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DRAFT DESIGN CONCEPT REPORT
TECHNICAL APPENDIX - VOLUME 1 OF 2
(NOISE STUDY AND TRAFFIC OPERATIONS REPORTS)

Indian Bend Road –
Scottsdale Road to Hayden Road
S-0402

Prepared For:



Prepared By:



June 2004

TECHNICAL APPENDIX

Appendix A

Noise Study Technical Report

Appendix B

Traffic Operations Analysis Report

Appendix C

Preliminary Drainage Report
(Bound Separately)

APPENDIX A
NOISE STUDY TECHNICAL REPORT

NOISE STUDY TECHNICAL REPORT

INDIAN BEND ROAD IMPROVEMENTS SCOTTSDALE ROAD TO HAYDEN ROAD Scottsdale, Arizona

DRAFT

Prepared For:
City of Scottsdale
7447 East Indian School Road, Suite 205
Scottsdale, Arizona 85251

In Association With:
URS Corporation
7720 North 16th Street, Suite 100
Phoenix, Arizona 85020

Prepared by:
Higgins & Associates
701 West Southern Avenue- Suite 105
Mesa, Arizona 85210

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SECTION 1 - INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Noise Study Technical Report (Noise Report) is to present the results of the noise analysis performed for the proposed improvements to Indian Bend Road from Scottsdale Road to Hayden Road in Scottsdale, Arizona. The project improves the existing roadway, adding an additional through lane in each direction, as well as a new structure crossing Indian Bend Wash. Four alternatives for the wash crossing were analyzed, each varying the horizontal alignment of the roadway. The project location is illustrated in Exhibit 1 - Project Location Map.

Roadway plans and aerial photographs were provided by URS Corporation of Phoenix, Arizona. URS also provided a Traffic Operations Analysis Report which included current traffic counts and future traffic projections. This noise study was conducted using English measurements.

1.2 EXISTING ROADWAY CONDITIONS & LAND USES

The project is located in Scottsdale, Arizona. Indian Bend Road currently consists of one lane each way through most of the project area, with widening at each end for the intersections with Scottsdale Road and Hayden Road. Near the center of the project area, Indian Bend Road crosses the Indian Bend Wash.

Land uses within the study area consist of single-family residences, condominium residences, a golf course, a park, and commercial businesses. Most of the residences through this area are shielded by five-foot to six-foot high privacy walls.

The existing and planned land uses within the study area fall within established Noise Abatement Criteria (NAC) categories established by the Federal Highway Administration (FHWA) Federal Aid Program Guide (FAPG) H-772 in accordance with 23 CFR Part 772. These criteria and activity categories are summarized in Table 1. Exhibit 2 presents noise levels, in decibels, of several common indoor and outdoor activities and noise sources. They are included for relative comparison purposes.

Criteria used to determine where noise mitigation may be warranted was weighted against established Federal and State thresholds, based on land-use activities for properties that might be affected by highway traffic noise. As indicated in Table 1, traffic-generated noise has been determined to affect some human land-use activities more than it affects others. For instance, parks, schools, residences, motels and churches (Activity Category B) have lower established limits (A-weighted decibels) than commercial or industrial land-uses (Activity Category C). For residential properties, noise levels must approach (within 3 dBA), or exceed 67 dBA to be considered for mitigation under the

Arizona Department of Transportation Noise Abatement Policy (NAP) (March 2000). Additionally, mitigation will be considered for residential properties if predicted traffic noise levels substantially exceed existing levels. "Substantially exceed" is defined in the NAP as 15 dBA.

