14 | 0 | 81 | | | |
| 7:24 AM | 0 | 0 | 6 | 0 | 0 | 20 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 26 | 7 | 0 | 66 | | | |
| 7:25 AM | 13 | 0 | 4 | 0 | 19 | 0 | 1 | 0 | 6 | 0 | 5 | 0 | 9 | 4 | 9 | 0 | 70 | | | |
| 7:26 AM | 0 | 0 | 7 | 0 | 5 | 21 | 2 | 0 | 7 | 0 | 0 | 0 | 0 | 41 | 11 | 0 | 94 | | | |
| 7:27 AM | 7 | 0 | 5 | 0 | 8 | 2 | 5 | 0 | 7 | 0 | 5 | 0 | 8 | 9 | 8 | 0 | 64 | | | |
| 7:28 AM | 0 | 0 | 8 | 0 | 0 | 21 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 25 | 3 | 0 | 67 | | | |
| 7:29 AM | 9 | 0 | 11 | 0 | 16 | 1 | 4 | 0 | 8 | 0 | 5 | 0 | 8 | 1 | 5 | 0 | 68 | | | |
| 7:30 AM | 0 | 0 | 7 | 0 | 6 | 20 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 33 | 3 | 0 | 78 | | | |
| 7:31 AM | 11 | 0 | 8 | 0 | 0 | 12 | 3 | 0 | 6 | 0 | 3 | 0 | 6 | 7 | 4 | 0 | 60 | | | |
| 7:32 AM | 0 | 0 | 7 | 0 | 16 | 27 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 34 | 6 | 0 | 92 | | | |
| 7:33 AM | 18 | 0 | 9 | 0 | 11 | 2 | 2 | 0 | 4 | 0 | 4 | 0 | 7 | 5 | 2 | 0 | 64 | | | |
| 7:34 AM | 0 | 0 | 9 | 0 | 2 | 19 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 40 | 2 | 0 | 80 | | | |
| 7:35 AM | 9 | 0 | 7 | 0 | 9 | 3 | 1 | 0 | 11 | 0 | 5 | 0 | 11 | 1 | 3 | 0 | 60 | | | |
| 7:36 AM | 0 | 0 | 8 | 0 | 0 | 22 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 29 | 8 | 0 | 71 | | | |
| 7:37 AM | 18 | 0 | 6 | 0 | 12 | 2 | 2 | 0 | 5 | 0 | 7 | 0 | 14 | 7 | 4 | 0 | 77 | | | |
| 7:38 AM | 0 | 0 | 5 | 0 | 4 | 21 | 2 | 0 | 2 | 0 | 0 | 0 | 1 | 29 | 4 | 0 | 68 | | | |
| 7:39 AM | 13 | 0 | 19 | 0 | 8 | 1 | 6 | 0 | 5 | 0 | 9 | 0 | 12 | 8 | 4 | 0 | 85 | | | |
| 7:40 AM | 0 | 0 | 12 | 0 | 0 | 21 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 42 | 2 | 0 | 82 | | | |
| 7:41 AM | 14 | 0 | 8 | 0 | 6 | 0 | 1 | 0 | 8 | 0 | 6 | 0 | 7 | 4 | 9 | 0 | 63 | | | |
| 7:42 AM | 0 | 0 | 10 | 0 | 10 | 16 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 34 | 6 | 0 | 84 | | | |
| 7:43 AM | 8 | 0 | 9 | 0 | 8 | 0 | 5 | 0 | 6 | 0 | 21 | 0 | 10 | 9 | 4 | 0 | 80 | | | |
| 7:44 AM | 0 | 0 | 16 | 0 | 2 | 19 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 33 | 9 | 0 | 89 | | | |
| 7:45 AM | 12 | 0 | 13 | 0 | 15 | 0 | 2 | 0 | 15 | 0 | 6 | 0 | 12 | 6 | 5 | 0 | 86 | | | |
| 7:46 AM | 0 | 0 | 7 | 0 | 1 | 21 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 32 | 4 | 0 | 72 | | | |
| 7:47 AM | 20 | 0 | 13 | 0 | 10 | 1 | 2 | 0 | 8 | 0 | 6 | 0 | 12 | 7 | 5 | 0 | 84 | | | |
| 7:48 AM | 0 | 0 | 5 | 0 | 9 | 23 | 6 | 0 | 8 | 0 | 0 | 0 | 0 | 42 | 4 | 0 | 97 | | | |
| 7:49 AM | 20 | 0 | 6 | 0 | 0 | 1 | 5 | 0 | 5 | 0 | 8 | 0 | 15 | 5 | 6 | 0 | 71 | | | |
| 7:50 AM | 0 | 0 | 3 | 0 | 8 | 31 | 3 | 0 | 13 | 0 | 0 | 0 | 0 | 30 | 5 | 0 | 93 | | | |
| 7:51 AM | 18 | 0 | 10 | 0 | 8 | 0 | 4 | 0 | 6 | 0 | 5 | 0 | 12 | 4 | 5 | 0 | 72 | | | |
| 7:52 AM | 0 | 0 | 5 | 0 | 0 | 26 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 38 | 8 | 0 | 86 | | | |
| 7:53 AM | 20 | 0 | 10 | 0 | 0 | 3 | 4 | 0 | 9 | 0 | 7 | 0 | 9 | 7 | 5 | 0 | 74 | | | |
| 7:54 AM | 0 | 0 | 12 | 0 | 14 | 17 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 38 | 6 | 0 | 95 | | | |
| 7:55 AM | 25 | 0 | 16 | 0 | 4 | 2 | 1 | 0 | 6 | 0 | 10 | 0 | 10 | 5 | 4 | 0 | 83 | | | |
| 7:56 AM | 0 | 0 | 9 | 0 | 2 | 17 | 2 | 0 | 11 | 0 | 1 | 0 | 0 | 42 | 3 | 0 | 87 | | | |
| 7:57 AM | 23 | 0 | 14 | 0 | 7 | 1 | 4 | 0 | 6 | 0 | 11 | 0 | 10 | 1 | 3 | 0 | 80 | | | |
| 7:58 AM | 0 | 0 | 3 | 0 | 2 | 30 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 43 | 3 | 0 | 88 | | | |
| 7:59 AM | 24 | 0 | 12 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 5 | 0 | 5 | 4 | 7 | 0 | 66 | 4297 | 7:00 AM to | 8:00 AM |
| 8:00 AM | 0 | 0 | 9 | 0 | 11 | 18 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 44 | 2 | 0 | 88 | 4332 | 7:01 AM to | 8:01 AM |
| 8:01 AM | 14 | 0 | 0 | 0 | 8 | 1 | 3 | 0 | 7 | 0 | 4 | 0 | 7 | 8 | 3 | 0 | 55 | 4328 | 7:02 AM to | 8:02 AM |
| 8:02 AM | 0 | 0 | 4 | 0 | 3 | 23 | 8 | 0 | 3 | 0 | 0 | 0 | 0 | 30 | 6 | 0 | 77 | 4330 | 7:03 AM to | 8:03 AM |
| 8:03 AM | 10 | 0 | 7 | 0 | 6 | 1 | 2 | 0 | 7 | 0 | 8 | 0 | 18 | 4 | 3 | 0 | 66 | 4348 | 7:04 AM to | 8:04 AM |
| 8:04 AM | 0 | 0 | 8 | 0 | 0 | 22 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 36 | 5 | 0 | 79 | 4377 | 7:05 AM to | 8:05 AM |
| 8:05 AM | 20 | 0 | 6 | 0 | 7 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 10 | 3 | 6 | 0 | 61 | 4386 | 7:06 AM to | 8:06 AM |
| 8:06 AM | 0 | 0 | 5 | 0 | 2 | 22 | 2 | 0 | 9 | 0 | 0 | 0 | 0 | 34 | 9 | 0 | 83 | 4406 | 7:07 AM to | 8:07 AM |
| 8:07 AM | 7 | 0 | 6 | 0 | 13 | 1 | 3 | 0 | 5 | 0 | 6 | 0 | 12 | 6 | 3 | 0 | 62 | 4406 | 7:08 AM to | 8:08 AM |
| 8:08 AM | 0 | 0 | 6 | 0 | 0 | 28 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 26 | 5 | 0 | 75 | 4419 | 7:09 AM to | 8:09 AM |
| 8:09 AM | 16 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 10 | 0 | 11 | 3 | 4 | 0 | 55 | 4406 | 7:10 AM to | 8:10 AM |
| 8:10 AM | 0 | 0 | 8 | 0 | 15 | 31 | 2 | 0 | 4 | 0 | 0 | 0 | 1 | 37 | 5 | 0 | 103 | 4456 | 7:11 AM to | 8:11 AM |
| 8:11 AM | 8 | 0 | 1 | 0 | 13 | 5 | 4 | 0 | 8 | 0 | 5 | 0 | 9 | 8 | 5 | 0 | 66 | 4460 | 7:12 AM to | 8:12 AM |
| 8:12 AM | 0 | 0 | 4 | 0 | 0 | 7 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 49 | 11 | 0 | 77 | 4476 | 7:13 AM to | 8:13 AM |
| 8:13 AM | 13 | 0 | 3 | 0 | 5 | 0 | 4 | 0 | 5 | 0 | 8 | 0 | 9 | 3 | 5 | 0 | 55 | 4469 | 7:14 AM to | 8:14 AM |
| 8:14 AM | 0 | 0 | 3 | 0 | 0 | 16 | 5 | 0 | 8 | 0 | 0 | 0 | 0 | 25 | 7 | 0 | 64 | 4473 | 7:15 AM to | 8:15 AM |
| 8:15 AM | 13 | 0 | 9 | 0 | 3 | 17 | 1 | 0 | 3 | 0 | 9 | 0 | 7 | 3 | 6 | 0 | 71 | 4474 | 7:16 AM to | 8:16 AM |
| 8:16 AM | 0 | 0 | 7 | 0 | 8 | 15 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 30 | 2 | 0 | 65 | 4476 | 7:17 AM to | 8:17 AM |
| 8:17 AM | 15 | 0 | 8 | 0 | 0 | 3 | 2 | 0 | 7 | 0 | 10 | 0 | 7 | 2 | 3 | 0 | 57 | 4467 | 7:18 AM to | 8:18 AM |
| 8:18 AM | 0 | 0 | 14 | 0 | 16 | 10 | 3 | 0 | 7 | 0 | 0 | 0 | 1 | 30 | 9 | 0 | 90 | 4482 | 7:19 AM to | 8:19 AM |
| 8:19 AM | 20 | 0 | 11 | 0 | 1 | 0 | 11 | 0 | 7 | 0 | 5 | 0 | 11 | 7 | 1 | 0 | 74 | 4469 | 7:20 AM to | 8:20 AM |
| 8:20 AM | 0 | 0 | 9 | 0 | 8 | 14 | 6 | 0 | 9 | 0 | 0 | 0 | 0 | 29 | 5 | 0 | 80 | 4511 | 7:21 AM to | 8:21 AM |
| 8:21 AM | 9 | 0 | 9 | 0 | 13 | 2 | 0 | 0 | 6 | 0 | 10 | 0 | 5 | 2 | 5 | 0 | 61 | 4511 | 7:22 AM to | 8:22 AM |
| 8:22 AM | 0 | 0 | 3 | 0 | 2 | 25 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 24 | 9 | 0 | 73 | 4514 | 7:23 AM to | 8:23 AM |
| 8:23 AM | 14 | 0 | 8 | 0 | 13 | 0 | 0 | 0 | 10 | 0 | 4 | 0 | 14 | 4 | 6 | 0 | 73 | 4506 | 7:24 AM to | 8:24 AM |
| 8:24 AM | 0 | 0 | 10 | 0 | 4 | 18 | 2 | 0 | 6 | 0 | 0 | 0 | 0 | 29 | 3 | 0 | 72 | 4512 | 7:25 AM to | 8:25 AM |
| 8:25 AM | 19 | 0 | 14 | 0 | 14 | 2 | 1 | 0 | 7 | 0 | 8 | 0 | 8 | 2 | 4 | 0 | 79 | 4521 | 7:26 AM to | 8:26 AM |
| 8:26 AM | 0 | 0 | 7 | 0 | 3 | 9 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 26 | 6 | 0 | 61 | 4488 | 7:27 AM to | 8:27 AM |
| 8:27 AM | 27 | 0 | 6 | 0 | 2 | 0 | 1 | 0 | 3 | 0 | 9 | 0 | 10 | 4 | 6 | 0 | 68 | 4492 | 7:28 AM to | 8:28 AM |
| 8:28 AM | 0 | 0 | 9 | 0 | 9 | 25 | 4 | 0 | 8 | 0 | 0 | 0 | 0 | 29 | 10 | 0 | 94 | 4519 | 7:29 AM to | 8:29 AM |
| 8:29 AM | 14 | 0 | 8 | 0 | 10 | 1 | 1 | 0 | 11 | 0 | 7 | 0 | 8 | 2 | 6 | 0 | 68 | 4519 | 7:30 AM to | 8:30 AM |
| Approach Total | 1235 | | | | 1839 | | | | 810 | | | | 2565 | | | | | | | |
| Grand Total | 586 | 0 | 649 | 0 | 602 | 970 | 267 | 0 | 509 | 0 | 301 | 0 | 440 | 1624 | 501 | 0 | 6449 | | | |
| Approach % | 47.4% | 0.0% | 52.6% | 0.0% | 32.7% | 52.7% | 14.5% | 0.0% | 62.8% | 0.0% | 37.2% | 0.0% | 17.2% | 63.3% | 19.5% | 0.0% | | | | |
| Total % | 9.1% | 0.0% | 10.1% | 0.0% | 9.3% | 15.0% | 4.1% | 0.0% | 7.9% | 0.0% | 4.7% | 0.0% | 6.8% | 25.2% | 7.8% | 0.0% | | | | |
| **Begin Peak Hour:** | **7:26** | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **447** | **0** | **486** | **0** | **369** | **684** | **185** | **0** | **360** | **0** | **215** | **0** | **300** | **1173** | **302** | **0** | **4521** | 4521 | 7:26 AM to | 8:26 AM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/21/2004
Start Time: 04:30 PM
Site Code: 4001

| | From North | | | | From East | | | | From South | | | | From West | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SR-51 (SB) OFF RAMP | | | | CACTUS RD | | | | SR-51 (NB) OFF RAMP | | | | CACTUS RD | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | | Left | Thru | Right | | TOTAL | TOTAL |
| 4:30 PM | 9 | 0 | 4 | 0 | 18 | 36 | 6 | 0 | 10 | 0 | 7 | 0 | 0 | 18 | 6 | 0 | 114 | |
| 4:31 PM | 1 | 0 | 3 | 0 | 6 | 20 | 12 | 0 | 0 | 0 | 10 | 0 | 6 | 36 | 6 | 0 | 100 | |
| 4:32 PM | 9 | 0 | 6 | 0 | 0 | 9 | 6 | 0 | 12 | 0 | 11 | 0 | 0 | 0 | 4 | 0 | 57 | |
| 4:33 PM | 0 | 0 | 7 | 0 | 2 | 21 | 2 | 0 | 5 | 0 | 9 | 0 | 7 | 42 | 10 | 0 | 105 | |
| 4:34 PM | 10 | 0 | 3 | 0 | 0 | 28 | 8 | 0 | 9 | 0 | 13 | 0 | 0 | 0 | 5 | 0 | 76 | |
| 4:35 PM | 0 | 0 | 4 | 0 | 7 | 16 | 4 | 0 | 0 | 0 | 8 | 0 | 11 | 28 | 3 | 0 | 81 | |
| 4:36 PM | 9 | 0 | 9 | 0 | 0 | 19 | 5 | 0 | 15 | 0 | 1 | 0 | 0 | 0 | 8 | 0 | 66 | |
| 4:37 PM | 4 | 0 | 2 | 0 | 16 | 24 | 3 | 0 | 6 | 0 | 7 | 0 | 12 | 20 | 3 | 0 | 97 | |
| 4:38 PM | 11 | 0 | 5 | 0 | 0 | 14 | 6 | 0 | 7 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 52 | |
| 4:39 PM | 2 | 0 | 7 | 0 | 8 | 26 | 1 | 0 | 1 | 0 | 10 | 0 | 14 | 30 | 1 | 0 | 100 | |
| 4:40 PM | 6 | 0 | 5 | 0 | 0 | 25 | 3 | 0 | 11 | 0 | 9 | 0 | 0 | 0 | 4 | 0 | 63 | |
| 4:41 PM | 0 | 0 | 3 | 0 | 8 | 21 | 3 | 0 | 0 | 0 | 5 | 0 | 13 | 40 | 3 | 0 | 96 | |
| 4:42 PM | 12 | 0 | 4 | 0 | 0 | 16 | 6 | 0 | 12 | 0 | 7 | 0 | 0 | 0 | 3 | 0 | 60 | |
| 4:43 PM | 1 | 0 | 2 | 0 | 6 | 26 | 7 | 0 | 2 | 0 | 6 | 0 | 9 | 28 | 3 | 0 | 90 | |
| 4:44 PM | 14 | 0 | 7 | 0 | 0 | 6 | 2 | 0 | 9 | 0 | 9 | 0 | 0 | 1 | 7 | 0 | 55 | |
| 4:45 PM | 0 | 0 | 4 | 0 | 8 | 19 | 4 | 0 | 0 | 0 | 6 | 0 | 8 | 52 | 3 | 0 | 104 | |
| 4:46 PM | 11 | 0 | 6 | 0 | 0 | 10 | 13 | 0 | 12 | 0 | 14 | 0 | 0 | 4 | 2 | 0 | 72 | |
| 4:47 PM | 0 | 0 | 4 | 0 | 18 | 27 | 3 | 0 | 3 | 0 | 9 | 0 | 20 | 29 | 3 | 0 | 116 | |
| 4:48 PM | 9 | 0 | 6 | 0 | 0 | 22 | 7 | 0 | 14 | 0 | 8 | 0 | 0 | 1 | 4 | 0 | 71 | |
| 4:49 PM | 10 | 0 | 7 | 0 | 15 | 20 | 2 | 0 | 1 | 0 | 15 | 0 | 12 | 31 | 6 | 0 | 119 | |
| 4:50 PM | 13 | 0 | 3 | 0 | 0 | 11 | 2 | 0 | 14 | 0 | 8 | 0 | 0 | 1 | 2 | 0 | 54 | |
| 4:51 PM | 7 | 0 | 1 | 0 | 12 | 25 | 3 | 0 | 1 | 0 | 4 | 0 | 9 | 35 | 4 | 0 | 101 | |
| 4:52 PM | 12 | 0 | 6 | 0 | 0 | 22 | 4 | 0 | 18 | 0 | 5 | 0 | 0 | 1 | 3 | 0 | 71 | |
| 4:53 PM | 2 | 0 | 8 | 0 | 8 | 16 | 5 | 0 | 5 | 0 | 13 | 0 | 10 | 46 | 2 | 0 | 115 | |
| 4:54 PM | 12 | 0 | 5 | 0 | 0 | 23 | 8 | 0 | 11 | 0 | 7 | 0 | 0 | 2 | 2 | 0 | 70 | |
| 4:55 PM | 1 | 0 | 4 | 0 | 11 | 21 | 7 | 0 | 1 | 0 | 5 | 0 | 16 | 30 | 3 | 0 | 99 | |
| 4:56 PM | 0 | 0 | 5 | 0 | 0 | 7 | 4 | 0 | 14 | 0 | 9 | 0 | 0 | 0 | 3 | 0 | 42 | |
| 4:57 PM | 23 | 0 | 2 | 0 | 9 | 0 | 2 | 0 | 3 | 0 | 7 | 0 | 7 | 0 | 1 | 0 | 54 | |
| 4:58 PM | 12 | 0 | 5 | 0 | 2 | 38 | 8 | 0 | 7 | 0 | 6 | 0 | 1 | 34 | 8 | 0 | 121 | |
| 4:59 PM | 0 | 0 | 4 | 0 | 11 | 32 | 10 | 0 | 0 | 0 | 12 | 0 | 6 | 36 | 4 | 0 | 115 | |
| 5:00 PM | 7 | 0 | 10 | 0 | 0 | 8 | 3 | 0 | 15 | 0 | 14 | 0 | 0 | 2 | 3 | 0 | 62 | |
| 5:01 PM | 4 | 0 | 3 | 0 | 23 | 24 | 5 | 0 | 8 | 0 | 11 | 0 | 13 | 29 | 5 | 0 | 125 | |
| 5:02 PM | 14 | 0 | 7 | 0 | 0 | 12 | 6 | 0 | 15 | 0 | 6 | 0 | 0 | 0 | 5 | 0 | 65 | |
| 5:03 PM | 3 | 0 | 3 | 0 | 17 | 22 | 1 | 0 | 2 | 0 | 7 | 0 | 10 | 30 | 4 | 0 | 99 | |
| 5:04 PM | 9 | 0 | 7 | 0 | 0 | 19 | 7 | 0 | 17 | 0 | 9 | 0 | 0 | 0 | 9 | 0 | 77 | |
| 5:05 PM | 3 | 0 | 5 | 0 | 12 | 9 | 0 | 0 | 2 | 0 | 16 | 0 | 7 | 44 | 6 | 0 | 104 | |
| 5:06 PM | 8 | 0 | 5 | 0 | 0 | 29 | 14 | 0 | 13 | 0 | 6 | 0 | 0 | 2 | 3 | 0 | 80 | |
| 5:07 PM | 0 | 0 | 11 | 0 | 14 | 31 | 8 | 0 | 0 | 0 | 7 | 0 | 9 | 27 | 4 | 0 | 111 | |
| 5:08 PM | 12 | 0 | 4 | 0 | 0 | 8 | 3 | 0 | 16 | 0 | 13 | 0 | 0 | 1 | 3 | 0 | 60 | |
| 5:09 PM | 3 | 0 | 8 | 0 | 15 | 16 | 6 | 0 | 1 | 0 | 15 | 0 | 10 | 31 | 4 | 0 | 109 | |
| 5:10 PM | 10 | 0 | 2 | 0 | 0 | 26 | 13 | 0 | 13 | 0 | 9 | 0 | 0 | 0 | 2 | 0 | 75 | |
| 5:11 PM | 0 | 0 | 7 | 0 | 14 | 32 | 5 | 0 | 2 | 0 | 7 | 0 | 5 | 39 | 4 | 0 | 115 | |
| 5:12 PM | 12 | 0 | 6 | 0 | 0 | 20 | 11 | 0 | 13 | 0 | 8 | 0 | 0 | 5 | 12 | 0 | 87 | |
| 5:13 PM | 2 | 0 | 6 | 0 | 26 | 24 | 9 | 0 | 0 | 0 | 11 | 0 | 15 | 29 | 6 | 0 | 128 | |
| 5:14 PM | 9 | 0 | 8 | 0 | 0 | 27 | 9 | 0 | 9 | 0 | 9 | 0 | 0 | 8 | 6 | 0 | 85 | |
| 5:15 PM | 0 | 0 | 13 | 0 | 11 | 25 | 4 | 0 | 0 | 0 | 8 | 0 | 6 | 48 | 2 | 0 | 117 | |
| 5:16 PM | 15 | 0 | 7 | 0 | 0 | 21 | 7 | 0 | 16 | 0 | 15 | 0 | 0 | 0 | 3 | 0 | 84 | |
| 5:17 PM | 1 | 0 | 9 | 0 | 8 | 19 | 6 | 0 | 1 | 0 | 10 | 0 | 9 | 46 | 8 | 0 | 117 | |
| 5:18 PM | 11 | 0 | 8 | 0 | 0 | 21 | 11 | 0 | 9 | 0 | 11 | 0 | 0 | 2 | 4 | 0 | 77 | |
| 5:19 PM | 0 | 0 | 13 | 0 | 19 | 25 | 5 | 0 | 0 | 0 | 7 | 0 | 11 | 22 | 0 | 0 | 102 | |
| 5:20 PM | 15 | 0 | 7 | 0 | 0 | 24 | 4 | 0 | 11 | 0 | 6 | 0 | 0 | 1 | 8 | 0 | 76 | |
| 5:21 PM | 5 | 0 | 9 | 0 | 15 | 24 | 7 | 0 | 0 | 0 | 13 | 0 | 10 | 33 | 5 | 0 | 121 | |
| 5:22 PM | 7 | 0 | 6 | 0 | 0 | 29 | 8 | 0 | 9 | 0 | 11 | 0 | 4 | 2 | 4 | 0 | 80 | |
| 5:23 PM | 0 | 0 | 10 | 0 | 16 | 32 | 5 | 0 | 0 | 0 | 9 | 0 | 3 | 43 | 7 | 0 | 125 | |
| 5:24 PM | 13 | 0 | 4 | 0 | 0 | 17 | 8 | 0 | 15 | 0 | 7 | 0 | 0 | 0 | 5 | 0 | 69 | |
| 5:25 PM | 0 | 0 | 5 | 0 | 19 | 27 | 12 | 0 | 0 | 0 | 7 | 0 | 13 | 31 | 6 | 0 | 120 | |
| 5:26 PM | 5 | 0 | 6 | 0 | 0 | 6 | 3 | 0 | 16 | 0 | 8 | 0 | 0 | 0 | 5 | 0 | 49 | |
| 5:27 PM | 2 | 0 | 7 | 0 | 14 | 23 | 5 | 0 | 1 | 0 | 7 | 0 | 3 | 46 | 5 | 0 | 113 | |
| 5:28 PM | 9 | 0 | 3 | 0 | 0 | 20 | 6 | 0 | 11 | 0 | 6 | 0 | 3 | 4 | 6 | 0 | 68 | |
| 5:29 PM | 0 | 0 | 3 | 0 | 8 | 10 | 1 | 0 | 0 | 0 | 6 | 0 | 9 | 35 | 8 | 0 | 80 | 5316 | 4:30 PM to | 5:30 PM |
| 5:30 PM | 13 | 0 | 4 | 0 | 0 | 28 | 15 | 0 | 11 | 0 | 4 | 0 | 0 | 10 | 6 | 0 | 91 | 5293 | 4:31 PM to | 5:31 PM |
| 5:31 PM | 0 | 0 | 7 | 0 | 16 | 38 | 4 | 0 | 0 | 0 | 14 | 0 | 9 | 30 | 3 | 0 | 121 | 5314 | 4:32 PM to | 5:32 PM |
| 5:32 PM | 11 | 0 | 7 | 0 | 0 | 17 | 8 | 0 | 14 | 0 | 12 | 0 | 0 | 1 | 5 | 0 | 75 | 5332 | 4:33 PM to | 5:33 PM |
| 5:33 PM | 0 | 0 | 8 | 0 | 5 | 22 | 6 | 0 | 1 | 0 | 10 | 0 | 7 | 29 | 7 | 0 | 95 | 5322 | 4:34 PM to | 5:34 PM |
| 5:34 PM | 13 | 0 | 8 | 0 | 0 | 18 | 7 | 0 | 14 | 0 | 9 | 0 | 0 | 0 | 3 | 0 | 72 | 5318 | 4:35 PM to | 5:35 PM |
| 5:35 PM | 2 | 0 | 9 | 0 | 18 | 27 | 6 | 0 | 0 | 0 | 11 | 0 | 9 | 34 | 6 | 0 | 122 | 5359 | 4:36 PM to | 5:36 PM |
| 5:36 PM | 6 | 0 | 4 | 0 | 0 | 24 | 8 | 0 | 16 | 0 | 11 | 0 | 2 | 1 | 9 | 0 | 81 | 5374 | 4:37 PM to | 5:37 PM |
| 5:37 PM | 0 | 0 | 3 | 0 | 14 | 38 | 6 | 0 | 0 | 0 | 11 | 0 | 11 | 28 | 8 | 0 | 119 | 5396 | 4:38 PM to | 5:38 PM |
| 5:38 PM | 14 | 0 | 7 | 0 | 0 | 15 | 1 | 0 | 13 | 0 | 6 | 0 | 0 | 0 | 8 | 0 | 64 | 5408 | 4:39 PM to | 5:39 PM |
| 5:39 PM | 5 | 0 | 3 | 0 | 20 | 23 | 1 | 0 | 0 | 0 | 8 | 0 | 9 | 30 | 4 | 0 | 103 | 5411 | 4:40 PM to | 5:40 PM |
| 5:40 PM | 16 | 0 | 2 | 0 | 0 | 24 | 7 | 0 | 11 | 0 | 9 | 0 | 0 | 3 | 2 | 0 | 74 | 5422 | 4:41 PM to | 5:41 PM |
| 5:41 PM | 4 | 0 | 6 | 0 | 15 | 19 | 5 | 0 | 0 | 0 | 7 | 0 | 14 | 46 | 4 | 0 | 120 | 5446 | 4:42 PM to | 5:42 PM |
| 5:42 PM | 12 | 0 | 4 | 0 | 0 | 16 | 11 | 0 | 15 | 0 | 9 | 0 | 0 | 8 | 4 | 0 | 79 | 5465 | 4:43 PM to | 5:43 PM |
| 5:43 PM | 1 | 0 | 6 | 0 | 16 | 31 | 9 | 0 | 0 | 0 | 8 | 0 | 9 | 25 | 4 | 0 | 109 | 5484 | 4:44 PM to | 5:44 PM |
| 5:44 PM | 14 | 0 | 8 | 0 | 0 | 11 | 7 | 0 | 15 | 0 | 8 | 0 | 0 | 1 | 3 | 0 | 67 | 5496 | 4:45 PM to | 5:45 PM |
| 5:45 PM | 0 | 0 | 7 | 0 | 14 | 21 | 7 | 0 | 0 | 0 | 3 | 0 | 11 | 31 | 6 | 0 | 100 | 5492 | 4:46 PM to | 5:46 PM |
| 5:46 PM | 14 | 0 | 4 | 0 | 0 | 20 | 6 | 0 | 14 | 0 | 13 | 0 | 1 | 0 | 3 | 0 | 75 | 5495 | 4:47 PM to | 5:47 PM |
| 5:47 PM | 0 | 0 | 5 | 0 | 19 | 25 | 5 | 0 | 0 | 0 | 8 | 0 | 12 | 44 | 7 | 0 | 125 | 5504 | 4:48 PM to | 5:48 PM |
| 5:48 PM | 7 | 0 | 4 | 0 | 0 | 6 | 3 | 0 | 12 | 0 | 10 | 0 | 6 | 1 | 9 | 0 | 58 | 5491 | 4:49 PM to | 5:49 PM |
| 5:49 PM | 0 | 0 | 5 | 0 | 19 | 23 | 3 | 0 | 0 | 0 | 7 | 0 | 5 | 25 | 1 | 0 | 88 | 5460 | 4:50 PM to | 5:50 PM |
| 5:50 PM | 19 | 0 | 6 | 0 | 0 | 4 | 0 | 0 | 11 | 0 | 12 | 0 | 0 | 2 | 3 | 0 | 57 | 5463 | 4:51 PM to | 5:51 PM |
| 5:51 PM | 2 | 0 | 5 | 0 | 6 | 21 | 8 | 0 | 1 | 0 | 11 | 0 | 8 | 35 | 5 | 0 | 102 | 5464 | 4:52 PM to | 5:52 PM |
| 5:52 PM | 11 | 0 | 6 | 0 | 0 | 13 | 8 | 0 | 12 | 0 | 8 | 0 | 5 | 2 | 4 | 0 | 69 | 5462 | 4:53 PM to | 5:53 PM |
| 5:53 PM | 1 | 0 | 2 | 0 | 10 | 22 | 8 | 0 | 0 | 0 | 6 | 0 | 7 | 46 | 4 | 0 | 106 | 5453 | 4:54 PM to | 5:54 PM |
| 5:54 PM | 7 | 0 | 4 | 0 | 0 | 14 | 11 | 0 | 11 | 0 | 14 | 0 | 5 | 1 | 7 | 0 | 74 | 5457 | 4:55 PM to | 5:55 PM |
| 5:55 PM | 0 | 0 | 3 | 0 | 18 | 26 | 9 | 0 | 0 | 0 | 9 | 0 | 5 | 46 | 5 | 0 | 121 | 5479 | 4:56 PM to | 5:56 PM |
| 5:56 PM | 16 | 0 | 11 | 0 | 0 | 7 | 2 | 0 | 8 | 0 | 12 | 0 | 0 | 1 | 5 | 0 | 62 | 5499 | 4:57 PM to | 5:57 PM |
| 5:57 PM | 1 | 0 | 3 | 0 | 15 | 26 | 5 | 0 | 0 | 0 | 8 | 0 | 10 | 30 | 4 | 0 | 102 | 5547 | 4:58 PM to | 5:58 PM |
| 5:58 PM | 16 | 0 | 5 | 0 | 0 | 16 | 12 | 0 | 17 | 0 | 4 | 0 | 4 | 1 | 6 | 0 | 81 | 5507 | 4:59 PM to | 5:59 PM |
| 5:59 PM | 0 | 0 | 3 | 0 | 6 | 25 | 10 | 0 | 0 | 0 | 16 | 0 | 6 | 31 | 9 | 0 | 106 | 5498 | 5:00 PM to | 6:00 PM |
| Approach Total | 1086 | | | | 3003 | | | | 1419 | | | | 2526 | | | | | |
| Grand Total | 584 | 0 | 502 | 0 | 607 | 1850 | 546 | 0 | 614 | 0 | 805 | 0 | 456 | 1647 | 423 | 0 | 8034 | |
| Approach % | 53.8% | 0.0% | 46.2% | 0.0% | 20.2% | 61.6% | 18.2% | 0.0% | 43.3% | 0.0% | 56.7% | 0.0% | 18.1% | 65.2% | 16.7% | 0.0% | | |
| Total % | 7.3% | 0.0% | 6.2% | 0.0% | 7.6% | 23.0% | 6.8% | 0.0% | 7.6% | 0.0% | 10.0% | 0.0% | 5.7% | 20.5% | 5.3% | 0.0% | | |
| **Begin Peak Hour:** | **16:58** | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **380** | **0** | **362** | **0** | **449** | **1279** | **386** | **0** | **401** | **0** | **555** | **0** | **292** | **1140** | **303** | **0** | **5547** | 5547 | 4:58 PM to | 5:58 PM |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/28/2004
Start Time: 07:00 AM
Site Code: 4001