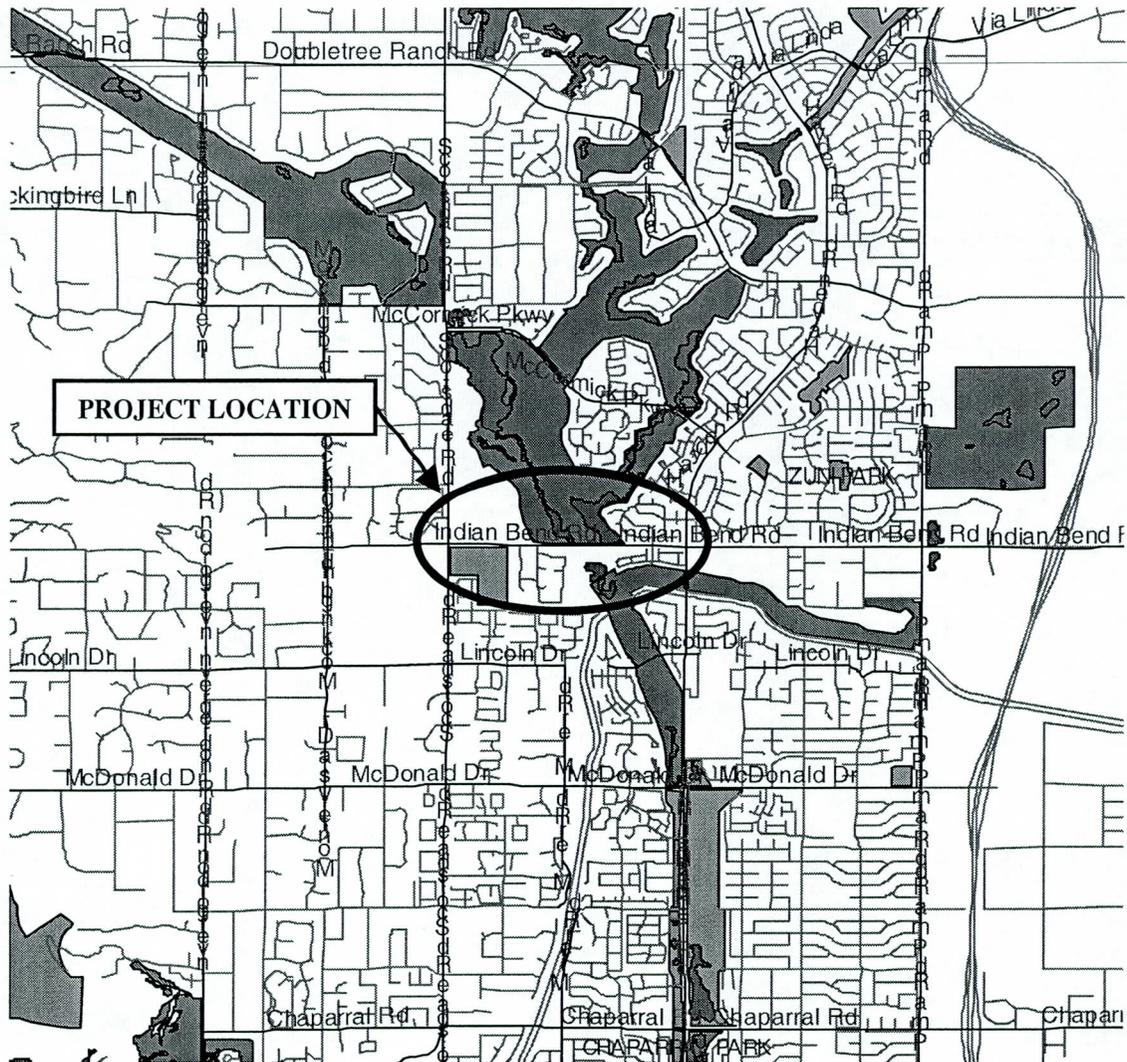


EXHIBIT 1 - PROJECT LOCATION MAP

Noise Abatement Criteria (NAC) Hourly A-Weighted Sound Level - Decibels (dBA)		
Activity Category	LAeq1h	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

The decibel (dB) is a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level.

It has been found that the A-scale on a sound-level meter best approximates the frequency response of the human ear. (dBA)

The hourly equivalent sound level, LA_{eq1h}, represents the A-weighted sound level which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over one hour.

Sources: U.S. Department of Transportation, Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement, Policy and Guidance*, June 1995, 23 CFR 772.