| | From North | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | W. LOOP 101 (SB) OFF RAMP | | | | | BELL RD--From East | | | | W. LOOP 101 (NB) OFF RAMP--From South | | | | | BELL RD--From West | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL |
| 7:00 AM | 4 | 0 | 10 | 8 | 0 | 14 | 5 | 1 | 0 | 0 | 0 | 9 | 5 | 0 | 21 | 11 | 15 | 0 | 90 | |
| 7:01 AM | 0 | 0 | 17 | 8 | 0 | 5 | 12 | 0 | 0 | 18 | 0 | 6 | 6 | 0 | 1 | 23 | 7 | 3 | 89 | |
| 7:02 AM | 7 | 0 | 11 | 7 | 1 | 5 | 10 | 1 | 1 | 0 | 0 | 4 | 4 | 1 | 28 | 11 | 9 | 1 | 86 | |
| 7:03 AM | 0 | 0 | 17 | 7 | 0 | 1 | 11 | 0 | 0 | 15 | 0 | 6 | 4 | 0 | 2 | 12 | 7 | 1 | 71 | |
| 7:04 AM | 4 | 0 | 12 | 10 | 0 | 4 | 9 | 0 | 1 | 0 | 0 | 5 | 4 | 0 | 17 | 21 | 9 | 3 | 81 | |
| 7:05 AM | 0 | 0 | 16 | 5 | 0 | 5 | 9 | 2 | 1 | 16 | 0 | 9 | 4 | 0 | 12 | 18 | 7 | 0 | 94 | |
| 7:06 AM | 6 | 0 | 14 | 10 | 0 | 11 | 2 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 27 | 34 | 8 | 1 | 105 | |
| 7:07 AM | 0 | 0 | 12 | 5 | 0 | 4 | 11 | 2 | 0 | 12 | 0 | 10 | 3 | 2 | 15 | 21 | 13 | 1 | 100 | |
| 7:08 AM | 1 | 0 | 8 | 7 | 0 | 6 | 19 | 1 | 2 | 0 | 0 | 6 | 6 | 0 | 22 | 9 | 13 | 1 | 85 | |
| 7:09 AM | 0 | 0 | 18 | 10 | 1 | 0 | 17 | 3 | 0 | 0 | 0 | 3 | 2 | 6 | 6 | 20 | 10 | 0 | 77 | |
| 7:10 AM | 4 | 0 | 10 | 5 | 0 | 12 | 2 | 2 | 0 | 0 | 0 | 11 | 9 | 0 | 27 | 17 | 14 | 0 | 99 | |
| 7:11 AM | 0 | 0 | 12 | 2 | 0 | 9 | 14 | 3 | 0 | 16 | 0 | 6 | 3 | 1 | 3 | 19 | 7 | 2 | 89 | |
| 7:12 AM | 3 | 0 | 13 | 9 | 1 | 11 | 5 | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 23 | 20 | 15 | 2 | 94 | |
| 7:13 AM | 0 | 0 | 13 | 3 | 2 | 3 | 11 | 3 | 0 | 13 | 0 | 11 | 9 | 4 | 9 | 16 | 5 | 1 | 84 | |
| 7:14 AM | 2 | 0 | 12 | 7 | 2 | 14 | 9 | 1 | 0 | 0 | 0 | 8 | 6 | 0 | 27 | 16 | 8 | 0 | 97 | |
| 7:15 AM | 0 | 0 | 13 | 10 | 0 | 0 | 20 | 1 | 0 | 6 | 0 | 17 | 2 | 4 | 8 | 26 | 13 | 0 | 104 | |
| 7:16 AM | 4 | 0 | 8 | 8 | 2 | 13 | 3 | 2 | 0 | 0 | 0 | 8 | 7 | 0 | 27 | 6 | 9 | 0 | 80 | |
| 7:17 AM | 0 | 0 | 18 | 9 | 0 | 2 | 18 | 2 | 1 | 19 | 0 | 8 | 8 | 2 | 9 | 18 | 13 | 1 | 107 | |
| 7:18 AM | 3 | 0 | 14 | 10 | 0 | 11 | 4 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 20 | 21 | 18 | 0 | 96 | |
| 7:19 AM | 0 | 0 | 21 | 9 | 0 | 0 | 19 | 2 | 1 | 18 | 0 | 4 | 3 | 1 | 1 | 23 | 7 | 1 | 95 | |
| 7:20 AM | 3 | 0 | 6 | 4 | 3 | 12 | 3 | 3 | 0 | 0 | 0 | 6 | 5 | 1 | 28 | 14 | 14 | 0 | 89 | |
| 7:21 AM | 0 | 0 | 16 | 8 | 1 | 3 | 19 | 1 | 1 | 12 | 0 | 11 | 5 | 0 | 9 | 26 | 4 | 2 | 101 | |
| 7:22 AM | 2 | 0 | 9 | 6 | 1 | 11 | 4 | 0 | 0 | 0 | 0 | 10 | 6 | 0 | 27 | 11 | 12 | 0 | 86 | |
| 7:23 AM | 0 | 0 | 22 | 9 | 0 | 1 | 16 | 1 | 0 | 25 | 0 | 9 | 2 | 9 | 5 | 15 | 1 | 1 | 95 | |
| 7:24 AM | 3 | 0 | 15 | 12 | 1 | 6 | 3 | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 25 | 28 | 10 | 0 | 95 | |
| 7:25 AM | 0 | 0 | 20 | 5 | 0 | 0 | 16 | 1 | 0 | 19 | 0 | 9 | 9 | 1 | 5 | 23 | 9 | 2 | 102 | |
| 7:26 AM | 8 | 0 | 11 | 7 | 0 | 9 | 18 | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 27 | 20 | 4 | 0 | 104 | |
| 7:27 AM | 0 | 0 | 14 | 4 | 2 | 0 | 18 | 1 | 0 | 16 | 0 | 11 | 3 | 2 | 11 | 21 | 6 | 2 | 98 | |
| 7:28 AM | 2 | 0 | 6 | 5 | 0 | 11 | 3 | 2 | 1 | 0 | 0 | 8 | 6 | 0 | 25 | 24 | 12 | 0 | 93 | |
| 7:29 AM | 0 | 0 | 28 | 13 | 4 | 1 | 11 | 5 | 2 | 20 | 0 | 12 | 12 | 2 | 9 | 21 | 7 | 3 | 114 | |
| 7:30 AM | 6 | 0 | 5 | 3 | 1 | 12 | 2 | 1 | 2 | 0 | 0 | 2 | 2 | 1 | 24 | 9 | 10 | 1 | 71 | |
| 7:31 AM | 0 | 0 | 16 | 6 | 3 | 4 | 19 | 1 | 0 | 24 | 0 | 11 | 8 | 3 | 5 | 21 | 13 | 0 | 114 | |
| 7:32 AM | 0 | 0 | 4 | 4 | 0 | 11 | 14 | 1 | 0 | 0 | 0 | 6 | 3 | 0 | 32 | 20 | 13 | 0 | 101 | |
| 7:33 AM | 0 | 0 | 26 | 14 | 0 | 0 | 24 | 2 | 0 | 14 | 0 | 12 | 5 | 2 | 7 | 19 | 4 | 0 | 108 | |
| 7:34 AM | 1 | 0 | 6 | 6 | 0 | 14 | 1 | 0 | 1 | 0 | 0 | 5 | 5 | 1 | 30 | 11 | 15 | 0 | 83 | |
| 7:35 AM | 0 | 0 | 22 | 9 | 0 | 5 | 15 | 0 | 1 | 23 | 0 | 7 | 5 | 0 | 7 | 21 | 6 | 1 | 106 | |
| 7:36 AM | 8 | 0 | 7 | 6 | 1 | 13 | 3 | 1 | 0 | 0 | 0 | 12 | 12 | 1 | 28 | 17 | 9 | 0 | 98 | |
| 7:37 AM | 0 | 0 | 25 | 6 | 1 | 0 | 13 | 3 | 1 | 23 | 0 | 8 | 8 | 1 | 9 | 22 | 13 | 3 | 116 | |
| 7:38 AM | 4 | 0 | 12 | 12 | 0 | 9 | 21 | 1 | 0 | 0 | 0 | 5 | 5 | 0 | 28 | 7 | 9 | 0 | 96 | |
| 7:39 AM | 0 | 0 | 26 | 9 | 2 | 0 | 20 | 0 | 1 | 10 | 0 | 6 | 5 | 5 | 10 | 25 | 10 | 0 | 107 | |
| 7:40 AM | 0 | 0 | 10 | 7 | 1 | 17 | 5 | 1 | 0 | 0 | 0 | 8 | 7 | 0 | 26 | 8 | 8 | 0 | 83 | |
| 7:41 AM | 0 | 0 | 30 | 10 | 3 | 2 | 12 | 2 | 1 | 26 | 0 | 14 | 8 | 1 | 1 | 23 | 5 | 2 | 115 | |
| 7:42 AM | 4 | 0 | 18 | 11 | 2 | 12 | 5 | 1 | 1 | 0 | 0 | 7 | 7 | 0 | 31 | 11 | 9 | 0 | 98 | |
| 7:43 AM | 0 | 0 | 22 | 0 | 1 | 0 | 22 | 4 | 0 | 16 | 0 | 7 | 4 | 2 | 0 | 25 | 7 | 1 | 103 | |
| 7:44 AM | 8 | 0 | 17 | 14 | 1 | 6 | 9 | 2 | 1 | 0 | 0 | 8 | 8 | 0 | 27 | 22 | 14 | 2 | 113 | |
| 7:45 AM | 0 | 0 | 27 | 10 | 5 | 0 | 21 | 1 | 0 | 17 | 0 | 8 | 2 | 2 | 2 | 24 | 9 | 0 | 109 | |
| 7:46 AM | 4 | 0 | 9 | 6 | 0 | 14 | 5 | 1 | 0 | 0 | 0 | 6 | 5 | 0 | 25 | 16 | 10 | 2 | 90 | |
| 7:47 AM | 0 | 0 | 26 | 2 | 0 | 4 | 18 | 2 | 0 | 16 | 0 | 11 | 9 | 2 | 7 | 27 | 8 | 0 | 119 | |
| 7:48 AM | 4 | 0 | 13 | 10 | 0 | 13 | 5 | 1 | 0 | 0 | 0 | 10 | 6 | 3 | 26 | 20 | 5 | 1 | 97 | |
| 7:49 AM | 0 | 0 | 25 | 6 | 2 | 0 | 16 | 1 | 0 | 24 | 0 | 16 | 9 | 1 | 4 | 25 | 5 | 0 | 116 | |
| 7:50 AM | 5 | 0 | 17 | 9 | 1 | 8 | 13 | 4 | 1 | 0 | 0 | 12 | 9 | 0 | 28 | 16 | 7 | 1 | 110 | |
| 7:51 AM | 0 | 0 | 37 | 9 | 2 | 0 | 19 | 1 | 1 | 26 | 0 | 18 | 10 | 1 | 3 | 25 | 3 | 0 | 132 | |
| 7:52 AM | 4 | 0 | 18 | 11 | 1 | 11 | 10 | 0 | 0 | 0 | 0 | 9 | 7 | 1 | 27 | 22 | 11 | 0 | 112 | |
| 7:53 AM | 0 | 0 | 20 | 9 | 1 | 0 | 15 | 2 | 0 | 26 | 0 | 16 | 10 | 0 | 3 | 17 | 11 | 0 | 110 | |
| 7:54 AM | 5 | 0 | 13 | 10 | 0 | 12 | 3 | 1 | 0 | 0 | 0 | 11 | 6 | 0 | 29 | 13 | 10 | 3 | 97 | |
| 7:55 AM | 0 | 0 | 21 | 12 | 1 | 1 | 22 | 0 | 1 | 32 | 0 | 10 | 8 | 1 | 0 | 21 | 12 | 0 | 119 | |
| 7:56 AM | 11 | 0 | 10 | 8 | 0 | 6 | 2 | 1 | 1 | 0 | 0 | 8 | 4 | 1 | 30 | 7 | 5 | 4 | 80 | |
| 7:57 AM | 0 | 0 | 21 | 10 | 0 | 0 | 18 | 1 | 0 | 24 | 0 | 15 | 9 | 0 | 4 | 25 | 7 | 2 | 115 | |
| 7:58 AM | 8 | 0 | 7 | 7 | 0 | 10 | 2 | 0 | 1 | 0 | 0 | 8 | 5 | 0 | 35 | 15 | 9 | 2 | 94 | |
| 7:59 AM | 0 | 0 | 35 | 10 | 1 | 1 | 9 | 0 | 0 | 22 | 0 | 5 | 4 | 1 | 4 | 17 | 8 | 1 | 101 | 5913 | 7:00 AM to | 8:00 AM |
| 8:00 AM | 6 | 0 | 11 | 10 | 1 | 5 | 4 | 2 | 2 | 0 | 0 | 7 | 1 | 1 | 31 | 15 | 7 | 0 | 88 | 5911 | 7:01 AM to | 8:01 AM |
| 8:01 AM | 0 | 0 | 27 | 4 | 2 | 0 | 22 | 0 | 1 | 26 | 0 | 7 | 4 | 4 | 0 | 15 | 6 | 2 | 103 | 5925 | 7:02 AM to | 8:02 AM |
| 8:02 AM | 4 | 0 | 8 | 7 | 0 | 10 | 14 | 2 | 0 | 10 | 0 | 4 | 4 | 0 | 23 | 12 | 9 | 0 | 96 | 5935 | 7:03 AM to | 8:03 AM |
| 8:03 AM | 0 | 0 | 13 | 4 | 0 | 0 | 11 | 0 | 0 | 15 | 0 | 8 | 5 | 1 | 0 | 25 | 7 | 4 | 79 | 5943 | 7:04 AM to | 8:04 AM |
| 8:04 AM | 7 | 0 | 7 | 6 | 1 | 7 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 | 34 | 13 | 9 | 0 | 81 | 5943 | 7:05 AM to | 8:05 AM |
| 8:05 AM | 0 | 0 | 7 | 4 | 1 | 0 | 14 | 1 | 0 | 13 | 0 | 8 | 6 | 0 | 5 | 27 | 8 | 2 | 83 | 5932 | 7:06 AM to | 8:06 AM |
| 8:06 AM | 2 | 0 | 9 | 8 | 2 | 12 | 4 | 0 | 1 | 0 | 0 | 8 | 5 | 0 | 37 | 11 | 9 | 0 | 92 | 5919 | 7:07 AM to | 8:07 AM |
| 8:07 AM | 0 | 0 | 22 | 9 | 1 | 0 | 21 | 3 | 0 | 14 | 0 | 13 | 8 | 1 | 5 | 26 | 12 | 0 | 116 | 5935 | 7:08 AM to | 8:08 AM |
| 8:08 AM | 5 | 0 | 9 | 9 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 10 | 8 | 1 | 33 | 8 | 11 | 0 | 86 | 5936 | 7:09 AM to | 8:09 AM |
| 8:09 AM | 0 | 0 | 24 | 15 | 1 | 0 | 9 | 2 | 0 | 14 | 0 | 2 | 1 | 0 | 1 | 16 | 5 | 1 | 73 | 5932 | 7:10 AM to | 8:10 AM |
| 8:10 AM | 4 | 0 | 12 | 10 | 0 | 11 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 0 | 26 | 10 | 7 | 1 | 73 | 5906 | 7:11 AM to | 8:11 AM |
| 8:11 AM | 0 | 0 | 12 | 9 | 0 | 0 | 7 | 0 | 0 | 9 | 0 | 2 | 2 | 1 | 0 | 15 | 3 | 0 | 48 | 5865 | 7:12 AM to | 8:12 AM |
| 8:12 AM | 2 | 0 | 14 | 12 | 0 | 9 | 2 | 1 | 1 | 0 | 0 | 9 | 6 | 1 | 30 | 9 | 5 | 0 | 81 | 5852 | 7:13 AM to | 8:13 AM |
| 8:13 AM | 0 | 0 | 18 | 12 | 1 | 0 | 16 | 2 | 2 | 12 | 0 | 13 | 5 | 2 | 5 | 8 | 4 | 2 | 78 | 5846 | 7:14 AM to | 8:14 AM |
| 8:14 AM | 4 | 0 | 7 | 7 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 34 | 12 | 5 | 0 | 71 | 5820 | 7:15 AM to | 8:15 AM |
| 8:15 AM | 0 | 0 | 23 | 8 | 1 | 0 | 24 | 2 | 1 | 20 | 0 | 9 | 9 | 2 | 3 | 24 | 6 | 3 | 111 | 5827 | 7:16 AM to | 8:16 AM |
| 8:16 AM | 7 | 0 | 9 | 9 | 0 | 7 | 5 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 28 | 9 | 8 | 0 | 78 | 5825 | 7:17 AM to | 8:17 AM |
| 8:17 AM | 0 | 0 | 19 | 5 | 1 | 0 | 15 | 0 | 1 | 18 | 0 | 9 | 8 | 1 | 0 | 13 | 2 | 0 | 76 | 5794 | 7:18 AM to | 8:18 AM |
| 8:18 AM | 4 | 0 | 6 | 6 | 0 | 9 | 5 | 3 | 1 | 0 | 0 | 6 | 4 | 0 | 31 | 9 | 14 | 1 | 87 | 5785 | 7:19 AM to | 8:19 AM |
| 8:19 AM | 0 | 0 | 20 | 9 | 0 | 0 | 19 | 1 | 0 | 16 | 0 | 6 | 5 | 0 | 2 | 21 | 2 | 0 | 87 | 5777 | 7:20 AM to | 8:20 AM |
| 8:20 AM | 6 | 0 | 6 | 6 | 1 | 6 | 1 | 1 | 2 | 0 | 0 | 11 | 9 | 0 | 13 | 9 | 9 | 0 | 62 | 5750 | 7:21 AM to | 8:21 AM |
| 8:21 AM | 0 | 0 | 23 | 11 | 0 | 0 | 15 | 0 | 2 | 11 | 0 | 4 | 3 | 3 | 0 | 21 | 0 | 1 | 74 | 5723 | 7:22 AM to | 8:22 AM |
| 8:22 AM | 9 | 0 | 7 | 6 | 2 | 12 | 0 | 0 | 1 | 0 | 0 | 7 | 5 | 2 | 36 | 18 | 8 | 1 | 97 | 5734 | 7:23 AM to | 8:23 AM |
| 8:23 AM | 0 | 0 | 16 | 8 | 1 | 2 | 4 | 3 | 1 | 15 | 0 | 12 | 7 | 1 | 5 | 21 | 3 | 1 | 81 | 5720 | 7:24 AM to | 8:24 AM |
| 8:24 AM | 4 | 0 | 11 | 9 | 2 | 6 | 3 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 32 | 14 | 15 | 0 | 89 | 5714 | 7:25 AM to | 8:25 AM |
| 8:25 AM | 0 | 0 | 20 | 7 | 0 | 3 | 20 | 0 | 0 | 12 | 0 | 9 | 6 | 0 | 3 | 11 | 9 | 3 | 87 | 5699 | 7:26 AM to | 8:26 AM |
| 8:26 AM | 3 | 0 | 10 | 10 | 0 | 6 | 0 | 3 | 0 | 0 | 0 | 2 | 1 | 0 | 20 | 14 | 10 | 3 | 68 | 5663 | 7:27 AM to | 8:27 AM |
| 8:27 AM | 0 | 0 | 11 | 6 | 1 | 0 | 11 | 4 | 1 | 13 | 0 | 7 | 5 | 3 | 0 | 11 | 7 | 0 | 64 | 5629 | 7:28 AM to | 8:28 AM |
| 8:28 AM | 4 | 0 | 10 | 9 | 0 | 10 | 0 | 0 | 1 | 0 | 0 | 11 | 8 | 0 | 33 | 14 | 8 | 1 | 90 | 5626 | 7:29 AM to | 8:29 AM |
| 8:29 AM | 0 | 0 | 23 | 9 | 0 | 0 | 14 | 2 | 0 | 21 | 0 | 4 | 4 | 0 | 1 | 13 | 3 | 0 | 81 | 5593 | 7:30 AM to | 8:30 AM |
| Approach Total | 1574 | | | | | 1553 | | | | 1505 | | | | | 3761 | | | | | | | |
| Grand Total | 199 | 0 | 1375 | 712 | 70 | 498 | 944 | 111 | 44 | 787 | 0 | 718 | 482 | 92 | 1439 | 1560 | 762 | 80 | 8393 | | | |
| Approach % | 12.6% | 0.0% | 87.4% | 45.2% | 4.4% | 32.1% | 60.8% | 7.1% | 2.8% | 52.3% | 0.0% | 47.7% | 32.0% | 6.1% | 38.3% | 41.5% | 20.3% | 2.1% | | | | |
| Total % | 2.4% | 0.0% | 16.4% | 8.5% | 0.8% | 5.9% | 11.2% | 1.3% | 0.5% | 9.4% | 0.0% | 8.6% | 5.7% | 1.1% | 17.1% | 18.6% | 9.1% | 1.0% | | | | |
| **Begin Peak Hour:** | **7:04** | | | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **127** | **0** | **965** | **463** | **53** | **359** | **697** | **80** | **27** | **566** | **0** | **511** | **338** | **72** | **970** | **1125** | **542** | **55** | **5943** | 5943 | 7:04 AM to | 8:04 AM |

| Left | Thru | Right | RTOR | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Left | Thru | Right | Trucks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 127 | 0 | 965 | 463 | 359 | 697 | 80 | 27 | 566 | 0 | 511 | 338 | 970 | 1126 | 542 | 55 |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/28/2004
Start Time: 04:30 PM
Site Code: 4001

| | From North | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | W. LOOP 101 (SB) OFF RAMP | | | | | BELL RD--From East | | | | W. LOOP 101 (NB) OFF RAMP--From South | | | | | BELL RD--From West | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL |
| 4:30 PM | 4 | 0 | 30 | 4 | 0 | 18 | 1 | 5 | 0 | 16 | 0 | 21 | 15 | 0 | 37 | 0 | 11 | 2 | 143 | |
| 4:31 PM | 1 | 0 | 5 | 5 | 0 | 0 | 56 | 6 | 0 | 2 | 0 | 15 | 15 | 0 | 0 | 33 | 4 | 0 | 122 | |
| 4:32 PM | 8 | 0 | 22 | 4 | 0 | 15 | 0 | 7 | 1 | 20 | 0 | 12 | 5 | 0 | 26 | 0 | 10 | 0 | 120 | |
| 4:33 PM | 1 | 0 | 5 | 5 | 0 | 0 | 62 | 4 | 1 | 1 | 0 | 11 | 11 | 0 | 0 | 71 | 13 | 0 | 168 | |
| 4:34 PM | 4 | 0 | 17 | 4 | 0 | 23 | 0 | 6 | 0 | 17 | 0 | 10 | 0 | 0 | 28 | 0 | 12 | 1 | 117 | |
| 4:35 PM | 0 | 0 | 7 | 7 | 0 | 0 | 56 | 4 | 0 | 3 | 0 | 13 | 13 | 0 | 0 | 32 | 7 | 0 | 122 | |
| 4:36 PM | 8 | 0 | 26 | 4 | 0 | 18 | 0 | 7 | 1 | 19 | 0 | 5 | 2 | 0 | 30 | 0 | 8 | 2 | 121 | |
| 4:37 PM | 1 | 0 | 3 | 3 | 0 | 0 | 47 | 3 | 0 | 6 | 0 | 7 | 7 | 0 | 0 | 51 | 9 | 1 | 127 | |
| 4:38 PM | 9 | 0 | 30 | 5 | 1 | 19 | 0 | 7 | 0 | 18 | 0 | 18 | 3 | 1 | 29 | 0 | 9 | 0 | 139 | |
| 4:39 PM | 3 | 0 | 7 | 7 | 0 | 0 | 59 | 8 | 0 | 23 | 0 | 15 | 10 | 0 | 0 | 31 | 7 | 0 | 151 | |
| 4:40 PM | 10 | 0 | 26 | 4 | 0 | 24 | 0 | 5 | 0 | 0 | 0 | 13 | 2 | 0 | 29 | 0 | 10 | 1 | 117 | |
| 4:41 PM | 0 | 0 | 12 | 12 | 0 | 2 | 43 | 6 | 0 | 22 | 0 | 12 | 6 | 0 | 0 | 45 | 8 | 0 | 150 | |
| 4:42 PM | 8 | 0 | 24 | 1 | 0 | 17 | 0 | 9 | 1 | 0 | 0 | 14 | 3 | 0 | 31 | 0 | 8 | 1 | 111 | |
| 4:43 PM | 5 | 0 | 5 | 5 | 0 | 0 | 57 | 4 | 0 | 19 | 0 | 18 | 12 | 0 | 0 | 50 | 13 | 0 | 171 | |
| 4:44 PM | 6 | 0 | 25 | 3 | 0 | 22 | 0 | 2 | 0 | 0 | 0 | 11 | 7 | 0 | 28 | 0 | 7 | 0 | 101 | |
| 4:45 PM | 0 | 0 | 7 | 7 | 0 | 0 | 52 | 5 | 0 | 15 | 0 | 10 | 6 | 0 | 0 | 43 | 11 | 1 | 143 | |
| 4:46 PM | 8 | 0 | 23 | 3 | 1 | 19 | 0 | 5 | 0 | 0 | 0 | 10 | 2 | 0 | 27 | 0 | 14 | 0 | 106 | |
| 4:47 PM | 4 | 0 | 9 | 9 | 1 | 2 | 50 | 6 | 0 | 24 | 0 | 20 | 11 | 0 | 0 | 48 | 10 | 0 | 173 | |
| 4:48 PM | 9 | 0 | 38 | 7 | 0 | 13 | 0 | 4 | 0 | 0 | 0 | 12 | 3 | 0 | 32 | 0 | 15 | 1 | 123 | |
| 4:49 PM | 3 | 0 | 9 | 10 | 2 | 0 | 55 | 4 | 1 | 13 | 0 | 8 | 5 | 0 | 0 | 49 | 9 | 0 | 150 | |
| 4:50 PM | 5 | 0 | 30 | 5 | 0 | 15 | 0 | 6 | 1 | 0 | 0 | 17 | 0 | 0 | 32 | 0 | 6 | 0 | 111 | |
| 4:51 PM | 2 | 0 | 4 | 4 | 0 | 2 | 47 | 6 | 0 | 22 | 0 | 16 | 11 | 0 | 0 | 53 | 7 | 1 | 159 | |
| 4:52 PM | 6 | 0 | 24 | 5 | 0 | 15 | 5 | 5 | 0 | 0 | 0 | 15 | 5 | 0 | 31 | 7 | 6 | 1 | 114 | |
| 4:53 PM | 0 | 0 | 3 | 3 | 0 | 0 | 50 | 7 | 0 | 24 | 0 | 12 | 9 | 0 | 0 | 23 | 7 | 1 | 126 | |
| 4:54 PM | 8 | 0 | 28 | 3 | 1 | 17 | 0 | 7 | 1 | 0 | 0 | 16 | 1 | 1 | 30 | 0 | 6 | 2 | 112 | |
| 4:55 PM | 1 | 0 | 9 | 9 | 0 | 2 | 46 | 4 | 0 | 16 | 0 | 19 | 12 | 0 | 0 | 54 | 10 | 0 | 161 | |
| 4:56 PM | 9 | 0 | 27 | 3 | 0 | 17 | 0 | 1 | 0 | 0 | 0 | 16 | 3 | 0 | 32 | 0 | 5 | 0 | 107 | |
| 4:57 PM | 2 | 0 | 9 | 9 | 0 | 0 | 38 | 6 | 0 | 22 | 0 | 15 | 8 | 0 | 0 | 40 | 7 | 0 | 139 | |
| 4:58 PM | 8 | 0 | 35 | 7 | 0 | 21 | 0 | 11 | 0 | 0 | 0 | 12 | 2 | 0 | 33 | 0 | 13 | 0 | 133 | |
| 4:59 PM | 1 | 0 | 8 | 8 | 0 | 0 | 51 | 3 | 1 | 20 | 0 | 17 | 12 | 0 | 0 | 51 | 10 | 1 | 161 | |
| 5:00 PM | 13 | 0 | 23 | 4 | 0 | 20 | 0 | 6 | 0 | 0 | 0 | 17 | 10 | 0 | 27 | 0 | 9 | 1 | 115 | |
| 5:01 PM | 1 | 0 | 4 | 4 | 0 | 3 | 48 | 8 | 2 | 20 | 0 | 11 | 5 | 0 | 0 | 37 | 6 | 1 | 138 | |
| 5:02 PM | 12 | 0 | 33 | 8 | 2 | 16 | 0 | 3 | 0 | 0 | 0 | 6 | 2 | 0 | 22 | 0 | 6 | 0 | 100 | |
| 5:03 PM | 0 | 0 | 9 | 9 | 0 | 4 | 52 | 3 | 0 | 22 | 0 | 14 | 14 | 0 | 2 | 33 | 11 | 0 | 150 | |
| 5:04 PM | 11 | 0 | 32 | 3 | 0 | 18 | 0 | 7 | 0 | 0 | 0 | 9 | 2 | 0 | 28 | 0 | 14 | 0 | 119 | |
| 5:05 PM | 0 | 0 | 8 | 8 | 0 | 0 | 47 | 8 | 0 | 21 | 0 | 10 | 8 | 0 | 1 | 43 | 5 | 0 | 143 | |
| 5:06 PM | 4 | 0 | 21 | 5 | 0 | 14 | 0 | 4 | 0 | 0 | 0 | 12 | 5 | 0 | 28 | 0 | 13 | 1 | 96 | |
| 5:07 PM | 1 | 0 | 5 | 5 | 1 | 2 | 46 | 4 | 0 | 23 | 0 | 15 | 10 | 0 | 0 | 39 | 13 | 0 | 148 | |
| 5:08 PM | 5 | 0 | 38 | 9 | 0 | 25 | 0 | 8 | 0 | 0 | 0 | 13 | 4 | 0 | 27 | 0 | 14 | 0 | 130 | |
| 5:09 PM | 0 | 0 | 13 | 13 | 0 | 0 | 39 | 1 | 1 | 19 | 0 | 10 | 6 | 0 | 0 | 41 | 7 | 1 | 130 | |
| 5:10 PM | 3 | 0 | 31 | 5 | 0 | 23 | 0 | 3 | 0 | 0 | 0 | 13 | 4 | 0 | 28 | 0 | 13 | 0 | 114 | |
| 5:11 PM | 0 | 0 | 7 | 7 | 0 | 4 | 49 | 9 | 1 | 13 | 0 | 10 | 9 | 0 | 2 | 46 | 11 | 0 | 151 | |
| 5:12 PM | 9 | 0 | 35 | 7 | 0 | 22 | 0 | 7 | 1 | 0 | 0 | 14 | 0 | 0 | 30 | 0 | 8 | 0 | 125 | |
| 5:13 PM | 2 | 0 | 5 | 5 | 0 | 4 | 39 | 3 | 0 | 19 | 0 | 13 | 9 | 0 | 0 | 48 | 9 | 0 | 142 | |
| 5:14 PM | 9 | 0 | 31 | 4 | 0 | 18 | 0 | 8 | 1 | 0 | 0 | 14 | 2 | 0 | 31 | 0 | 12 | 2 | 123 | |
| 5:15 PM | 1 | 0 | 9 | 9 | 0 | 5 | 42 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 47 | 10 | 0 | 120 | |
| 5:16 PM | 9 | 0 | 17 | 2 | 0 | 12 | 0 | 3 | 0 | 10 | 0 | 17 | 9 | 0 | 26 | 0 | 13 | 2 | 107 | |
| 5:17 PM | 0 | 0 | 7 | 7 | 0 | 5 | 56 | 4 | 0 | 0 | 0 | 13 | 2 | 0 | 2 | 49 | 12 | 0 | 148 | |
| 5:18 PM | 13 | 0 | 28 | 1 | 0 | 14 | 0 | 9 | 0 | 19 | 0 | 15 | 10 | 0 | 26 | 0 | 8 | 0 | 132 | |
| 5:19 PM | 2 | 0 | 8 | 8 | 0 | 0 | 39 | 0 | 0 | 0 | 0 | 8 | 0 | 3 | 2 | 44 | 8 | 0 | 111 | |
| 5:20 PM | 9 | 0 | 22 | 8 | 0 | 26 | 0 | 6 | 0 | 26 | 0 | 18 | 12 | 0 | 27 | 0 | 10 | 0 | 144 | |
| 5:21 PM | 0 | 0 | 9 | 9 | 0 | 3 | 42 | 3 | 0 | 0 | 0 | 15 | 3 | 0 | 2 | 36 | 17 | 0 | 127 | |
| 5:22 PM | 3 | 0 | 32 | 5 | 0 | 16 | 4 | 0 | 0 | 27 | 0 | 15 | 12 | 0 | 28 | 0 | 5 | 0 | 130 | |
| 5:23 PM | 0 | 0 | 9 | 9 | 0 | 8 | 55 | 5 | 0 | 0 | 0 | 20 | 4 | 0 | 2 | 45 | 5 | 0 | 149 | |
| 5:24 PM | 9 | 0 | 31 | 8 | 0 | 16 | 0 | 14 | 0 | 21 | 0 | 20 | 14 | 0 | 28 | 0 | 5 | 0 | 144 | |
| 5:25 PM | 1 | 0 | 6 | 6 | 0 | 8 | 44 | 4 | 0 | 0 | 0 | 15 | 1 | 0 | 4 | 46 | 12 | 0 | 140 | |
| 5:26 PM | 10 | 0 | 22 | 0 | 0 | 13 | 0 | 6 | 0 | 23 | 0 | 11 | 9 | 0 | 24 | 0 | 15 | 0 | 124 | |
| 5:27 PM | 0 | 0 | 4 | 4 | 0 | 8 | 53 | 2 | 0 | 0 | 0 | 12 | 1 | 0 | 4 | 43 | 10 | 0 | 136 | |
| 5:28 PM | 6 | 0 | 27 | 4 | 0 | 15 | 0 | 0 | 0 | 16 | 0 | 11 | 7 | 0 | 24 | 0 | 13 | 1 | 112 | |
| 5:29 PM | 0 | 0 | 8 | 8 | 0 | 7 | 45 | 5 | 0 | 0 | 0 | 12 | 0 | 0 | 2 | 54 | 6 | 0 | 139 | 7885 | 4:30 PM to 5:30 PM |
| 5:30 PM | 11 | 0 | 28 | 3 | 0 | 15 | 1 | 3 | 0 | 23 | 0 | 15 | 7 | 0 | 24 | 0 | 3 | 1 | 123 | 7865 | 4:31 PM to 5:31 PM |
| 5:31 PM | 0 | 0 | 5 | 5 | 0 | 6 | 55 | 5 | 0 | 0 | 0 | 11 | 2 | 1 | 5 | 52 | 8 | 0 | 147 | 7890 | 4:32 PM to 5:32 PM |
| 5:32 PM | 6 | 0 | 34 | 9 | 0 | 10 | 3 | 4 | 1 | 15 | 0 | 7 | 7 | 0 | 24 | 0 | 11 | 4 | 114 | 7884 | 4:33 PM to 5:33 PM |
| 5:33 PM | 0 | 0 | 10 | 9 | 0 | 6 | 34 | 5 | 0 | 0 | 0 | 16 | 0 | 0 | 2 | 41 | 9 | 0 | 123 | 7839 | 4:34 PM to 5:34 PM |
| 5:34 PM | 12 | 0 | 31 | 4 | 0 | 11 | 7 | 4 | 0 | 15 | 0 | 13 | 7 | 0 | 21 | 2 | 6 | 1 | 122 | 7844 | 4:35 PM to 5:35 PM |
| 5:35 PM | 0 | 0 | 7 | 7 | 0 | 6 | 48 | 8 | 0 | 0 | 0 | 15 | 3 | 1 | 8 | 28 | 10 | 0 | 130 | 7852 | 4:36 PM to 5:36 PM |
| 5:36 PM | 16 | 0 | 24 | 1 | 0 | 11 | 3 | 7 | 0 | 22 | 0 | 7 | 5 | 0 | 22 | 0 | 12 | 1 | 124 | 7855 | 4:37 PM to 5:37 PM |
| 5:37 PM | 2 | 0 | 6 | 6 | 0 | 9 | 45 | 3 | 0 | 0 | 0 | 16 | 5 | 0 | 7 | 42 | 1 | 0 | 131 | 7859 | 4:38 PM to 5:38 PM |
| 5:38 PM | 9 | 0 | 36 | 6 | 0 | 7 | 4 | 0 | 0 | 18 | 0 | 9 | 9 | 0 | 16 | 0 | 9 | 2 | 108 | 7828 | 4:39 PM to 5:39 PM |
| 5:39 PM | 1 | 0 | 3 | 3 | 0 | 8 | 55 | 5 | 0 | 0 | 0 | 12 | 1 | 0 | 6 | 46 | 9 | 0 | 145 | 7822 | 4:40 PM to 5:40 PM |
| 5:40 PM | 7 | 0 | 27 | 5 | 0 | 6 | 6 | 6 | 0 | 18 | 0 | 23 | 17 | 0 | 22 | 2 | 7 | 0 | 124 | 7829 | 4:41 PM to 5:41 PM |
| 5:41 PM | 2 | 0 | 9 | 9 | 0 | 8 | 48 | 5 | 0 | 0 | 0 | 13 | 4 | 0 | 7 | 50 | 10 | 0 | 152 | 7831 | 4:42 PM to 5:42 PM |
| 5:42 PM | 11 | 0 | 32 | 4 | 1 | 6 | 5 | 5 | 0 | 14 | 0 | 13 | 8 | 0 | 25 | 1 | 10 | 1 | 122 | 7842 | 4:43 PM to 5:43 PM |
| 5:43 PM | 0 | 0 | 6 | 6 | 0 | 10 | 57 | 5 | 1 | 0 | 0 | 18 | 4 | 0 | 7 | 50 | 8 | 0 | 161 | 7832 | 4:44 PM to 5:44 PM |
| 5:44 PM | 6 | 0 | 31 | 6 | 0 | 8 | 5 | 3 | 0 | 20 | 0 | 13 | 11 | 0 | 25 | 0 | 11 | 0 | 122 | 7853 | 4:45 PM to 5:45 PM |
| 5:45 PM | 0 | 0 | 7 | 7 | 0 | 8 | 42 | 4 | 0 | 0 | 0 | 16 | 2 | 0 | 8 | 37 | 8 | 0 | 130 | 7840 | 4:46 PM to 5:46 PM |
| 5:46 PM | 6 | 0 | 24 | 3 | 0 | 10 | 6 | 8 | 0 | 25 | 0 | 8 | 7 | 0 | 19 | 8 | 10 | 0 | 124 | 7858 | 4:47 PM to 5:47 PM |
| 5:47 PM | 0 | 0 | 12 | 12 | 0 | 6 | 32 | 9 | 0 | 0 | 0 | 13 | 4 | 0 | 5 | 37 | 9 | 0 | 123 | 7808 | 4:48 PM to 5:48 PM |
| 5:48 PM | 6 | 0 | 12 | 3 | 0 | 14 | 7 | 3 | 0 | 15 | 0 | 15 | 9 | 0 | 24 | 1 | 10 | 0 | 107 | 7792 | 4:49 PM to 5:49 PM |
| 5:49 PM | 0 | 0 | 9 | 9 | 0 | 8 | 47 | 3 | 0 | 0 | 0 | 11 | 1 | 0 | 5 | 51 | 5 | 0 | 139 | 7781 | 4:50 PM to 5:50 PM |
| 5:50 PM | 11 | 0 | 27 | 4 | 1 | 6 | 7 | 3 | 0 | 25 | 0 | 5 | 5 | 0 | 21 | 0 | 6 | 0 | 111 | 7781 | 4:51 PM to 5:51 PM |
| 5:51 PM | 0 | 0 | 3 | 3 | 0 | 10 | 42 | 3 | 0 | 0 | 0 | 12 | 1 | 0 | 7 | 60 | 11 | 0 | 148 | 7770 | 4:52 PM to 5:52 PM |
| 5:52 PM | 9 | 0 | 31 | 2 | 0 | 16 | 5 | 4 | 0 | 23 | 0 | 15 | 11 | 0 | 21 | 3 | 7 | 0 | 134 | 7790 | 4:53 PM to 5:53 PM |
| 5:53 PM | 0 | 0 | 4 | 4 | 0 | 8 | 42 | 1 | 0 | 0 | 0 | 13 | 5 | 0 | 10 | 17 | 6 | 0 | 101 | 7765 | 4:54 PM to 5:54 PM |
| 5:54 PM | 10 | 0 | 27 | 6 | 0 | 12 | 6 | 7 | 0 | 22 | 0 | 10 | 10 | 0 | 17 | 3 | 7 | 0 | 121 | 7774 | 4:55 PM to 5:55 PM |
| 5:55 PM | 0 | 0 | 6 | 6 | 0 | 10 | 35 | 9 | 0 | 0 | 0 | 14 | 2 | 2 | 7 | 54 | 9 | 0 | 144 | 7757 | 4:56 PM to 5:56 PM |
| 5:56 PM | 11 | 0 | 25 | 5 | 0 | 11 | 6 | 3 | 0 | 25 | 0 | 19 | 17 | 0 | 21 | 3 | 4 | 0 | 128 | 7778 | 4:57 PM to 5:57 PM |
| 5:57 PM | 1 | 0 | 10 | 10 | 0 | 11 | 26 | 3 | 0 | 0 | 0 | 12 | 2 | 0 | 8 | 50 | 6 | 0 | 127 | 7766 | 4:58 PM to 5:58 PM |
| 5:58 PM | 9 | 0 | 19 | 1 | 0 | 6 | 12 | 12 | 0 | 17 | 0 | 7 | 7 | 0 | 17 | 10 | 10 | 1 | 119 | 7752 | 4:59 PM to 5:59 PM |
| 5:59 PM | 0 | 0 | 5 | 5 | 0 | 21 | 48 | 6 | 0 | 0 | 0 | 3 | 3 | 0 | 9 | 29 | 6 | 0 | 127 | 7718 | 5:00 PM to 6:00 PM |
| Approach Total | 1964 | | | | | 3562 | | | | 2965 | | | | | 4125 | | | | | | |
| Grand Total | 413 | 0 | 1551 | 512 | 11 | 894 | 2214 | 454 | 16 | 898 | 0 | 1167 | 551 | 9 | 1304 | 2009 | 812 | 38 | 11716 | | |
| Approach % | 21.0% | 0.0% | 79.0% | 26.1% | 0.6% | 25.1% | 62.2% | 12.7% | 0.4% | 43.5% | 0.0% | 56.5% | 26.7% | 0.4% | 31.6% | 48.7% | 19.7% | 0.9% | | | |
| Total % | 3.5% | 0.0% | 13.2% | 4.4% | 0.1% | 7.6% | 18.9% | 3.9% | 0.1% | 7.7% | 0.0% | 10.0% | 4.7% | 0.1% | 11.1% | 17.1% | 6.9% | 0.3% | | | |
| **Begin Peak Hour:** | **16:32** | | | | | | | | | | | | | | | | | | | | |
| **Peak Interval:** | | | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **273** | **0** | **1039** | **348** | **9** | **613** | **1474** | **305** | **14** | **606** | **0** | **783** | **354** | **6** | **876** | **1351** | **570** | **24** | **7890** | 7890 | 4:32 PM to 5:32 PM |

| Left | Thru | Right | RTOR | Left | Thru | Right | Trucks | Left | Thru | Right | RTOR | Left | Thru | Right | Trucks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 273 | 0 | 1039 | 348 | 613 | 1474 | 305 | 14 | 606 | 0 | 783 | 354 | 876 | 1351 | 570 | 24 |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/29/2004
Start Time: 07:00 AM
Site Code: 4001