TABLE 1

Common Indoor and Outdoor Noise Levels		
Common Outdoor Noise Level	Noise Level (dBA)	Common Indoor Noise Level
	110	Rock Band
Jet Flyover at 350 m	100	
Gas Lawn Mower at 1 m		Food Blender at 1 m
Diesel Truck at 15 m	90	
Noisy Urban Daytime	80	Garbage Disposal at 1 m
Gas Lawn Mower at 30 m	70	Shouting at 1 m Vacuum Cleaner at 3 m
Commercial Area	60	Normal Speech at 1 m
Quiet Urban Daytime	50	Large Business Office Dishwasher Next Door
Quiet Urban Nighttime	40	Small Theater, Large Conference Room (background)
Quiet Suburban Nighttime	30	Library
Quiet Rural Nighttime	20	Concert Hall (background)
	10	Broadcast & Recording Studio
	0	Threshold of Hearing

Source: AASHTO Guide on Evaluation and Abatement of Traffic Noise, 1993

EXHIBIT 2

SECTION 2 - NOISE ANALYSIS

2.1 INTRODUCTION

The introduction of a new or expanded roadway into an area may introduce or increase traffic-generated noise into that area. To assess the change, it is first necessary to determine the nature of the existing noise environment. This assessment begins by selecting representative sites within the project area and recording the relevant existing noise level, called the ambient noise level. During the measurement phase, other factors that may affect the noise levels are noted. Atmospheric conditions (wind, temperature, humidity) and other noise sources, such as lawn mowers, industrial or commercial noises, aircraft, animals, etc. are examples of non-traffic related noises. Future predicted traffic noise levels are developed and evaluated against Noise Abatement Criteria (NAC) using the noise prediction model, STAMINA/Optima 2.0, described below.

2.2 STAMINA 2.0 MODELING

The noise prediction computer model STAMINA/Optima 2.0 was used for noise computations. The model translates the highway into a series of endpoints on a three-dimensional X, Y, Z coordinate system. This program is considered the current standard for roadway noise analysis.

Mainline roadways were defined by a series of roadway segment endpoints and traffic volumes were assigned to each roadway segment. Correspondingly, barriers to noise such as existing privacy walls were modeled as vertical planes. Receivers were identified as single points and assigned an elevation 5 feet above grade to simulate the height of human hearing.

In order to determine the noise produced by each roadway, the model requires traffic volume, speed, and grade adjustments. Traffic speeds for Indian Bend Road were modeled at the posted speed of 40 miles per hour (mph), which is the current approximate operating speed. Current and future daily traffic volumes and peak hour volumes were obtained from the Traffic Operations Analysis Report for this project. (See Appendix B).

Additionally, vehicles were defined as cars (four wheels), medium trucks and RVs (six wheels) and heavy trucks (eight wheels +). Each of these vehicles generates noise from different heights above the roadway, called the source height. Vehicle classification used in the modeling consisted of 97% automobiles, 2% medium trucks and RVs, and 1% heavy trucks, for a total of 3% trucks. This vehicle mixture is typical for this type of roadway and was similar to that observed during the ambient monitoring. The Glossary further defines the weight classifications for medium and heavy trucks and several other terms and phrases that may be used in this project.

The propagation path between noise sources and receivers is commonly modeled through the use of shielding factors and propagation constants. Shielding factors include rows of homes, steep terrain, dense trees, or other features that act to reduce noise levels at receiver locations. Propagation constants are used to reflect noise drop-off over distance. Due to the predominance of natural ground surfaces and vegetation throughout the project area, drop-off rates were modeled at 4.5 dB per doubling of distance. A shielding factor of 2.0 dB was needed to calibrate the model to the monitored noise levels.

STAMINA individually calculated the noise contribution from each roadway segment to each receiver and then determined the cumulative effect of all roadway sources for each receiver. Noise calculations were conducted for each receiver assuming no noise mitigation, as a base condition. The standard FHWA version of STAMINA allows up to 40 receivers per computer run. Research and experience indicate that the STAMINA 2.0 model typically predicts noise levels within ± 3 dB of measured values (Shrouds, 1986). In general, the level of accuracy is higher for receivers located near the roadway (within a few hundred feet) than for more distant receivers, largely due to the effects of wind and temperature gradients.

While the STAMINA 2.0 model has been calibrated and tested against actual noise measurements for several years, it should be noted that it is still a noise prediction model. Based on the assumptions stated in this report, it "predicts" noise levels along the project route for the future design year for this project. Actual noise levels at that time may differ somewhat due to a number of factors including design changes in the roadway, changes in traffic volumes, vehicle mix and speeds.