| | From North | | | | From East | | | | From South | | | | From West | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SCOTTSDALE RD | | | | LOOP 202 (WB) OFF RAMP | | | | SCOTTSDALE RD | | | | LOOP 202 (EB) OFF RAMP | | | | INTSEC | HOUR |
| Start Time | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL |
| 7:00 AM | 3 | 1 | 6 | 1 | 9 | 0 | 2 | 0 | 4 | 22 | 0 | 0 | 6 | 0 | 4 | 1 | 57 | |
| 7:01 AM | 0 | 9 | 5 | 1 | 1 | 0 | 4 | 0 | 15 | 5 | 0 | 0 | 0 | 0 | 8 | 0 | 47 | |
| 7:02 AM | 5 | 9 | 4 | 0 | 10 | 0 | 3 | 0 | 6 | 17 | 0 | 0 | 16 | 0 | 4 | 1 | 74 | |
| 7:03 AM | 0 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 10 | 8 | 1 | 0 | 9 | 0 | 9 | 0 | 43 | |
| 7:04 AM | 3 | 14 | 2 | 1 | 8 | 0 | 4 | 0 | 2 | 11 | 0 | 0 | 3 | 0 | 2 | 0 | 49 | |
| 7:05 AM | 6 | 4 | 6 | 0 | 0 | 0 | 2 | 0 | 14 | 21 | 2 | 0 | 10 | 0 | 8 | 1 | 73 | |
| 7:06 AM | 1 | 11 | 4 | 2 | 10 | 0 | 3 | 0 | 17 | 2 | 3 | 0 | 0 | 0 | 3 | 0 | 54 | |
| 7:07 AM | 0 | 17 | 12 | 0 | 0 | 0 | 1 | 0 | 0 | 21 | 2 | 2 | 6 | 0 | 12 | 0 | 71 | |
| 7:08 AM | 0 | 6 | 8 | 0 | 15 | 0 | 6 | 0 | 5 | 1 | 1 | 1 | 0 | 0 | 13 | 0 | 55 | |
| 7:09 AM | 6 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 15 | 6 | 1 | 14 | 0 | 6 | 1 | 55 | |
| 7:10 AM | 0 | 22 | 10 | 0 | 13 | 0 | 3 | 0 | 13 | 7 | 1 | 0 | 0 | 0 | 9 | 0 | 78 | |
| 7:11 AM | 2 | 3 | 3 | 0 | 10 | 0 | 3 | 0 | 0 | 14 | 2 | 0 | 4 | 0 | 15 | 0 | 56 | |
| 7:12 AM | 0 | 11 | 12 | 0 | 0 | 0 | 2 | 0 | 8 | 7 | 0 | 0 | 0 | 0 | 8 | 1 | 48 | |
| 7:13 AM | 0 | 9 | 3 | 1 | 14 | 0 | 3 | 0 | 0 | 14 | 3 | 1 | 12 | 0 | 8 | 1 | 66 | |
| 7:14 AM | 0 | 12 | 5 | 1 | 0 | 0 | 4 | 0 | 10 | 12 | 2 | 0 | 8 | 0 | 11 | 1 | 64 | |
| 7:15 AM | 6 | 10 | 8 | 0 | 13 | 0 | 4 | 0 | 1 | 10 | 1 | 1 | 2 | 0 | 16 | 1 | 71 | |
| 7:16 AM | 2 | 6 | 5 | 0 | 0 | 0 | 2 | 0 | 10 | 13 | 0 | 0 | 3 | 0 | 8 | 1 | 49 | |
| 7:17 AM | 0 | 13 | 5 | 1 | 8 | 0 | 4 | 0 | 10 | 11 | 6 | 0 | 0 | 0 | 20 | 3 | 77 | |
| 7:18 AM | 6 | 3 | 4 | 1 | 0 | 0 | 3 | 0 | 0 | 25 | 2 | 0 | 14 | 0 | 10 | 0 | 67 | |
| 7:19 AM | 0 | 14 | 9 | 1 | 10 | 0 | 6 | 0 | 7 | 3 | 3 | 0 | 0 | 0 | 18 | 1 | 70 | |
| 7:20 AM | 6 | 0 | 3 | 0 | 1 | 0 | 3 | 0 | 0 | 21 | 4 | 0 | 11 | 0 | 13 | 1 | 62 | |
| 7:21 AM | 0 | 14 | 3 | 1 | 11 | 0 | 5 | 0 | 10 | 7 | 0 | 1 | 0 | 0 | 16 | 1 | 66 | |
| 7:22 AM | 5 | 11 | 5 | 0 | 9 | 0 | 10 | 0 | 0 | 18 | 1 | 0 | 7 | 0 | 14 | 1 | 80 | |
| 7:23 AM | 0 | 2 | 6 | 1 | 0 | 0 | 6 | 0 | 12 | 12 | 1 | 1 | 0 | 0 | 14 | 0 | 53 | |
| 7:24 AM | 7 | 13 | 12 | 0 | 11 | 0 | 3 | 0 | 0 | 27 | 3 | 0 | 16 | 0 | 11 | 2 | 103 | |
| 7:25 AM | 0 | 2 | 2 | 0 | 0 | 0 | 3 | 0 | 9 | 12 | 2 | 1 | 9 | 0 | 9 | 0 | 48 | |
| 7:26 AM | 7 | 15 | 8 | 0 | 12 | 0 | 6 | 0 | 4 | 15 | 4 | 0 | 2 | 0 | 6 | 1 | 79 | |
| 7:27 AM | 1 | 0 | 4 | 1 | 0 | 0 | 5 | 0 | 9 | 18 | 3 | 3 | 6 | 0 | 13 | 2 | 59 | |
| 7:28 AM | 4 | 16 | 6 | 1 | 14 | 0 | 3 | 0 | 10 | 7 | 1 | 0 | 0 | 0 | 6 | 0 | 67 | |
| 7:29 AM | 6 | 4 | 8 | 0 | 0 | 0 | 2 | 0 | 0 | 31 | 2 | 2 | 13 | 0 | 15 | 2 | 81 | |
| 7:30 AM | 0 | 17 | 7 | 1 | 3 | 0 | 7 | 0 | 17 | 7 | 0 | 0 | 0 | 0 | 7 | 0 | 65 | |
| 7:31 AM | 8 | 9 | 7 | 1 | 1 | 0 | 2 | 0 | 0 | 30 | 4 | 1 | 11 | 0 | 12 | 2 | 84 | |
| 7:32 AM | 0 | 17 | 11 | 0 | 5 | 0 | 5 | 0 | 8 | 8 | 1 | 0 | 0 | 0 | 5 | 1 | 60 | |
| 7:33 AM | 2 | 2 | 7 | 1 | 4 | 0 | 3 | 0 | 0 | 21 | 1 | 1 | 14 | 0 | 8 | 1 | 62 | |
| 7:34 AM | 0 | 16 | 5 | 0 | 0 | 0 | 2 | 0 | 17 | 15 | 1 | 0 | 2 | 0 | 4 | 0 | 62 | |
| 7:35 AM | 6 | 7 | 3 | 0 | 9 | 0 | 5 | 0 | 0 | 21 | 3 | 0 | 8 | 0 | 13 | 0 | 75 | |
| 7:36 AM | 0 | 6 | 7 | 0 | 0 | 0 | 7 | 0 | 14 | 17 | 2 | 2 | 8 | 0 | 8 | 0 | 69 | |
| 7:37 AM | 4 | 9 | 6 | 0 | 2 | 0 | 7 | 0 | 1 | 19 | 0 | 0 | 2 | 0 | 5 | 0 | 55 | |
| 7:38 AM | 0 | 9 | 9 | 1 | 0 | 0 | 2 | 0 | 14 | 27 | 1 | 2 | 16 | 0 | 12 | 0 | 90 | |
| 7:39 AM | 10 | 13 | 8 | 0 | 7 | 0 | 10 | 0 | 9 | 10 | 1 | 0 | 0 | 0 | 5 | 1 | 73 | |
| 7:40 AM | 6 | 1 | 4 | 1 | 0 | 0 | 2 | 0 | 16 | 43 | 2 | 2 | 12 | 0 | 12 | 0 | 98 | |
| 7:41 AM | 0 | 21 | 17 | 3 | 6 | 0 | 6 | 0 | 10 | 4 | 2 | 0 | 0 | 0 | 9 | 0 | 75 | |
| 7:42 AM | 5 | 3 | 4 | 0 | 2 | 0 | 5 | 0 | 0 | 29 | 4 | 0 | 12 | 0 | 8 | 0 | 72 | |
| 7:43 AM | 0 | 23 | 9 | 0 | 5 | 0 | 8 | 0 | 9 | 12 | 0 | 0 | 0 | 0 | 7 | 0 | 73 | |
| 7:44 AM | 11 | 5 | 7 | 0 | 4 | 0 | 5 | 0 | 0 | 23 | 2 | 0 | 13 | 0 | 21 | 2 | 91 | |
| 7:45 AM | 0 | 7 | 4 | 0 | 1 | 0 | 8 | 0 | 12 | 18 | 1 | 2 | 0 | 0 | 11 | 1 | 62 | |
| 7:46 AM | 2 | 18 | 7 | 0 | 9 | 0 | 3 | 0 | 0 | 24 | 3 | 0 | 13 | 0 | 14 | 0 | 93 | |
| 7:47 AM | 0 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 15 | 21 | 2 | 1 | 13 | 0 | 8 | 1 | 71 | |
| 7:48 AM | 12 | 16 | 10 | 1 | 0 | 0 | 3 | 0 | 1 | 19 | 0 | 0 | 0 | 0 | 9 | 2 | 70 | |
| 7:49 AM | 3 | 1 | 7 | 0 | 13 | 0 | 6 | 0 | 9 | 26 | 2 | 0 | 15 | 0 | 11 | 1 | 93 | |
| 7:50 AM | 0 | 15 | 5 | 0 | 0 | 0 | 2 | 0 | 16 | 17 | 3 | 0 | 0 | 0 | 10 | 0 | 68 | |
| 7:51 AM | 3 | 0 | 9 | 0 | 11 | 0 | 5 | 0 | 0 | 32 | 1 | 0 | 17 | 0 | 9 | 2 | 87 | |
| 7:52 AM | 0 | 21 | 4 | 0 | 0 | 0 | 5 | 1 | 9 | 7 | 1 | 0 | 0 | 0 | 8 | 0 | 55 | |
| 7:53 AM | 5 | 0 | 7 | 0 | 4 | 0 | 8 | 0 | 0 | 38 | 1 | 2 | 11 | 0 | 8 | 1 | 82 | |
| 7:54 AM | 0 | 27 | 3 | 0 | 2 | 0 | 5 | 0 | 12 | 11 | 0 | 1 | 0 | 0 | 12 | 0 | 72 | |
| 7:55 AM | 0 | 0 | 3 | 0 | 12 | 0 | 8 | 0 | 0 | 21 | 1 | 1 | 8 | 0 | 14 | 0 | 67 | |
| 7:56 AM | 8 | 21 | 7 | 0 | 0 | 0 | 4 | 0 | 7 | 0 | 1 | 0 | 1 | 0 | 6 | 0 | 55 | |
| 7:57 AM | 0 | 2 | 2 | 0 | 0 | 0 | 9 | 0 | 12 | 48 | 3 | 0 | 0 | 0 | 13 | 2 | 89 | |
| 7:58 AM | 0 | 12 | 7 | 0 | 11 | 0 | 4 | 0 | 0 | 13 | 2 | 0 | 2 | 0 | 12 | 0 | 63 | |
| 7:59 AM | 11 | 9 | 3 | 0 | 1 | 0 | 13 | 0 | 0 | 23 | 2 | 0 | 18 | 0 | 10 | 1 | 90 | 4143 |
| 8:00 AM | 1 | 10 | 8 | 0 | 10 | 0 | 7 | 0 | 20 | 19 | 3 | 1 | 11 | 0 | 4 | 1 | 93 | 4179 |
| 8:01 AM | 5 | 17 | 11 | 0 | 0 | 0 | 6 | 0 | 13 | 6 | 1 | 1 | 0 | 0 | 9 | 0 | 68 | 4200 |
| 8:02 AM | 4 | 0 | 5 | 0 | 11 | 0 | 8 | 0 | 0 | 32 | 2 | 1 | 20 | 0 | 18 | 0 | 100 | 4226 |
| 8:03 AM | 0 | 20 | 9 | 0 | 0 | 0 | 8 | 0 | 13 | 4 | 2 | 1 | 0 | 0 | 5 | 0 | 61 | 4244 |
| 8:04 AM | 5 | 1 | 8 | 1 | 17 | 0 | 6 | 1 | 0 | 13 | 1 | 0 | 9 | 0 | 12 | 1 | 72 | 4267 |
| 8:05 AM | 0 | 22 | 6 | 0 | 1 | 0 | 5 | 0 | 6 | 3 | 1 | 0 | 0 | 0 | 12 | 0 | 56 | 4250 |
| 8:06 AM | 6 | 9 | 3 | 0 | 21 | 0 | 4 | 0 | 0 | 8 | 3 | 0 | 14 | 0 | 12 | 1 | 80 | 4276 |
| 8:07 AM | 0 | 4 | 4 | 0 | 12 | 0 | 6 | 0 | 6 | 7 | 1 | 0 | 0 | 0 | 11 | 0 | 51 | 4256 |
| 8:08 AM | 5 | 11 | 7 | 0 | 3 | 0 | 3 | 0 | 0 | 7 | 3 | 0 | 17 | 0 | 13 | 0 | 69 | 4270 |
| 8:09 AM | 0 | 3 | 4 | 0 | 17 | 0 | 11 | 1 | 5 | 19 | 1 | 1 | 10 | 0 | 11 | 2 | 81 | 4296 |
| 8:10 AM | 3 | 28 | 7 | 0 | 0 | 0 | 5 | 0 | 0 | 10 | 5 | 0 | 2 | 0 | 6 | 1 | 66 | 4284 |
| 8:11 AM | 5 | 0 | 3 | 0 | 13 | 0 | 7 | 1 | 8 | 32 | 2 | 1 | 10 | 0 | 12 | 0 | 92 | 4320 |
| 8:12 AM | 1 | 21 | 7 | 1 | 0 | 0 | 6 | 0 | 7 | 16 | 1 | 1 | 0 | 0 | 17 | 0 | 76 | 4348 |
| 8:13 AM | 0 | 5 | 8 | 0 | 17 | 0 | 6 | 1 | 0 | 28 | 4 | 0 | 21 | 0 | 13 | 0 | 102 | 4384 |
| 8:14 AM | 0 | 23 | 8 | 0 | 0 | 0 | 2 | 0 | 15 | 4 | 0 | 1 | 0 | 0 | 18 | 1 | 70 | 4390 |
| 8:15 AM | 5 | 0 | 15 | 1 | 25 | 0 | 10 | 0 | 1 | 44 | 1 | 3 | 8 | 0 | 11 | 0 | 120 | 4439 |
| 8:16 AM | 0 | 30 | 8 | 0 | 3 | 0 | 8 | 0 | 10 | 9 | 1 | 1 | 0 | 0 | 18 | 1 | 87 | 4477 |
| 8:17 AM | 5 | 6 | 8 | 0 | 12 | 0 | 4 | 0 | 0 | 16 | 1 | 1 | 9 | 0 | 13 | 2 | 74 | 4474 |
| 8:18 AM | 0 | 15 | 7 | 0 | 12 | 0 | 7 | 0 | 17 | 17 | 0 | 2 | 4 | 0 | 13 | 0 | 92 | 4499 |
| 8:19 AM | 10 | 0 | 15 | 0 | 1 | 0 | 10 | 0 | 0 | 27 | 4 | 0 | 9 | 0 | 19 | 1 | 95 | 4524 |
| 8:20 AM | 0 | 10 | 7 | 0 | 16 | 0 | 8 | 1 | 6 | 13 | 2 | 0 | 11 | 0 | 18 | 1 | 91 | 4553 |
| 8:21 AM | 3 | 19 | 4 | 0 | 1 | 0 | 8 | 0 | 0 | 18 | 0 | 0 | 7 | 0 | 12 | 0 | 72 | 4559 |
| 8:22 AM | 0 | 16 | 9 | 0 | 21 | 0 | 12 | 1 | 15 | 18 | 2 | 1 | 11 | 0 | 13 | 0 | 117 | 4596 |
| 8:23 AM | 4 | 21 | 7 | 0 | 0 | 0 | 8 | 0 | 8 | 5 | 2 | 0 | 0 | 0 | 8 | 1 | 63 | 4606 |
| 8:24 AM | 3 | 4 | 10 | 0 | 20 | 0 | 6 | 0 | 5 | 37 | 3 | 0 | 10 | 0 | 11 | 2 | 109 | 4612 |
| 8:25 AM | 0 | 29 | 8 | 0 | 0 | 0 | 2 | 1 | 13 | 2 | 2 | 1 | 0 | 0 | 21 | 0 | 77 | 4641 |
| 8:26 AM | 7 | 0 | 3 | 0 | 20 | 0 | 12 | 0 | 0 | 33 | 3 | 2 | 14 | 0 | 18 | 2 | 110 | 4672 |
| 8:27 AM | 0 | 20 | 11 | 1 | 5 | 0 | 3 | 0 | 13 | 11 | 2 | 0 | 0 | 0 | 11 | 0 | 76 | 4689 |
| 8:28 AM | 4 | 6 | 4 | 1 | 24 | 0 | 4 | 0 | 0 | 17 | 3 | 0 | 16 | 0 | 15 | 0 | 93 | 4715 |
| 8:29 AM | 0 | 8 | 6 | 0 | 17 | 0 | 8 | 0 | 14 | 11 | 0 | 0 | 4 | 0 | 13 | 1 | 81 | 4715 |
| Approach Total | 1763 | | | | 1058 | | | | 2245 | | | | 1571 | | | | | |
| Grand Total | 248 | 927 | 588 | 28 | 590 | 0 | 468 | 8 | 589 | 1497 | 159 | 48 | 584 | 0 | 987 | 59 | 6637 | |
| Approach % | 14.1% | 52.6% | 33.4% | 1.6% | 55.8% | 0.0% | 44.2% | 0.8% | 26.2% | 66.7% | 7.1% | 2.1% | 37.2% | 0.0% | 62.8% | 3.8% | | |
| Total % | 3.7% | 14.0% | 8.9% | 0.4% | 8.9% | 0.0% | 7.1% | 0.1% | 8.9% | 22.6% | 2.4% | 0.7% | 8.8% | 0.0% | 14.9% | 0.9% | | |
| **Begin Peak Hour:** | **7:30** | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **172** | **674** | **412** | **14** | **411** | **0** | **359** | **8** | **403** | **1090** | **103** | **34** | **413** | **0** | **678** | **36** | **4715** | 4715 |

4715 7:30 AM to 8:30 AM

| From East | | | | | From South | | | | From West | | | | From North | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOOP 202 (WB) OFF RAMP | | | | | SCOTTSDALE RD | | | | LOOP 202 (EB) OFF RAMP | | | | SCOTTSDALE RD | | | |
| Left | Thru | Right | Trucks | | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks |
| 411 | 0 | 359 | 8 | | 403 | 1090 | 103 | 34 | 413 | 0 | 678 | 36 | 172 | 674 | 412 | 14 |

Traffic Research Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018

Start Date: 1/29/2004
Start Time: 04:30 PM
Site Code: 4001

| | From North | | | | From East | | | | From South | | | | From West | | | | INTSEC | HOUR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street Name | SCOTTSDALE RD | | | | LOOP 202 (WB) OFF RAMP | | | | SCOTTSDALE RD | | | | LOOP 202 (EB) OFF RAMP | | | | | | | |
| Start Time | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | TOTAL | TOTAL | | |
| 4:30 PM | 9 | 17 | 11 | 0 | 10 | 0 | 2 | 0 | 0 | 13 | 0 | 0 | 10 | 0 | 6 | 0 | 78 | | | |
| 4:31 PM | 0 | 15 | 8 | 1 | 0 | 0 | 6 | 0 | 11 | 19 | 4 | 0 | 2 | 0 | 8 | 0 | 71 | | | |
| 4:32 PM | 20 | 17 | 11 | 0 | 9 | 0 | 5 | 1 | 0 | 15 | 7 | 1 | 11 | 0 | 5 | 0 | 100 | | | |
| 4:33 PM | 0 | 8 | 6 | 0 | 3 | 0 | 9 | 0 | 22 | 17 | 7 | 0 | 9 | 0 | 3 | 0 | 84 | | | |
| 4:34 PM | 9 | 33 | 4 | 0 | 5 | 0 | 7 | 0 | 0 | 7 | 7 | 0 | 3 | 0 | 4 | 1 | 79 | | | |
| 4:35 PM | 6 | 6 | 10 | 0 | 0 | 0 | 4 | 0 | 9 | 29 | 8 | 0 | 9 | 0 | 10 | 0 | 91 | | | |
| 4:36 PM | 6 | 27 | 2 | 0 | 10 | 0 | 4 | 0 | 14 | 5 | 9 | 0 | 0 | 0 | 10 | 0 | 87 | | | |
| 4:37 PM | 19 | 9 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 33 | 11 | 0 | 11 | 0 | 13 | 0 | 110 | | | |
| 4:38 PM | 2 | 37 | 9 | 0 | 4 | 0 | 7 | 1 | 23 | 4 | 9 | 0 | 0 | 0 | 5 | 0 | 100 | | | |
| 4:39 PM | 20 | 6 | 5 | 0 | 0 | 0 | 4 | 0 | 1 | 45 | 10 | 0 | 8 | 0 | 13 | 0 | 112 | | | |
| 4:40 PM | 0 | 41 | 6 | 0 | 17 | 0 | 5 | 0 | 23 | 21 | 5 | 1 | 0 | 0 | 3 | 0 | 121 | | | |
| 4:41 PM | 17 | 3 | 4 | 0 | 6 | 0 | 4 | 0 | 0 | 8 | 5 | 0 | 18 | 0 | 5 | 1 | 70 | | | |
| 4:42 PM | 0 | 30 | 7 | 0 | 0 | 0 | 4 | 0 | 18 | 19 | 10 | 0 | 4 | 0 | 4 | 0 | 96 | | | |
| 4:43 PM | 8 | 20 | 2 | 0 | 7 | 0 | 2 | 1 | 0 | 20 | 10 | 1 | 6 | 0 | 6 | 0 | 81 | | | |
| 4:44 PM | 0 | 22 | 8 | 2 | 0 | 0 | 7 | 0 | 14 | 7 | 6 | 1 | 5 | 0 | 6 | 0 | 75 | | | |
| 4:45 PM | 13 | 29 | 8 | 0 | 9 | 0 | 6 | 0 | 11 | 14 | 12 | 0 | 1 | 0 | 10 | 1 | 113 | | | |
| 4:46 PM | 0 | 8 | 7 | 0 | 0 | 0 | 8 | 0 | 4 | 30 | 5 | 0 | 13 | 0 | 8 | 0 | 83 | | | |
| 4:47 PM | 12 | 36 | 10 | 0 | 6 | 0 | 4 | 0 | 10 | 6 | 11 | 0 | 0 | 0 | 7 | 1 | 102 | | | |
| 4:48 PM | 11 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 11 | 48 | 6 | 0 | 7 | 0 | 5 | 0 | 93 | | | |
| 4:49 PM | 0 | 33 | 16 | 0 | 11 | 0 | 9 | 0 | 26 | 7 | 9 | 0 | 0 | 0 | 5 | 0 | 116 | | | |
| 4:50 PM | 17 | 1 | 4 | 0 | 2 | 0 | 5 | 0 | 0 | 46 | 12 | 0 | 18 | 0 | 10 | 0 | 115 | | | |
| 4:51 PM | 0 | 34 | 9 | 1 | 3 | 0 | 4 | 0 | 24 | 4 | 8 | 0 | 0 | 0 | 5 | 1 | 91 | | | |
| 4:52 PM | 10 | 7 | 6 | 0 | 3 | 0 | 4 | 0 | 0 | 29 | 13 | 0 | 11 | 0 | 5 | 0 | 88 | | | |
| 4:53 PM | 0 | 25 | 6 | 0 | 0 | 0 | 3 | 0 | 25 | 25 | 12 | 0 | 2 | 0 | 5 | 0 | 103 | | | |
| 4:54 PM | 22 | 25 | 9 | 0 | 9 | 0 | 6 | 0 | 0 | 25 | 11 | 1 | 6 | 0 | 8 | 0 | 121 | | | |
| 4:55 PM | 0 | 7 | 4 | 1 | 1 | 0 | 7 | 0 | 26 | 17 | 4 | 0 | 11 | 0 | 4 | 1 | 81 | | | |
| 4:56 PM | 12 | 29 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 10 | 0 | 7 | 0 | 8 | 0 | 90 | | | |
| 4:57 PM | 8 | 8 | 11 | 1 | 10 | 0 | 7 | 0 | 17 | 33 | 9 | 0 | 8 | 0 | 12 | 0 | 123 | | | |
| 4:58 PM | 0 | 25 | 5 | 0 | 0 | 0 | 4 | 0 | 15 | 5 | 12 | 0 | 0 | 0 | 6 | 1 | 72 | | | |
| 4:59 PM | 6 | 4 | 9 | 0 | 14 | 0 | 6 | 1 | 0 | 29 | 6 | 0 | 19 | 0 | 15 | 0 | 108 | | | |
| 5:00 PM | 10 | 32 | 6 | 0 | 0 | 0 | 5 | 0 | 19 | 1 | 14 | 0 | 0 | 0 | 6 | 0 | 93 | | | |
| 5:01 PM | 9 | 0 | 6 | 0 | 5 | 0 | 2 | 0 | 0 | 36 | 4 | 1 | 9 | 0 | 10 | 0 | 81 | | | |
| 5:02 PM | 0 | 38 | 10 | 0 | 3 | 0 | 2 | 0 | 22 | 25 | 10 | 0 | 0 | 0 | 11 | 0 | 121 | | | |
| 5:03 PM | 21 | 19 | 5 | 1 | 5 | 0 | 2 | 0 | 0 | 5 | 7 | 0 | 7 | 0 | 7 | 0 | 78 | | | |
| 5:04 PM | 0 | 24 | 10 | 0 | 7 | 0 | 8 | 0 | 11 | 24 | 8 | 1 | 3 | 0 | 8 | 0 | 103 | | | |
| 5:05 PM | 12 | 20 | 8 | 0 | 1 | 0 | 7 | 0 | 0 | 12 | 5 | 0 | 7 | 0 | 8 | 0 | 80 | | | |
| 5:06 PM | 0 | 16 | 8 | 2 | 6 | 0 | 6 | 0 | 21 | 21 | 11 | 0 | 10 | 0 | 7 | 0 | 106 | | | |
| 5:07 PM | 14 | 37 | 7 | 0 | 0 | 0 | 3 | 0 | 8 | 7 | 11 | 0 | 0 | 0 | 8 | 0 | 95 | | | |
| 5:08 PM | 0 | 9 | 3 | 1 | 11 | 0 | 3 | 0 | 9 | 35 | 7 | 0 | 16 | 0 | 5 | 1 | 98 | | | |
| 5:09 PM | 12 | 38 | 13 | 0 | 0 | 0 | 8 | 0 | 11 | 7 | 8 | 0 | 0 | 0 | 6 | 0 | 103 | | | |
| 5:10 PM | 13 | 5 | 2 | 0 | 5 | 0 | 10 | 1 | 7 | 32 | 11 | 1 | 4 | 0 | 9 | 1 | 98 | | | |
| 5:11 PM | 0 | 29 | 9 | 0 | 0 | 0 | 5 | 0 | 11 | 15 | 13 | 0 | 0 | 0 | 4 | 0 | 86 | | | |
| 5:12 PM | 15 | 0 | 4 | 0 | 2 | 0 | 4 | 0 | 0 | 20 | 7 | 1 | 17 | 0 | 6 | 4 | 75 | | | |
| 5:13 PM | 0 | 52 | 8 | 0 | 6 | 0 | 5 | 0 | 21 | 12 | 11 | 0 | 0 | 0 | 3 | 0 | 118 | | | |
| 5:14 PM | 16 | 15 | 10 | 0 | 3 | 0 | 6 | 1 | 0 | 15 | 10 | 0 | 11 | 0 | 7 | 1 | 93 | | | |
| 5:15 PM | 0 | 29 | 11 | 0 | 7 | 0 | 4 | 0 | 17 | 9 | 8 | 0 | 4 | 0 | 8 | 0 | 95 | | | |
| 5:16 PM | 23 | 27 | 13 | 0 | 0 | 0 | 7 | 1 | 0 | 13 | 11 | 0 | 11 | 0 | 7 | 0 | 112 | | | |
| 5:17 PM | 0 | 11 | 2 | 0 | 6 | 0 | 6 | 0 | 15 | 17 | 5 | 0 | 13 | 0 | 8 | 0 | 83 | | | |
| 5:18 PM | 14 | 35 | 9 | 1 | 0 | 0 | 4 | 0 | 4 | 8 | 11 | 0 | 0 | 0 | 7 | 0 | 92 | | | |
| 5:19 PM | 13 | 6 | 10 | 0 | 8 | 0 | 3 | 0 | 21 | 27 | 6 | 0 | 8 | 0 | 6 | 0 | 108 | | | |
| 5:20 PM | 6 | 32 | 5 | 0 | 0 | 0 | 3 | 0 | 19 | 5 | 7 | 0 | 0 | 0 | 4 | 0 | 81 | | | |
| 5:21 PM | 17 | 0 | 8 | 0 | 4 | 0 | 10 | 1 | 0 | 40 | 9 | 0 | 9 | 0 | 7 | 0 | 104 | | | |
| 5:22 PM | 0 | 30 | 12 | 0 | 0 | 0 | 8 | 0 | 19 | 2 | 6 | 0 | 0 | 0 | 5 | 0 | 82 | | | |
| 5:23 PM | 13 | 1 | 15 | 0 | 6 | 0 | 6 | 0 | 0 | 29 | 5 | 0 | 11 | 0 | 5 | 1 | 91 | | | |
| 5:24 PM | 0 | 39 | 7 | 0 | 0 | 0 | 5 | 0 | 17 | 20 | 11 | 0 | 0 | 0 | 7 | 1 | 106 | | | |
| 5:25 PM | 17 | 11 | 4 | 0 | 7 | 0 | 5 | 0 | 0 | 13 | 8 | 0 | 14 | 0 | 5 | 0 | 84 | | | |
| 5:26 PM | 0 | 32 | 12 | 2 | 5 | 0 | 6 | 0 | 19 | 21 | 4 | 0 | 6 | 0 | 10 | 0 | 115 | | | |
| 5:27 PM | 9 | 26 | 2 | 0 | 0 | 0 | 5 | 0 | 0 | 21 | 11 | 0 | 6 | 0 | 9 | 0 | 89 | | | |
| 5:28 PM | 0 | 24 | 10 | 1 | 6 | 0 | 9 | 0 | 15 | 13 | 3 | 0 | 7 | 0 | 9 | 1 | 96 | | | |
| 5:29 PM | 7 | 38 | 6 | 0 | 0 | 0 | 6 | 0 | 12 | 11 | 3 | 1 | 0 | 0 | 9 | 0 | 92 | 5712 | 4:30 PM | to 5:30 PM |
| 5:30 PM | 11 | 19 | 10 | 0 | 7 | 0 | 8 | 0 | 10 | 32 | 12 | 0 | 10 | 0 | 6 | 0 | 125 | 5759 | 4:31 PM | to 5:31 PM |
| 5:31 PM | 5 | 37 | 6 | 0 | 0 | 0 | 3 | 1 | 15 | 4 | 8 | 0 | 0 | 0 | 5 | 0 | 83 | 5771 | 4:32 PM | to 5:32 PM |
| 5:32 PM | 15 | 0 | 2 | 1 | 7 | 0 | 3 | 0 | 0 | 16 | 4 | 0 | 3 | 0 | 12 | 0 | 62 | 5733 | 4:33 PM | to 5:33 PM |
| 5:33 PM | 0 | 45 | 11 | 1 | 0 | 0 | 3 | 0 | 21 | 4 | 9 | 0 | 0 | 0 | 5 | 0 | 98 | 5747 | 4:34 PM | to 5:34 PM |
| 5:34 PM | 17 | 8 | 4 | 0 | 13 | 0 | 4 | 1 | 0 | 27 | 8 | 0 | 10 | 0 | 11 | 0 | 102 | 5770 | 4:35 PM | to 5:35 PM |
| 5:35 PM | 0 | 33 | 8 | 0 | 6 | 0 | 5 | 0 | 11 | 7 | 9 | 0 | 0 | 0 | 7 | 0 | 86 | 5765 | 4:36 PM | to 5:36 PM |
| 5:36 PM | 17 | 27 | 16 | 2 | 2 | 0 | 4 | 0 | 0 | 19 | 3 | 1 | 12 | 0 | 6 | 0 | 106 | 5784 | 4:37 PM | to 5:37 PM |
| 5:37 PM | 0 | 13 | 5 | 0 | 13 | 0 | 5 | 0 | 14 | 19 | 11 | 0 | 7 | 0 | 3 | 1 | 90 | 5764 | 4:38 PM | to 5:38 PM |
| 5:38 PM | 8 | 32 | 10 | 1 | 0 | 0 | 9 | 0 | 0 | 16 | 7 | 0 | 6 | 0 | 10 | 0 | 98 | 5782 | 4:39 PM | to 5:39 PM |
| 5:39 PM | 0 | 7 | 2 | 0 | 18 | 0 | 5 | 0 | 10 | 10 | 7 | 0 | 10 | 0 | 5 | 0 | 74 | 5724 | 4:40 PM | to 5:40 PM |
| 5:40 PM | 13 | 47 | 9 | 0 | 0 | 0 | 4 | 1 | 4 | 4 | 9 | 0 | 1 | 0 | 10 | 2 | 101 | 5704 | 4:41 PM | to 5:41 PM |
| 5:41 PM | 1 | 4 | 7 | 0 | 11 | 0 | 10 | 0 | 11 | 27 | 9 | 1 | 17 | 0 | 10 | 0 | 107 | 5741 | 4:42 PM | to 5:42 PM |
| 5:42 PM | 9 | 43 | 2 | 0 | 0 | 0 | 2 | 0 | 12 | 5 | 5 | 0 | 0 | 0 | 2 | 0 | 80 | 5725 | 4:43 PM | to 5:43 PM |
| 5:43 PM | 13 | 8 | 9 | 1 | 7 | 0 | 9 | 0 | 0 | 28 | 1 | 0 | 8 | 0 | 8 | 0 | 91 | 5735 | 4:44 PM | to 5:44 PM |
| 5:44 PM | 0 | 34 | 2 | 0 | 0 | 0 | 4 | 0 | 17 | 16 | 8 | 1 | 0 | 0 | 5 | 0 | 86 | 5746 | 4:45 PM | to 5:45 PM |
| 5:45 PM | 8 | 0 | 10 | 0 | 4 | 0 | 5 | 0 | 0 | 17 | 4 | 0 | 22 | 0 | 6 | 0 | 76 | 5709 | 4:46 PM | to 5:46 PM |
| 5:46 PM | 0 | 54 | 10 | 1 | 5 | 0 | 8 | 0 | 21 | 13 | 4 | 1 | 0 | 0 | 3 | 0 | 118 | 5744 | 4:47 PM | to 5:47 PM |
| 5:47 PM | 22 | 28 | 2 | 0 | 3 | 0 | 4 | 0 | 0 | 7 | 8 | 0 | 18 | 0 | 10 | 1 | 102 | 5744 | 4:48 PM | to 5:48 PM |
| 5:48 PM | 0 | 29 | 21 | 0 | 11 | 0 | 3 | 0 | 10 | 21 | 8 | 0 | 10 | 0 | 0 | 0 | 113 | 5764 | 4:49 PM | to 5:49 PM |
| 5:49 PM | 17 | 32 | 5 | 0 | 2 | 0 | 5 | 0 | 0 | 24 | 3 | 0 | 1 | 0 | 16 | 0 | 105 | 5753 | 4:50 PM | to 5:50 PM |
| 5:50 PM | 3 | 14 | 8 | 1 | 10 | 0 | 6 | 0 | 13 | 18 | 1 | 0 | 9 | 0 | 7 | 0 | 89 | 5727 | 4:51 PM | to 5:51 PM |
| 5:51 PM | 10 | 34 | 9 | 0 | 0 | 0 | 5 | 0 | 7 | 6 | 15 | 1 | 0 | 0 | 13 | 0 | 99 | 5735 | 4:52 PM | to 5:52 PM |
| 5:52 PM | 7 | 11 | 8 | 0 | 14 | 0 | 7 | 0 | 1 | 31 | 4 | 0 | 12 | 0 | 13 | 1 | 108 | 5755 | 4:53 PM | to 5:53 PM |
| 5:53 PM | 3 | 32 | 12 | 0 | 0 | 0 | 2 | 0 | 11 | 5 | 10 | 0 | 0 | 0 | 9 | 0 | 84 | 5736 | 4:54 PM | to 5:54 PM |
| 5:54 PM | 14 | 0 | 1 | 1 | 10 | 0 | 5 | 0 | 0 | 30 | 2 | 1 | 11 | 0 | 10 | 0 | 83 | 5698 | 4:55 PM | to 5:55 PM |
| 5:55 PM | 0 | 42 | 9 | 1 | 0 | 0 | 1 | 0 | 14 | 1 | 7 | 0 | 0 | 0 | 8 | 0 | 82 | 5699 | 4:56 PM | to 5:56 PM |
| 5:56 PM | 15 | 17 | 5 | 0 | 8 | 0 | 3 | 0 | 0 | 29 | 11 | 1 | 11 | 0 | 9 | 0 | 108 | 5717 | 4:57 PM | to 5:57 PM |
| 5:57 PM | 0 | 32 | 15 | 0 | 12 | 0 | 9 | 1 | 12 | 16 | 6 | 0 | 0 | 0 | 8 | 1 | 110 | 5704 | 4:58 PM | to 5:58 PM |
| 5:58 PM | 7 | 18 | 9 | 0 | 2 | 0 | 4 | 0 | 0 | 11 | 3 | 0 | 15 | 0 | 3 | 1 | 72 | 5704 | 4:59 PM | to 5:59 PM |
| 5:59 PM | 0 | 8 | 9 | 1 | 15 | 0 | 7 | 1 | 19 | 23 | 4 | 0 | 11 | 0 | 4 | 0 | 100 | 5696 | 5:00 PM | to 6:00 PM |
| Approach Total | 3324 | | | | 880 | | | | 3123 | | | | 1223 | | | | | | | |
| Grand Total | 683 | 1949 | 692 | 26 | 422 | 0 | 458 | 13 | 835 | 1597 | 691 | 17 | 576 | 0 | 647 | 24 | 8550 | | | |
| Approach % | 20.5% | 58.6% | 20.8% | 0.8% | 48.0% | 0.0% | 52.0% | 1.5% | 26.7% | 51.1% | 22.1% | 0.5% | 47.1% | 0.0% | 52.9% | 2.0% | | | | |
| Total % | 8.0% | 22.8% | 8.1% | 0.3% | 4.9% | 0.0% | 5.4% | 0.2% | 9.8% | 18.7% | 8.1% | 0.2% | 6.7% | 0.0% | 7.6% | 0.3% | | | | |
| **Begin Peak Hour:** | **16:37** | | | | | | | | | | | | | | | | | | | |
| **Peak Hour Vol:** | **483** | **1287** | **461** | **18** | **240** | **0** | **299** | **9** | **603** | **1115** | **502** | **10** | **363** | **0** | **431** | **16** | **5784** | 5784 | 4:37 PM | to 5:37 PM |

| From East | | | | From South | | | | From West | | | | From North | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOOP 202 (WB) OFF RAMP | | | | SCOTTSDALE RD | | | | LOOP 202 (EB) OFF RAMP | | | | SCOTTSDALE RD | | | |
| Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks | Left | Thru | Right | Trucks |
| 240 | 0 | 299 | 9 | 603 | 1115 | 502 | 10 | 363 | 0 | 431 | 16 | 483 | 1287 | 461 | 18 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400117 | LOOP 101 (WEST) NB OFF RAMP | S. of BELL RD | NB | 24 | 1/28/2004 | 12:00 | 16204 | 7:15 | 1123 | 0.8406 | 16:45 | 1367 | 0.9906 | 33.63528 | -112.23822 |
| 0400118 | LOOP 101 (WEST) NB OFF RAMP-RT TURNS | S. of BELL RD | NB | 24 | 1/28/2004 | 0:00 | 10097 | 11:45 | 813 | 0.9366 | 12:00 | 836 | 0.9048 | 33.63777 | -112.23722 |
| 0400119 | BELL RD | BTWN LOOP 101(WEST) NB OFF RAMP (T-SPLIT) | EB | 24 | 1/28/2004 | 0:00 | 22210 | 11:30 | 1953 | 0.9630 | 12:00 | 1851 | 0.9127 | 33.63798 | -112.23710 |
| 0400120 | BELL RD | E. of LOOP 101 (WEST) NB ON RAMP | WB | 24 | 1/28/2004 | 0:00 | 26977 | 11:45 | 1891 | 0.9197 | 15:00 | 2281 | 0.9348 | 33.63835 | -112.23475 |
| 0400121 | LOOP 101 (WEST) SB OFF RAMP | N. of BELL RD | SB | 24 | 1/28/2004 | 0:00 | 16867 | 7:15 | 1217 | 0.8405 | 16:45 | 1385 | 0.9699 | 33.64108 | -112.23692 |
| 0400122 | LOOP 101 (WEST) SB OFF RAMP-RT TURNS | N. of BELL RD | SB | 24 | 1/28/2004 | 0:00 | 12760 | 7:15 | 1067 | 0.8441 | 16:45 | 1022 | 0.9642 | 33.63867 | -112.23820 |
| 0400123 | BELL RD | BTWN LOOP 101(WEST) SB OFF RAMP (T-SPLIT) | WB | 24 | 1/28/2004 | 0:00 | 27065 | 11:45 | 1829 | 0.9447 | 15:00 | 2387 | 0.9281 | 33.63833 | -112.23837 |
| 0400124 | BELL RD | W. of LOOP 101 (WEST) SB ON RAMP | EB | 24 | 1/28/2004 | 0:00 | 37409 | 11:30 | 2750 | 0.9683 | 16:30 | 2768 | 0.9665 | 33.63812 | -112.24095 |
| 0400125 | SR-51 NB OFF RAMP | S. of GLENDALE AVE | NB | 24 | 2/3/2004 | 0:00 | 8790 | 7:15 | 754 | 0.9472 | 15:00 | 639 | 0.9623 | 33.53799 | -112.04113 |
| 0400126 | SR-51 NB OFF RAMP-RT TURNS | S. of GLENDALE AVE | NB | 24 | 2/3/2004 | 0:00 | 3240 | 6:15 | 339 | 0.8737 | 13:30 | 238 | 0.8750 | 33.53611 | -112.04118 |
| 0400127 | GLENDALE AVE | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 2/3/2004 | 0:00 | 25584 | 7:15 | 3302 | 0.9723 | 17:00 | 1694 | 0.9691 | 33.53826 | -112.04119 |
| 0400128 | GLENDALE AVE | E. of SR-51 NB ON RAMP | WB | 24 | 2/3/2004 | 0:00 | 24184 | 8:00 | 1378 | 0.9211 | 17:15 | 2929 | 0.9803 | 33.53845 | -112.03926 |
| 0400129 | SR-51 SB OFF RAMP | N. of GLENDALE AVE | SB | 24 | 2/3/2004 | 0:00 | 13798 | 8:30 | 1708 | 0.9183 | 16:00 | 815 | 0.9178 | 33.54078 | -112.04140 |
| 0400130 | SR-51 SB OFF RAMP-RT TURNS | N. of GLENDALE AVE | SB | 24 | 2/3/2004 | 0:00 | 4317 | 8:30 | 462 | 0.7000 | 17:30 | 331 | 0.9298 | 33.53866 | -112.04196 |
| 0400131 | GLENDALE AVE | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 2/3/2004 | 0:00 | 20613 | 7:30 | 1419 | 0.8674 | 16:30 | 1910 | 0.9608 | 33.53835 | -112.04198 |
| 0400132 | GLENDALE AVE | W. of SR-51 SB ON RAMP | EB | 24 | 2/3/2004 | 0:00 | 24496 | 5:15 | 2231 | 0.9219 | 15:00 | 2041 | 0.9484 | 33.53816 | -112.04301 |
| 0400133 | SR-51 NB OFF RAMP | S. of INDIAN SCHOOL RD | NB | 24 | 1/20/2004 | 0:00 | 8234 | 7:15 | 819 | 0.8825 | 12:00 | 678 | 0.9212 | 33.49205 | -112.04362 |
| 0400134 | SR-51 NB OFF RAMP-RT TURNS | S. of INDIAN SCHOOL RD | NB | 24 | 1/20/2004 | 0:00 | 3872 | 11:15 | 350 | 0.8750 | 14:15 | 334 | 0.8978 | 33.49440 | -112.04351 |
| 0400135 | INDIAN SCHOOL RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/20/2004 | 0:00 | 23208 | 11:15 | 1632 | 0.9107 | 16:45 | 2040 | 0.8629 | 33.49461 | -112.04343 |
| 0400136 | INDIAN SCHOOL RD | E. of SR-51 NB ON RAMPS | WB | 24 | 1/20/2004 | 0:00 | 24896 | 7:15 | 1641 | 0.9016 | 15:45 | 1935 | 0.9579 | 33.49489 | -112.04126 |
| 0400137 | SR-51 SB OFF RAMPS | N. of INDIAN SCHOOL RD | SB | 24 | 1/20/2004 | 0:00 | 10214 | 8:30 | 979 | 0.9751 | 15:30 | 710 | 0.9245 | 33.49755 | -112.04408 |
| 0400138 | SR-51 SB OFF RAMPS-RT TURNS | N. of INDIAN SCHOOL RD | SB | 24 | 1/20/2004 | 0:00 | 4940 | 8:00 | 609 | 0.9117 | 12:00 | 336 | 0.8485 | 33.49509 | -112.04430 |
| 0400139 | INDIAN SCHOOL RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/20/2004 | 0:00 | 25662 | 7:30 | 1823 | 0.8648 | 15:30 | 2111 | 0.9275 | 33.49476 | -112.04437 |
| 0400140 | INDIAN SCHOOL RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/20/2004 | 0:00 | 31791 | 11:15 | 2246 | 0.9731 | 16:45 | 2852 | 0.8890 | 33.49457 | -112.04629 |
| 0400141 | SR-51 NB OFF RAMP | S. of CACTUS RD | NB | 24 | 1/21/2004 | 0:00 | 11284 | 11:45 | 675 | 0.8789 | 17:00 | 999 | 0.9182 | 33.59393 | -112.00919 |
| 0400142 | SR-51 NB OFF RAMP-RT TURNS | S. of CACTUS RD | NB | 24 | 1/21/2004 | 0:00 | 6296 | 11:45 | 407 | 0.8479 | 17:45 | 576 | 0.9412 | 33.59666 | -112.00895 |
| 0400143 | CACTUS RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/21/2004 | 0:00 | 20258 | 7:30 | 1881 | 0.8644 | 16:45 | 1690 | 0.9431 | 33.59691 | -112.00904 |
| 0400144 | CACTUS RD | E. of SR-51 NB ON RAMP | WB | 24 | 1/21/2004 | 0:00 | 22398 | 7:00 | 1310 | 0.9411 | 16:45 | 2013 | 0.9051 | 33.59720 | -112.00584 |
| 0400145 | SR-51 SB OFF RAMPS | N. of CACTUS RD | SB | 24 | 1/21/2004 | 0:00 | 9483 | 7:30 | 1029 | 0.8272 | 16:45 | 788 | 0.9752 | 33.60019 | -112.00975 |
| 0400146 | SR-51 SB OFF RAMPS-RT TURNS | N. of CACTUS RD | SB | 24 | 1/21/2004 | 0:00 | 4475 | 7:30 | 505 | 0.8417 | 15:15 | 384 | 0.8205 | 33.59747 | -112.01011 |
| 0400147 | CACTUS RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/21/2004 | 0:00 | 17505 | 11:45 | 1011 | 0.9258 | 16:45 | 1646 | 0.9395 | 33.59705 | -112.01020 |
| 0400148 | CACTUS RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/21/2004 | 0:00 | 23799 | 7:15 | 1934 | 0.9536 | 17:00 | 1963 | 0.9474 | 33.59685 | -112.01150 |
| 0400149 | SR-51 NB OFF RAMP | S. of GREENWAY RD | NB | 24 | 1/27/2004 | 0:00 | 12831 | 7:30 | 739 | 0.9192 | 15:45 | 1205 | 0.8783 | 33.62380 | -112.00748 |
| 0400150 | SR-51 NB OFF RAMP-RT TURNS | S. of GREENWAY RD | NB | 24 | 1/27/2004 | 0:00 | 6618 | 6:30 | 479 | 0.8146 | 17:15 | 598 | 0.9061 | 33.62593 | -112.00630 |
| 0400151 | GREENWAY RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/27/2004 | 0:00 | 19866 | 7:15 | 2090 | 0.8782 | 16:30 | 1486 | 0.9751 | 33.62618 | -112.00613 |
| 0400152 | GREENWAY RD | E. of SR-51 NB ON RAMP | WB | 24 | 1/27/2004 | 0:00 | 28811 | 8:00 | 1961 | 0.9096 | 16:45 | 3104 | 0.9545 | 33.62647 | -112.00517 |
| 0400153 | SR-51 SB OFF RAMPS | N. of GREENWAY RD | SB | 24 | 1/27/2004 | 0:00 | 7926 | 7:30 | 460 | 0.8647 | 17:00 | 799 | 0.9248 | 33.62847 | -112.00625 |
| 0400154 | SR-51 SB OFF RAMPS-RT TURNS | N. of GREENWAY RD | SB | 24 | 1/27/2004 | 0:00 | 3291 | 11:15 | 185 | 0.8565 | 16:30 | 352 | 0.8302 | 33.62677 | -112.00723 |
| 0400155 | GREENWAY RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/27/2004 | 0:00 | 22790 | 11:45 | 1305 | 0.9512 | 16:30 | 2634 | 0.9828 | 33.62648 | -112.00740 |
| 0400156 | GREENWAY RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/27/2004 | 0:00 | 20235 | 7:00 | 2026 | 0.9380 | 16:00 | 1226 | 0.9519 | 33.62633 | -112.00840 |
| 0400157 | LOOP 202 EB OFF RAMPS | W. of SCOTTSDALE RD | EB | 24 | 1/29/2004 | 0:00 | 15650 | 8:00 | 1282 | 0.9054 | 14:00 | 1004 | 0.9544 | 33.43567 | -111.92925 |
| 0400158 | LOOP 202 EB OFF RAMP-RT TURNS | W. of SCOTTSDALE RD | EB | 24 | 1/29/2004 | 0:00 | 8339 | 8:00 | 731 | 0.9277 | 12:30 | 495 | 0.8839 | 33.43567 | -111.92665 |
| 0400159 | SCOTTSDALE RD | BTWN LOOP 202 EB OFF RAMPS (T-SPLIT) | SB | 24 | 1/29/2004 | 0:00 | 17389 | 8:00 | 1341 | 0.8730 | 17:00 | 1365 | 0.9004 | 33.43568 | -111.92648 |
| 0400160 | SCOTTSDALE RD | S. of LOOP 202 EB ON RAMP | NB | 24 | 1/29/2004 | 0:00 | 32116 | 11:45 | 2070 | 0.8697 | 15:00 | 2884 | 0.8945 | 33.43458 | -111.92610 |
| 0400161 | LOOP 202 WB OFF RAMPS | E. of SCOTTSDALE RD | WB | 24 | 1/29/2004 | 0:00 | 11919 | 8:15 | 1214 | 0.8848 | 12:45 | 859 | 0.9177 | 33.43643 | -111.92382 |
| 0400162 | LOOP 202 WB OFF RAMP-RT TURNS | E. of SCOTTSDALE RD | WB | 24 | 1/29/2004 | 0:00 | 6026 | 9:00 | 580 | 0.8480 | 12:15 | 410 | 0.9579 | 33.43652 | -111.92587 |
| 0400163 | SCOTTSDALE RD | BTWN LOOP 202 WB OFF RAMPS (T-SPLIT) | NB | 24 | 1/29/2004 | 0:00 | 24488 | 7:30 | 1778 | 0.9241 | 15:00 | 1776 | 0.9507 | 33.43660 | -111.92613 |
| 0400164 | SCOTTSDALE RD | N. of LOOP 202 WB ON RAMP | SB | 24 | 1/29/2004 | 0:00 | 27418 | 11:30 | 1732 | 0.9097 | 17:15 | 2380 | 0.9917 | 33.43737 | -111.92648 |

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3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400133 | SR-51 NB OFF RAMP | S. of INDIAN SCHOOL RD | NB | 24 | 1/20/2004 | 0:00 | 8234 | 7:15 | 819 | 0.8825 | 12:00 | 678 | 0.9212 |
| 0400134 | SR-51 NB OFF RAMP-RT TURNS | S. of INDIAN SCHOOL RD | NB | 24 | 1/20/2004 | 0:00 | 3872 | 11:15 | 350 | 0.8750 | 14:15 | 334 | 0.8978 |
| 0400135 | INDIAN SCHOOL RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/20/2004 | 0:00 | 23208 | 11:15 | 1632 | 0.9107 | 16:45 | 2040 | 0.8629 |
| 0400136 | INDIAN SCHOOL RD | E. of SR-51 NB ON RAMPS | WB | 24 | 1/20/2004 | 0:00 | 24896 | 7:15 | 1641 | 0.9016 | 15:45 | 1935 | 0.9579 |
| 0400137 | SR-51 SB OFF RAMPS | N. of INDIAN SCHOOL RD | SB | 24 | 1/20/2004 | 0:00 | 10214 | 8:30 | 979 | 0.9751 | 15:30 | 710 | 0.9245 |
| 0400138 | SR-51 SB OFF RAMPS-RT TURNS | N. of INDIAN SCHOOL RD | SB | 24 | 1/20/2004 | 0:00 | 4940 | 8:00 | 609 | 0.9117 | 12:00 | 336 | 0.8485 |
| 0400139 | INDIAN SCHOOL RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/20/2004 | 0:00 | 25662 | 7:30 | 1823 | 0.8648 | 15:30 | 2111 | 0.9275 |
| 0400140 | INDIAN SCHOOL RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/20/2004 | 0:00 | 31791 | 11:15 | 2246 | 0.9731 | 16:45 | 2852 | 0.8890 |

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3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400133
Duration: 24
Site Code: 3
TRA ID: 0400133
Location 1: SR-51 NB OFF RAMP S. of INDIAN SCHOOL RD
Count Type: VOL
Direction: NB
Latitude: 33.49205
Longitude: -112.04362

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 12 | 164 | 12 | 164 |
| 12:15 | 5 | 168 | 5 | 168 |
| 12:30 | 9 | 184 | 9 | 184 |
| 12:45 | 8 | 162 | 8 | 162 |
| 1:00 | 9 | 143 | 9 | 143 |
| 1:15 | 3 | 148 | 3 | 148 |
| 1:30 | 12 | 155 | 12 | 155 |
| 1:45 | 6 | 136 | 6 | 136 |
| 2:00 | 7 | 136 | 7 | 136 |
| 2:15 | 1 | 152 | 1 | 152 |
| 2:30 | 7 | 172 | 7 | 172 |
| 2:45 | 5 | 190 | 5 | 190 |
| 3:00 | 3 | 153 | 3 | 153 |
| 3:15 | 8 | 148 | 8 | 148 |
| 3:30 | 3 | 156 | 3 | 156 |
| 3:45 | 4 | 138 | 4 | 138 |
| 4:00 | 4 | 135 | 4 | 135 |
| 4:15 | 13 | 121 | 13 | 121 |
| 4:30 | 13 | 111 | 13 | 111 |
| 4:45 | 13 | 103 | 13 | 103 |
| 5:00 | 39 | 111 | 39 | 111 |
| 5:15 | 37 | 78 | 37 | 78 |
| 5:30 | 49 | 119 | 49 | 119 |
| 5:45 | 89 | 152 | 89 | 152 |
| 6:00 | 103 | 120 | 103 | 120 |
| 6:15 | 123 | 1 | 123 | 1 |
| 6:30 | 137 | 4 | 137 | 4 |
| 6:45 | 167 | 3 | 167 | 3 |
| 7:00 | 191 | 4 | 191 | 4 |
| 7:15 | 191 | 1 | 191 | 1 |
| 7:30 | 201 | 5 | 201 | 5 |
| 7:45 | 232 | 3 | 232 | 3 |
| 8:00 | 195 | 0 | 195 | 0 |
| 8:15 | 186 | 2 | 186 | 2 |
| 8:30 | 188 | 6 | 188 | 6 |
| 8:45 | 214 | 5 | 214 | 5 |
| 9:00 | 181 | 8 | 181 | 8 |
| 9:15 | 158 | 2 | 158 | 2 |
| 9:30 | 176 | 2 | 176 | 2 |
| 9:45 | 157 | 6 | 157 | 6 |
| 10:00 | 163 | 16 | 163 | 16 |
| 10:15 | 123 | 25 | 123 | 25 |
| 10:30 | 134 | 33 | 134 | 33 |
| 10:45 | 150 | 57 | 150 | 57 |
| 11:00 | 160 | 52 | 160 | 52 |
| 11:15 | 156 | 29 | 156 | 29 |
| 11:30 | 158 | 20 | 158 | 20 |
| 11:45 | 168 | 24 | 168 | 24 |
| **Total** | **4371** | **3863** | **4371** | **3863** |
| **Day Total** | **8234** | | **8234** | |
| **Split** | 1.1315 | | 1.1315 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 819 | | 819 | |
| AM PHF | 0.8825 | | 0.8825 | |
| PM Peak Hour | | 12:00 | | 12:00 |
| PM Peak Vol | | 678 | | 678 |
| PM PHF | | 0.9212 | | 0.9212 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400134
Duration: 24
Site Code: 3
TRA ID: 0400134
Location 1: SR-51 NB OFF RAMP-RT TURNS S. of INDIAN SCHOOL RD
Count Type: VOL
Direction: NB
Latitude: 33.49440
Longitude: -112.04351

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 8 | 88 | 8 | 88 |
| 12:15 | 3 | 78 | 3 | 78 |
| 12:30 | 4 | 83 | 4 | 83 |
| 12:45 | 4 | 76 | 4 | 76 |
| 1:00 | 5 | 68 | 5 | 68 |
| 1:15 | 3 | 76 | 3 | 76 |
| 1:30 | 8 | 85 | 8 | 85 |
| 1:45 | 1 | 57 | 1 | 57 |
| 2:00 | 5 | 62 | 5 | 62 |
| 2:15 | 1 | 66 | 1 | 66 |
| 2:30 | 1 | 86 | 1 | 86 |
| 2:45 | 2 | 93 | 2 | 93 |
| 3:00 | 1 | 89 | 1 | 89 |
| 3:15 | 4 | 64 | 4 | 64 |
| 3:30 | 1 | 70 | 1 | 70 |
| 3:45 | 1 | 65 | 1 | 65 |
| 4:00 | 2 | 75 | 2 | 75 |
| 4:15 | 18 | 61 | 18 | 61 |
| 4:30 | 8 | 59 | 8 | 59 |
| 4:45 | 9 | 49 | 9 | 49 |
| 5:00 | 22 | 38 | 22 | 38 |
| 5:15 | 15 | 34 | 15 | 34 |
| 5:30 | 17 | 65 | 17 | 65 |
| 5:45 | 28 | 73 | 28 | 73 |
| 6:00 | 41 | 56 | 41 | 56 |
| 6:15 | 38 | 38 | 38 | 38 |
| 6:30 | 48 | 29 | 48 | 29 |
| 6:45 | 27 | 32 | 27 | 32 |
| 7:00 | 70 | 16 | 70 | 16 |
| 7:15 | 68 | 24 | 68 | 24 |
| 7:30 | 71 | 13 | 71 | 13 |
| 7:45 | 98 | 17 | 98 | 17 |
| 8:00 | 77 | 23 | 77 | 23 |
| 8:15 | 69 | 12 | 69 | 12 |
| 8:30 | 67 | 11 | 67 | 11 |
| 8:45 | 98 | 16 | 98 | 16 |
| 9:00 | 75 | 2 | 75 | 2 |
| 9:15 | 62 | 17 | 62 | 17 |
| 9:30 | 75 | 13 | 75 | 13 |
| 9:45 | 83 | 6 | 83 | 6 |
| 10:00 | 66 | 5 | 66 | 5 |
| 10:15 | 57 | 2 | 57 | 2 |
| 10:30 | 58 | 9 | 58 | 9 |
| 10:45 | 79 | 6 | 79 | 6 |
| 11:00 | 76 | 7 | 76 | 7 |
| 11:15 | 79 | 6 | 79 | 6 |
| 11:30 | 100 | 10 | 100 | 10 |
| 11:45 | 83 | 6 | 83 | 6 |
| **Total** | **1836** | **2036** | **1836** | **2036** |
| **Day Total** | **3872** | | **3872** | |
| **Split** | 0.9018 | | 0.9018 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:15 | | 11:15 | |
| AM Peak Vol | 350 | | 350 | |
| AM PHF | 0.8750 | | 0.8750 | |
| PM Peak Hour | | 14:15 | | 14:15 |
| PM Peak Vol | | 334 | | 334 |
| PM PHF | | 0.8978 | | 0.8978 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400135
Duration: 24
Site Code: 3
TRA ID: 0400135
Location 1: INDIAN SCHOOL RD BTWN SR-51 NB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: EB
Latitude: 33.49461
Longitude: -112.04343

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 57 | 448 | 57 | 448 |
| 12:15 | 45 | 366 | 45 | 366 |
| 12:30 | 31 | 373 | 31 | 373 |
| 12:45 | 36 | 413 | 36 | 413 |
| 1:00 | 30 | 372 | 30 | 372 |
| 1:15 | 36 | 390 | 36 | 390 |
| 1:30 | 22 | 420 | 22 | 420 |
| 1:45 | 26 | 424 | 26 | 424 |
| 2:00 | 16 | 393 | 16 | 393 |
| 2:15 | 17 | 429 | 17 | 429 |
| 2:30 | 11 | 390 | 11 | 390 |
| 2:45 | 15 | 403 | 15 | 403 |
| 3:00 | 17 | 442 | 17 | 442 |
| 3:15 | 12 | 460 | 12 | 460 |
| 3:30 | 17 | 460 | 17 | 460 |
| 3:45 | 17 | 503 | 17 | 503 |
| 4:00 | 18 | 493 | 18 | 493 |
| 4:15 | 28 | 474 | 28 | 474 |
| 4:30 | 33 | 470 | 33 | 470 |
| 4:45 | 49 | 499 | 49 | 499 |
| 5:00 | 67 | 433 | 67 | 433 |
| 5:15 | 71 | 591 | 71 | 591 |
| 5:30 | 91 | 517 | 91 | 517 |
| 5:45 | 104 | 446 | 104 | 446 |
| 6:00 | 105 | 449 | 105 | 449 |
| 6:15 | 159 | 412 | 159 | 412 |
| 6:30 | 182 | 310 | 182 | 310 |
| 6:45 | 220 | 326 | 220 | 326 |
| 7:00 | 244 | 284 | 244 | 284 |
| 7:15 | 239 | 256 | 239 | 256 |
| 7:30 | 336 | 236 | 336 | 236 |
| 7:45 | 306 | 210 | 306 | 210 |
| 8:00 | 346 | 244 | 346 | 244 |
| 8:15 | 331 | 193 | 331 | 193 |
| 8:30 | 310 | 167 | 310 | 167 |
| 8:45 | 379 | 188 | 379 | 188 |
| 9:00 | 339 | 174 | 339 | 174 |
| 9:15 | 320 | 147 | 320 | 147 |
| 9:30 | 320 | 103 | 320 | 103 |
| 9:45 | 350 | 84 | 350 | 84 |
| 10:00 | 394 | 81 | 394 | 81 |
| 10:15 | 316 | 75 | 316 | 75 |
| 10:30 | 304 | 68 | 304 | 68 |
| 10:45 | 363 | 98 | 363 | 98 |
| 11:00 | 367 | 53 | 367 | 53 |
| 11:15 | 379 | 54 | 379 | 54 |
| 11:30 | 421 | 57 | 421 | 57 |
| 11:45 | 384 | 50 | 384 | 50 |
| **Total** | **8280** | **14928** | **8280** | **14928** |
| **Day Total** | **23208** | | **23208** | |
| **Split** | 0.5547 | | 0.5547 | |
| AM Peak Hour | 11:15 | | 11:15 | |
| AM Peak Vol | 1632 | | 1632 | |
| AM PHF | 0.9107 | | 0.9107 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 2040 | | 2040 |
| PM PHF | | 0.8629 | | 0.8629 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400136
Duration: 24
Site Code: 3
TRA ID: 0400136
Location 1: INDIAN SCHOOL RD E. of SR-51 NB ON RAMPS
Count Type: VOL
Direction: WB
Latitude: 33.49489
Longitude: -112.04126

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 58 | 395 | 58 | 395 |
| 12:15 | 48 | 418 | 48 | 418 |
| 12:30 | 39 | 407 | 39 | 407 |
| 12:45 | 31 | 413 | 31 | 413 |
| 1:00 | 38 | 455 | 38 | 455 |
| 1:15 | 36 | 397 | 36 | 397 |
| 1:30 | 35 | 492 | 35 | 492 |
| 1:45 | 34 | 395 | 34 | 395 |
| 2:00 | 21 | 431 | 21 | 431 |
| 2:15 | 17 | 428 | 17 | 428 |
| 2:30 | 16 | 393 | 16 | 393 |
| 2:45 | 22 | 479 | 22 | 479 |
| 3:00 | 23 | 482 | 23 | 482 |
| 3:15 | 21 | 490 | 21 | 490 |
| 3:30 | 21 | 441 | 21 | 441 |
| 3:45 | 29 | 473 | 29 | 473 |
| 4:00 | 27 | 487 | 27 | 487 |
| 4:15 | 38 | 505 | 38 | 505 |
| 4:30 | 42 | 470 | 42 | 470 |
| 4:45 | 60 | 471 | 60 | 471 |
| 5:00 | 47 | 470 | 47 | 470 |
| 5:15 | 87 | 413 | 87 | 413 |
| 5:30 | 144 | 490 | 144 | 490 |
| 5:45 | 117 | 403 | 117 | 403 |
| 6:00 | 157 | 484 | 157 | 484 |
| 6:15 | 176 | 419 | 176 | 419 |
| 6:30 | 278 | 389 | 278 | 389 |
| 6:45 | 278 | 349 | 278 | 349 |
| 7:00 | 279 | 330 | 279 | 330 |
| 7:15 | 363 | 302 | 363 | 302 |
| 7:30 | 452 | 222 | 452 | 222 |
| 7:45 | 455 | 277 | 455 | 277 |
| 8:00 | 371 | 224 | 371 | 224 |
| 8:15 | 353 | 232 | 353 | 232 |
| 8:30 | 365 | 203 | 365 | 203 |
| 8:45 | 343 | 188 | 343 | 188 |
| 9:00 | 280 | 210 | 280 | 210 |
| 9:15 | 319 | 224 | 319 | 224 |
| 9:30 | 315 | 170 | 315 | 170 |
| 9:45 | 332 | 157 | 332 | 157 |
| 10:00 | 285 | 146 | 285 | 146 |
| 10:15 | 313 | 135 | 313 | 135 |
| 10:30 | 337 | 122 | 337 | 122 |
| 10:45 | 323 | 111 | 323 | 111 |
| 11:00 | 343 | 81 | 343 | 81 |
| 11:15 | 382 | 94 | 382 | 94 |
| 11:30 | 400 | 77 | 400 | 77 |
| 11:45 | 418 | 84 | 418 | 84 |
| **Total** | **8968** | **15928** | **8968** | **15928** |
| **Day Total** | **24896** | | **24896** | |
| **Split** | 0.5630 | | 0.5630 | |
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 1641 | | 1641 | |
| AM PHF | 0.9016 | | 0.9016 | |
| PM Peak Hour | | 15:45 | | 15:45 |
| PM Peak Vol | | 1935 | | 1935 |
| PM PHF | | 0.9579 | | 0.9579 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400137
Duration: 24
Site Code: 3
TRA ID: 0400137
Location 1: SR-51 SB OFF RAMPS N. of INDIAN SCHOOL RD
Count Type: VOL
Direction: SB
Latitude: 33.49755
Longitude: -112.04408

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 12 | 157 | 12 | 157 |
| 12:15 | 20 | 168 | 20 | 168 |
| 12:30 | 18 | 141 | 18 | 141 |
| 12:45 | 11 | 161 | 11 | 161 |
| 1:00 | 17 | 186 | 17 | 186 |
| 1:15 | 12 | 148 | 12 | 148 |
| 1:30 | 18 | 163 | 18 | 163 |
| 1:45 | 9 | 159 | 9 | 159 |
| 2:00 | 7 | 164 | 7 | 164 |
| 2:15 | 5 | 159 | 5 | 159 |
| 2:30 | 6 | 176 | 6 | 176 |
| 2:45 | 6 | 180 | 6 | 180 |
| 3:00 | 5 | 175 | 5 | 175 |
| 3:15 | 9 | 159 | 9 | 159 |
| 3:30 | 4 | 187 | 4 | 187 |
| 3:45 | 5 | 168 | 5 | 168 |
| 4:00 | 12 | 192 | 12 | 192 |
| 4:15 | 9 | 163 | 9 | 163 |
| 4:30 | 9 | 183 | 9 | 183 |
| 4:45 | 14 | 150 | 14 | 150 |
| 5:00 | 19 | 151 | 19 | 151 |
| 5:15 | 35 | 153 | 35 | 153 |
| 5:30 | 48 | 174 | 48 | 174 |
| 5:45 | 58 | 159 | 58 | 159 |
| 6:00 | 92 | 131 | 92 | 131 |
| 6:15 | 102 | 90 | 102 | 90 |
| 6:30 | 135 | 106 | 135 | 106 |
| 6:45 | 141 | 93 | 141 | 93 |
| 7:00 | 172 | 80 | 172 | 80 |
| 7:15 | 198 | 97 | 198 | 97 |
| 7:30 | 186 | 100 | 186 | 100 |
| 7:45 | 186 | 95 | 186 | 95 |
| 8:00 | 219 | 74 | 219 | 74 |
| 8:15 | 226 | 62 | 226 | 62 |
| 8:30 | 248 | 78 | 248 | 78 |
| 8:45 | 251 | 79 | 251 | 79 |
| 9:00 | 239 | 76 | 239 | 76 |
| 9:15 | 241 | 77 | 241 | 77 |
| 9:30 | 191 | 52 | 191 | 52 |
| 9:45 | 201 | 51 | 201 | 51 |
| 10:00 | 221 | 53 | 221 | 53 |
| 10:15 | 157 | 39 | 157 | 39 |
| 10:30 | 144 | 30 | 144 | 30 |
| 10:45 | 119 | 20 | 119 | 20 |
| 11:00 | 148 | 27 | 148 | 27 |
| 11:15 | 175 | 19 | 175 | 19 |
| 11:30 | 155 | 25 | 155 | 25 |
| 11:45 | 148 | 21 | 148 | 21 |
| **Total** | **4663** | **5551** | **4663** | **5551** |
| **Day Total** | **10214** | | **10214** | |
| **Split** | 0.8400 | | 0.8400 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 8:30 | | 8:30 | |
| AM Peak Vol | 979 | | 979 | |
| AM PHF | 0.9751 | | 0.9751 | |
| PM Peak Hour | | 15:30 | | 15:30 |
| PM Peak Vol | | 710 | | 710 |
| PM PHF | | 0.9245 | | 0.9245 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400138
Duration: 24
Site Code: 3
TRA ID: 0400138
Location 1: SR-51 SB OFF RAMPS-RT TURNS N. of INDIAN SCHOOL RD
Count Type: VOL
Direction: SB
Latitude: 33.49509
Longitude: -112.04430

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 7 | 81 | 7 | 81 |
| 12:15 | 3 | 72 | 3 | 72 |
| 12:30 | 5 | 84 | 5 | 84 |
| 12:45 | 7 | 99 | 7 | 99 |
| 1:00 | 5 | 76 | 5 | 76 |
| 1:15 | 9 | 74 | 9 | 74 |
| 1:30 | 1 | 76 | 1 | 76 |
| 1:45 | 2 | 77 | 2 | 77 |
| 2:00 | 2 | 74 | 2 | 74 |
| 2:15 | 1 | 78 | 1 | 78 |
| 2:30 | 4 | 93 | 4 | 93 |
| 2:45 | 4 | 88 | 4 | 88 |
| 3:00 | 1 | 74 | 1 | 74 |
| 3:15 | 3 | 73 | 3 | 73 |
| 3:30 | 2 | 84 | 2 | 84 |
| 3:45 | 5 | 89 | 5 | 89 |
| 4:00 | 4 | 71 | 4 | 71 |
| 4:15 | 3 | 72 | 3 | 72 |
| 4:30 | 10 | 61 | 10 | 61 |
| 4:45 | 9 | 58 | 9 | 58 |
| 5:00 | 16 | 70 | 16 | 70 |
| 5:15 | 29 | 59 | 29 | 59 |
| 5:30 | 37 | 55 | 37 | 55 |
| 5:45 | 71 | 53 | 71 | 53 |
| 6:00 | 67 | 31 | 67 | 31 |
| 6:15 | 87 | 24 | 87 | 24 |
| 6:30 | 109 | 23 | 109 | 23 |
| 6:45 | 126 | 25 | 126 | 25 |
| 7:00 | 132 | 24 | 132 | 24 |
| 7:15 | 133 | 16 | 133 | 16 |
| 7:30 | 113 | 10 | 113 | 10 |
| 7:45 | 140 | 16 | 140 | 16 |
| 8:00 | 141 | 19 | 141 | 19 |
| 8:15 | 158 | 11 | 158 | 11 |
| 8:30 | 167 | 21 | 167 | 21 |
| 8:45 | 143 | 9 | 143 | 9 |
| 9:00 | 135 | 11 | 135 | 11 |
| 9:15 | 111 | 9 | 111 | 9 |
| 9:30 | 125 | 9 | 125 | 9 |
| 9:45 | 118 | 12 | 118 | 12 |
| 10:00 | 66 | 5 | 66 | 5 |
| 10:15 | 75 | 6 | 75 | 6 |
| 10:30 | 62 | 5 | 62 | 5 |
| 10:45 | 62 | 8 | 62 | 8 |
| 11:00 | 82 | 6 | 82 | 6 |
| 11:15 | 85 | 5 | 85 | 5 |
| 11:30 | 69 | 5 | 69 | 5 |
| 11:45 | 85 | 8 | 85 | 8 |
| **Total** | **2831** | **2109** | **2831** | **2109** |
| **Day Total** | **4940** | | **4940** | |
| **Split** | 1.3423 | | 1.3423 | |
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 609 | | 609 | |
| AM PHF | 0.9117 | | 0.9117 | |
| PM Peak Hour | | 12:00 | | 12:00 |
| PM Peak Vol | | 336 | | 336 |
| PM PHF | | 0.8485 | | 0.8485 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400139
Duration: 24
Site Code: 3
TRA ID: 0400139
Location 1: INDIAN SCHOOL RD BTWN SR-51 SB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: WB
Latitude: 33.49476
Longitude: -112.04437

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 42 | 362 | 42 | 362 |
| 12:15 | 32 | 363 | 32 | 363 |
| 12:30 | 30 | 393 | 30 | 393 |
| 12:45 | 29 | 366 | 29 | 366 |
| 1:00 | 27 | 364 | 27 | 364 |
| 1:15 | 25 | 344 | 25 | 344 |
| 1:30 | 28 | 393 | 28 | 393 |
| 1:45 | 31 | 431 | 31 | 431 |
| 2:00 | 15 | 474 | 15 | 474 |
| 2:15 | 18 | 494 | 18 | 494 |
| 2:30 | 21 | 447 | 21 | 447 |
| 2:45 | 20 | 519 | 20 | 519 |
| 3:00 | 16 | 517 | 16 | 517 |
| 3:15 | 21 | 504 | 21 | 504 |
| 3:30 | 15 | 526 | 15 | 526 |
| 3:45 | 27 | 504 | 27 | 504 |
| 4:00 | 15 | 569 | 15 | 569 |
| 4:15 | 28 | 512 | 28 | 512 |
| 4:30 | 26 | 480 | 26 | 480 |
| 4:45 | 32 | 500 | 32 | 500 |
| 5:00 | 53 | 505 | 53 | 505 |
| 5:15 | 77 | 458 | 77 | 458 |
| 5:30 | 110 | 499 | 110 | 499 |
| 5:45 | 124 | 468 | 124 | 468 |
| 6:00 | 176 | 528 | 176 | 528 |
| 6:15 | 219 | 473 | 219 | 473 |
| 6:30 | 265 | 486 | 265 | 486 |
| 6:45 | 371 | 427 | 371 | 427 |
| 7:00 | 388 | 315 | 388 | 315 |
| 7:15 | 395 | 334 | 395 | 334 |
| 7:30 | 462 | 229 | 462 | 229 |
| 7:45 | 527 | 302 | 527 | 302 |
| 8:00 | 436 | 278 | 436 | 278 |
| 8:15 | 398 | 247 | 398 | 247 |
| 8:30 | 437 | 193 | 437 | 193 |
| 8:45 | 405 | 216 | 405 | 216 |
| 9:00 | 345 | 176 | 345 | 176 |
| 9:15 | 349 | 161 | 349 | 161 |
| 9:30 | 351 | 154 | 351 | 154 |
| 9:45 | 319 | 115 | 319 | 115 |
| 10:00 | 312 | 113 | 312 | 113 |
| 10:15 | 305 | 117 | 305 | 117 |
| 10:30 | 320 | 91 | 320 | 91 |
| 10:45 | 314 | 108 | 314 | 108 |
| 11:00 | 336 | 77 | 336 | 77 |
| 11:15 | 321 | 91 | 321 | 91 |
| 11:30 | 336 | 63 | 336 | 63 |
| 11:45 | 368 | 59 | 368 | 59 |
| **Total** | **9317** | **16345** | **9317** | **16345** |
| **Day Total** | **25662** | | **25662** | |
| **Split** | 0.5700 | | 0.5700 | |
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 1823 | | 1823 | |
| AM PHF | 0.8648 | | 0.8648 | |
| PM Peak Hour | | 15:30 | | 15:30 |
| PM Peak Vol | | 2111 | | 2111 |
| PM PHF | | 0.9275 | | 0.9275 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400140
Duration: 24
Site Code: 3
TRA ID: 0400140
Location 1: INDIAN SCHOOL RD W. of SR-51 SB ON RAMP
Count Type: VOL
Direction: EB
Latitude: 33.49457
Longitude: -112.04629

| Date | 1/20/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 68 | 577 | 68 | 577 |
| 12:15 | 60 | 542 | 60 | 542 |
| 12:30 | 39 | 525 | 39 | 525 |
| 12:45 | 59 | 570 | 59 | 570 |
| 1:00 | 49 | 558 | 49 | 558 |
| 1:15 | 34 | 507 | 34 | 507 |
| 1:30 | 29 | 554 | 29 | 554 |
| 1:45 | 40 | 549 | 40 | 549 |
| 2:00 | 31 | 570 | 31 | 570 |
| 2:15 | 19 | 567 | 19 | 567 |
| 2:30 | 24 | 560 | 24 | 560 |
| 2:45 | 11 | 617 | 11 | 617 |
| 3:00 | 24 | 607 | 24 | 607 |
| 3:15 | 26 | 575 | 26 | 575 |
| 3:30 | 31 | 663 | 31 | 663 |
| 3:45 | 17 | 715 | 17 | 715 |
| 4:00 | 21 | 702 | 21 | 702 |
| 4:15 | 34 | 637 | 34 | 637 |
| 4:30 | 43 | 642 | 43 | 642 |
| 4:45 | 77 | 708 | 77 | 708 |
| 5:00 | 70 | 645 | 70 | 645 |
| 5:15 | 122 | 802 | 122 | 802 |
| 5:30 | 132 | 697 | 132 | 697 |
| 5:45 | 155 | 620 | 155 | 620 |
| 6:00 | 177 | 601 | 177 | 601 |
| 6:15 | 221 | 598 | 221 | 598 |
| 6:30 | 341 | 494 | 341 | 494 |
| 6:45 | 312 | 447 | 312 | 447 |
| 7:00 | 337 | 381 | 337 | 381 |
| 7:15 | 316 | 346 | 316 | 346 |
| 7:30 | 473 | 308 | 473 | 308 |
| 7:45 | 393 | 281 | 393 | 281 |
| 8:00 | 451 | 300 | 451 | 300 |
| 8:15 | 360 | 242 | 360 | 242 |
| 8:30 | 383 | 262 | 383 | 262 |
| 8:45 | 415 | 226 | 415 | 226 |
| 9:00 | 356 | 235 | 356 | 235 |
| 9:15 | 412 | 218 | 412 | 218 |
| 9:30 | 417 | 206 | 417 | 206 |
| 9:45 | 407 | 156 | 407 | 156 |
| 10:00 | 455 | 140 | 455 | 140 |
| 10:15 | 404 | 149 | 404 | 149 |
| 10:30 | 442 | 119 | 442 | 119 |
| 10:45 | 408 | 156 | 408 | 156 |
| 11:00 | 451 | 107 | 451 | 107 |
| 11:15 | 565 | 98 | 565 | 98 |
| 11:30 | 567 | 105 | 567 | 105 |
| 11:45 | 537 | 92 | 537 | 92 |
| **Total** | **10815** | **20976** | **10815** | **20976** |
| **Day Total** | **31791** | | **31791** | |
| **Split** | 0.5156 | | 0.5156 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:15 | | 11:15 | |
| AM Peak Vol | 2246 | | 2246 | |
| AM PHF | 0.9731 | | 0.9731 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 2852 | | 2852 |
| PM PHF | | 0.8890 | | 0.8890 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

| Site ID | File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0400125 | SR-51 NB OFF RAMP | S. of GLENDALE AVE | NB | 24 | 2/3/2004 | 0:00 | 8790 | 7:15 | 754 | 0.9472 | 15:00 | 639 | 0.9623 |
| 2 | 0400126 | SR-51 NB OFF RAMP-RT TURNS | S. of GLENDALE AVE | NB | 24 | 2/3/2004 | 0:00 | 3240 | 6:15 | 339 | 0.8737 | 13:30 | 238 | 0.8750 |
| 2 | 0400127 | GLENDALE AVE | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 2/3/2004 | 0:00 | 25584 | 7:15 | 3302 | 0.9723 | 17:00 | 1694 | 0.9691 |
| 2 | 0400128 | GLENDALE AVE | E. of SR-51 NB ON RAMP | WB | 24 | 2/3/2004 | 0:00 | 24184 | 8:00 | 1378 | 0.9211 | 17:15 | 2929 | 0.9803 |
| 2 | 0400129 | SR-51 SB OFF RAMP | N. of GLENDALE AVE | SB | 24 | 2/3/2004 | 0:00 | 13798 | 8:30 | 1708 | 0.9183 | 16:00 | 815 | 0.9178 |
| 2 | 0400130 | SR-51 SB OFF RAMP-RT TURNS | N. of GLENDALE AVE | SB | 24 | 2/3/2004 | 0:00 | 4317 | 8:30 | 462 | 0.7000 | 17:30 | 331 | 0.9298 |
| 2 | 0400131 | GLENDALE AVE | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 2/3/2004 | 0:00 | 20613 | 7:30 | 1419 | 0.8674 | 16:30 | 1910 | 0.9608 |
| 2 | 0400132 | GLENDALE AVE | W. of SR-51 SB ON RAMP | EB | 24 | 2/3/2004 | 0:00 | 24496 | 5:15 | 2231 | 0.9219 | 15:00 | 2041 | 0.9484 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400125
Duration: 24
Site Code: 2
TRA ID: 0400125
Location 1: SR-51 NB OFF RAMP S. of GLENDALE AVE
Count Type: VOL
Direction: NB
Latitude: 33.53799
Longitude: -112.04113