2.3 EXISTING NOISE LEVELS

Ambient sound level readings were taken at four locations within the project limits. The ambient readings were taken near the roadway at sites not protected by backyard privacy walls. The monitoring sites are described below and are shown in Appendix A, Monitoring Sites and Receiver Locations. The monitoring sites were selected based on convenience and accessibility.

Ambient sound levels were recorded at the monitoring sites with a Larson Davis Model 820 Type I integrating sound level meter. Readings were taken on May 20, 2004 during late-morning traffic conditions. The weather conditions during the readings were clear skies, 86 degrees Fahrenheit, 18 percent relative humidity and a 2.5 mph breeze from the southeast. These weather conditions have little effect on transmission of sound energy for the receivers in the project area.

Monitoring periods consisted of ten minute-long sound level recordings using an integrating sound level meter. The meter was placed approximately 5 feet above the ground of the monitoring sites. The monitoring sites were located at:

- M1** – Near ramada in northeast portion of McCormick Railroad Park, on the south side of Indian Bend road, east of Scottsdale Road. Meter was approximately 90 feet from existing edge of pavement of Indian Bend Road. Ambient reading was 61 dBA.
- M2** – On pathway east of Sienna Condominiums, on the south side of Indian Bend Road, just west of Indian Bend Wash. Meter was approximately 255 feet from existing edge of pavement of Indian Bend Road. Ambient reading was 55 dBA.
- M3** – At southwest corner of Villa La Playa development, on the north side of Indian Bend Road, just east of Indian Bend Wash. Meter was approximately 30 feet from existing edge of pavement of Indian Bend Road. Ambient reading was 67 dBA.
- M4** – Along north side of Camelview Greens Condominiums, on the south side of Indian Bend Road, west of 78th Street. Meter was approximately 80 feet from existing edge of pavement of Indian Bend Road. Ambient reading was 61 dBA.

The monitoring sites and the measured traffic volumes were modeled in STAMINA in order to determine the ability of STAMINA to accurately predict noise levels for this project. The STAMINA calculations were between 1 and 4 dB higher than the monitored noise levels for the four monitoring sites. The average difference was 2.0 dB. A 2.0 dB shielding factor was included in the model, resulting in modeled noise levels between 1 dB lower to 2 dB higher than the monitored noise levels. This variation is within an acceptable range. Therefore, with the addition of the shielding factor, the model is considered calibrated to accurately predict future traffic noise levels for this project.

2.4 LEVEL OF SERVICE TRAFFIC AND NOISE LEVELS

Traffic engineers describe the flow of traffic with a series of conditions called Level of Service or LOS. LOS A depicts free flowing traffic able to travel at or above the posted speed limit with little or no difficulty in changing lanes. The conditions become more congested as the LOS increases through the alphabet to LOS F, representing a stop and go condition. From a traffic noise perspective, the LOS C condition usually represents the "worst hourly traffic noise impacts" since traffic speeds are at or near the posted speed limit and lane capacity is high. Although more vehicles may be accommodated when LOS D is achieved, the lower speeds drastically reduce tire noise, a major source of traffic noise.

The future traffic volumes for Indian Bend Road are predicted to be LOS C or better. As a result the actual traffic predictions (volumes and speeds) were used to determine predicted future traffic noise levels. (see Appendix B).

2.5 CONSTRUCTION NOISE

Short-term noise impacts may be experienced during the construction of any part of the proposed improvements. The quantification of such impacts is difficult without data on this project's construction schedule and equipment use. Therefore, several assumptions were made in order to predict the approximate noise level at the right-of-way. These predictions are based on the use of the noisiest equipment expected to be used during each construction stage of a typical roadway project. Data on construction equipment noise are available from the U.S. Department of Transportation document entitled "Highway Construction Noise: Measurement, Prediction and Mitigation".

An analysis was conducted during a freeway construction project in Arizona that assessed the collective impact of construction noise. The maximum noise levels (Lmax) were calculated at the right-of-way line. The distance between the right-of-way and the construction activity was estimated based on the type of work being performed.

The results of the preliminary estimates, shown in the chart below, indicate that sensitive receivers could be substantially impacted by construction noise if the receivers are immediately adjacent to the right-of-way. The highest noise levels would occur during the grading/earthwork phase.