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 16 | 145 | 16 | 145 |
| 12:15 | 7 | 128 | 7 | 128 |
| 12:30 | 5 | 146 | 5 | 146 |
| 12:45 | 16 | 119 | 16 | 119 |
| 1:00 | 9 | 133 | 9 | 133 |
| 1:15 | 5 | 131 | 5 | 131 |
| 1:30 | 10 | 133 | 10 | 133 |
| 1:45 | 4 | 141 | 4 | 141 |
| 2:00 | 5 | 140 | 5 | 140 |
| 2:15 | 4 | 156 | 4 | 156 |
| 2:30 | 10 | 180 | 10 | 180 |
| 2:45 | 5 | 118 | 5 | 118 |
| 3:00 | 5 | 154 | 5 | 154 |
| 3:15 | 2 | 166 | 2 | 166 |
| 3:30 | 5 | 156 | 5 | 156 |
| 3:45 | 11 | 163 | 11 | 163 |
| 4:00 | 9 | 136 | 9 | 136 |
| 4:15 | 7 | 130 | 7 | 130 |
| 4:30 | 12 | 150 | 12 | 150 |
| 4:45 | 24 | 110 | 24 | 110 |
| 5:00 | 22 | 104 | 22 | 104 |
| 5:15 | 29 | 104 | 29 | 104 |
| 5:30 | 43 | 84 | 43 | 84 |
| 5:45 | 100 | 70 | 100 | 70 |
| 6:00 | 75 | 95 | 75 | 95 |
| 6:15 | 100 | 98 | 100 | 98 |
| 6:30 | 135 | 159 | 135 | 159 |
| 6:45 | 179 | 150 | 179 | 150 |
| 7:00 | 168 | 95 | 168 | 95 |
| 7:15 | 199 | 106 | 199 | 106 |
| 7:30 | 169 | 96 | 169 | 96 |
| 7:45 | 195 | 104 | 195 | 104 |
| 8:00 | 191 | 86 | 191 | 86 |
| 8:15 | 174 | 87 | 174 | 87 |
| 8:30 | 163 | 75 | 163 | 75 |
| 8:45 | 177 | 53 | 177 | 53 |
| 9:00 | 158 | 72 | 158 | 72 |
| 9:15 | 147 | 82 | 147 | 82 |
| 9:30 | 123 | 54 | 123 | 54 |
| 9:45 | 146 | 66 | 146 | 66 |
| 10:00 | 113 | 46 | 113 | 46 |
| 10:15 | 124 | 41 | 124 | 41 |
| 10:30 | 107 | 38 | 107 | 38 |
| 10:45 | 121 | 33 | 121 | 33 |
| 11:00 | 118 | 29 | 118 | 29 |
| 11:15 | 139 | 23 | 139 | 23 |
| 11:30 | 139 | 21 | 139 | 21 |
| 11:45 | 143 | 16 | 143 | 16 |
| **Total** | **3868** | **4922** | **3868** | **4922** |
| **Day Total** | **8790** | | **8790** | |
| **Split** | 0.7859 | | 0.7859 | |
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 754 | | 754 | |
| AM PHF | 0.9472 | | 0.9472 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 639 | | 639 |
| PM PHF | | 0.9623 | | 0.9623 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400126
Duration: 24
Site Code: 2
TRA ID: 0400126
Location 1: SR-51 NB OFF RAMP-RT TURNS S. of GLENDALE AVE
Count Type: VOL
Direction: NB
Latitude: 33.53611
Longitude: -112.04118

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 2 | 51 | 2 | 51 |
| 12:15 | 1 | 58 | 1 | 58 |
| 12:30 | 4 | 47 | 4 | 47 |
| 12:45 | 2 | 43 | 2 | 43 |
| 1:00 | 1 | 42 | 1 | 42 |
| 1:15 | 0 | 40 | 0 | 40 |
| 1:30 | 0 | 55 | 0 | 55 |
| 1:45 | 0 | 48 | 0 | 48 |
| 2:00 | 1 | 67 | 1 | 67 |
| 2:15 | 2 | 68 | 2 | 68 |
| 2:30 | 2 | 33 | 2 | 33 |
| 2:45 | 2 | 56 | 2 | 56 |
| 3:00 | 0 | 61 | 0 | 61 |
| 3:15 | 2 | 66 | 2 | 66 |
| 3:30 | 6 | 50 | 6 | 50 |
| 3:45 | 4 | 51 | 4 | 51 |
| 4:00 | 2 | 53 | 2 | 53 |
| 4:15 | 5 | 43 | 5 | 43 |
| 4:30 | 14 | 29 | 14 | 29 |
| 4:45 | 11 | 36 | 11 | 36 |
| 5:00 | 19 | 36 | 19 | 36 |
| 5:15 | 27 | 34 | 27 | 34 |
| 5:30 | 44 | 26 | 44 | 26 |
| 5:45 | 37 | 33 | 37 | 33 |
| 6:00 | 51 | 40 | 51 | 40 |
| 6:15 | 72 | 55 | 72 | 55 |
| 6:30 | 97 | 48 | 97 | 48 |
| 6:45 | 73 | 39 | 73 | 39 |
| 7:00 | 97 | 40 | 97 | 40 |
| 7:15 | 66 | 31 | 66 | 31 |
| 7:30 | 91 | 29 | 91 | 29 |
| 7:45 | 74 | 30 | 74 | 30 |
| 8:00 | 65 | 25 | 65 | 25 |
| 8:15 | 72 | 26 | 72 | 26 |
| 8:30 | 69 | 18 | 69 | 18 |
| 8:45 | 55 | 22 | 55 | 22 |
| 9:00 | 55 | 31 | 55 | 31 |
| 9:15 | 41 | 12 | 41 | 12 |
| 9:30 | 51 | 12 | 51 | 12 |
| 9:45 | 44 | 11 | 44 | 11 |
| 10:00 | 50 | 11 | 50 | 11 |
| 10:15 | 41 | 7 | 41 | 7 |
| 10:30 | 38 | 11 | 38 | 11 |
| 10:45 | 29 | 5 | 29 | 5 |
| 11:00 | 50 | 7 | 50 | 7 |
| 11:15 | 30 | 3 | 30 | 3 |
| 11:30 | 48 | 3 | 48 | 3 |
| 11:45 | 49 | 2 | 49 | 2 |
| **Total** | **1596** | **1644** | **1596** | **1644** |
| **Day Total** | **3240** | | **3240** | |
| **Split** | 0.9708 | | 0.9708 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 6:15 | | 6:15 | |
| AM Peak Vol | 339 | | 339 | |
| AM PHF | 0.8737 | | 0.8737 | |
| PM Peak Hour | | 13:30 | | 13:30 |
| PM Peak Vol | | 238 | | 238 |
| PM PHF | | 0.8750 | | 0.8750 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400127
Duration: 24
Site Code: 2
TRA ID: 0400127
Location 1: GLENDALE AVE BTWN SR-51 NB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: EB
Latitude: 33.53826
Longitude: -112.04119

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 18 | 303 | 18 | 303 |
| 12:15 | 16 | 341 | 16 | 341 |
| 12:30 | 15 | 345 | 15 | 345 |
| 12:45 | 6 | 385 | 6 | 385 |
| 1:00 | 15 | 326 | 15 | 326 |
| 1:15 | 18 | 316 | 18 | 316 |
| 1:30 | 8 | 297 | 8 | 297 |
| 1:45 | 10 | 302 | 10 | 302 |
| 2:00 | 2 | 337 | 2 | 337 |
| 2:15 | 4 | 340 | 4 | 340 |
| 2:30 | 6 | 342 | 6 | 342 |
| 2:45 | 5 | 347 | 5 | 347 |
| 3:00 | 7 | 339 | 7 | 339 |
| 3:15 | 5 | 368 | 5 | 368 |
| 3:30 | 9 | 379 | 9 | 379 |
| 3:45 | 11 | 397 | 11 | 397 |
| 4:00 | 14 | 393 | 14 | 393 |
| 4:15 | 53 | 403 | 53 | 403 |
| 4:30 | 58 | 404 | 58 | 404 |
| 4:45 | 71 | 406 | 71 | 406 |
| 5:00 | 66 | 417 | 66 | 417 |
| 5:15 | 99 | 427 | 99 | 427 |
| 5:30 | 151 | 413 | 151 | 413 |
| 5:45 | 254 | 437 | 254 | 437 |
| 6:00 | 232 | 343 | 232 | 343 |
| 6:15 | 386 | 308 | 386 | 308 |
| 6:30 | 480 | 330 | 480 | 330 |
| 6:45 | 693 | 307 | 693 | 307 |
| 7:00 | 721 | 218 | 721 | 218 |
| 7:15 | 814 | 185 | 814 | 185 |
| 7:30 | 849 | 181 | 849 | 181 |
| 7:45 | 801 | 184 | 801 | 184 |
| 8:00 | 838 | 162 | 838 | 162 |
| 8:15 | 683 | 156 | 683 | 156 |
| 8:30 | 720 | 142 | 720 | 142 |
| 8:45 | 736 | 137 | 736 | 137 |
| 9:00 | 631 | 125 | 631 | 125 |
| 9:15 | 531 | 117 | 531 | 117 |
| 9:30 | 407 | 112 | 407 | 112 |
| 9:45 | 340 | 102 | 340 | 102 |
| 10:00 | 353 | 107 | 353 | 107 |
| 10:15 | 304 | 74 | 304 | 74 |
| 10:30 | 321 | 83 | 321 | 83 |
| 10:45 | 261 | 63 | 261 | 63 |
| 11:00 | 259 | 44 | 259 | 44 |
| 11:15 | 324 | 42 | 324 | 42 |
| 11:30 | 340 | 27 | 340 | 27 |
| 11:45 | 297 | 29 | 297 | 29 |
| **Total** | **13242** | **12342** | **13242** | **12342** |
| **Day Total** | **25584** | | **25584** | |
| **Split** | 1.0729 | | 1.0729 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 3302 | | 3302 | |
| AM PHF | 0.9723 | | 0.9723 | |
| PM Peak Hour | | 17:00 | | 17:00 |
| PM Peak Vol | | 1694 | | 1694 |
| PM PHF | | 0.9691 | | 0.9691 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400128
Duration: 24
Site Code: 2
TRA ID: 0400128
Location 1: GLENDALE AVE E. of SR-51 NB ON RAMP
Count Type: VOL
Direction: WB
Latitude: 33.53845
Longitude: -112.03926

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 51 | 319 | 51 | 319 |
| 12:15 | 35 | 308 | 35 | 308 |
| 12:30 | 42 | 313 | 42 | 313 |
| 12:45 | 26 | 327 | 26 | 327 |
| 1:00 | 17 | 353 | 17 | 353 |
| 1:15 | 19 | 324 | 19 | 324 |
| 1:30 | 19 | 303 | 19 | 303 |
| 1:45 | 27 | 344 | 27 | 344 |
| 2:00 | 7 | 307 | 7 | 307 |
| 2:15 | 14 | 337 | 14 | 337 |
| 2:30 | 8 | 369 | 8 | 369 |
| 2:45 | 10 | 513 | 10 | 513 |
| 3:00 | 15 | 449 | 15 | 449 |
| 3:15 | 10 | 499 | 10 | 499 |
| 3:30 | 7 | 513 | 7 | 513 |
| 3:45 | 8 | 590 | 8 | 590 |
| 4:00 | 8 | 567 | 8 | 567 |
| 4:15 | 10 | 658 | 10 | 658 |
| 4:30 | 13 | 594 | 13 | 594 |
| 4:45 | 24 | 669 | 24 | 669 |
| 5:00 | 24 | 737 | 24 | 737 |
| 5:15 | 34 | 731 | 34 | 731 |
| 5:30 | 23 | 721 | 23 | 721 |
| 5:45 | 64 | 730 | 64 | 730 |
| 6:00 | 67 | 747 | 67 | 747 |
| 6:15 | 75 | 668 | 75 | 668 |
| 6:30 | 127 | 510 | 127 | 510 |
| 6:45 | 158 | 439 | 158 | 439 |
| 7:00 | 207 | 339 | 207 | 339 |
| 7:15 | 244 | 267 | 244 | 267 |
| 7:30 | 292 | 255 | 292 | 255 |
| 7:45 | 356 | 225 | 356 | 225 |
| 8:00 | 374 | 183 | 374 | 183 |
| 8:15 | 301 | 180 | 301 | 180 |
| 8:30 | 341 | 198 | 341 | 198 |
| 8:45 | 362 | 177 | 362 | 177 |
| 9:00 | 312 | 191 | 312 | 191 |
| 9:15 | 288 | 205 | 288 | 205 |
| 9:30 | 291 | 223 | 291 | 223 |
| 9:45 | 290 | 159 | 290 | 159 |
| 10:00 | 305 | 148 | 305 | 148 |
| 10:15 | 260 | 144 | 260 | 144 |
| 10:30 | 292 | 148 | 292 | 148 |
| 10:45 | 260 | 106 | 260 | 106 |
| 11:00 | 259 | 73 | 259 | 73 |
| 11:15 | 285 | 70 | 285 | 70 |
| 11:30 | 262 | 83 | 262 | 83 |
| 11:45 | 303 | 45 | 303 | 45 |
| **Total** | **6826** | **17358** | **6826** | **17358** |
| **Day Total** | **24184** | | **24184** | |
| **Split** | 0.3932 | | 0.3932 | |
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 1378 | | 1378 | |
| AM PHF | 0.9211 | | 0.9211 | |
| PM Peak Hour | | 17:15 | | 17:15 |
| PM Peak Vol | | 2929 | | 2929 |
| PM PHF | | 0.9803 | | 0.9803 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400129
Duration: 24
Site Code: 2
TRA ID: 0400129
Location 1: SR-51 SB OFF RAMP N. of GLENDALE AVE
Count Type: VOL
Direction: SB
Latitude: 33.54078
Longitude: -112.04140

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 11 | 158 | 11 | 158 |
| 12:15 | 14 | 183 | 14 | 183 |
| 12:30 | 9 | 198 | 9 | 198 |
| 12:45 | 16 | 183 | 16 | 183 |
| 1:00 | 9 | 167 | 9 | 167 |
| 1:15 | 11 | 139 | 11 | 139 |
| 1:30 | 4 | 141 | 4 | 141 |
| 1:45 | 4 | 139 | 4 | 139 |
| 2:00 | 4 | 170 | 4 | 170 |
| 2:15 | 8 | 166 | 8 | 166 |
| 2:30 | 3 | 183 | 3 | 183 |
| 2:45 | 2 | 206 | 2 | 206 |
| 3:00 | 11 | 176 | 11 | 176 |
| 3:15 | 4 | 202 | 4 | 202 |
| 3:30 | 6 | 173 | 6 | 173 |
| 3:45 | 3 | 198 | 3 | 198 |
| 4:00 | 5 | 222 | 5 | 222 |
| 4:15 | 24 | 205 | 24 | 205 |
| 4:30 | 28 | 182 | 28 | 182 |
| 4:45 | 28 | 206 | 28 | 206 |
| 5:00 | 29 | 206 | 29 | 206 |
| 5:15 | 43 | 181 | 43 | 181 |
| 5:30 | 59 | 216 | 59 | 216 |
| 5:45 | 111 | 193 | 111 | 193 |
| 6:00 | 110 | 162 | 110 | 162 |
| 6:15 | 218 | 176 | 218 | 176 |
| 6:30 | 243 | 168 | 243 | 168 |
| 6:45 | 411 | 157 | 411 | 157 |
| 7:00 | 429 | 110 | 429 | 110 |
| 7:15 | 445 | 118 | 445 | 118 |
| 7:30 | 367 | 116 | 367 | 116 |
| 7:45 | 406 | 77 | 406 | 77 |
| 8:00 | 400 | 93 | 400 | 93 |
| 8:15 | 399 | 103 | 399 | 103 |
| 8:30 | 401 | 76 | 401 | 76 |
| 8:45 | 403 | 76 | 403 | 76 |
| 9:00 | 465 | 77 | 465 | 77 |
| 9:15 | 439 | 83 | 439 | 83 |
| 9:30 | 247 | 92 | 247 | 92 |
| 9:45 | 226 | 59 | 226 | 59 |
| 10:00 | 167 | 73 | 167 | 73 |
| 10:15 | 154 | 62 | 154 | 62 |
| 10:30 | 179 | 52 | 179 | 52 |
| 10:45 | 139 | 37 | 139 | 37 |
| 11:00 | 145 | 33 | 145 | 33 |
| 11:15 | 149 | 28 | 149 | 28 |
| 11:30 | 177 | 21 | 177 | 21 |
| 11:45 | 160 | 31 | 160 | 31 |
| **Total** | **7325** | **6473** | **7325** | **6473** |
| **Day Total** | **13798** | | **13798** | |
| **Split** | 1.1316 | | 1.1316 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 8:30 | | 8:30 | |
| AM Peak Vol | 1708 | | 1708 | |
| AM PHF | 0.9183 | | 0.9183 | |
| PM Peak Hour | | 16:00 | | 16:00 |
| PM Peak Vol | | 815 | | 815 |
| PM PHF | | 0.9178 | | 0.9178 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400130
Duration: 24
Site Code: 2
TRA ID: 0400130
Location 1: SR-51 SB OFF RAMP-RT TURNS N. of GLENDALE AVE
Count Type: VOL
Direction: SB
Latitude: 33.53866
Longitude: -112.04196

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 3 | 53 | 3 | 53 |
| 12:15 | 9 | 60 | 9 | 60 |
| 12:30 | 1 | 86 | 1 | 86 |
| 12:45 | 9 | 56 | 9 | 56 |
| 1:00 | 7 | 58 | 7 | 58 |
| 1:15 | 4 | 47 | 4 | 47 |
| 1:30 | 4 | 56 | 4 | 56 |
| 1:45 | 3 | 66 | 3 | 66 |
| 2:00 | 3 | 54 | 3 | 54 |
| 2:15 | 6 | 60 | 6 | 60 |
| 2:30 | 3 | 75 | 3 | 75 |
| 2:45 | 1 | 102 | 1 | 102 |
| 3:00 | 1 | 77 | 1 | 77 |
| 3:15 | 0 | 68 | 0 | 68 |
| 3:30 | 1 | 69 | 1 | 69 |
| 3:45 | 1 | 74 | 1 | 74 |
| 4:00 | 1 | 73 | 1 | 73 |
| 4:15 | 5 | 86 | 5 | 86 |
| 4:30 | 4 | 63 | 4 | 63 |
| 4:45 | 10 | 68 | 10 | 68 |
| 5:00 | 5 | 77 | 5 | 77 |
| 5:15 | 12 | 60 | 12 | 60 |
| 5:30 | 8 | 89 | 8 | 89 |
| 5:45 | 14 | 84 | 14 | 84 |
| 6:00 | 19 | 73 | 19 | 73 |
| 6:15 | 17 | 85 | 17 | 85 |
| 6:30 | 0 | 67 | 0 | 67 |
| 6:45 | 20 | 73 | 20 | 73 |
| 7:00 | 97 | 45 | 97 | 45 |
| 7:15 | 95 | 50 | 95 | 50 |
| 7:30 | 89 | 54 | 89 | 54 |
| 7:45 | 76 | 27 | 76 | 27 |
| 8:00 | 78 | 28 | 78 | 28 |
| 8:15 | 75 | 45 | 75 | 45 |
| 8:30 | 95 | 37 | 95 | 37 |
| 8:45 | 86 | 35 | 86 | 35 |
| 9:00 | 116 | 28 | 116 | 28 |
| 9:15 | 165 | 35 | 165 | 35 |
| 9:30 | 84 | 40 | 84 | 40 |
| 9:45 | 71 | 19 | 71 | 19 |
| 10:00 | 51 | 30 | 51 | 30 |
| 10:15 | 47 | 23 | 47 | 23 |
| 10:30 | 61 | 23 | 61 | 23 |
| 10:45 | 64 | 18 | 64 | 18 |
| 11:00 | 66 | 18 | 66 | 18 |
| 11:15 | 56 | 13 | 56 | 13 |
| 11:30 | 55 | 9 | 55 | 9 |
| 11:45 | 68 | 15 | 68 | 15 |
| **Total** | **1766** | **2551** | **1766** | **2551** |
| **Day Total** | **4317** | | **4317** | |
| **Split** | 0.6923 | | 0.6923 | |
| AM Peak Hour | 8:30 | | 8:30 | |
| AM Peak Vol | 462 | | 462 | |
| AM PHF | 0.7000 | | 0.7000 | |
| PM Peak Hour | | 17:30 | | 17:30 |
| PM Peak Vol | | 331 | | 331 |
| PM PHF | | 0.9298 | | 0.9298 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400131
Duration: 24
Site Code: 2
TRA ID: 0400131
Location 1: GLENDALE AVE BTWN SR-51 SB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: WB
Latitude: 33.53835
Longitude: -112.04198

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 35 | 292 | 35 | 292 |
| 12:15 | 33 | 282 | 33 | 282 |
| 12:30 | 24 | 306 | 24 | 306 |
| 12:45 | 25 | 289 | 25 | 289 |
| 1:00 | 18 | 344 | 18 | 344 |
| 1:15 | 24 | 349 | 24 | 349 |
| 1:30 | 28 | 340 | 28 | 340 |
| 1:45 | 11 | 304 | 11 | 304 |
| 2:00 | 10 | 325 | 10 | 325 |
| 2:15 | 6 | 298 | 6 | 298 |
| 2:30 | 17 | 445 | 17 | 445 |
| 2:45 | 19 | 383 | 19 | 383 |
| 3:00 | 11 | 398 | 11 | 398 |
| 3:15 | 9 | 426 | 9 | 426 |
| 3:30 | 9 | 420 | 9 | 420 |
| 3:45 | 6 | 463 | 6 | 463 |
| 4:00 | 9 | 462 | 9 | 462 |
| 4:15 | 13 | 412 | 13 | 412 |
| 4:30 | 30 | 478 | 30 | 478 |
| 4:45 | 23 | 476 | 23 | 476 |
| 5:00 | 39 | 459 | 39 | 459 |
| 5:15 | 27 | 497 | 27 | 497 |
| 5:30 | 46 | 466 | 46 | 466 |
| 5:45 | 99 | 469 | 99 | 469 |
| 6:00 | 91 | 407 | 91 | 407 |
| 6:15 | 140 | 358 | 140 | 358 |
| 6:30 | 174 | 352 | 174 | 352 |
| 6:45 | 212 | 337 | 212 | 337 |
| 7:00 | 245 | 227 | 245 | 227 |
| 7:15 | 296 | 252 | 296 | 252 |
| 7:30 | 358 | 205 | 358 | 205 |
| 7:45 | 409 | 185 | 409 | 185 |
| 8:00 | 314 | 171 | 314 | 171 |
| 8:15 | 338 | 168 | 338 | 168 |
| 8:30 | 305 | 161 | 305 | 161 |
| 8:45 | 315 | 132 | 315 | 132 |
| 9:00 | 285 | 166 | 285 | 166 |
| 9:15 | 281 | 212 | 281 | 212 |
| 9:30 | 264 | 154 | 264 | 154 |
| 9:45 | 275 | 148 | 275 | 148 |
| 10:00 | 246 | 116 | 246 | 116 |
| 10:15 | 239 | 106 | 239 | 106 |
| 10:30 | 235 | 100 | 235 | 100 |
| 10:45 | 225 | 77 | 225 | 77 |
| 11:00 | 288 | 69 | 288 | 69 |
| 11:15 | 263 | 67 | 263 | 67 |
| 11:30 | 286 | 49 | 286 | 49 |
| 11:45 | 311 | 45 | 311 | 45 |
| **Total** | **6966** | **13647** | **6966** | **13647** |
| **Day Total** | **20613** | | **20613** | |
| **Split** | 0.5104 | | 0.5104 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 1419 | | 1419 | |
| AM PHF | 0.8674 | | 0.8674 | |
| PM Peak Hour | | 16:30 | | 16:30 |
| PM Peak Vol | | 1910 | | 1910 |
| PM PHF | | 0.9608 | | 0.9608 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400132
Duration: 24
Site Code: 2
TRA ID: 0400132
Location 1: GLENDALE AVE W. of SR-51 SB ON RAMP
Count Type: VOL
Direction: EB
Latitude: 33.53816
Longitude: -112.04301

| Date | 2/3/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 13 | 362 | 13 | 362 |
| 12:15 | 4 | 340 | 4 | 340 |
| 12:30 | 10 | 363 | 10 | 363 |
| 12:45 | 8 | 364 | 8 | 364 |
| 1:00 | 6 | 429 | 6 | 429 |
| 1:15 | 5 | 395 | 5 | 395 |
| 1:30 | 9 | 455 | 9 | 455 |
| 1:45 | 11 | 419 | 11 | 419 |
| 2:00 | 26 | 441 | 26 | 441 |
| 2:15 | 40 | 476 | 40 | 476 |
| 2:30 | 47 | 457 | 47 | 457 |
| 2:45 | 69 | 497 | 69 | 497 |
| 3:00 | 69 | 519 | 69 | 519 |
| 3:15 | 117 | 538 | 117 | 538 |
| 3:30 | 178 | 483 | 178 | 483 |
| 3:45 | 201 | 501 | 201 | 501 |
| 4:00 | 218 | 426 | 218 | 426 |
| 4:15 | 297 | 383 | 297 | 383 |
| 4:30 | 449 | 382 | 449 | 382 |
| 4:45 | 478 | 302 | 478 | 302 |
| 5:00 | 464 | 263 | 464 | 263 |
| 5:15 | 566 | 201 | 566 | 201 |
| 5:30 | 605 | 198 | 605 | 198 |
| 5:45 | 529 | 170 | 529 | 170 |
| 6:00 | 531 | 179 | 531 | 179 |
| 6:15 | 524 | 164 | 524 | 164 |
| 6:30 | 524 | 176 | 524 | 176 |
| 6:45 | 487 | 188 | 487 | 188 |
| 7:00 | 395 | 150 | 395 | 150 |
| 7:15 | 375 | 124 | 375 | 124 |
| 7:30 | 332 | 101 | 332 | 101 |
| 7:45 | 349 | 78 | 349 | 78 |
| 8:00 | 331 | 96 | 331 | 96 |
| 8:15 | 311 | 77 | 311 | 77 |
| 8:30 | 339 | 94 | 339 | 94 |
| 8:45 | 279 | 72 | 279 | 72 |
| 9:00 | 313 | 49 | 313 | 49 |
| 9:15 | 350 | 57 | 350 | 57 |
| 9:30 | 320 | 41 | 320 | 41 |
| 9:45 | 327 | 37 | 327 | 37 |
| 10:00 | 346 | 31 | 346 | 31 |
| 10:15 | 304 | 38 | 304 | 38 |
| 10:30 | 368 | 24 | 368 | 24 |
| 10:45 | 358 | 24 | 358 | 24 |
| 11:00 | 352 | 12 | 352 | 12 |
| 11:15 | 329 | 26 | 329 | 26 |
| 11:30 | 370 | 17 | 370 | 17 |
| 11:45 | 329 | 15 | 329 | 15 |
| **Total** | **13262** | **11234** | **13262** | **11234** |
| **Day Total** | **24496** | | **24496** | |
| **Split** | 1.1805 | | 1.1805 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 5:15 | | 5:15 | |
| AM Peak Vol | 2231 | | 2231 | |
| AM PHF | 0.9219 | | 0.9219 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 2041 | | 2041 |
| PM PHF | | 0.9484 | | 0.9484 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400141 | SR-51 NB OFF RAMP | S. of CACTUS RD | NB | 24 | 1/21/2004 | 0:00 | 11284 | 11:45 | 675 | 0.8789 | 17:00 | 999 | 0.9182 |
| 0400142 | SR-51 NB OFF RAMP-RT TURNS | S. of CACTUS RD | NB | 24 | 1/21/2004 | 0:00 | 6296 | 11:45 | 407 | 0.8479 | 17:45 | 576 | 0.9412 |
| 0400143 | CACTUS RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/21/2004 | 0:00 | 20258 | 7:30 | 1881 | 0.8644 | 16:45 | 1690 | 0.9431 |
| 0400144 | CACTUS RD | E. of SR-51 NB ON RAMP | WB | 24 | 1/21/2004 | 0:00 | 22398 | 7:00 | 1310 | 0.9411 | 16:45 | 2013 | 0.9051 |
| 0400145 | SR-51 SB OFF RAMPS | N. of CACTUS RD | SB | 24 | 1/21/2004 | 0:00 | 9483 | 7:30 | 1029 | 0.8272 | 16:45 | 788 | 0.9752 |
| 0400146 | SR-51 SB OFF RAMPS-RT TURNS | N. of CACTUS RD | SB | 24 | 1/21/2004 | 0:00 | 4475 | 7:30 | 505 | 0.8417 | 15:15 | 384 | 0.8205 |
| 0400147 | CACTUS RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/21/2004 | 0:00 | 17505 | 11:45 | 1011 | 0.9258 | 16:45 | 1646 | 0.9395 |
| 0400148 | CACTUS RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/21/2004 | 0:00 | 23799 | 7:15 | 1934 | 0.9536 | 17:00 | 1963 | 0.9474 |

11111

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400141
Duration: 24
Site Code: 4
TRA ID: 0400141
Location 1: SR-51 NB OFF RAMP S. of CACTUS RD
Count Type: VOL
Direction: NB
Latitude: 33.59393
Longitude: -112.00919

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 26 | 151 | 26 | 151 |
| 12:15 | 25 | 192 | 25 | 192 |
| 12:30 | 15 | 153 | 15 | 153 |
| 12:45 | 20 | 199 | 20 | 199 |
| 1:00 | 12 | 135 | 12 | 135 |
| 1:15 | 19 | 137 | 19 | 137 |
| 1:30 | 10 | 192 | 10 | 192 |
| 1:45 | 16 | 211 | 16 | 211 |
| 2:00 | 6 | 221 | 6 | 221 |
| 2:15 | 10 | 205 | 10 | 205 |
| 2:30 | 6 | 227 | 6 | 227 |
| 2:45 | 7 | 213 | 7 | 213 |
| 3:00 | 6 | 221 | 6 | 221 |
| 3:15 | 7 | 239 | 7 | 239 |
| 3:30 | 4 | 200 | 4 | 200 |
| 3:45 | 5 | 233 | 5 | 233 |
| 4:00 | 10 | 273 | 10 | 273 |
| 4:15 | 5 | 240 | 5 | 240 |
| 4:30 | 10 | 218 | 10 | 218 |
| 4:45 | 28 | 240 | 28 | 240 |
| 5:00 | 16 | 272 | 16 | 272 |
| 5:15 | 21 | 242 | 21 | 242 |
| 5:30 | 27 | 243 | 27 | 243 |
| 5:45 | 55 | 242 | 55 | 242 |
| 6:00 | 48 | 216 | 48 | 216 |
| 6:15 | 68 | 240 | 68 | 240 |
| 6:30 | 92 | 266 | 92 | 266 |
| 6:45 | 123 | 207 | 123 | 207 |
| 7:00 | 102 | 176 | 102 | 176 |
| 7:15 | 130 | 148 | 130 | 148 |
| 7:30 | 136 | 119 | 136 | 119 |
| 7:45 | 160 | 132 | 160 | 132 |
| 8:00 | 121 | 116 | 121 | 116 |
| 8:15 | 159 | 112 | 159 | 112 |
| 8:30 | 144 | 98 | 144 | 98 |
| 8:45 | 143 | 98 | 143 | 98 |
| 9:00 | 135 | 73 | 135 | 73 |
| 9:15 | 142 | 96 | 142 | 96 |
| 9:30 | 151 | 86 | 151 | 86 |
| 9:45 | 134 | 62 | 134 | 62 |
| 10:00 | 122 | 73 | 122 | 73 |
| 10:15 | 135 | 67 | 135 | 67 |
| 10:30 | 138 | 72 | 138 | 72 |
| 10:45 | 155 | 41 | 155 | 41 |
| 11:00 | 144 | 32 | 144 | 32 |
| 11:15 | 167 | 38 | 167 | 38 |
| 11:30 | 149 | 40 | 149 | 40 |
| 11:45 | 179 | 34 | 179 | 34 |
| **Total** | **3543** | **7741** | **3543** | **7741** |
| **Day Total** | **11284** | | **11284** | |
| **Split** | 0.4577 | | 0.4577 | |
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 675 | | 675 | |
| AM PHF | 0.8789 | | 0.8789 | |
| PM Peak Hour | | 17:00 | | 17:00 |
| PM Peak Vol | | 999 | | 999 |
| PM PHF | | 0.9182 | | 0.9182 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400142
Duration: 24
Site Code: 4
TRA ID: 0400142
Location 1: SR-51 NB OFF RAMP-RT TURNS S. of CACTUS RD
Count Type: VOL
Direction: NB
Latitude: 33.59666
Longitude: -112.00895

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 7 | 76 | 7 | 76 |
| 12:15 | 13 | 110 | 13 | 110 |
| 12:30 | 5 | 101 | 5 | 101 |
| 12:45 | 6 | 109 | 6 | 109 |
| 1:00 | 5 | 66 | 5 | 66 |
| 1:15 | 8 | 76 | 8 | 76 |
| 1:30 | 7 | 102 | 7 | 102 |
| 1:45 | 8 | 106 | 8 | 106 |
| 2:00 | 2 | 119 | 2 | 119 |
| 2:15 | 8 | 121 | 8 | 121 |
| 2:30 | 2 | 121 | 2 | 121 |
| 2:45 | 3 | 107 | 3 | 107 |
| 3:00 | 2 | 127 | 2 | 127 |
| 3:15 | 3 | 124 | 3 | 124 |
| 3:30 | 3 | 112 | 3 | 112 |
| 3:45 | 0 | 119 | 0 | 119 |
| 4:00 | 2 | 131 | 2 | 131 |
| 4:15 | 5 | 135 | 5 | 135 |
| 4:30 | 5 | 123 | 5 | 123 |
| 4:45 | 17 | 125 | 17 | 125 |
| 5:00 | 10 | 151 | 10 | 151 |
| 5:15 | 15 | 144 | 15 | 144 |
| 5:30 | 19 | 137 | 19 | 137 |
| 5:45 | 40 | 142 | 40 | 142 |
| 6:00 | 31 | 129 | 31 | 129 |
| 6:15 | 47 | 152 | 47 | 152 |
| 6:30 | 54 | 153 | 54 | 153 |
| 6:45 | 85 | 90 | 85 | 90 |
| 7:00 | 62 | 90 | 62 | 90 |
| 7:15 | 90 | 84 | 90 | 84 |
| 7:30 | 79 | 57 | 79 | 57 |
| 7:45 | 105 | 71 | 105 | 71 |
| 8:00 | 75 | 48 | 75 | 48 |
| 8:15 | 100 | 51 | 100 | 51 |
| 8:30 | 91 | 52 | 91 | 52 |
| 8:45 | 95 | 54 | 95 | 54 |
| 9:00 | 82 | 35 | 82 | 35 |
| 9:15 | 74 | 36 | 74 | 36 |
| 9:30 | 86 | 40 | 86 | 40 |
| 9:45 | 74 | 29 | 74 | 29 |
| 10:00 | 70 | 41 | 70 | 41 |
| 10:15 | 78 | 32 | 78 | 32 |
| 10:30 | 88 | 35 | 88 | 35 |
| 10:45 | 93 | 20 | 93 | 20 |
| 11:00 | 79 | 16 | 79 | 16 |
| 11:15 | 107 | 16 | 107 | 16 |
| 11:30 | 93 | 9 | 93 | 9 |
| 11:45 | 120 | 19 | 120 | 19 |
| **Total** | **2153** | **4143** | **2153** | **4143** |
| **Day Total** | **6296** | | **6296** | |
| **Split** | 0.5197 | | 0.5197 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 407 | | 407 | |
| AM PHF | 0.8479 | | 0.8479 | |
| PM Peak Hour | | 17:45 | | 17:45 |
| PM Peak Vol | | 576 | | 576 |
| PM PHF | | 0.9412 | | 0.9412 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400143
Duration: 24
Site Code: 4
TRA ID: 0400143
Location 1: CACTUS RD BTWN SR-51 NB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: EB
Latitude: 33.59691
Longitude: -112.00904

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 27 | 295 | 27 | 295 |
| 12:15 | 26 | 273 | 26 | 273 |
| 12:30 | 19 | 311 | 19 | 311 |
| 12:45 | 27 | 290 | 27 | 290 |
| 1:00 | 21 | 274 | 21 | 274 |
| 1:15 | 21 | 242 | 21 | 242 |
| 1:30 | 20 | 299 | 20 | 299 |
| 1:45 | 16 | 292 | 16 | 292 |
| 2:00 | 12 | 285 | 12 | 285 |
| 2:15 | 11 | 308 | 11 | 308 |
| 2:30 | 10 | 341 | 10 | 341 |
| 2:45 | 9 | 332 | 9 | 332 |
| 3:00 | 9 | 307 | 9 | 307 |
| 3:15 | 16 | 322 | 16 | 322 |
| 3:30 | 11 | 333 | 11 | 333 |
| 3:45 | 9 | 345 | 9 | 345 |
| 4:00 | 13 | 354 | 13 | 354 |
| 4:15 | 13 | 355 | 13 | 355 |
| 4:30 | 30 | 355 | 30 | 355 |
| 4:45 | 56 | 448 | 56 | 448 |
| 5:00 | 40 | 393 | 40 | 393 |
| 5:15 | 70 | 443 | 70 | 443 |
| 5:30 | 96 | 406 | 96 | 406 |
| 5:45 | 129 | 431 | 129 | 431 |
| 6:00 | 149 | 363 | 149 | 363 |
| 6:15 | 175 | 319 | 175 | 319 |
| 6:30 | 269 | 309 | 269 | 309 |
| 6:45 | 312 | 321 | 312 | 321 |
| 7:00 | 319 | 270 | 319 | 270 |
| 7:15 | 375 | 211 | 375 | 211 |
| 7:30 | 461 | 157 | 461 | 157 |
| 7:45 | 544 | 173 | 544 | 173 |
| 8:00 | 434 | 168 | 434 | 168 |
| 8:15 | 442 | 153 | 442 | 153 |
| 8:30 | 389 | 178 | 389 | 178 |
| 8:45 | 389 | 134 | 389 | 134 |
| 9:00 | 269 | 170 | 269 | 170 |
| 9:15 | 285 | 139 | 285 | 139 |
| 9:30 | 296 | 144 | 296 | 144 |
| 9:45 | 313 | 112 | 313 | 112 |
| 10:00 | 274 | 127 | 274 | 127 |
| 10:15 | 256 | 91 | 256 | 91 |
| 10:30 | 227 | 66 | 227 | 66 |
| 10:45 | 292 | 54 | 292 | 54 |
| 11:00 | 308 | 43 | 308 | 43 |
| 11:15 | 307 | 38 | 307 | 38 |
| 11:30 | 277 | 49 | 277 | 49 |
| 11:45 | 339 | 23 | 339 | 23 |
| **Total** | **8412** | **11846** | **8412** | **11846** |
| **Day Total** | **20258** | | **20258** | |
| **Split** | 0.7101 | | 0.7101 | |
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 1881 | | 1881 | |
| AM PHF | 0.8644 | | 0.8644 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 1690 | | 1690 |
| PM PHF | | 0.9431 | | 0.9431 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400144
Duration: 24
Site Code: 4
TRA ID: 0400144
Location 1: CACTUS RD E. of SR-51 NB ON RAMP
Count Type: VOL
Direction: WB
Latitude: 33.59720
Longitude: -112.00584