CONSTRUCTION EQUIPMENT NOISE

<u>Phase</u>	<u>Equipment</u>	<u>Equip. Lmax</u>	<u># Ft to ROW</u>	<u>Lmax at ROW</u>
Site Clearing	Dozer	84 dBA	50 Ft	----
	Backhoe	85 dBA	50 Ft	88 dBA
Grading/Earthwork	Scraper	92 dBA	75 Ft	-----
	Grader	91 dBA	75 Ft	93 dBA
Foundation	Backhoe	85 dBA	100 Ft	-----
	Loader	84 dBA	100 Ft	85 dBA
Base Preparation	Compressor	85 dBA	100 Ft	-----
	Dozer	84 dBA	100 Ft	85 dBA

2.6 FUTURE NOISE LEVELS

Future noise levels in the project area were evaluated for a total of 30 sensitive receivers within the corridor. The roadway was evaluated for future noise conditions using each of the four proposed lane configurations (Alternatives A, B1, B2, and C) with the future peak traffic volumes (Build Conditions).

Descriptions of Sensitive Noise Receiver Areas

Thirty sensitive noise receivers were identified within the proposed project study limits to assess impacts from the proposed improvements. The receivers were distributed throughout the project area.

The 30 receivers were identified because of their land use and proximity to the roadway alignment. The receivers represent single family residences, condominium residences, and recreation uses. Not every home within the corridor was modeled as a receiver. Each modeled receiver represents several residences that are similarly situated in relation to Indian Bend Road. The 30 receivers were modeled at the active outdoor use area, such as the patio or pool area. The goal was to model the future noise level at the portion of the property expected to have the highest outdoor use, and therefore, be the most noise sensitive. The Noise Analysis Summary Sheet (Exhibit 3) shows the receiver identification and description, projected noise level, land use, number of residential units represented by the receiver, and any mitigation considerations. The receivers are shown in Appendix A, Monitoring Sites and Receiver Locations.

Noise Analysis Procedure

Design plans, aerial photographs and field reconnaissance were used to determine the approximate locations and land use activities near the roadway. Standard English units of measurement were used throughout this project. The STAMINA model was used to predict the noise levels of future design year traffic conditions.

As noted earlier, noise levels are affected by traffic volumes, traffic speeds, and traffic mix (percentage of cars, medium trucks and heavy trucks). These variables were used in the STAMINA model to predict future noise levels at the sensitive receivers. Traffic volumes and speeds utilized in the modeling for this project represent "worst case" peak hour traffic conditions.

Unmitigated noise levels for design year traffic and roadway conditions were determined at the 30 sensitive receivers and compared with the NAC (Table 1 on Page 1-4) to determine if traffic noise mitigation should be considered. Generally, mitigation considerations consist of sound barriers within proposed rights-of-way. Although other mitigation considerations are possible, sound

barriers are considered the most cost effective and accepted technique when they are warranted. Sound barriers may consist of earth berms or concrete/masonry walls or combinations of the two.

This study was conducted according to the guidelines contained within the *ADOT Noise Abatement Policy (NAP)*. The NAP defines specific exceptions to conditions where the NAC would suggest that noise mitigation is necessary. These exceptions include, among others, commercial sites, isolated receivers, and the cost of abatement per residence. These exceptions are defined as follows:

- Commercial Areas - "It generally will not be considered reasonable to provide abatement for impacted businesses." (*ADOT NAP*, p. 5)
- Isolated Receivers - "It generally will not be considered reasonable to provide abatement for isolated receivers." (*ADOT NAP*, p. 6)
- Cost of Abatement - "The maximum cost of abatement per benefited receiver ratio is \$35,000. As defined in Section IIB, benefited receivers include all single-family dwelling residences (including mobile homes), whether owner occupied or rental; individual residential units, within multi-family buildings; and other sensitive activities..... All benefited receivers should be included in the ratio, regardless of whether they are impacted as defined in Section IIM. The threshold of noise reduction for a receiver to be benefited is 5 dBA." (*ADOT NAP*, p. 5)

2.7 NOISE ANALYSIS RESULTS AND RECOMMENDATIONS

The 30 sensitive receivers were evaluated from a traffic noise perspective for existing and future design year traffic conditions, obtained from the traffic report prepared for this project. The results of the noise analysis are presented in Exhibit 3, Noise Analysis Summary Sheet. The following information is presented in the Exhibit:

Rec #. The first column lists an arbitrarily assigned number to identify the receiver. The unique sequential numbers generally begin at the western end of the project and progress higher approaching the eastern end of the project.

Station. The second column lists the existing roadway centerline station of the receiver included on the engineering design plans. Station numbering begins approximately 2000 feet west of the centerline of Scottsdale Road and progresses eastward.

Distance from Existing Centerline. This column lists the distance, in feet, from the centerline of the existing roadway to the sensitive receiver. Since each

proposed alternative varies in horizontal alignment, the distance the centerline of each alternative will vary.

Receiver Description. Brief description of the sensitive receivers, including the address of the property, if available.

Existing Condition – Peak 2004 (Modeled). This column displays the predicted noise levels, in dBA L_{Aeq1h} , at the sensitive receivers utilizing the existing roadway configuration and the AM and PM peak hour existing year (2004) traffic volumes obtained from the traffic data presented in the Traffic Operations Analysis Report.

Alternative A – Future Build Condition – Peak 2020 (Modeled). This column displays the predicted noise levels for the AM and PM peak hour, in dBA L_{Aeq1h} , at the sensitive receivers utilizing the Alternative A roadway configuration. The design year (2020) traffic volumes were used in the future analysis.

Alternative B1 – Future Build Condition – Peak 2020 (Modeled). This column displays the predicted noise levels for the AM and PM peak hour, in dBA L_{Aeq1h} , at the sensitive receivers utilizing the Alternative B1 roadway configuration. The design year (2020) traffic volumes were used in the future analysis.

Alternative B2 – Future Build Condition – Peak 2020 (Modeled). This column displays the predicted noise levels for the AM and PM peak hour, in dBA L_{Aeq1h} , at the sensitive receivers utilizing the Alternative B2 roadway configuration. The design year (2020) traffic volumes were used in the future analysis.

Alternative C – Future Build Condition – Peak 2020 (Modeled). This column displays the predicted noise levels for the AM and PM peak hour, in dBA L_{Aeq1h} , at the sensitive receivers utilizing the Alternative C roadway configuration. The design year (2020) traffic volumes were used in the future analysis.

Noise Sensitive Area Data. The **Land Use** column refers to the primary use of the receiver location and immediate area. The abbreviations are explained in the notes at the end of the exhibit. **# Units** is an estimation of the number of residences in the area, neighborhood or facility represented by the sensitive receiver. The number of units is used to determine cost effectiveness of mitigation considerations.

Mitigation Considerations. Brief description of possible applications of mitigation measures based on ADOT's NAP.

RESULTS

Predicted noise levels for the existing year (2004) AM and PM peak hour conditions were below the ADOT mitigation criterion of 64 dBA for all 30

receivers. Predicted existing AM peak hour noise levels ranged from a low of 54 dBA to a high of 60 dBA. Predicted existing PM peak hour noise levels ranged from a low of 55 dBA to a high of 61 dBA.

The receivers in the Camelview Greens condominiums and the Via La Playa development, both in the eastern portion of the project area, are partially mitigated by existing concrete block privacy walls around the rear portions of the properties. These existing walls, which were included in the modeling for the existing and future conditions, ranged from 5 feet in height for the Camelview Greens condominiums to 6 feet in height for the Via La Playa homes.

Future predicted noise levels for the **Alternative A** Build Condition under Design Year 2020 traffic (AM and PM peak) were below the ADOT NAP criteria at all 30 receivers. Predicted future AM peak hour noise levels for Alternative A ranged from a low of 56 dBA to a high of 62 dBA. Predicted future PM peak hour noise levels for Alternative A ranged from a low of 57 dBA to a high of 63 dBA. Alternative A noise levels ranged from 2 dBA lower to 7 dBA higher than the existing 2004 noise levels, with the greatest increase in the western portion of the Camelview Greens condominiums. Alternative A shifts the eastbound lanes the farthest south, nearest to the receivers in the western portion of Camelview Greens. The increase in traffic and changes in the roadway alignment accounted for the differences.