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 45 | 306 | 45 | 306 |
| 12:15 | 39 | 357 | 39 | 357 |
| 12:30 | 19 | 329 | 19 | 329 |
| 12:45 | 30 | 387 | 30 | 387 |
| 1:00 | 27 | 350 | 27 | 350 |
| 1:15 | 24 | 393 | 24 | 393 |
| 1:30 | 14 | 356 | 14 | 356 |
| 1:45 | 18 | 383 | 18 | 383 |
| 2:00 | 17 | 381 | 17 | 381 |
| 2:15 | 18 | 378 | 18 | 378 |
| 2:30 | 14 | 404 | 14 | 404 |
| 2:45 | 10 | 434 | 10 | 434 |
| 3:00 | 10 | 339 | 10 | 339 |
| 3:15 | 13 | 469 | 13 | 469 |
| 3:30 | 18 | 417 | 18 | 417 |
| 3:45 | 12 | 431 | 12 | 431 |
| 4:00 | 8 | 461 | 8 | 461 |
| 4:15 | 16 | 478 | 16 | 478 |
| 4:30 | 44 | 407 | 44 | 407 |
| 4:45 | 37 | 461 | 37 | 461 |
| 5:00 | 51 | 504 | 51 | 504 |
| 5:15 | 55 | 492 | 55 | 492 |
| 5:30 | 96 | 556 | 96 | 556 |
| 5:45 | 107 | 441 | 107 | 441 |
| 6:00 | 129 | 453 | 129 | 453 |
| 6:15 | 183 | 451 | 183 | 451 |
| 6:30 | 240 | 313 | 240 | 313 |
| 6:45 | 227 | 315 | 227 | 315 |
| 7:00 | 312 | 341 | 312 | 341 |
| 7:15 | 348 | 284 | 348 | 284 |
| 7:30 | 327 | 221 | 327 | 221 |
| 7:45 | 323 | 258 | 323 | 258 |
| 8:00 | 304 | 213 | 304 | 213 |
| 8:15 | 326 | 233 | 326 | 233 |
| 8:30 | 317 | 238 | 317 | 238 |
| 8:45 | 296 | 208 | 296 | 208 |
| 9:00 | 283 | 291 | 283 | 291 |
| 9:15 | 271 | 256 | 271 | 256 |
| 9:30 | 268 | 198 | 268 | 198 |
| 9:45 | 235 | 148 | 235 | 148 |
| 10:00 | 269 | 153 | 269 | 153 |
| 10:15 | 257 | 129 | 257 | 129 |
| 10:30 | 242 | 130 | 242 | 130 |
| 10:45 | 267 | 94 | 267 | 94 |
| 11:00 | 306 | 53 | 306 | 53 |
| 11:15 | 291 | 56 | 291 | 56 |
| 11:30 | 285 | 45 | 285 | 45 |
| 11:45 | 313 | 42 | 313 | 42 |
| **Total** | **7361** | **15037** | **7361** | **15037** |
| **Day Total** | **22398** | | **22398** | |
| **Split** | 0.4895 | | 0.4895 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:00 | | 7:00 | |
| AM Peak Vol | 1310 | | 1310 | |
| AM PHF | 0.9411 | | 0.9411 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 2013 | | 2013 |
| PM PHF | | 0.9051 | | 0.9051 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400145
Duration: 24
Site Code: 4
TRA ID: 0400145
Location 1: SR-51 SB OFF RAMPS N. of CACTUS RD
Count Type: VOL
Direction: SB
Latitude: 33.60019
Longitude: -112.00975

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 13 | 144 | 13 | 144 |
| 12:15 | 18 | 130 | 18 | 130 |
| 12:30 | 22 | 129 | 22 | 129 |
| 12:45 | 11 | 116 | 11 | 116 |
| 1:00 | 8 | 132 | 8 | 132 |
| 1:15 | 11 | 123 | 11 | 123 |
| 1:30 | 10 | 120 | 10 | 120 |
| 1:45 | 7 | 154 | 7 | 154 |
| 2:00 | 5 | 138 | 5 | 138 |
| 2:15 | 8 | 162 | 8 | 162 |
| 2:30 | 3 | 148 | 3 | 148 |
| 2:45 | 6 | 165 | 6 | 165 |
| 3:00 | 5 | 141 | 5 | 141 |
| 3:15 | 12 | 175 | 12 | 175 |
| 3:30 | 4 | 184 | 4 | 184 |
| 3:45 | 5 | 202 | 5 | 202 |
| 4:00 | 6 | 142 | 6 | 142 |
| 4:15 | 6 | 181 | 6 | 181 |
| 4:30 | 14 | 159 | 14 | 159 |
| 4:45 | 17 | 202 | 17 | 202 |
| 5:00 | 26 | 187 | 26 | 187 |
| 5:15 | 21 | 199 | 21 | 199 |
| 5:30 | 28 | 200 | 28 | 200 |
| 5:45 | 66 | 176 | 66 | 176 |
| 6:00 | 48 | 166 | 48 | 166 |
| 6:15 | 54 | 150 | 54 | 150 |
| 6:30 | 59 | 129 | 59 | 129 |
| 6:45 | 94 | 149 | 94 | 149 |
| 7:00 | 129 | 117 | 129 | 117 |
| 7:15 | 180 | 101 | 180 | 101 |
| 7:30 | 263 | 93 | 263 | 93 |
| 7:45 | 311 | 92 | 311 | 92 |
| 8:00 | 177 | 82 | 177 | 82 |
| 8:15 | 278 | 90 | 278 | 90 |
| 8:30 | 199 | 74 | 199 | 74 |
| 8:45 | 139 | 78 | 139 | 78 |
| 9:00 | 137 | 78 | 137 | 78 |
| 9:15 | 110 | 67 | 110 | 67 |
| 9:30 | 98 | 72 | 98 | 72 |
| 9:45 | 145 | 73 | 145 | 73 |
| 10:00 | 112 | 56 | 112 | 56 |
| 10:15 | 110 | 62 | 110 | 62 |
| 10:30 | 123 | 44 | 123 | 44 |
| 10:45 | 141 | 29 | 141 | 29 |
| 11:00 | 118 | 39 | 118 | 39 |
| 11:15 | 129 | 32 | 129 | 32 |
| 11:30 | 120 | 27 | 120 | 27 |
| 11:45 | 155 | 13 | 155 | 13 |
| **Total** | **3761** | **5722** | **3761** | **5722** |
| **Day Total** | **9483** | | **9483** | |
| **Split** | 0.6573 | | 0.6573 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 1029 | | 1029 | |
| AM PHF | 0.8272 | | 0.8272 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 788 | | 788 |
| PM PHF | | 0.9752 | | 0.9752 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400146
Duration: 24
Site Code: 4
TRA ID: 0400146
Location 1: SR-51 SB OFF RAMPS-RT TURNS N. of CACTUS RD
Count Type: VOL
Direction: SB
Latitude: 33.59747
Longitude: -112.01011

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 8 | 69 | 8 | 69 |
| 12:15 | 11 | 69 | 11 | 69 |
| 12:30 | 13 | 47 | 13 | 47 |
| 12:45 | 6 | 44 | 6 | 44 |
| 1:00 | 2 | 60 | 2 | 60 |
| 1:15 | 8 | 52 | 8 | 52 |
| 1:30 | 6 | 47 | 6 | 47 |
| 1:45 | 3 | 75 | 3 | 75 |
| 2:00 | 3 | 70 | 3 | 70 |
| 2:15 | 6 | 88 | 6 | 88 |
| 2:30 | 1 | 77 | 1 | 77 |
| 2:45 | 5 | 89 | 5 | 89 |
| 3:00 | 4 | 59 | 4 | 59 |
| 3:15 | 5 | 95 | 5 | 95 |
| 3:30 | 3 | 103 | 3 | 103 |
| 3:45 | 2 | 117 | 2 | 117 |
| 4:00 | 3 | 69 | 3 | 69 |
| 4:15 | 3 | 82 | 3 | 82 |
| 4:30 | 7 | 76 | 7 | 76 |
| 4:45 | 7 | 76 | 7 | 76 |
| 5:00 | 11 | 90 | 11 | 90 |
| 5:15 | 11 | 117 | 11 | 117 |
| 5:30 | 17 | 85 | 17 | 85 |
| 5:45 | 31 | 72 | 31 | 72 |
| 6:00 | 17 | 81 | 17 | 81 |
| 6:15 | 31 | 71 | 31 | 71 |
| 6:30 | 27 | 65 | 27 | 65 |
| 6:45 | 46 | 62 | 46 | 62 |
| 7:00 | 62 | 51 | 62 | 51 |
| 7:15 | 110 | 41 | 110 | 41 |
| 7:30 | 145 | 44 | 145 | 44 |
| 7:45 | 150 | 31 | 150 | 31 |
| 8:00 | 78 | 37 | 78 | 37 |
| 8:15 | 132 | 39 | 132 | 39 |
| 8:30 | 91 | 31 | 91 | 31 |
| 8:45 | 44 | 36 | 44 | 36 |
| 9:00 | 48 | 34 | 48 | 34 |
| 9:15 | 52 | 31 | 52 | 31 |
| 9:30 | 36 | 37 | 36 | 37 |
| 9:45 | 49 | 35 | 49 | 35 |
| 10:00 | 54 | 33 | 54 | 33 |
| 10:15 | 53 | 32 | 53 | 32 |
| 10:30 | 59 | 28 | 59 | 28 |
| 10:45 | 53 | 16 | 53 | 16 |
| 11:00 | 53 | 24 | 53 | 24 |
| 11:15 | 59 | 25 | 59 | 25 |
| 11:30 | 60 | 10 | 60 | 10 |
| 11:45 | 59 | 9 | 59 | 9 |
| **Total** | **1744** | **2731** | **1744** | **2731** |
| **Day Total** | **4475** | | **4475** | |
| **Split** | 0.6386 | | 0.6386 | |
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 505 | | 505 | |
| AM PHF | 0.8417 | | 0.8417 | |
| PM Peak Hour | | 15:15 | | 15:15 |
| PM Peak Vol | | 384 | | 384 |
| PM PHF | | 0.8205 | | 0.8205 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400147
Duration: 24
Site Code: 4
TRA ID: 0400147
Location 1: CACTUS RD BTWN SR-51 SB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: WB
Latitude: 33.59705
Longitude: -112.01020

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 44 | 235 | 44 | 235 |
| 12:15 | 39 | 265 | 39 | 265 |
| 12:30 | 16 | 273 | 16 | 273 |
| 12:45 | 34 | 274 | 34 | 274 |
| 1:00 | 30 | 274 | 30 | 274 |
| 1:15 | 21 | 285 | 21 | 285 |
| 1:30 | 16 | 300 | 16 | 300 |
| 1:45 | 21 | 311 | 21 | 311 |
| 2:00 | 10 | 305 | 10 | 305 |
| 2:15 | 16 | 294 | 16 | 294 |
| 2:30 | 11 | 346 | 11 | 346 |
| 2:45 | 8 | 348 | 8 | 348 |
| 3:00 | 14 | 299 | 14 | 299 |
| 3:15 | 7 | 368 | 7 | 368 |
| 3:30 | 8 | 348 | 8 | 348 |
| 3:45 | 14 | 369 | 14 | 369 |
| 4:00 | 11 | 463 | 11 | 463 |
| 4:15 | 6 | 372 | 6 | 372 |
| 4:30 | 19 | 393 | 19 | 393 |
| 4:45 | 28 | 362 | 28 | 362 |
| 5:00 | 27 | 438 | 27 | 438 |
| 5:15 | 30 | 417 | 30 | 417 |
| 5:30 | 46 | 429 | 46 | 429 |
| 5:45 | 57 | 349 | 57 | 349 |
| 6:00 | 75 | 358 | 75 | 358 |
| 6:15 | 92 | 327 | 92 | 327 |
| 6:30 | 122 | 301 | 122 | 301 |
| 6:45 | 146 | 297 | 146 | 297 |
| 7:00 | 165 | 292 | 165 | 292 |
| 7:15 | 207 | 234 | 207 | 234 |
| 7:30 | 212 | 193 | 212 | 193 |
| 7:45 | 221 | 194 | 221 | 194 |
| 8:00 | 227 | 196 | 227 | 196 |
| 8:15 | 190 | 191 | 190 | 191 |
| 8:30 | 222 | 174 | 222 | 174 |
| 8:45 | 214 | 158 | 214 | 158 |
| 9:00 | 209 | 214 | 209 | 214 |
| 9:15 | 190 | 199 | 190 | 199 |
| 9:30 | 208 | 175 | 208 | 175 |
| 9:45 | 184 | 124 | 184 | 124 |
| 10:00 | 190 | 118 | 190 | 118 |
| 10:15 | 210 | 117 | 210 | 117 |
| 10:30 | 176 | 113 | 176 | 113 |
| 10:45 | 217 | 91 | 217 | 91 |
| 11:00 | 231 | 51 | 231 | 51 |
| 11:15 | 222 | 54 | 222 | 54 |
| 11:30 | 214 | 55 | 214 | 55 |
| 11:45 | 238 | 47 | 238 | 47 |
| **Total** | **5115** | **12390** | **5115** | **12390** |
| **Day Total** | **17505** | | **17505** | |
| **Split** | 0.4128 | | 0.4128 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 1011 | | 1011 | |
| AM PHF | 0.9258 | | 0.9258 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 1646 | | 1646 |
| PM PHF | | 0.9395 | | 0.9395 |

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3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400148
Duration: 24
Site Code: 4
TRA ID: 0400148
Location 1: CACTUS RD W. of SR-51 SB ON RAMP
Count Type: VOL
Direction: EB
Latitude: 33.59685
Longitude: -112.01150

| Date | 1/21/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 34 | 363 | 34 | 363 |
| 12:15 | 25 | 351 | 25 | 351 |
| 12:30 | 19 | 366 | 19 | 366 |
| 12:45 | 27 | 340 | 27 | 340 |
| 1:00 | 22 | 295 | 22 | 295 |
| 1:15 | 30 | 294 | 30 | 294 |
| 1:30 | 25 | 386 | 25 | 386 |
| 1:45 | 15 | 358 | 15 | 358 |
| 2:00 | 17 | 346 | 17 | 346 |
| 2:15 | 17 | 388 | 17 | 388 |
| 2:30 | 14 | 459 | 14 | 459 |
| 2:45 | 5 | 395 | 5 | 395 |
| 3:00 | 10 | 373 | 10 | 373 |
| 3:15 | 19 | 377 | 19 | 377 |
| 3:30 | 26 | 363 | 26 | 363 |
| 3:45 | 19 | 386 | 19 | 386 |
| 4:00 | 27 | 407 | 27 | 407 |
| 4:15 | 24 | 411 | 24 | 411 |
| 4:30 | 70 | 429 | 70 | 429 |
| 4:45 | 78 | 462 | 78 | 462 |
| 5:00 | 53 | 471 | 53 | 471 |
| 5:15 | 117 | 518 | 117 | 518 |
| 5:30 | 177 | 463 | 177 | 463 |
| 5:45 | 183 | 511 | 183 | 511 |
| 6:00 | 251 | 424 | 251 | 424 |
| 6:15 | 282 | 397 | 282 | 397 |
| 6:30 | 446 | 356 | 446 | 356 |
| 6:45 | 415 | 342 | 415 | 342 |
| 7:00 | 415 | 269 | 415 | 269 |
| 7:15 | 473 | 228 | 473 | 228 |
| 7:30 | 484 | 194 | 484 | 194 |
| 7:45 | 507 | 171 | 507 | 171 |
| 8:00 | 470 | 175 | 470 | 175 |
| 8:15 | 439 | 178 | 439 | 178 |
| 8:30 | 430 | 173 | 430 | 173 |
| 8:45 | 406 | 165 | 406 | 165 |
| 9:00 | 324 | 184 | 324 | 184 |
| 9:15 | 320 | 137 | 320 | 137 |
| 9:30 | 361 | 157 | 361 | 157 |
| 9:45 | 324 | 110 | 324 | 110 |
| 10:00 | 312 | 141 | 312 | 141 |
| 10:15 | 294 | 100 | 294 | 100 |
| 10:30 | 302 | 81 | 302 | 81 |
| 10:45 | 335 | 70 | 335 | 70 |
| 11:00 | 341 | 43 | 341 | 43 |
| 11:15 | 350 | 46 | 350 | 46 |
| 11:30 | 362 | 46 | 362 | 46 |
| 11:45 | 367 | 37 | 367 | 37 |
| **Total** | **10063** | **13736** | **10063** | **13736** |
| **Day Total** | **23799** | | **23799** | |
| **Split** | 0.7326 | | 0.7326 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 1934 | | 1934 | |
| AM PHF | 0.9536 | | 0.9536 | |
| PM Peak Hour | | 17:00 | | 17:00 |
| PM Peak Vol | | 1963 | | 1963 |
| PM PHF | | 0.9474 | | 0.9474 |

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| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400149 | SR-51 NB OFF RAMP | S. of GREENWAY RD | NB | 24 | 1/27/2004 | 0:00 | 12831 | 7:30 | 739 | 0.9192 | 15:45 | 1205 | 0.8783 |
| 0400150 | SR-51 NB OFF RAMP-RT TURNS | S. of GREENWAY RD | NB | 24 | 1/27/2004 | 0:00 | 6618 | 6:30 | 479 | 0.8146 | 17:15 | 598 | 0.9061 |
| 0400151 | GREENWAY RD | BTWN SR-51 NB OFF RAMPS (T-SPLIT) | EB | 24 | 1/27/2004 | 0:00 | 19866 | 7:15 | 2090 | 0.8782 | 16:30 | 1486 | 0.9751 |
| 0400152 | GREENWAY RD | E. of SR-51 NB ON RAMP | WB | 24 | 1/27/2004 | 0:00 | 28811 | 8:00 | 1961 | 0.9096 | 16:45 | 3104 | 0.9545 |
| 0400153 | SR-51 SB OFF RAMPS | N. of GREENWAY RD | SB | 24 | 1/27/2004 | 0:00 | 7926 | 7:30 | 460 | 0.8647 | 17:00 | 799 | 0.9248 |
| 0400154 | SR-51 SB OFF RAMPS-RT TURNS | N. of GREENWAY RD | SB | 24 | 1/27/2004 | 0:00 | 3291 | 11:15 | 185 | 0.8565 | 16:30 | 352 | 0.8302 |
| 0400155 | GREENWAY RD | BTWN SR-51 SB OFF RAMPS (T-SPLIT) | WB | 24 | 1/27/2004 | 0:00 | 22790 | 11:45 | 1305 | 0.9512 | 16:30 | 2634 | 0.9828 |
| 0400156 | GREENWAY RD | W. of SR-51 SB ON RAMP | EB | 24 | 1/27/2004 | 0:00 | 20235 | 7:00 | 2026 | 0.9380 | 16:00 | 1226 | 0.9519 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400149
Duration: 24
Site Code: 5
TRA ID: 0400149
Location 1: SR-51 NB OFF RAMP S. of GREENWAY RD
Count Type: VOL
Direction: NB
Latitude: 33.62380
Longitude: -112.00748

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 19 | 166 | 19 | 166 |
| 12:15 | 23 | 175 | 23 | 175 |
| 12:30 | 17 | 179 | 17 | 179 |
| 12:45 | 15 | 171 | 15 | 171 |
| 1:00 | 12 | 172 | 12 | 172 |
| 1:15 | 16 | 179 | 16 | 179 |
| 1:30 | 11 | 158 | 11 | 158 |
| 1:45 | 11 | 179 | 11 | 179 |
| 2:00 | 10 | 161 | 10 | 161 |
| 2:15 | 6 | 203 | 6 | 203 |
| 2:30 | 13 | 214 | 13 | 214 |
| 2:45 | 15 | 234 | 15 | 234 |
| 3:00 | 7 | 248 | 7 | 248 |
| 3:15 | 4 | 272 | 4 | 272 |
| 3:30 | 7 | 270 | 7 | 270 |
| 3:45 | 7 | 343 | 7 | 343 |
| 4:00 | 9 | 290 | 9 | 290 |
| 4:15 | 8 | 258 | 8 | 258 |
| 4:30 | 17 | 314 | 17 | 314 |
| 4:45 | 23 | 293 | 23 | 293 |
| 5:00 | 30 | 262 | 30 | 262 |
| 5:15 | 44 | 287 | 44 | 287 |
| 5:30 | 62 | 268 | 62 | 268 |
| 5:45 | 76 | 326 | 76 | 326 |
| 6:00 | 77 | 272 | 77 | 272 |
| 6:15 | 120 | 283 | 120 | 283 |
| 6:30 | 180 | 323 | 180 | 323 |
| 6:45 | 182 | 264 | 182 | 264 |
| 7:00 | 168 | 166 | 168 | 166 |
| 7:15 | 143 | 160 | 143 | 160 |
| 7:30 | 195 | 151 | 195 | 151 |
| 7:45 | 201 | 137 | 201 | 137 |
| 8:00 | 180 | 113 | 180 | 113 |
| 8:15 | 163 | 120 | 163 | 120 |
| 8:30 | 160 | 88 | 160 | 88 |
| 8:45 | 197 | 108 | 197 | 108 |
| 9:00 | 140 | 106 | 140 | 106 |
| 9:15 | 129 | 105 | 129 | 105 |
| 9:30 | 146 | 105 | 146 | 105 |
| 9:45 | 169 | 83 | 169 | 83 |
| 10:00 | 132 | 96 | 132 | 96 |
| 10:15 | 140 | 109 | 140 | 109 |
| 10:30 | 129 | 58 | 129 | 58 |
| 10:45 | 146 | 68 | 146 | 68 |
| 11:00 | 138 | 39 | 138 | 39 |
| 11:15 | 158 | 53 | 158 | 53 |
| 11:30 | 138 | 33 | 138 | 33 |
| 11:45 | 153 | 23 | 153 | 23 |
| **Total** | **4146** | **8685** | **4146** | **8685** |
| **Day Total** | **12831** | | **12831** | |
| **Split** | 0.4774 | | 0.4774 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 739 | | 739 | |
| AM PHF | 0.9192 | | 0.9192 | |
| PM Peak Hour | | 15:45 | | 15:45 |
| PM Peak Vol | | 1205 | | 1205 |
| PM PHF | | 0.8783 | | 0.8783 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400150
Duration: 24
Site Code: 5
TRA ID: 0400150
Location 1: SR-51 NB OFF RAMP-RT TURNS S. of GREENWAY RD
Count Type: VOL
Direction: NB
Latitude: 33.62593
Longitude: -112.00630

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 7 | 82 | 7 | 82 |
| 12:15 | 9 | 86 | 9 | 86 |
| 12:30 | 11 | 91 | 11 | 91 |
| 12:45 | 8 | 90 | 8 | 90 |
| 1:00 | 2 | 79 | 2 | 79 |
| 1:15 | 6 | 84 | 6 | 84 |
| 1:30 | 5 | 81 | 5 | 81 |
| 1:45 | 6 | 90 | 6 | 90 |
| 2:00 | 3 | 85 | 3 | 85 |
| 2:15 | 2 | 104 | 2 | 104 |
| 2:30 | 5 | 107 | 5 | 107 |
| 2:45 | 2 | 116 | 2 | 116 |
| 3:00 | 3 | 129 | 3 | 129 |
| 3:15 | 2 | 141 | 2 | 141 |
| 3:30 | 5 | 146 | 5 | 146 |
| 3:45 | 4 | 153 | 4 | 153 |
| 4:00 | 4 | 140 | 4 | 140 |
| 4:15 | 5 | 121 | 5 | 121 |
| 4:30 | 11 | 150 | 11 | 150 |
| 4:45 | 11 | 137 | 11 | 137 |
| 5:00 | 22 | 116 | 22 | 116 |
| 5:15 | 28 | 147 | 28 | 147 |
| 5:30 | 48 | 146 | 48 | 146 |
| 5:45 | 62 | 165 | 62 | 165 |
| 6:00 | 54 | 140 | 54 | 140 |
| 6:15 | 91 | 135 | 91 | 135 |
| 6:30 | 123 | 138 | 123 | 138 |
| 6:45 | 147 | 120 | 147 | 120 |
| 7:00 | 115 | 71 | 115 | 71 |
| 7:15 | 94 | 63 | 94 | 63 |
| 7:30 | 116 | 67 | 116 | 67 |
| 7:45 | 132 | 54 | 132 | 54 |
| 8:00 | 102 | 48 | 102 | 48 |
| 8:15 | 105 | 56 | 105 | 56 |
| 8:30 | 105 | 39 | 105 | 39 |
| 8:45 | 103 | 53 | 103 | 53 |
| 9:00 | 77 | 46 | 77 | 46 |
| 9:15 | 69 | 62 | 69 | 62 |
| 9:30 | 78 | 51 | 78 | 51 |
| 9:45 | 94 | 43 | 94 | 43 |
| 10:00 | 69 | 41 | 69 | 41 |
| 10:15 | 68 | 36 | 68 | 36 |
| 10:30 | 72 | 30 | 72 | 30 |
| 10:45 | 73 | 31 | 73 | 31 |
| 11:00 | 78 | 16 | 78 | 16 |
| 11:15 | 77 | 22 | 77 | 22 |
| 11:30 | 55 | 19 | 55 | 19 |
| 11:45 | 73 | 10 | 73 | 10 |
| **Total** | **2441** | **4177** | **2441** | **4177** |
| **Day Total** | **6618** | | **6618** | |
| **Split** | 0.5844 | | 0.5844 | |
| AM Peak Hour | 6:30 | | 6:30 | |
| AM Peak Vol | 479 | | 479 | |
| AM PHF | 0.8146 | | 0.8146 | |
| PM Peak Hour | | 17:15 | | 17:15 |
| PM Peak Vol | | 598 | | 598 |
| PM PHF | | 0.9061 | | 0.9061 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400151
Duration: 24
Site Code: 5
TRA ID: 0400151
Location 1: GREENWAY RD BTWN SR-51 NB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: EB
Latitude: 33.62618
Longitude: -112.00613

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 34 | 250 | 34 | 250 |
| 12:15 | 35 | 249 | 35 | 249 |
| 12:30 | 16 | 255 | 16 | 255 |
| 12:45 | 16 | 244 | 16 | 244 |
| 1:00 | 29 | 234 | 29 | 234 |
| 1:15 | 30 | 222 | 30 | 222 |
| 1:30 | 7 | 265 | 7 | 265 |
| 1:45 | 25 | 286 | 25 | 286 |
| 2:00 | 13 | 267 | 13 | 267 |
| 2:15 | 11 | 318 | 11 | 318 |
| 2:30 | 6 | 318 | 6 | 318 |
| 2:45 | 4 | 309 | 4 | 309 |
| 3:00 | 5 | 313 | 5 | 313 |
| 3:15 | 8 | 355 | 8 | 355 |
| 3:30 | 16 | 334 | 16 | 334 |
| 3:45 | 9 | 339 | 9 | 339 |
| 4:00 | 18 | 363 | 18 | 363 |
| 4:15 | 22 | 358 | 22 | 358 |
| 4:30 | 43 | 362 | 43 | 362 |
| 4:45 | 41 | 372 | 41 | 372 |
| 5:00 | 65 | 371 | 65 | 371 |
| 5:15 | 60 | 381 | 60 | 381 |
| 5:30 | 106 | 350 | 106 | 350 |
| 5:45 | 137 | 370 | 137 | 370 |
| 6:00 | 156 | 336 | 156 | 336 |
| 6:15 | 269 | 318 | 269 | 318 |
| 6:30 | 336 | 299 | 336 | 299 |
| 6:45 | 427 | 302 | 427 | 302 |
| 7:00 | 385 | 245 | 385 | 245 |
| 7:15 | 524 | 238 | 524 | 238 |
| 7:30 | 566 | 208 | 566 | 208 |
| 7:45 | 595 | 151 | 595 | 151 |
| 8:00 | 405 | 181 | 405 | 181 |
| 8:15 | 497 | 206 | 497 | 206 |
| 8:30 | 312 | 160 | 312 | 160 |
| 8:45 | 371 | 144 | 371 | 144 |
| 9:00 | 292 | 177 | 292 | 177 |
| 9:15 | 229 | 176 | 229 | 176 |
| 9:30 | 236 | 120 | 236 | 120 |
| 9:45 | 263 | 111 | 263 | 111 |
| 10:00 | 204 | 109 | 204 | 109 |
| 10:15 | 240 | 106 | 240 | 106 |
| 10:30 | 205 | 76 | 205 | 76 |
| 10:45 | 244 | 63 | 244 | 63 |
| 11:00 | 244 | 66 | 244 | 66 |
| 11:15 | 199 | 45 | 199 | 45 |
| 11:30 | 229 | 50 | 229 | 50 |
| 11:45 | 270 | 40 | 270 | 40 |
| **Total** | **8454** | **11412** | **8454** | **11412** |
| **Day Total** | **19866** | | **19866** | |
| **Split** | 0.7408 | | 0.7408 | |
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 2090 | | 2090 | |
| AM PHF | 0.8782 | | 0.8782 | |
| PM Peak Hour | | 16:30 | | 16:30 |
| PM Peak Vol | | 1486 | | 1486 |
| PM PHF | | 0.9751 | | 0.9751 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400152
Duration: 24
Site Code: 5
TRA ID: 0400152
Location 1: GREENWAY RD E. of SR-51 NB ON RAMP
Count Type: VOL
Direction: WB
Latitude: 33.62647
Longitude: -112.00517

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 49 | 358 | 49 | 358 |
| 12:15 | 48 | 394 | 48 | 394 |
| 12:30 | 32 | 388 | 32 | 388 |
| 12:45 | 29 | 345 | 29 | 345 |
| 1:00 | 23 | 395 | 23 | 395 |
| 1:15 | 22 | 343 | 22 | 343 |
| 1:30 | 20 | 341 | 20 | 341 |
| 1:45 | 9 | 352 | 9 | 352 |
| 2:00 | 19 | 390 | 19 | 390 |
| 2:15 | 15 | 421 | 15 | 421 |
| 2:30 | 12 | 470 | 12 | 470 |
| 2:45 | 19 | 541 | 19 | 541 |
| 3:00 | 12 | 536 | 12 | 536 |
| 3:15 | 4 | 612 | 4 | 612 |
| 3:30 | 27 | 660 | 27 | 660 |
| 3:45 | 23 | 696 | 23 | 696 |
| 4:00 | 17 | 717 | 17 | 717 |
| 4:15 | 27 | 714 | 27 | 714 |
| 4:30 | 47 | 773 | 47 | 773 |
| 4:45 | 60 | 740 | 60 | 740 |
| 5:00 | 65 | 771 | 65 | 771 |
| 5:15 | 115 | 780 | 115 | 780 |
| 5:30 | 166 | 813 | 166 | 813 |
| 5:45 | 196 | 707 | 196 | 707 |
| 6:00 | 265 | 594 | 265 | 594 |
| 6:15 | 299 | 499 | 299 | 499 |
| 6:30 | 420 | 439 | 420 | 439 |
| 6:45 | 441 | 380 | 441 | 380 |
| 7:00 | 510 | 332 | 510 | 332 |
| 7:15 | 472 | 283 | 472 | 283 |
| 7:30 | 448 | 246 | 448 | 246 |
| 7:45 | 427 | 245 | 427 | 245 |
| 8:00 | 463 | 214 | 463 | 214 |
| 8:15 | 499 | 222 | 499 | 222 |
| 8:30 | 539 | 215 | 539 | 215 |
| 8:45 | 460 | 227 | 460 | 227 |
| 9:00 | 342 | 191 | 342 | 191 |
| 9:15 | 388 | 188 | 388 | 188 |
| 9:30 | 308 | 166 | 308 | 166 |
| 9:45 | 344 | 153 | 344 | 153 |
| 10:00 | 276 | 142 | 276 | 142 |
| 10:15 | 313 | 134 | 313 | 134 |
| 10:30 | 298 | 115 | 298 | 115 |
| 10:45 | 295 | 96 | 295 | 96 |
| 11:00 | 329 | 94 | 329 | 94 |
| 11:15 | 306 | 83 | 306 | 83 |
| 11:30 | 362 | 59 | 362 | 59 |
| 11:45 | 328 | 49 | 328 | 49 |
| **Total** | **10188** | **18623** | **10188** | **18623** |
| **Day Total** | **28811** | | **28811** | |
| **Split** | 0.5471 | | 0.5471 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 1961 | | 1961 | |
| AM PHF | 0.9096 | | 0.9096 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 3104 | | 3104 |
| PM PHF | | 0.9545 | | 0.9545 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400153
Duration: 24
Site Code: 5
TRA ID: 0400153
Location 1: SR-51 SB OFF RAMPS N. of GREENWAY RD
Count Type: VOL
Direction: SB
Latitude: 33.62847
Longitude: -112.00625

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 15 | 92 | 15 | 92 |
| 12:15 | 18 | 95 | 18 | 95 |
| 12:30 | 15 | 103 | 15 | 103 |
| 12:45 | 15 | 100 | 15 | 100 |
| 1:00 | 13 | 81 | 13 | 81 |
| 1:15 | 16 | 104 | 16 | 104 |
| 1:30 | 3 | 93 | 3 | 93 |
| 1:45 | 11 | 124 | 11 | 124 |
| 2:00 | 11 | 109 | 11 | 109 |
| 2:15 | 5 | 142 | 5 | 142 |
| 2:30 | 4 | 139 | 4 | 139 |
| 2:45 | 6 | 135 | 6 | 135 |
| 3:00 | 2 | 151 | 2 | 151 |
| 3:15 | 7 | 164 | 7 | 164 |
| 3:30 | 11 | 173 | 11 | 173 |
| 3:45 | 10 | 179 | 10 | 179 |
| 4:00 | 14 | 184 | 14 | 184 |
| 4:15 | 4 | 186 | 4 | 186 |
| 4:30 | 8 | 184 | 8 | 184 |
| 4:45 | 23 | 183 | 23 | 183 |
| 5:00 | 12 | 209 | 12 | 209 |
| 5:15 | 19 | 216 | 19 | 216 |
| 5:30 | 26 | 168 | 26 | 168 |
| 5:45 | 33 | 206 | 33 | 206 |
| 6:00 | 27 | 190 | 27 | 190 |
| 6:15 | 43 | 171 | 43 | 171 |
| 6:30 | 47 | 145 | 47 | 145 |
| 6:45 | 64 | 126 | 64 | 126 |
| 7:00 | 78 | 116 | 78 | 116 |
| 7:15 | 105 | 101 | 105 | 101 |
| 7:30 | 121 | 91 | 121 | 91 |
| 7:45 | 98 | 88 | 98 | 88 |
| 8:00 | 108 | 85 | 108 | 85 |
| 8:15 | 133 | 87 | 133 | 87 |
| 8:30 | 108 | 99 | 108 | 99 |
| 8:45 | 107 | 72 | 107 | 72 |
| 9:00 | 105 | 73 | 105 | 73 |
| 9:15 | 95 | 108 | 95 | 108 |
| 9:30 | 79 | 70 | 79 | 70 |
| 9:45 | 88 | 49 | 88 | 49 |
| 10:00 | 64 | 77 | 64 | 77 |
| 10:15 | 92 | 64 | 92 | 64 |
| 10:30 | 82 | 50 | 82 | 50 |
| 10:45 | 95 | 33 | 95 | 33 |
| 11:00 | 75 | 40 | 75 | 40 |
| 11:15 | 95 | 27 | 95 | 27 |
| 11:30 | 85 | 25 | 85 | 25 |
| 11:45 | 99 | 25 | 99 | 25 |
| **Total** | **2394** | **5532** | **2394** | **5532** |
| **Day Total** | **7926** | | **7926** | |
| **Split** | 0.4328 | | 0.4328 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 460 | | 460 | |
| AM PHF | 0.8647 | | 0.8647 | |
| PM Peak Hour | | 17:00 | | 17:00 |
| PM Peak Vol | | 799 | | 799 |
| PM PHF | | 0.9248 | | 0.9248 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400154
Duration: 24
Site Code: 5
TRA ID: 0400154
Location 1: SR-51 SB OFF RAMPS-RT TURNS N. of GREENWAY RD
Count Type: VOL
Direction: SB
Latitude: 33.62677
Longitude: -112.00723

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 6 | 43 | 6 | 43 |
| 12:15 | 5 | 43 | 5 | 43 |
| 12:30 | 9 | 43 | 9 | 43 |
| 12:45 | 5 | 44 | 5 | 44 |
| 1:00 | 1 | 33 | 1 | 33 |
| 1:15 | 4 | 49 | 4 | 49 |
| 1:30 | 0 | 49 | 0 | 49 |
| 1:45 | 1 | 50 | 1 | 50 |
| 2:00 | 3 | 40 | 3 | 40 |
| 2:15 | 4 | 67 | 4 | 67 |
| 2:30 | 3 | 58 | 3 | 58 |
| 2:45 | 3 | 60 | 3 | 60 |
| 3:00 | 2 | 59 | 2 | 59 |
| 3:15 | 1 | 77 | 1 | 77 |
| 3:30 | 4 | 81 | 4 | 81 |
| 3:45 | 4 | 85 | 4 | 85 |
| 4:00 | 4 | 83 | 4 | 83 |
| 4:15 | 1 | 87 | 1 | 87 |
| 4:30 | 5 | 82 | 5 | 82 |
| 4:45 | 10 | 77 | 10 | 77 |
| 5:00 | 8 | 87 | 8 | 87 |
| 5:15 | 9 | 106 | 9 | 106 |
| 5:30 | 13 | 64 | 13 | 64 |
| 5:45 | 16 | 83 | 16 | 83 |
| 6:00 | 10 | 84 | 10 | 84 |
| 6:15 | 15 | 74 | 15 | 74 |
| 6:30 | 11 | 51 | 11 | 51 |
| 6:45 | 14 | 62 | 14 | 62 |
| 7:00 | 22 | 50 | 22 | 50 |
| 7:15 | 43 | 36 | 43 | 36 |
| 7:30 | 35 | 40 | 35 | 40 |
| 7:45 | 38 | 35 | 38 | 35 |
| 8:00 | 39 | 29 | 39 | 29 |
| 8:15 | 37 | 31 | 37 | 31 |
| 8:30 | 43 | 37 | 43 | 37 |
| 8:45 | 41 | 34 | 41 | 34 |
| 9:00 | 34 | 22 | 34 | 22 |
| 9:15 | 46 | 34 | 46 | 34 |
| 9:30 | 31 | 33 | 31 | 33 |
| 9:45 | 42 | 16 | 42 | 16 |
| 10:00 | 31 | 23 | 31 | 23 |
| 10:15 | 33 | 27 | 33 | 27 |
| 10:30 | 40 | 14 | 40 | 14 |
| 10:45 | 47 | 14 | 47 | 14 |
| 11:00 | 38 | 13 | 38 | 13 |
| 11:15 | 54 | 14 | 54 | 14 |
| 11:30 | 37 | 6 | 37 | 6 |
| 11:45 | 51 | 9 | 51 | 9 |
| **Total** | **953** | **2338** | **953** | **2338** |
| **Day Total** | **3291** | | **3291** | |
| **Split** | 0.4076 | | 0.4076 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:15 | | 11:15 | |
| AM Peak Vol | 185 | | 185 | |
| AM PHF | 0.8565 | | 0.8565 | |
| PM Peak Hour | | 16:30 | | 16:30 |
| PM Peak Vol | | 352 | | 352 |
| PM PHF | | 0.8302 | | 0.8302 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400155
Duration: 24
Site Code: 5
TRA ID: 0400155
Location 1: GREENWAY RD BTWN SR-51 SB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: WB
Latitude: 33.62648
Longitude: -112.00740

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 31 | 336 | 31 | 336 |
| 12:15 | 42 | 343 | 42 | 343 |
| 12:30 | 24 | 329 | 24 | 329 |
| 12:45 | 19 | 294 | 19 | 294 |
| 1:00 | 18 | 328 | 18 | 328 |
| 1:15 | 25 | 315 | 25 | 315 |
| 1:30 | 20 | 294 | 20 | 294 |
| 1:45 | 16 | 312 | 16 | 312 |
| 2:00 | 16 | 328 | 16 | 328 |
| 2:15 | 16 | 359 | 16 | 359 |
| 2:30 | 16 | 419 | 16 | 419 |
| 2:45 | 20 | 461 | 20 | 461 |
| 3:00 | 10 | 431 | 10 | 431 |
| 3:15 | 4 | 528 | 4 | 528 |
| 3:30 | 13 | 477 | 13 | 477 |
| 3:45 | 20 | 585 | 20 | 585 |
| 4:00 | 12 | 563 | 12 | 563 |
| 4:15 | 14 | 611 | 14 | 611 |
| 4:30 | 23 | 670 | 23 | 670 |
| 4:45 | 38 | 662 | 38 | 662 |
| 5:00 | 40 | 641 | 40 | 641 |
| 5:15 | 67 | 661 | 67 | 661 |
| 5:30 | 69 | 653 | 69 | 653 |
| 5:45 | 93 | 596 | 93 | 596 |
| 6:00 | 108 | 521 | 108 | 521 |
| 6:15 | 136 | 467 | 136 | 467 |
| 6:30 | 155 | 453 | 155 | 453 |
| 6:45 | 177 | 404 | 177 | 404 |
| 7:00 | 207 | 322 | 207 | 322 |
| 7:15 | 247 | 301 | 247 | 301 |
| 7:30 | 299 | 248 | 299 | 248 |
| 7:45 | 262 | 248 | 262 | 248 |
| 8:00 | 278 | 212 | 278 | 212 |
| 8:15 | 279 | 204 | 279 | 204 |
| 8:30 | 267 | 187 | 267 | 187 |
| 8:45 | 316 | 188 | 316 | 188 |
| 9:00 | 220 | 196 | 220 | 196 |
| 9:15 | 266 | 170 | 266 | 170 |
| 9:30 | 210 | 167 | 210 | 167 |
| 9:45 | 265 | 137 | 265 | 137 |
| 10:00 | 219 | 131 | 219 | 131 |
| 10:15 | 245 | 172 | 245 | 172 |
| 10:30 | 245 | 103 | 245 | 103 |
| 10:45 | 242 | 93 | 242 | 93 |
| 11:00 | 273 | 92 | 273 | 92 |
| 11:15 | 250 | 67 | 250 | 67 |
| 11:30 | 287 | 57 | 287 | 57 |
| 11:45 | 297 | 38 | 297 | 38 |
| **Total** | **6416** | **16374** | **6416** | **16374** |
| **Day Total** | **22790** | | **22790** | |
| **Split** | 0.3918 | | 0.3918 | |
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 1305 | | 1305 | |
| AM PHF | 0.9512 | | 0.9512 | |
| PM Peak Hour | | 16:30 | | 16:30 |
| PM Peak Vol | | 2634 | | 2634 |
| PM PHF | | 0.9828 | | 0.9828 |

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File Name: 0400156
Duration: 24
Site Code: 5
TRA ID: 0400156
Location 1: GREENWAY RD W. of SR-51 SB ON RAMP
Count Type: VOL
Direction: EB
Latitude: 33.62633
Longitude: -112.00840

| Date | 1/27/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 26 | 282 | 26 | 282 |
| 12:15 | 31 | 304 | 31 | 304 |
| 12:30 | 18 | 278 | 18 | 278 |
| 12:45 | 21 | 273 | 21 | 273 |
| 1:00 | 21 | 283 | 21 | 283 |
| 1:15 | 23 | 248 | 23 | 248 |
| 1:30 | 16 | 295 | 16 | 295 |
| 1:45 | 17 | 310 | 17 | 310 |
| 2:00 | 15 | 272 | 15 | 272 |
| 2:15 | 16 | 301 | 16 | 301 |
| 2:30 | 9 | 305 | 9 | 305 |
| 2:45 | 10 | 301 | 10 | 301 |
| 3:00 | 14 | 270 | 14 | 270 |
| 3:15 | 13 | 302 | 13 | 302 |
| 3:30 | 16 | 305 | 16 | 305 |
| 3:45 | 14 | 286 | 14 | 286 |
| 4:00 | 18 | 301 | 18 | 301 |
| 4:15 | 37 | 296 | 37 | 296 |
| 4:30 | 59 | 322 | 59 | 322 |
| 4:45 | 53 | 307 | 53 | 307 |
| 5:00 | 83 | 288 | 83 | 288 |
| 5:15 | 86 | 307 | 86 | 307 |
| 5:30 | 182 | 299 | 182 | 299 |
| 5:45 | 207 | 307 | 207 | 307 |
| 6:00 | 221 | 288 | 221 | 288 |
| 6:15 | 362 | 285 | 362 | 285 |
| 6:30 | 456 | 239 | 456 | 239 |
| 6:45 | 502 | 270 | 502 | 270 |
| 7:00 | 454 | 231 | 454 | 231 |
| 7:15 | 507 | 211 | 507 | 211 |
| 7:30 | 525 | 183 | 525 | 183 |
| 7:45 | 540 | 155 | 540 | 155 |
| 8:00 | 440 | 174 | 440 | 174 |
| 8:15 | 466 | 190 | 466 | 190 |
| 8:30 | 367 | 159 | 367 | 159 |
| 8:45 | 409 | 140 | 409 | 140 |
| 9:00 | 312 | 177 | 312 | 177 |
| 9:15 | 306 | 149 | 306 | 149 |
| 9:30 | 287 | 112 | 287 | 112 |
| 9:45 | 308 | 109 | 308 | 109 |
| 10:00 | 277 | 93 | 277 | 93 |
| 10:15 | 267 | 89 | 267 | 89 |
| 10:30 | 254 | 72 | 254 | 72 |
| 10:45 | 288 | 68 | 288 | 68 |
| 11:00 | 273 | 52 | 273 | 52 |
| 11:15 | 236 | 39 | 236 | 39 |
| 11:30 | 263 | 43 | 263 | 43 |
| 11:45 | 301 | 39 | 301 | 39 |
| **Total** | **9626** | **10609** | **9626** | **10609** |
| **Day Total** | **20235** | | **20235** | |
| **Split** | 0.9073 | | 0.9073 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:00 | | 7:00 | |
| AM Peak Vol | 2026 | | 2026 | |
| AM PHF | 0.9380 | | 0.9380 | |
| PM Peak Hour | | 16:00 | | 16:00 |
| PM Peak Vol | | 1226 | | 1226 |
| PM PHF | | 0.9519 | | 0.9519 |

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| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400117 | LOOP 101 (WEST) NB OFF RAMP | S. of BELL RD | NB | 24 | 1/28/2004 | 12:00 | 16204 | 7:15 | 1123 | 0.8406 | 16:45 | 1367 | 0.9906 |
| 0400118 | LOOP 101 (WEST) NB OFF RAMP-RT TURNS | S. of BELL RD | NB | 24 | 1/28/2004 | 0:00 | 10097 | 11:45 | 813 | 0.9366 | 12:00 | 836 | 0.9048 |
| 0400119 | BELL RD | BTWN LOOP 101(WEST) NB OFF RAMP (T-SPLIT) | EB | 24 | 1/28/2004 | 0:00 | 22210 | 11:30 | 1953 | 0.9630 | 12:00 | 1851 | 0.9127 |
| 0400120 | BELL RD | E. of LOOP 101 (WEST) NB ON RAMP | WB | 24 | 1/28/2004 | 0:00 | 26977 | 11:45 | 1891 | 0.9197 | 15:00 | 2281 | 0.9348 |
| 0400121 | LOOP 101 (WEST) SB OFF RAMP | N. of BELL RD | SB | 24 | 1/28/2004 | 0:00 | 16867 | 7:15 | 1217 | 0.8405 | 16:45 | 1385 | 0.9699 |
| 0400122 | LOOP 101 (WEST) SB OFF RAMP-RT TURNS | N. of BELL RD | SB | 24 | 1/28/2004 | 0:00 | 12760 | 7:15 | 1067 | 0.8441 | 16:45 | 1022 | 0.9642 |
| 0400123 | BELL RD | BTWN LOOP 101(WEST) SB OFF RAMP (T-SPLIT) | WB | 24 | 1/28/2004 | 0:00 | 27065 | 11:45 | 1829 | 0.9447 | 15:00 | 2387 | 0.9281 |
| 0400124 | BELL RD | W. of LOOP 101 (WEST) SB ON RAMP | EB | 24 | 1/28/2004 | 0:00 | 37409 | 11:30 | 2750 | 0.9683 | 16:30 | 2768 | 0.9665 |

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3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400117
Duration: 24
Site Code: 1
TRA ID: 0400117
Location 1: LOOP 101 (WEST) NB OFF RAMP S. of BELL RD
Count Type: VOL
Direction: NB
Latitude: 33.63528
Longitude: -112.23822

| Date | 1/28/2004 | | 1/29/2004 | | Average | |
|---|---|---|---|---|---|---|
| Time | AM | PM | AM | PM | AM | PM |
| 12:00 | | 256 | 23 | | 23 | 256 |
| 12:15 | | 302 | 24 | | 24 | 302 |
| 12:30 | | 272 | 20 | | 20 | 272 |
| 12:45 | | 317 | 14 | | 14 | 317 |
| 1:00 | | 231 | 14 | | 14 | 231 |
| 1:15 | | 256 | 20 | | 20 | 256 |
| 1:30 | | 285 | 15 | | 15 | 285 |
| 1:45 | | 290 | 12 | | 12 | 290 |
| 2:00 | | 254 | 11 | | 11 | 254 |
| 2:15 | | 247 | 14 | | 14 | 247 |
| 2:30 | | 256 | 12 | | 12 | 256 |
| 2:45 | | 314 | 17 | | 17 | 314 |
| 3:00 | | 298 | 20 | | 20 | 298 |
| 3:15 | | 305 | 5 | | 5 | 305 |
| 3:30 | | 310 | 16 | | 16 | 310 |
| 3:45 | | 339 | 20 | | 20 | 339 |
| 4:00 | | 276 | 5 | | 5 | 276 |
| 4:15 | | 330 | 22 | | 22 | 330 |
| 4:30 | | 333 | 28 | | 28 | 333 |
| 4:45 | | 342 | 29 | | 29 | 342 |
| 5:00 | | 345 | 30 | | 30 | 345 |
| 5:15 | | 338 | 40 | | 40 | 338 |
| 5:30 | | 342 | 50 | | 50 | 342 |
| 5:45 | | 335 | 96 | | 96 | 335 |
| 6:00 | | 286 | 96 | | 96 | 286 |
| 6:15 | | 266 | 120 | | 120 | 266 |
| 6:30 | | 269 | 159 | | 159 | 269 |
| 6:45 | | 254 | 268 | | 268 | 254 |
| 7:00 | | 193 | 207 | | 207 | 193 |
| 7:15 | | 187 | 243 | | 243 | 187 |
| 7:30 | | 170 | 303 | | 303 | 170 |
| 7:45 | | 124 | 334 | | 334 | 124 |
| 8:00 | | 141 | 243 | | 243 | 141 |
| 8:15 | | 117 | 222 | | 222 | 117 |
| 8:30 | | 91 | 253 | | 253 | 91 |
| 8:45 | | 98 | 281 | | 281 | 98 |
| 9:00 | | 90 | 214 | | 214 | 90 |
| 9:15 | | 81 | 192 | | 192 | 81 |
| 9:30 | | 72 | 237 | | 237 | 72 |
| 9:45 | | 89 | 281 | | 281 | 89 |
| 10:00 | | 55 | 214 | | 214 | 55 |
| 10:15 | | 56 | 227 | | 227 | 56 |
| 10:30 | | 50 | 211 | | 211 | 50 |
| 10:45 | | 45 | 288 | | 288 | 45 |
| 11:00 | | 24 | 257 | | 257 | 24 |
| 11:15 | | 33 | 268 | | 268 | 33 |
| 11:30 | | 28 | 231 | | 231 | 28 |
| 11:45 | | 32 | 274 | | 274 | 32 |
| **Total** | **0** | **10024** | **6180** | **0** | **6180** | **10024** |
| **Day Total** | **10024** | | **6180** | | **16204** | |
| **Split** | 0.0000 | | 0.0000 | | 0.6165 | |
| AM Peak Hour | | | 7:15 | | 7:15 | |
| AM Peak Vol | | | 1123 | | 1123 | |
| AM PHF | | | 0.8406 | | 0.8406 | |
| PM Peak Hour | | | | | | 16:45 |
| PM Peak Vol | | | | | | 1367 |
| PM PHF | | | | | | 0.9906 |

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File Name: 0400118
Duration: 24
Site Code: 1
TRA ID: 0400118
Location 1: LOOP 101 (WEST) NB OFF RAMP-RT TURNS S. of BELL RD
Count Type: VOL
Direction: NB
Latitude: 33.63777
Longitude: -112.23722

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 12 | 189 | 12 | 189 |
| 12:15 | 13 | 217 | 13 | 217 |
| 12:30 | 19 | 199 | 19 | 199 |
| 12:45 | 13 | 231 | 13 | 231 |
| 1:00 | 6 | 172 | 6 | 172 |
| 1:15 | 10 | 191 | 10 | 191 |
| 1:30 | 3 | 187 | 3 | 187 |
| 1:45 | 12 | 175 | 12 | 175 |
| 2:00 | 3 | 182 | 3 | 182 |
| 2:15 | 5 | 172 | 5 | 172 |
| 2:30 | 12 | 166 | 12 | 166 |
| 2:45 | 12 | 197 | 12 | 197 |
| 3:00 | 6 | 168 | 6 | 168 |
| 3:15 | 8 | 205 | 8 | 205 |
| 3:30 | 4 | 170 | 4 | 170 |
| 3:45 | 10 | 232 | 10 | 232 |
| 4:00 | 7 | 166 | 7 | 166 |
| 4:15 | 10 | 193 | 10 | 193 |
| 4:30 | 15 | 191 | 15 | 191 |
| 4:45 | 18 | 230 | 18 | 230 |
| 5:00 | 17 | 195 | 17 | 195 |
| 5:15 | 27 | 199 | 27 | 199 |
| 5:30 | 31 | 195 | 31 | 195 |
| 5:45 | 57 | 201 | 57 | 201 |
| 6:00 | 41 | 185 | 41 | 185 |
| 6:15 | 58 | 178 | 58 | 178 |
| 6:30 | 82 | 181 | 82 | 181 |
| 6:45 | 129 | 149 | 129 | 149 |
| 7:00 | 111 | 133 | 111 | 133 |
| 7:15 | 136 | 131 | 136 | 131 |
| 7:30 | 133 | 131 | 133 | 131 |
| 7:45 | 182 | 81 | 182 | 81 |
| 8:00 | 123 | 95 | 123 | 95 |
| 8:15 | 118 | 70 | 118 | 70 |
| 8:30 | 112 | 55 | 112 | 55 |
| 8:45 | 129 | 66 | 129 | 66 |
| 9:00 | 125 | 49 | 125 | 49 |
| 9:15 | 141 | 48 | 141 | 48 |
| 9:30 | 147 | 38 | 147 | 38 |
| 9:45 | 175 | 55 | 175 | 55 |
| 10:00 | 142 | 30 | 142 | 30 |
| 10:15 | 148 | 24 | 148 | 24 |
| 10:30 | 179 | 30 | 179 | 30 |
| 10:45 | 188 | 20 | 188 | 20 |
| 11:00 | 135 | 10 | 135 | 10 |
| 11:15 | 209 | 20 | 209 | 20 |
| 11:30 | 183 | 15 | 183 | 15 |
| 11:45 | 208 | 16 | 208 | 16 |
| **Total** | **3664** | **6433** | **3664** | **6433** |
| **Day Total** | **10097** | | **10097** | |
| **Split** | 0.5696 | | 0.5696 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 813 | | 813 | |
| AM PHF | 0.9366 | | 0.9366 | |
| PM Peak Hour | | 12:00 | | 12:00 |
| PM Peak Vol | | 836 | | 836 |
| PM PHF | | 0.9048 | | 0.9048 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400119
Duration: 24
Site Code: 1
TRA ID: 0400119
Location 1: BELL RD BTWN LOOP 101(WEST) NB OFF RAMP (T-SPLIT)
Count Type: VOL
Direction: EB
Latitude: 33.63798
Longitude: -112.23710

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 21 | 507 | 21 | 507 |
| 12:15 | 14 | 478 | 14 | 478 |
| 12:30 | 24 | 470 | 24 | 470 |
| 12:45 | 6 | 396 | 6 | 396 |
| 1:00 | 4 | 501 | 4 | 501 |
| 1:15 | 15 | 396 | 15 | 396 |
| 1:30 | 13 | 441 | 13 | 441 |
| 1:45 | 11 | 381 | 11 | 381 |
| 2:00 | 12 | 422 | 12 | 422 |
| 2:15 | 5 | 399 | 5 | 399 |
| 2:30 | 10 | 394 | 10 | 394 |
| 2:45 | 13 | 365 | 13 | 365 |
| 3:00 | 8 | 367 | 8 | 367 |
| 3:15 | 7 | 398 | 7 | 398 |
| 3:30 | 9 | 423 | 9 | 423 |
| 3:45 | 17 | 357 | 17 | 357 |
| 4:00 | 14 | 388 | 14 | 388 |
| 4:15 | 14 | 369 | 14 | 369 |
| 4:30 | 23 | 414 | 23 | 414 |
| 4:45 | 31 | 393 | 31 | 393 |
| 5:00 | 39 | 394 | 39 | 394 |
| 5:15 | 61 | 381 | 61 | 381 |
| 5:30 | 74 | 455 | 74 | 455 |
| 5:45 | 94 | 399 | 94 | 399 |
| 6:00 | 108 | 406 | 108 | 406 |
| 6:15 | 183 | 413 | 183 | 413 |
| 6:30 | 202 | 358 | 202 | 358 |
| 6:45 | 316 | 330 | 316 | 330 |
| 7:00 | 307 | 297 | 307 | 297 |
| 7:15 | 348 | 259 | 348 | 259 |
| 7:30 | 286 | 229 | 286 | 229 |
| 7:45 | 381 | 161 | 381 | 161 |
| 8:00 | 280 | 165 | 280 | 165 |
| 8:15 | 284 | 136 | 284 | 136 |
| 8:30 | 209 | 144 | 209 | 144 |
| 8:45 | 267 | 107 | 267 | 107 |
| 9:00 | 282 | 117 | 282 | 117 |
| 9:15 | 315 | 90 | 315 | 90 |
| 9:30 | 299 | 86 | 299 | 86 |
| 9:45 | 376 | 102 | 376 | 102 |
| 10:00 | 391 | 65 | 391 | 65 |
| 10:15 | 360 | 57 | 360 | 57 |
| 10:30 | 434 | 53 | 434 | 53 |
| 10:45 | 437 | 52 | 437 | 52 |
| 11:00 | 495 | 43 | 495 | 43 |
| 11:15 | 466 | 32 | 466 | 32 |
| 11:30 | 489 | 28 | 489 | 28 |
| 11:45 | 479 | 59 | 479 | 59 |
| **Total** | **8533** | **13677** | **8533** | **13677** |
| **Day Total** | **22210** | | **22210** | |
| **Split** | 0.6239 | | 0.6239 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:30 | | 11:30 | |
| AM Peak Vol | 1953 | | 1953 | |
| AM PHF | 0.9630 | | 0.9630 | |
| PM Peak Hour | | 12:00 | | 12:00 |
| PM Peak Vol | | 1851 | | 1851 |
| PM PHF | | 0.9127 | | 0.9127 |

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3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400120
Duration: 24
Site Code: 1
TRA ID: 0400120
Location 1: BELL RD E. of LOOP 101 (WEST) NB ON RAMP
Count Type: VOL
Direction: WB
Latitude: 33.63835
Longitude: -112.23475

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 51 | 452 | 51 | 452 |
| 12:15 | 38 | 473 | 38 | 473 |
| 12:30 | 35 | 514 | 35 | 514 |
| 12:45 | 34 | 518 | 34 | 518 |
| 1:00 | 43 | 562 | 43 | 562 |
| 1:15 | 36 | 518 | 36 | 518 |
| 1:30 | 30 | 566 | 30 | 566 |
| 1:45 | 13 | 577 | 13 | 577 |
| 2:00 | 15 | 516 | 15 | 516 |
| 2:15 | 12 | 506 | 12 | 506 |
| 2:30 | 21 | 564 | 21 | 564 |
| 2:45 | 16 | 531 | 16 | 531 |
| 3:00 | 22 | 550 | 22 | 550 |
| 3:15 | 14 | 553 | 14 | 553 |
| 3:30 | 13 | 610 | 13 | 610 |
| 3:45 | 12 | 568 | 12 | 568 |
| 4:00 | 22 | 514 | 22 | 514 |
| 4:15 | 37 | 485 | 37 | 485 |
| 4:30 | 32 | 544 | 32 | 544 |
| 4:45 | 30 | 474 | 30 | 474 |
| 5:00 | 50 | 519 | 50 | 519 |
| 5:15 | 65 | 497 | 65 | 497 |
| 5:30 | 76 | 519 | 76 | 519 |
| 5:45 | 97 | 492 | 97 | 492 |
| 6:00 | 125 | 512 | 125 | 512 |
| 6:15 | 192 | 545 | 192 | 545 |
| 6:30 | 214 | 525 | 214 | 525 |
| 6:45 | 226 | 461 | 226 | 461 |
| 7:00 | 257 | 442 | 257 | 442 |
| 7:15 | 274 | 432 | 274 | 432 |
| 7:30 | 293 | 361 | 293 | 361 |
| 7:45 | 268 | 365 | 268 | 365 |
| 8:00 | 202 | 378 | 202 | 378 |
| 8:15 | 212 | 375 | 212 | 375 |
| 8:30 | 211 | 320 | 211 | 320 |
| 8:45 | 221 | 324 | 221 | 324 |
| 9:00 | 225 | 386 | 225 | 386 |
| 9:15 | 234 | 328 | 234 | 328 |
| 9:30 | 253 | 245 | 253 | 245 |
| 9:45 | 244 | 188 | 244 | 188 |
| 10:00 | 261 | 207 | 261 | 207 |
| 10:15 | 291 | 135 | 291 | 135 |
| 10:30 | 327 | 96 | 327 | 96 |
| 10:45 | 331 | 104 | 331 | 104 |
| 11:00 | 365 | 98 | 365 | 98 |
| 11:15 | 392 | 90 | 392 | 90 |
| 11:30 | 427 | 69 | 427 | 69 |
| 11:45 | 452 | 58 | 452 | 58 |
| **Total** | **7311** | **19666** | **7311** | **19666** |
| **Day Total** | **26977** | | **26977** | |
| **Split** | 0.3718 | | 0.3718 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 1891 | | 1891 | |
| AM PHF | 0.9197 | | 0.9197 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 2281 | | 2281 |
| PM PHF | | 0.9348 | | 0.9348 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400121
Duration: 24
Site Code: 1
TRA ID: 0400121
Location 1: LOOP 101 (WEST) SB OFF RAMP N. of BELL RD
Count Type: VOL
Direction: SB
Latitude: 33.64108
Longitude: -112.23692

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 34 | 254 | 34 | 254 |
| 12:15 | 24 | 221 | 24 | 221 |
| 12:30 | 23 | 252 | 23 | 252 |
| 12:45 | 15 | 233 | 15 | 233 |
| 1:00 | 17 | 225 | 17 | 225 |
| 1:15 | 16 | 243 | 16 | 243 |
| 1:30 | 13 | 232 | 13 | 232 |
| 1:45 | 14 | 259 | 14 | 259 |
| 2:00 | 13 | 214 | 13 | 214 |
| 2:15 | 9 | 250 | 9 | 250 |
| 2:30 | 9 | 236 | 9 | 236 |
| 2:45 | 14 | 283 | 14 | 283 |
| 3:00 | 10 | 269 | 10 | 269 |
| 3:15 | 9 | 313 | 9 | 313 |
| 3:30 | 9 | 309 | 9 | 309 |
| 3:45 | 19 | 347 | 19 | 347 |
| 4:00 | 13 | 299 | 13 | 299 |
| 4:15 | 16 | 294 | 16 | 294 |
| 4:30 | 37 | 306 | 37 | 306 |
| 4:45 | 22 | 350 | 22 | 350 |
| 5:00 | 43 | 357 | 43 | 357 |
| 5:15 | 45 | 323 | 45 | 323 |
| 5:30 | 85 | 355 | 85 | 355 |
| 5:45 | 93 | 292 | 93 | 292 |
| 6:00 | 144 | 321 | 144 | 321 |
| 6:15 | 203 | 340 | 203 | 340 |
| 6:30 | 279 | 283 | 279 | 283 |
| 6:45 | 288 | 266 | 288 | 266 |
| 7:00 | 254 | 200 | 254 | 200 |
| 7:15 | 263 | 202 | 263 | 202 |
| 7:30 | 309 | 170 | 309 | 170 |
| 7:45 | 362 | 162 | 362 | 162 |
| 8:00 | 283 | 188 | 283 | 188 |
| 8:15 | 263 | 171 | 263 | 171 |
| 8:30 | 253 | 156 | 253 | 156 |
| 8:45 | 277 | 137 | 277 | 137 |
| 9:00 | 236 | 138 | 236 | 138 |
| 9:15 | 246 | 127 | 246 | 127 |
| 9:30 | 246 | 125 | 246 | 125 |
| 9:45 | 240 | 113 | 240 | 113 |
| 10:00 | 225 | 99 | 225 | 99 |
| 10:15 | 217 | 67 | 217 | 67 |
| 10:30 | 219 | 69 | 219 | 69 |
| 10:45 | 229 | 88 | 229 | 88 |
| 11:00 | 237 | 48 | 237 | 48 |
| 11:15 | 208 | 61 | 208 | 61 |
| 11:30 | 224 | 50 | 224 | 50 |
| 11:45 | 225 | 38 | 225 | 38 |
| **Total** | **6532** | **10335** | **6532** | **10335** |
| **Day Total** | **16867** | | **16867** | |
| **Split** | 0.6320 | | 0.6320 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 1217 | | 1217 | |
| AM PHF | 0.8405 | | 0.8405 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 1385 | | 1385 |
| PM PHF | | 0.9699 | | 0.9699 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400122
Duration: 24
Site Code: 1
TRA ID: 0400122
Location 1: LOOP 101 (WEST) SB OFF RAMP-RT TURNS N. of BELL RD
Count Type: VOL
Direction: SB
Latitude: 33.63867
Longitude: -112.23820

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 27 | 167 | 27 | 167 |
| 12:15 | 17 | 160 | 17 | 160 |
| 12:30 | 19 | 177 | 19 | 177 |
| 12:45 | 12 | 173 | 12 | 173 |
| 1:00 | 15 | 158 | 15 | 158 |
| 1:15 | 13 | 173 | 13 | 173 |
| 1:30 | 9 | 165 | 9 | 165 |
| 1:45 | 11 | 187 | 11 | 187 |
| 2:00 | 12 | 164 | 12 | 164 |
| 2:15 | 9 | 176 | 9 | 176 |
| 2:30 | 7 | 173 | 7 | 173 |
| 2:45 | 12 | 212 | 12 | 212 |
| 3:00 | 9 | 200 | 9 | 200 |
| 3:15 | 7 | 222 | 7 | 222 |
| 3:30 | 6 | 220 | 6 | 220 |
| 3:45 | 17 | 244 | 17 | 244 |
| 4:00 | 11 | 222 | 11 | 222 |
| 4:15 | 15 | 235 | 15 | 235 |
| 4:30 | 32 | 222 | 32 | 222 |
| 4:45 | 19 | 265 | 19 | 265 |
| 5:00 | 33 | 265 | 33 | 265 |
| 5:15 | 40 | 244 | 40 | 244 |
| 5:30 | 63 | 248 | 63 | 248 |
| 5:45 | 80 | 227 | 80 | 227 |
| 6:00 | 125 | 226 | 125 | 226 |
| 6:15 | 181 | 240 | 181 | 240 |
| 6:30 | 253 | 203 | 253 | 203 |
| 6:45 | 245 | 174 | 245 | 174 |
| 7:00 | 213 | 126 | 213 | 126 |
| 7:15 | 225 | 121 | 225 | 121 |
| 7:30 | 279 | 120 | 279 | 120 |
| 7:45 | 316 | 120 | 316 | 120 |
| 8:00 | 247 | 138 | 247 | 138 |
| 8:15 | 215 | 132 | 215 | 132 |
| 8:30 | 212 | 110 | 212 | 110 |
| 8:45 | 214 | 103 | 214 | 103 |
| 9:00 | 182 | 106 | 182 | 106 |
| 9:15 | 195 | 109 | 195 | 109 |
| 9:30 | 193 | 103 | 193 | 103 |
| 9:45 | 173 | 90 | 173 | 90 |
| 10:00 | 164 | 83 | 164 | 83 |
| 10:15 | 155 | 56 | 155 | 56 |
| 10:30 | 154 | 56 | 154 | 56 |
| 10:45 | 165 | 72 | 165 | 72 |
| 11:00 | 154 | 39 | 154 | 39 |
| 11:15 | 141 | 49 | 141 | 49 |
| 11:30 | 170 | 42 | 170 | 42 |
| 11:45 | 145 | 32 | 145 | 32 |
| **Total** | **5211** | **7549** | **5211** | **7549** |
| **Day Total** | **12760** | | **12760** | |
| **Split** | 0.6903 | | 0.6903 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 7:15 | | 7:15 | |
| AM Peak Vol | 1067 | | 1067 | |
| AM PHF | 0.8441 | | 0.8441 | |
| PM Peak Hour | | 16:45 | | 16:45 |
| PM Peak Vol | | 1022 | | 1022 |
| PM PHF | | 0.9642 | | 0.9642 |

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3844 East Indian School Road
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File Name: 0400123
Duration: 24
Site Code: 1
TRA ID: 0400123
Location 1: BELL RD BTWN LOOP 101(WEST) SB OFF RAMP (T-SPLIT)
Count Type: VOL
Direction: WB
Latitude: 33.63833
Longitude: -112.23837

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 55 | 440 | 55 | 440 |
| 12:15 | 34 | 469 | 34 | 469 |
| 12:30 | 32 | 484 | 32 | 484 |
| 12:45 | 23 | 544 | 23 | 544 |
| 1:00 | 31 | 503 | 31 | 503 |
| 1:15 | 41 | 505 | 41 | 505 |
| 1:30 | 27 | 531 | 27 | 531 |
| 1:45 | 11 | 531 | 11 | 531 |
| 2:00 | 15 | 502 | 15 | 502 |
| 2:15 | 4 | 489 | 4 | 489 |
| 2:30 | 18 | 522 | 18 | 522 |
| 2:45 | 13 | 579 | 13 | 579 |
| 3:00 | 15 | 575 | 15 | 575 |
| 3:15 | 13 | 533 | 13 | 533 |
| 3:30 | 15 | 643 | 15 | 643 |
| 3:45 | 16 | 636 | 16 | 636 |
| 4:00 | 19 | 556 | 19 | 556 |
| 4:15 | 32 | 512 | 32 | 512 |
| 4:30 | 16 | 588 | 16 | 588 |
| 4:45 | 36 | 498 | 36 | 498 |
| 5:00 | 43 | 543 | 43 | 543 |
| 5:15 | 57 | 528 | 57 | 528 |
| 5:30 | 66 | 569 | 66 | 569 |
| 5:45 | 136 | 519 | 136 | 519 |
| 6:00 | 114 | 506 | 114 | 506 |
| 6:15 | 183 | 502 | 183 | 502 |
| 6:30 | 273 | 518 | 273 | 518 |
| 6:45 | 272 | 473 | 272 | 473 |
| 7:00 | 313 | 383 | 313 | 383 |
| 7:15 | 325 | 360 | 325 | 360 |
| 7:30 | 378 | 319 | 378 | 319 |
| 7:45 | 384 | 291 | 384 | 291 |
| 8:00 | 293 | 307 | 293 | 307 |
| 8:15 | 252 | 310 | 252 | 310 |
| 8:30 | 311 | 267 | 311 | 267 |
| 8:45 | 284 | 272 | 284 | 272 |
| 9:00 | 282 | 262 | 282 | 262 |
| 9:15 | 265 | 210 | 265 | 210 |
| 9:30 | 306 | 199 | 306 | 199 |
| 9:45 | 302 | 149 | 302 | 149 |
| 10:00 | 294 | 119 | 294 | 119 |
| 10:15 | 330 | 116 | 330 | 116 |
| 10:30 | 351 | 86 | 351 | 86 |
| 10:45 | 360 | 70 | 360 | 70 |
| 11:00 | 380 | 75 | 380 | 75 |
| 11:15 | 408 | 76 | 408 | 76 |
| 11:30 | 424 | 52 | 424 | 52 |
| 11:45 | 436 | 56 | 436 | 56 |
| **Total** | **8288** | **18777** | **8288** | **18777** |
| **Day Total** | **27065** | | **27065** | |
| **Split** | 0.4414 | | 0.4414 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 1829 | | 1829 | |
| AM PHF | 0.9447 | | 0.9447 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 2387 | | 2387 |
| PM PHF | | 0.9281 | | 0.9281 |

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3844 East Indian School Road
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File Name: 0400124
Duration: 24
Site Code: 1
TRA ID: 0400124
Location 1: BELL RD W. of LOOP 101 (WEST) SB ON RAMP
Count Type: VOL
Direction: EB
Latitude: 33.63812
Longitude: -112.24095

| Date | 1/28/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 49 | 694 | 49 | 694 |
| 12:15 | 30 | 710 | 30 | 710 |
| 12:30 | 41 | 657 | 41 | 657 |
| 12:45 | 12 | 562 | 12 | 562 |
| 1:00 | 11 | 736 | 11 | 736 |
| 1:15 | 26 | 589 | 26 | 589 |
| 1:30 | 28 | 646 | 28 | 646 |
| 1:45 | 25 | 594 | 25 | 594 |
| 2:00 | 21 | 667 | 21 | 667 |
| 2:15 | 21 | 622 | 21 | 622 |
| 2:30 | 20 | 621 | 20 | 621 |
| 2:45 | 22 | 607 | 22 | 607 |
| 3:00 | 22 | 591 | 22 | 591 |
| 3:15 | 34 | 651 | 34 | 651 |
| 3:30 | 30 | 680 | 30 | 680 |
| 3:45 | 35 | 637 | 35 | 637 |
| 4:00 | 45 | 681 | 45 | 681 |
| 4:15 | 79 | 640 | 79 | 640 |
| 4:30 | 93 | 716 | 93 | 716 |
| 4:45 | 100 | 655 | 100 | 655 |
| 5:00 | 154 | 709 | 154 | 709 |
| 5:15 | 262 | 688 | 262 | 688 |
| 5:30 | 327 | 697 | 327 | 697 |
| 5:45 | 366 | 626 | 366 | 626 |
| 6:00 | 463 | 645 | 463 | 645 |
| 6:15 | 519 | 557 | 519 | 557 |
| 6:30 | 568 | 488 | 568 | 488 |
| 6:45 | 637 | 421 | 637 | 421 |
| 7:00 | 646 | 405 | 646 | 405 |
| 7:15 | 701 | 318 | 701 | 318 |
| 7:30 | 657 | 287 | 657 | 287 |
| 7:45 | 656 | 243 | 656 | 243 |
| 8:00 | 578 | 252 | 578 | 252 |
| 8:15 | 552 | 229 | 552 | 229 |
| 8:30 | 519 | 237 | 519 | 237 |
| 8:45 | 501 | 164 | 501 | 164 |
| 9:00 | 532 | 216 | 532 | 216 |
| 9:15 | 506 | 170 | 506 | 170 |
| 9:30 | 513 | 126 | 513 | 126 |
| 9:45 | 567 | 164 | 567 | 164 |
| 10:00 | 598 | 114 | 598 | 114 |
| 10:15 | 592 | 113 | 592 | 113 |
| 10:30 | 635 | 85 | 635 | 85 |
| 10:45 | 638 | 87 | 638 | 87 |
| 11:00 | 710 | 68 | 710 | 68 |
| 11:15 | 690 | 45 | 690 | 45 |
| 11:30 | 666 | 45 | 666 | 45 |
| 11:45 | 680 | 77 | 680 | 77 |
| **Total** | **16177** | **21232** | **16177** | **21232** |
| **Day Total** | **37409** | | **37409** | |
| **Split** | 0.7619 | | 0.7619 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:30 | | 11:30 | |
| AM Peak Vol | 2750 | | 2750 | |
| AM PHF | 0.9683 | | 0.9683 | |
| PM Peak Hour | | 16:30 | | 16:30 |
| PM Peak Vol | | 2768 | | 2768 |
| PM PHF | | 0.9665 | | 0.9665 |

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| File Name | Location | Location2 | Direction | Count Dur | Start Date | Start Time | Avg Vol | AM PkHr | AM PkVol | AM PHF | PM PkHr | PM PkVol | PM PHF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0400157 | LOOP 202 EB OFF RAMPS | W. of SCOTTSDALE RD | EB | 24 | 1/29/2004 | 0:00 | 15650 | 8:00 | 1282 | 0.9054 | 14:00 | 1004 | 0.9544 |
| 0400158 | LOOP 202 EB OFF RAMP-RT TURNS | W. of SCOTTSDALE RD | EB | 24 | 1/29/2004 | 0:00 | 8339 | 8:00 | 731 | 0.9277 | 12:30 | 495 | 0.8839 |
| 0400159 | SCOTTSDALE RD | BTWN LOOP 202 EB OFF RAMPS (T-SPLIT) | SB | 24 | 1/29/2004 | 0:00 | 17389 | 8:00 | 1341 | 0.8730 | 17:00 | 1365 | 0.9004 |
| 0400160 | SCOTTSDALE RD | S. of LOOP 202 EB ON RAMP | NB | 24 | 1/29/2004 | 0:00 | 32116 | 11:45 | 2070 | 0.8697 | 15:00 | 2884 | 0.8945 |
| 0400161 | LOOP 202 WB OFF RAMPS | E. of SCOTTSDALE RD | WB | 24 | 1/29/2004 | 0:00 | 11919 | 8:15 | 1214 | 0.8848 | 12:45 | 859 | 0.9177 |
| 0400162 | LOOP 202 WB OFF RAMP-RT TURNS | E. of SCOTTSDALE RD | WB | 24 | 1/29/2004 | 0:00 | 6026 | 9:00 | 580 | 0.8480 | 12:15 | 410 | 0.9579 |
| 0400163 | SCOTTSDALE RD | BTWN LOOP 202 WB OFF RAMPS (T-SPLIT) | NB | 24 | 1/29/2004 | 0:00 | 24488 | 7:30 | 1778 | 0.9241 | 15:00 | 1776 | 0.9507 |
| 0400164 | SCOTTSDALE RD | N. of LOOP 202 WB ON RAMP | SB | 24 | 1/29/2004 | 0:00 | 27418 | 11:30 | 1732 | 0.9097 | 17:15 | 2380 | 0.9917 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400157
Duration: 24
Site Code: 6
TRA ID: 0400157
Location 1: LOOP 202 EB OFF RAMPS W. of SCOTTSDALE RD
Count Type: VOL
Direction: EB
Latitude: 33.43567
Longitude: -111.92925

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 43 | 262 | 43 | 262 |
| 12:15 | 31 | 221 | 31 | 221 |
| 12:30 | 32 | 225 | 32 | 225 |
| 12:45 | 28 | 233 | 28 | 233 |
| 1:00 | 29 | 251 | 29 | 251 |
| 1:15 | 32 | 222 | 32 | 222 |
| 1:30 | 28 | 221 | 28 | 221 |
| 1:45 | 18 | 208 | 18 | 208 |
| 2:00 | 25 | 249 | 25 | 249 |
| 2:15 | 19 | 230 | 19 | 230 |
| 2:30 | 18 | 263 | 18 | 263 |
| 2:45 | 14 | 262 | 14 | 262 |
| 3:00 | 13 | 216 | 13 | 216 |
| 3:15 | 7 | 245 | 7 | 245 |
| 3:30 | 8 | 239 | 8 | 239 |
| 3:45 | 17 | 237 | 17 | 237 |
| 4:00 | 14 | 235 | 14 | 235 |
| 4:15 | 24 | 199 | 24 | 199 |
| 4:30 | 22 | 204 | 22 | 204 |
| 4:45 | 29 | 206 | 29 | 206 |
| 5:00 | 36 | 213 | 36 | 213 |
| 5:15 | 44 | 199 | 44 | 199 |
| 5:30 | 75 | 199 | 75 | 199 |
| 5:45 | 125 | 240 | 125 | 240 |
| 6:00 | 151 | 215 | 151 | 215 |
| 6:15 | 181 | 219 | 181 | 219 |
| 6:30 | 207 | 205 | 207 | 205 |
| 6:45 | 222 | 245 | 222 | 245 |
| 7:00 | 211 | 206 | 211 | 206 |
| 7:15 | 262 | 204 | 262 | 204 |
| 7:30 | 241 | 158 | 241 | 158 |
| 7:45 | 256 | 169 | 256 | 169 |
| 8:00 | 300 | 166 | 300 | 166 |
| 8:15 | 322 | 133 | 322 | 133 |
| 8:30 | 306 | 134 | 306 | 134 |
| 8:45 | 354 | 135 | 354 | 135 |
| 9:00 | 223 | 138 | 223 | 138 |
| 9:15 | 208 | 140 | 208 | 140 |
| 9:30 | 229 | 145 | 229 | 145 |
| 9:45 | 243 | 144 | 243 | 144 |
| 10:00 | 302 | 143 | 302 | 143 |
| 10:15 | 261 | 131 | 261 | 131 |
| 10:30 | 207 | 103 | 207 | 103 |
| 10:45 | 196 | 109 | 196 | 109 |
| 11:00 | 226 | 109 | 226 | 109 |
| 11:15 | 249 | 77 | 249 | 77 |
| 11:30 | 262 | 73 | 262 | 73 |
| 11:45 | 254 | 66 | 254 | 66 |
| **Total** | **6604** | **9046** | **6604** | **9046** |
| **Day Total** | **15650** | | **15650** | |
| **Split** | 0.7300 | | 0.7300 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 1282 | | 1282 | |
| AM PHF | 0.9054 | | 0.9054 | |
| PM Peak Hour | | 14:00 | | 14:00 |
| PM Peak Vol | | 1004 | | 1004 |
| PM PHF | | 0.9544 | | 0.9544 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400158
Duration: 24
Site Code: 6
TRA ID: 0400158
Location 1: LOOP 202 EB OFF RAMP-RT TURNS W. of SCOTTSDALE RD
Count Type: VOL
Direction: EB
Latitude: 33.43567
Longitude: -111.92665

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 20 | 131 | 20 | 131 |
| 12:15 | 19 | 111 | 19 | 111 |
| 12:30 | 16 | 110 | 16 | 110 |
| 12:45 | 15 | 117 | 15 | 117 |
| 1:00 | 18 | 128 | 18 | 128 |
| 1:15 | 18 | 140 | 18 | 140 |
| 1:30 | 17 | 104 | 17 | 104 |
| 1:45 | 13 | 91 | 13 | 91 |
| 2:00 | 14 | 114 | 14 | 114 |
| 2:15 | 10 | 117 | 10 | 117 |
| 2:30 | 11 | 119 | 11 | 119 |
| 2:45 | 6 | 133 | 6 | 133 |
| 3:00 | 5 | 109 | 5 | 109 |
| 3:15 | 4 | 120 | 4 | 120 |
| 3:30 | 6 | 121 | 6 | 121 |
| 3:45 | 9 | 101 | 9 | 101 |
| 4:00 | 9 | 124 | 9 | 124 |
| 4:15 | 20 | 110 | 20 | 110 |
| 4:30 | 11 | 108 | 11 | 108 |
| 4:45 | 17 | 110 | 17 | 110 |
| 5:00 | 18 | 108 | 18 | 108 |
| 5:15 | 33 | 104 | 33 | 104 |
| 5:30 | 47 | 109 | 47 | 109 |
| 5:45 | 69 | 121 | 69 | 121 |
| 6:00 | 82 | 117 | 82 | 117 |
| 6:15 | 88 | 116 | 88 | 116 |
| 6:30 | 103 | 106 | 103 | 106 |
| 6:45 | 117 | 144 | 117 | 144 |
| 7:00 | 118 | 103 | 118 | 103 |
| 7:15 | 176 | 102 | 176 | 102 |
| 7:30 | 124 | 77 | 124 | 77 |
| 7:45 | 150 | 76 | 150 | 76 |
| 8:00 | 167 | 84 | 167 | 84 |
| 8:15 | 197 | 64 | 197 | 64 |
| 8:30 | 185 | 65 | 185 | 65 |
| 8:45 | 182 | 65 | 182 | 65 |
| 9:00 | 152 | 74 | 152 | 74 |
| 9:15 | 113 | 69 | 113 | 69 |
| 9:30 | 136 | 94 | 136 | 94 |
| 9:45 | 130 | 78 | 130 | 78 |
| 10:00 | 185 | 69 | 185 | 69 |
| 10:15 | 153 | 58 | 153 | 58 |
| 10:30 | 114 | 48 | 114 | 48 |
| 10:45 | 96 | 49 | 96 | 49 |
| 11:00 | 121 | 62 | 121 | 62 |
| 11:15 | 139 | 43 | 139 | 43 |
| 11:30 | 143 | 42 | 143 | 42 |
| 11:45 | 145 | 33 | 145 | 33 |
| **Total** | **3741** | **4598** | **3741** | **4598** |
| **Day Total** | **8339** | | **8339** | |
| **Split** | 0.8136 | | 0.8136 | |
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 731 | | 731 | |
| AM PHF | 0.9277 | | 0.9277 | |
| PM Peak Hour | | 12:30 | | 12:30 |
| PM Peak Vol | | 495 | | 495 |
| PM PHF | | 0.8839 | | 0.8839 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400159
Duration: 24
Site Code: 6
TRA ID: 0400159
Location 1: SCOTTSDALE RD BTWN LOOP 202 EB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: SB
Latitude: 33.43568
Longitude: -111.92648

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 38 | 287 | 38 | 287 |
| 12:15 | 42 | 226 | 42 | 226 |
| 12:30 | 45 | 262 | 45 | 262 |
| 12:45 | 56 | 303 | 56 | 303 |
| 1:00 | 57 | 344 | 57 | 344 |
| 1:15 | 35 | 262 | 35 | 262 |
| 1:30 | 20 | 188 | 20 | 188 |
| 1:45 | 19 | 217 | 19 | 217 |
| 2:00 | 19 | 243 | 19 | 243 |
| 2:15 | 17 | 290 | 17 | 290 |
| 2:30 | 11 | 275 | 11 | 275 |
| 2:45 | 16 | 241 | 16 | 241 |
| 3:00 | 8 | 222 | 8 | 222 |
| 3:15 | 10 | 251 | 10 | 251 |
| 3:30 | 7 | 254 | 7 | 254 |
| 3:45 | 8 | 256 | 8 | 256 |
| 4:00 | 18 | 268 | 18 | 268 |
| 4:15 | 25 | 290 | 25 | 290 |
| 4:30 | 35 | 272 | 35 | 272 |
| 4:45 | 19 | 292 | 19 | 292 |
| 5:00 | 38 | 291 | 38 | 291 |
| 5:15 | 68 | 350 | 68 | 350 |
| 5:30 | 80 | 379 | 80 | 379 |
| 5:45 | 67 | 345 | 67 | 345 |
| 6:00 | 91 | 289 | 91 | 289 |
| 6:15 | 88 | 270 | 88 | 270 |
| 6:30 | 128 | 273 | 128 | 273 |
| 6:45 | 185 | 243 | 185 | 243 |
| 7:00 | 188 | 218 | 188 | 218 |
| 7:15 | 172 | 192 | 172 | 192 |
| 7:30 | 195 | 188 | 195 | 188 |
| 7:45 | 240 | 202 | 240 | 202 |
| 8:00 | 311 | 148 | 311 | 148 |
| 8:15 | 375 | 169 | 375 | 169 |
| 8:30 | 384 | 192 | 384 | 192 |
| 8:45 | 271 | 183 | 271 | 183 |
| 9:00 | 199 | 224 | 199 | 224 |
| 9:15 | 201 | 195 | 201 | 195 |
| 9:30 | 240 | 189 | 240 | 189 |
| 9:45 | 310 | 162 | 310 | 162 |
| 10:00 | 343 | 163 | 343 | 163 |
| 10:15 | 204 | 127 | 204 | 127 |
| 10:30 | 197 | 148 | 197 | 148 |
| 10:45 | 227 | 130 | 227 | 130 |
| 11:00 | 282 | 123 | 282 | 123 |
| 11:15 | 299 | 108 | 299 | 108 |
| 11:30 | 311 | 81 | 311 | 81 |
| 11:45 | 276 | 89 | 276 | 89 |
| **Total** | **6475** | **10914** | **6475** | **10914** |
| **Day Total** | **17389** | | **17389** | |
| **Split** | 0.5933 | | 0.5933 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 8:00 | | 8:00 | |
| AM Peak Vol | 1341 | | 1341 | |
| AM PHF | 0.8730 | | 0.8730 | |
| PM Peak Hour | | 17:00 | | 17:00 |
| PM Peak Vol | | 1365 | | 1365 |
| PM PHF | | 0.9004 | | 0.9004 |

Traffic Research and Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

File Name: 0400160
Duration: 24
Site Code: 6
TRA ID: 0400160
Location 1: SCOTTSDALE RD S. of LOOP 202 EB ON RAMP
Count Type: VOL
Direction: NB
Latitude: 33.43458
Longitude: -111.92610

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 174 | 578 | 174 | 578 |
| 12:15 | 130 | 595 | 130 | 595 |
| 12:30 | 96 | 441 | 96 | 441 |
| 12:45 | 130 | 439 | 130 | 439 |
| 1:00 | 152 | 422 | 152 | 422 |
| 1:15 | 117 | 466 | 117 | 466 |
| 1:30 | 91 | 556 | 91 | 556 |
| 1:45 | 73 | 840 | 73 | 840 |
| 2:00 | 61 | 657 | 61 | 657 |
| 2:15 | 38 | 425 | 38 | 425 |
| 2:30 | 27 | 449 | 27 | 449 |
| 2:45 | 33 | 500 | 33 | 500 |
| 3:00 | 38 | 727 | 38 | 727 |
| 3:15 | 19 | 806 | 19 | 806 |
| 3:30 | 8 | 725 | 8 | 725 |
| 3:45 | 19 | 626 | 19 | 626 |
| 4:00 | 25 | 469 | 25 | 469 |
| 4:15 | 33 | 504 | 33 | 504 |
| 4:30 | 30 | 564 | 30 | 564 |
| 4:45 | 38 | 688 | 38 | 688 |
| 5:00 | 49 | 588 | 49 | 588 |
| 5:15 | 60 | 555 | 60 | 555 |
| 5:30 | 59 | 484 | 59 | 484 |
| 5:45 | 90 | 466 | 90 | 466 |
| 6:00 | 126 | 512 | 126 | 512 |
| 6:15 | 172 | 478 | 172 | 478 |
| 6:30 | 232 | 506 | 232 | 506 |
| 6:45 | 308 | 515 | 308 | 515 |
| 7:00 | 326 | 416 | 326 | 416 |
| 7:15 | 374 | 432 | 374 | 432 |
| 7:30 | 494 | 361 | 494 | 361 |
| 7:45 | 546 | 388 | 546 | 388 |
| 8:00 | 403 | 417 | 403 | 417 |
| 8:15 | 484 | 348 | 484 | 348 |
| 8:30 | 330 | 384 | 330 | 384 |
| 8:45 | 349 | 387 | 349 | 387 |
| 9:00 | 306 | 420 | 306 | 420 |
| 9:15 | 298 | 492 | 298 | 492 |
| 9:30 | 263 | 532 | 263 | 532 |
| 9:45 | 270 | 351 | 270 | 351 |
| 10:00 | 253 | 287 | 253 | 287 |
| 10:15 | 292 | 279 | 292 | 279 |
| 10:30 | 397 | 216 | 397 | 216 |
| 10:45 | 535 | 252 | 535 | 252 |
| 11:00 | 326 | 231 | 326 | 231 |
| 11:15 | 348 | 193 | 348 | 193 |
| 11:30 | 322 | 166 | 322 | 166 |
| 11:45 | 456 | 183 | 456 | 183 |
| **Total** | **9800** | **22316** | **9800** | **22316** |
| **Day Total** | **32116** | | **32116** | |
| **Split** | 0.4391 | | 0.4391 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:45 | | 11:45 | |
| AM Peak Vol | 2070 | | 2070 | |
| AM PHF | 0.8697 | | 0.8697 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 2884 | | 2884 |
| PM PHF | | 0.8945 | | 0.8945 |

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File Name: 0400161
Duration: 24
Site Code: 6
TRA ID: 0400161
Location 1: LOOP 202 WB OFF RAMPS E. of SCOTTSDALE RD
Count Type: VOL
Direction: WB
Latitude: 33.43643
Longitude: -111.92382

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 19 | 204 | 19 | 204 |
| 12:15 | 21 | 198 | 21 | 198 |
| 12:30 | 17 | 177 | 17 | 177 |
| 12:45 | 14 | 211 | 14 | 211 |
| 1:00 | 16 | 234 | 16 | 234 |
| 1:15 | 24 | 223 | 24 | 223 |
| 1:30 | 17 | 191 | 17 | 191 |
| 1:45 | 11 | 145 | 11 | 145 |
| 2:00 | 8 | 164 | 8 | 164 |
| 2:15 | 8 | 154 | 8 | 154 |
| 2:30 | 11 | 198 | 11 | 198 |
| 2:45 | 8 | 179 | 8 | 179 |
| 3:00 | 6 | 150 | 6 | 150 |
| 3:15 | 11 | 148 | 11 | 148 |
| 3:30 | 12 | 136 | 12 | 136 |
| 3:45 | 3 | 149 | 3 | 149 |
| 4:00 | 8 | 152 | 8 | 152 |
| 4:15 | 8 | 149 | 8 | 149 |
| 4:30 | 26 | 141 | 26 | 141 |
| 4:45 | 47 | 150 | 47 | 150 |
| 5:00 | 27 | 136 | 27 | 136 |
| 5:15 | 44 | 140 | 44 | 140 |
| 5:30 | 81 | 171 | 81 | 171 |
| 5:45 | 104 | 172 | 104 | 172 |
| 6:00 | 89 | 151 | 89 | 151 |
| 6:15 | 119 | 154 | 119 | 154 |
| 6:30 | 121 | 135 | 121 | 135 |
| 6:45 | 113 | 160 | 113 | 160 |
| 7:00 | 135 | 129 | 135 | 129 |
| 7:15 | 164 | 118 | 164 | 118 |
| 7:30 | 120 | 110 | 120 | 110 |
| 7:45 | 162 | 108 | 162 | 108 |
| 8:00 | 229 | 96 | 229 | 96 |
| 8:15 | 284 | 89 | 284 | 89 |
| 8:30 | 343 | 80 | 343 | 80 |
| 8:45 | 320 | 98 | 320 | 98 |
| 9:00 | 267 | 116 | 267 | 116 |
| 9:15 | 218 | 117 | 218 | 117 |
| 9:30 | 225 | 101 | 225 | 101 |
| 9:45 | 271 | 97 | 271 | 97 |
| 10:00 | 318 | 83 | 318 | 83 |
| 10:15 | 289 | 70 | 289 | 70 |
| 10:30 | 180 | 74 | 180 | 74 |
| 10:45 | 165 | 71 | 165 | 71 |
| 11:00 | 172 | 61 | 172 | 61 |
| 11:15 | 184 | 49 | 184 | 49 |
| 11:30 | 235 | 44 | 235 | 44 |
| 11:45 | 228 | 34 | 228 | 34 |
| **Total** | **5502** | **6417** | **5502** | **6417** |
| **Day Total** | **11919** | | **11919** | |
| **Split** | 0.8574 | | 0.8574 | |
| AM Peak Hour | 8:15 | | 8:15 | |
| AM Peak Vol | 1214 | | 1214 | |
| AM PHF | 0.8848 | | 0.8848 | |
| PM Peak Hour | | 12:45 | | 12:45 |
| PM Peak Vol | | 859 | | 859 |
| PM PHF | | 0.9177 | | 0.9177 |

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File Name: 0400162
Duration: 24
Site Code: 6
TRA ID: 0400162
Location 1: LOOP 202 WB OFF RAMP-RT TURNS E. of SCOTTSDALE RD
Count Type: VOL
Direction: WB
Latitude: 33.43652
Longitude: -111.92587

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 5 | 85 | 5 | 85 |
| 12:15 | 13 | 106 | 13 | 106 |
| 12:30 | 7 | 94 | 7 | 94 |
| 12:45 | 7 | 103 | 7 | 103 |
| 1:00 | 9 | 107 | 9 | 107 |
| 1:15 | 8 | 94 | 8 | 94 |
| 1:30 | 6 | 85 | 6 | 85 |
| 1:45 | 5 | 78 | 5 | 78 |
| 2:00 | 7 | 98 | 7 | 98 |
| 2:15 | 5 | 69 | 5 | 69 |
| 2:30 | 6 | 102 | 6 | 102 |
| 2:45 | 6 | 99 | 6 | 99 |
| 3:00 | 5 | 84 | 5 | 84 |
| 3:15 | 11 | 94 | 11 | 94 |
| 3:30 | 7 | 78 | 7 | 78 |
| 3:45 | 2 | 101 | 2 | 101 |
| 4:00 | 6 | 90 | 6 | 90 |
| 4:15 | 6 | 91 | 6 | 91 |
| 4:30 | 12 | 86 | 12 | 86 |
| 4:45 | 27 | 93 | 27 | 93 |
| 5:00 | 14 | 91 | 14 | 91 |
| 5:15 | 25 | 100 | 25 | 100 |
| 5:30 | 27 | 102 | 27 | 102 |
| 5:45 | 59 | 86 | 59 | 86 |
| 6:00 | 54 | 78 | 54 | 78 |
| 6:15 | 64 | 79 | 64 | 79 |
| 6:30 | 77 | 72 | 77 | 72 |
| 6:45 | 49 | 72 | 49 | 72 |
| 7:00 | 52 | 73 | 52 | 73 |
| 7:15 | 80 | 53 | 80 | 53 |
| 7:30 | 85 | 57 | 85 | 57 |
| 7:45 | 97 | 41 | 97 | 41 |
| 8:00 | 121 | 59 | 121 | 59 |
| 8:15 | 134 | 46 | 134 | 46 |
| 8:30 | 128 | 44 | 128 | 44 |
| 8:45 | 138 | 32 | 138 | 32 |
| 9:00 | 145 | 43 | 145 | 43 |
| 9:15 | 132 | 58 | 132 | 58 |
| 9:30 | 132 | 49 | 132 | 49 |
| 9:45 | 171 | 42 | 171 | 42 |
| 10:00 | 113 | 41 | 113 | 41 |
| 10:15 | 115 | 40 | 115 | 40 |
| 10:30 | 99 | 31 | 99 | 31 |
| 10:45 | 95 | 31 | 95 | 31 |
| 11:00 | 76 | 28 | 76 | 28 |
| 11:15 | 60 | 18 | 60 | 18 |
| 11:30 | 101 | 15 | 101 | 15 |
| 11:45 | 88 | 17 | 88 | 17 |
| **Total** | **2691** | **3335** | **2691** | **3335** |
| **Day Total** | **6026** | | **6026** | |
| **Split** | 0.8069 | | 0.8069 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 9:00 | | 9:00 | |
| AM Peak Vol | 580 | | 580 | |
| AM PHF | 0.8480 | | 0.8480 | |
| PM Peak Hour | | 12:15 | | 12:15 |
| PM Peak Vol | | 410 | | 410 |
| PM PHF | | 0.9579 | | 0.9579 |

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File Name: 0400163
Duration: 24
Site Code: 6
TRA ID: 0400163
Location 1: SCOTTSDALE RD BTWN LOOP 202 WB OFF RAMPS (T-SPLIT)
Count Type: VOL
Direction: NB
Latitude: 33.43660
Longitude: -111.92613

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 80 | 408 | 80 | 408 |
| 12:15 | 75 | 401 | 75 | 401 |
| 12:30 | 57 | 341 | 57 | 341 |
| 12:45 | 65 | 344 | 65 | 344 |
| 1:00 | 72 | 356 | 72 | 356 |
| 1:15 | 77 | 348 | 77 | 348 |
| 1:30 | 50 | 377 | 50 | 377 |
| 1:45 | 43 | 480 | 43 | 480 |
| 2:00 | 46 | 424 | 46 | 424 |
| 2:15 | 28 | 359 | 28 | 359 |
| 2:30 | 20 | 388 | 20 | 388 |
| 2:45 | 27 | 423 | 27 | 423 |
| 3:00 | 26 | 425 | 26 | 425 |
| 3:15 | 20 | 467 | 20 | 467 |
| 3:30 | 6 | 445 | 6 | 445 |
| 3:45 | 17 | 439 | 17 | 439 |
| 4:00 | 24 | 372 | 24 | 372 |
| 4:15 | 20 | 350 | 20 | 350 |
| 4:30 | 22 | 419 | 22 | 419 |
| 4:45 | 41 | 460 | 41 | 460 |
| 5:00 | 45 | 411 | 45 | 411 |
| 5:15 | 41 | 387 | 41 | 387 |
| 5:30 | 81 | 335 | 81 | 335 |
| 5:45 | 118 | 417 | 118 | 417 |
| 6:00 | 182 | 355 | 182 | 355 |
| 6:15 | 205 | 328 | 205 | 328 |
| 6:30 | 296 | 354 | 296 | 354 |
| 6:45 | 339 | 364 | 339 | 364 |
| 7:00 | 313 | 309 | 313 | 309 |
| 7:15 | 351 | 320 | 351 | 320 |
| 7:30 | 459 | 263 | 459 | 263 |
| 7:45 | 481 | 303 | 481 | 303 |
| 8:00 | 417 | 283 | 417 | 283 |
| 8:15 | 421 | 224 | 421 | 224 |
| 8:30 | 338 | 255 | 338 | 255 |
| 8:45 | 353 | 235 | 353 | 235 |
| 9:00 | 254 | 255 | 254 | 255 |
| 9:15 | 301 | 235 | 301 | 235 |
| 9:30 | 275 | 280 | 275 | 280 |
| 9:45 | 301 | 235 | 301 | 235 |
| 10:00 | 295 | 208 | 295 | 208 |
| 10:15 | 316 | 233 | 316 | 233 |
| 10:30 | 314 | 178 | 314 | 178 |
| 10:45 | 359 | 192 | 359 | 192 |
| 11:00 | 307 | 176 | 307 | 176 |
| 11:15 | 325 | 127 | 325 | 127 |
| 11:30 | 311 | 120 | 311 | 120 |
| 11:45 | 334 | 132 | 334 | 132 |
| **Total** | **8948** | **15540** | **8948** | **15540** |
| **Day Total** | **24488** | | **24488** | |
| **Split** | 0.5758 | | 0.5758 | |
| AM Peak Hour | 7:30 | | 7:30 | |
| AM Peak Vol | 1778 | | 1778 | |
| AM PHF | 0.9241 | | 0.9241 | |
| PM Peak Hour | | 15:00 | | 15:00 |
| PM Peak Vol | | 1776 | | 1776 |
| PM PHF | | 0.9507 | | 0.9507 |

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File Name: 0400164
Duration: 24
Site Code: 6
TRA ID: 0400164
Location 1: SCOTTSDALE RD N. of LOOP 202 WB ON RAMP
Count Type: VOL
Direction: SB
Latitude: 33.43737
Longitude: -111.92648

| Date | 1/29/2004 | | Average | |
|---|---|---|---|---|
| Time | AM | PM | AM | PM |
| 12:00 | 107 | 403 | 107 | 403 |
| 12:15 | 85 | 447 | 85 | 447 |
| 12:30 | 74 | 382 | 74 | 382 |
| 12:45 | 85 | 391 | 85 | 391 |
| 1:00 | 111 | 450 | 111 | 450 |
| 1:15 | 103 | 454 | 103 | 454 |
| 1:30 | 68 | 383 | 68 | 383 |
| 1:45 | 49 | 394 | 49 | 394 |
| 2:00 | 37 | 414 | 37 | 414 |
| 2:15 | 38 | 410 | 38 | 410 |
| 2:30 | 27 | 457 | 27 | 457 |
| 2:45 | 30 | 419 | 30 | 419 |
| 3:00 | 36 | 448 | 36 | 448 |
| 3:15 | 31 | 457 | 31 | 457 |
| 3:30 | 27 | 534 | 27 | 534 |
| 3:45 | 26 | 493 | 26 | 493 |
| 4:00 | 37 | 487 | 37 | 487 |
| 4:15 | 37 | 486 | 37 | 486 |
| 4:30 | 48 | 511 | 48 | 511 |
| 4:45 | 35 | 552 | 35 | 552 |
| 5:00 | 47 | 569 | 47 | 569 |
| 5:15 | 58 | 600 | 58 | 600 |
| 5:30 | 123 | 596 | 123 | 596 |
| 5:45 | 120 | 600 | 120 | 600 |
| 6:00 | 117 | 584 | 117 | 584 |
| 6:15 | 155 | 525 | 155 | 525 |
| 6:30 | 195 | 444 | 195 | 444 |
| 6:45 | 230 | 396 | 230 | 396 |
| 7:00 | 273 | 392 | 273 | 392 |
| 7:15 | 294 | 332 | 294 | 332 |
| 7:30 | 346 | 303 | 346 | 303 |
| 7:45 | 321 | 269 | 321 | 269 |
| 8:00 | 317 | 296 | 317 | 296 |
| 8:15 | 384 | 262 | 384 | 262 |
| 8:30 | 397 | 280 | 397 | 280 |
| 8:45 | 400 | 305 | 400 | 305 |
| 9:00 | 337 | 257 | 337 | 257 |
| 9:15 | 256 | 316 | 256 | 316 |
| 9:30 | 264 | 276 | 264 | 276 |
| 9:45 | 305 | 288 | 305 | 288 |
| 10:00 | 339 | 260 | 339 | 260 |
| 10:15 | 391 | 218 | 391 | 218 |
| 10:30 | 281 | 213 | 281 | 213 |
| 10:45 | 341 | 212 | 341 | 212 |
| 11:00 | 359 | 193 | 359 | 193 |
| 11:15 | 357 | 192 | 357 | 192 |
| 11:30 | 406 | 157 | 406 | 157 |
| 11:45 | 476 | 131 | 476 | 131 |
| **Total** | **8980** | **18438** | **8980** | **18438** |
| **Day Total** | **27418** | | **27418** | |
| **Split** | 0.4870 | | 0.4870 | |

| | | | | |
|---|---|---|---|---|
| AM Peak Hour | 11:30 | | 11:30 | |
| AM Peak Vol | 1732 | | 1732 | |
| AM PHF | 0.9097 | | 0.9097 | |
| PM Peak Hour | | 17:15 | | 17:15 |
| PM Peak Vol | | 2380 | | 2380 |
| PM PHF | | 0.9917 | | 0.9917 |

| | Intersection Control Delay | Stopped Vehicle Count | | Trucks - RT Lane | | Date |
|---|---|---|---|---|---|---|
| | | 7:00 - 8:30 am | 4:30 - 6:00 pm | AM | PM | |
| 1 | Indian School Rd & SR- 51 NB Off Ramp - Right Turn Lane Only | 223 | 157 | - | 3 | 1/20/2004 |
| 2 | Indian School Rd & SR- 51 SB Off Ramp - Right Turn Lane Only | 488 | 141 | 1 | 1 | 1/20/2004 |
| 3 | Cactus Rd & SR-51 NB Off Ramp - Right Turn Lane Only | 293 | 378 | 10 | 1 | 1/21/2004 |
| 4 | Cactus Rd & SR-51 SB Off Ramp - Right Turn Lane Only | 230 | 298 | 5 | 3 | 1/21/2004 |
| 5 | Glendale Rd & SR-51 NB Off Ramp - Right Turn Lane Only | 456 | 115 | 15 | 0 | 2/3/2004 |
| 6 | Glendale Rd & SR-51 SB Off Ramp - Right Turn Lane Only | 223 | 293 | 5 | 1 | 2/3/2004 |
| 7 | Greenway Rd & SR-51 NB Off Ramp - Right Turn Lane Only | 413 | 476 | 10 | 4 | 1/27/2004 |
| 8 | Greenway Rd & SR-51 SB Off Ramp - Right Turn Lane Only | 81 | 393 | 4 | 1 | 1/27/2004 |
| 9 | Bell Rd & Loop 101(W) NB Off Ramp - Right Turn Lane Only | 423 | 744 | 24 | 5 | 1/28/2004 |
| 10 | Bell Rd & Loop 101(W) SB Off Ramp - Right Turn Lane Only | 674 | 1194 | 62 | 9 | 1/28/2004 |
| 11 | Scottsdale Rd & Loop 202 EB Off Ramp - Right Turn Lane Only | 530 | 403 | 10 | 1 | 1/29/2004 |
| 12 | Scottsdale Rd & Loop 202 WB Off Ramp - Right Turn Lane Only | 282 | 262 | 4 | 9 | 1/29/2004 |

## Appendix B

**Control Delay Calculation Description & Example**
(Excerpt from *Highway Capacity Manual 2000*)

# APPENDIX A. FIELD MEASUREMENT OF INTERSECTION CONTROL DELAY

## GENERAL NOTES

*Equipment and personnel requirements*

As an alternative to the estimation of control delay per vehicle using Equation 16-9 and the progression adjustment factor, delay at existing locations may be measured directly. There are a number of techniques for making this measurement, including the use of test-car observations, path tracing of individual vehicles, and the recording of arrival and departure volumes on a cycle-by-cycle basis. The method summarized here is based on direct observation of vehicle-in-queue counts at the intersection and normally requires two field personnel per lane group surveyed, unless the volume is light. Also needed is a multifunction digital watch that includes a countdown-repeat timer, with the countdown interval in seconds, plus a volume-count board with at least two tally counters. As an alternative, a laptop computer can be programmed to emit audio count markers at user-selected intervals, take volume counts, and execute real-time delay computations, thus simplifying data reduction.

In general, this method is applicable to all undersaturated signalized intersections. For oversaturated conditions, queue buildup normally makes the method impractical. Under such conditions, more personnel will be required to complete the field study, and other methods may be considered, such as an input-output technique or a zoned-survey technique.

In the input-output technique, different observers count arrivals separately from departures and vehicles in queue are calculated as the accumulated difference, subject to in-process checks for vehicles leaving the queue before they reach the stop line. The zoned-survey technique requires subdividing the approach into manageable segments to which the observers are assigned; they then count queued vehicles in their assigned zone. Both of these techniques require more personnel and are more complicated in setup and execution.

The method described here is applicable to situations in which the average maximum queue per cycle is no more than about 20 to 25 veh/ln. When queues are long or the demand to capacity ratio is near 1.0, care must be taken to continue the vehicle-in-queue count past the end of the arrival count period, as detailed below. This requirement is for consistency with the analytic delay equation used in the chapter text.

*Delay during deceleration is not directly measured*

The method does not directly measure delay during deceleration and during a portion of acceleration, which are very difficult to measure without sophisticated tracking equipment. However, this method has been shown to yield a reasonable estimate of control delay. The method includes an adjustment for errors that may occur when this type of sampling technique is used, as well as an acceleration-deceleration delay correction factor. The acceleration-deceleration factor is a function of the typical number of vehicles in queue during each cycle and the normal free-flow speed when vehicles are unimpeded by the signal.

Exhibit A16-1 is a worksheet that can be used for recording observations and computation of average time-in-queue delay. Before beginning the detailed survey, the observers need to make an estimate of the average free-flow speed during the study period. Free-flow speed is the speed at which vehicles would pass unimpeded through the intersection if the signal were green for an extended period. This speed may be obtained by driving through the intersection a few times when the signal is green and there is no queue and recording the speed at a location least affected by signal control. Typically, the recording location should be upstream about midblock.

EXHIBIT A16-1. INTERSECTION CONTROL DELAY WORKSHEET

**INTERSECTION CONTROL DELAY WORKSHEET**

***General Information***

Analyst _____
Agency or Company _____
Date Performed _____
Analysis Time Period _____

***Site Information***

Intersection _____
Area Type ❑ CBD ❑ Other
Jurisdiction _____
Analysis Year _____

***Input Initial Parameters***

Number of lanes, N _____
Free-flow speed, FFS (mi/h) _____
Survey count interval, $I_s$ (s) _____
Total vehicles arriving, $V_{tot}$ _____
Stopped-vehicle count, $V_{stop}$ _____
Cycle length, C (s) _____

***Input Field Data***

| Clock Time | Cycle Number | Number of Vehicles in Queue, Count Interval 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Total | | | | | | | | | | | |

***Computations***

Total vehicles in queue, $\Sigma V_{iq}$ = _____
Time-in-queue per vehicle, $d_{vq} = (I_s * \frac{\Sigma V_{iq}}{V_{tot}}) * 0.9$ _____ s
No. of vehicles stopping per lane each cycle = $\frac{V_{stop}}{(N_c \times N)}$ _____
Accel/Decel correction factor, CF (Ex. A16-2) _____
Number of cycles surveyed, $N_c$ = _____
Fraction of vehicles stopping, FVS = $\frac{V_{stop}}{V_{tot}}$ _____
Accel/Decel correction delay, $d_{ad}$ = FVS * CF _____ s
Control delay/vehicle, $d = d_{vq} + d_{ad}$ _____ s

## MEASUREMENT TECHNIQUE

*Field procedure*

The survey should begin at the start of the red phase of the lane group, ideally when there is no overflow queue from the previous green phase. There is a need for consistency with the analytic delay equation, which is based on delay to vehicles that arrive during the study period, not before. If the survey does start with an overflow queue, the overflow vehicles need to be excluded from subsequent queue counts.

Observer 1 performs the following tasks during the field study.

1. Keeps track of the end of standing queues for each cycle in the survey period by observing the last vehicle in each lane that stops because of the signal. This count includes vehicles arriving when the signal is actually green but stopped because vehicles in front have not yet started moving. For purposes of the survey, a vehicle is considered as having joined the queue when it approaches within one car length of a stopped vehicle and is itself about to stop. This definition is used because of the difficulty of keeping precise track of the moment when a vehicle comes to a stop. All vehicles that join a queue are then included in the vehicle-in-queue counts until they cross the stop line.

2. At regular intervals of between 10 and 20 s, records the number of vehicles in queue (e.g., using the countdown-repeat timer on a digital watch to signal the count time). The regular intervals should not be an integral divisor of the cycle length (e.g., if the cycle length is 120 s, 14-s or 16-s count intervals should be used, not 15-s intervals). Vehicles in queue are those that are included in the queue of stopping vehicles as defined in Step 1 and have not yet exited the intersection. For through vehicles, exiting the intersection can be considered to occur when the rear axle of a vehicle crosses the stop line. For turning vehicles, exiting the intersection occurs the instant a vehicle clears opposing through traffic or pedestrians to which it must yield and begins accelerating back to free-flow speed. Note that the vehicle-in-queue count often includes some vehicles that have regained speed but have not yet exited the intersection.

3. Enters the vehicle-in-queue counts in the appropriate box on the worksheet. Cycles of the survey period are listed in the second column of the sheet, after the column to record clock time every five cycles, and interval count identifiers are listed as column headings. For ease in conducting the study, the survey period is most conveniently defined as an integer number of cycles, though a precisely defined time length for the survey period (e.g., 15 min) can be used. The key point is that the end of the survey period must be clearly defined in advance since the last arriving vehicle or vehicles that stop in the period must be identified and counted until they exit the intersection, per the next step.

4. At the end of the survey period, continues taking vehicle-in-queue counts for all vehicles that arrived during the survey period until all of them have exited the intersection. This step requires mentally noting the last stopping vehicle that arrived during the survey period in each lane of the lane group and continuing the vehicle-in-queue counts until the last stopping vehicle or vehicles, plus all vehicles in front of the last stopping vehicles, exit the intersection. Stopping vehicles that arrive after the end of the survey period are not included in the final vehicle-in-queue counts.

Observer 2 performs the following study task.

1. During the entire survey period, maintains separate volume counts of total vehicles arriving during the survey period and total vehicles arriving during the survey period that stop one or more times. A vehicle stopping multiple times is counted only once as a stopping vehicle. Enters these volumes in the appropriate boxes on the worksheet.

Data reduction is accomplished with the following steps.

1. Sum each column of vehicle-in-queue counts, then sum the column totals for the entire survey period.

2. A vehicle recorded as part of a vehicle-in-queue count is in queue, on average, for the time interval between counts. The average time-in-queue per vehicle arriving during the survey period is estimated using Equation A16-1.

$$\text{Time-in-queue per vehicle} = \left( I_s * \frac{\Sigma V_{iq}}{V_{tot}} \right) * 0.9 \qquad \text{(A16-1)}$$

where

$I_s$ = interval between vehicle-in-queue counts (s),
$\Sigma V_{iq}$ = sum of vehicle-in-queue counts (veh),

$V_{tot}$ = total number of vehicles arriving during the survey period (veh), and
0.9 = empirical adjustment factor.

The 0.9 adjustment factor accounts for the errors that may occur when this type of sampling technique is used to derive actual delay values, normally resulting in an overestimate of delay. Research has shown the correction required to be fairly consistent over a variety of conditions.

3. Compute the fraction of vehicles stopping and the average number of vehicles stopping per lane in each signal cycle, as indicated on the worksheet.

4. Using Exhibit A16-2, look up a correction factor appropriate to the lane group free-flow speed and the average number of vehicles stopping per lane in each cycle. This factor adds an adjustment for deceleration and acceleration delay, which cannot be measured directly with manual techniques.

EXHIBIT A16-2. ACCELERATION-DECELERATION DELAY CORRECTION FACTOR, CF (s)

| Free-Flow Speed | ≤ 7 Vehicles | 8 - 19 Vehicles | 20 - 30 Vehicles[a] |
|---|---|---|---|
| ≤ 37 mi/h | + 5 | + 2 | - 1 |
| > 37–45 mi/h | + 7 | + 4 | + 2 |
| > 45 mi/h | + 9 | + 7 | + 5 |

Note:
a. Vehicle-in-queue counts in excess of about 30 vehicles per lane are typically unreliable.

5. Multiply the correction factor by the fraction of vehicles stopping, then add this product to the time-in-queue value of Step 2 to obtain the final estimate of control delay per vehicle.

Exhibit A16-3 presents a sample computation for a study site over a 15-min period, operating with a 115-s cycle over almost eight cycles. The exhibit is annotated to clarify the procedure. The 15-s count interval is not an integral divisor of the cycle length, thus eliminating potential survey bias due to queue buildup in a regular, cyclic pattern.

Exhibit A16-4 shows how the field study would have been finished if a queue still remained at the end of the 15-min study period. Only the vehicles that arrived during the 15-min period would be counted.

If the study site is an actuated signal with varying cycle and phase lengths, the count interval may be chosen as the most convenient value for conducting the field survey on the basis of volume and vantage point considerations.

EXHIBIT A16-3. EXAMPLE APPLICATION

## INTERSECTION CONTROL DELAY WORKSHEET

**General Information**

Analyst
Agency or Company
Date Performed
Analysis Time Period: PM

**Site Information**

Intersection: Cicero & Belmont
Area Type: ☐ CBD ☒ Other
Jurisdiction
Analysis Year: 1999

**Input Initial Parameters**

Number of lanes, N: 2
Free-flow speed, FFS (mi/h): 40
Survey count interval, $I_s$ (s): 15
Total vehicles arriving, $V_{tot}$: 530
Stopped vehicles count, $V_{stop}$: 223
Cycle length, C (s):

**Input Field Data**

| Clock Time | Cycle Number | Number of Vehicles in Queue, Count Interval 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:34 | 1 | 3 | 8 | 11 | 15 | 12 | 2 | 0 | 2 | | |
| | 2 | 6 | 12 | 15 | 16 | 6 | 0 | 0 | 2 | | |
| | 3 | 7 | 11 | 14 | 14 | 2 | 0 | 0 | | | |
| | 4 | 5 | 7 | 10 | 13 | 13 | 2 | 0 | 1 | | |
| 4:42 | 5 | 4 | 6 | 10 | 12 | 3 | 0 | 0 | 1 | | |
| | 6 | 5 | 7 | 9 | 13 | 4 | 0 | 0 | | | |
| | 7 | 3 | 6 | 8 | 12 | 12 | 0 | 0 | 0 | | |
| 4:47 | 8 | 4 | 7 | 11 | 16 | 9 | 0 | | | | |
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| | | | | | | | | | | | |
| Total | | 37 | 64 | 88 | 111 | 61 | 4 | 0 | 6 | | |

**Computations**

Total vehicles in queue, $\Sigma V_{iq}$ = 371
Time-in-queue per vehicle, $d_{vq} = (I_s * \frac{\Sigma V_{iq}}{V_{tot}}) * 0.9$ = 9.5 s
No. of vehicles stopping per lane each cycle = $\frac{V_{stop}}{(N_c \times N)}$ = 14
Accel/Decel correction factor, CF (Ex. A16-2) = 4
Number of cycles surveyed, $N_c$ = 7.8
Fraction of vehicles stopping, FVS = $\frac{V_{stop}}{V_{tot}}$ = 0.42
Accel/Decel correction delay, $d_{ad}$ = FVS * CF = 1.7 s
Control delay/vehicle, $d = d_{vq} + d_{ad}$ = 11.2 s

EXHIBIT A16-4. EXAMPLE APPLICATION WITH RESIDUAL QUEUE AT END

## INTERSECTION CONTROL DELAY WORKSHEET

### General Information

Analyst
Agency or Company
Date Performed
Analysis Time Period: PM

### Site Information

Intersection: Cicero & Belmont
Area Type: ☐ CBD ☒ Other
Jurisdiction
Analysis Year: 1999

### Input Initial Parameters

Number of lanes, N: 2
Free-flow speed, FFS (mi/h): 40
Survey count interval, $I_s$ (s): 15
Total vehicles arriving, $V_{tot}$
Stopped-vehicle count, $V_{stop}$
Cycle length, C (s)

### Input Field Data

| Clock Time | Cycle Number | Number of Vehicles in Queue, Count Interval 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:47 | B | 4 | 7 | 11 | 16 | 9 | 0 | > Queue count in previous example | | | |
| 4:47 | B | 4 | 4* | 4* | 4* | 0 | First four in queue have cleared by now | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| Total | | 37 | 61 | 81 | 99 | 52 | 4 | 0 | 6 | | |

← say 15 min. survey period ends here

4* - last stopping vehicles in survey period; count only until they clear.

### Computations

Total vehicles in queue, $\Sigma V_{iq}$ =
Time-in-queue per vehicle, $d_{vq} = (I_s * \frac{\Sigma V_{iq}}{V_{tot}}) * 0.9$ ____ s
No. of vehicles stopping per lane each cycle = $\frac{V_{stop}}{(N_c \times N)}$
Accel/Decel correction factor, CF (Ex. A16-2)
Number of cycles surveyed, $N_c$ =
Fraction of vehicles stopping, FVS = $\frac{V_{stop}}{V_{tot}}$
Accel/Decel correction delay, $d_{ad}$ = FVS * CF ____ s
Control delay/vehicle, $d = d_{vq} + d_{ad}$ ____ s