Future predicted noise levels for the **Alternative B1** Build Condition under Design Year 2020 traffic (AM and PM peak) were below the ADOT NAP criteria at 27 of the 30 receivers. Three receivers had predicted PM peak hour noise levels that met the 64 dBA ADOT criteria. Predicted future AM peak hour noise levels for Alternative B1 ranged from a low of 56 dBA to a high of 63 dBA. Predicted future PM peak hour noise levels for Alternative B1 ranged from a low of 56 dBA to a high of 64 dBA at three receivers. Alternative B1 noise levels ranged from 2 dBA lower to 3 dBA higher than the existing 2004 noise levels. The increase in traffic and changes in the roadway alignment accounted for the differences.

Future predicted noise levels for the **Alternative B2** Build Condition under Design Year 2020 traffic (AM and PM peak) were below the ADOT NAP criteria at 27 of the 30 receivers. Three receivers had predicted PM peak hour noise levels that met the 64 dBA ADOT criteria. Predicted future AM peak hour noise levels for Alternative B2 ranged from a low of 56 dBA to a high of 63 dBA. Predicted future PM peak hour noise levels for Alternative B2 ranged from a low of 56 dBA to a high of 64 dBA at three receivers. Alternative B2 noise levels ranged from 2 dBA lower to 3 dBA higher than the existing 2004 noise levels. The increase in traffic and changes in the roadway alignment accounted for the differences.

Future predicted noise levels for the **Alternative C** Build Condition under Design Year 2020 traffic (AM and PM peak) were below the ADOT NAP criteria at 29 of the 30 receivers. One receiver had a predicted PM peak hour noise level that met the 64 dBA ADOT criteria. Predicted future AM peak hour noise levels for Alternative C ranged from a low of 55 dBA to a high of 63 dBA. Predicted future PM peak hour noise levels for Alternative C ranged from a low of 57 dBA to a high of 64 dBA at one receiver. Alternative C noise levels ranged from 0 dBA to 3 dBA higher than the existing 2004 noise levels. The increase in traffic and changes in the roadway alignment accounted for the differences.

The modeling for all of the Build Conditions included changes in the vertical alignment resulting from the proposed structure alternatives over Indian Bend Wash.

Rubberized Asphalt Pavement

Predicted future noise levels do not include the benefits provided by the rubberized asphalt pavement that will be included in the project. Rubberized asphalt has been shown to reduce noise levels by about 3 to 5 decibels over conventional asphalt pavement. Adjusting the predicted noise levels for rubberized asphalt pavement would result in noise levels that are similar to or several decibels lower than the existing noise levels. Assuming a minimum 3 dBA reduction provided by the rubberized asphalt pavement, future predicted noise levels for all of the alternatives would range from a low of 53 dBA to a high of 61 dBA at the receivers throughout the project corridor.

RECOMMENDATIONS

Of the four alternatives, B1, B2, and C result in PM peak hour noise levels that meet the ADOT NAP criteria of 64 dBA at between one and three receivers. Alternative A resulted in noise levels that were below the ADOT NAP criteria of 64 dBA at all 30 receivers. The rubberized asphalt that will be incorporated into this project will reduce noise predicted noise levels at all receivers below the ADOT NAP for all four alternatives. Therefore, mitigation was not evaluated for this project.

Based on the noise analysis and the discussions presented above, noise abatement, other than the rubberized asphalt already planned for the project, is not warranted for the sensitive receivers along Indian Bend Road between Scottsdale Road and Hayden Road. Therefore, noise mitigation is not recommended for this project.

EXHIBIT 3

NOISE ANALYSIS SUMMARY SHEET

Figures in dBA – LAeq1h

Rec #	Station	Distance from Existing Centerline (feet)	Receiver Description	Existing Condition	Alternative A	Alternative B1	Alternative B2	Alternative C	Noise Sensitive Area Data		Mitigation Considerations
				Peak 2004 (Modeled) AM / PM	Peak 2020 (Modeled) AM / PM	Land Use	# Units				
R1	23+00	230 ft. South	McCormick Railroad Park Northwest ramada	56 / 57	57 / 58	58 / 59	58 / 59	57 / 58	Rec.	-	None warranted – Below ADOT NAC
R2	24+90	115 ft. South	McCormick Railroad Park North ramada	60 / 61	62 / 62	63 / 64	63 / 64	62 / 62	Rec.	-	See discussions in text
R3	25+90	220 ft. South	McCormick Railroad Park Playground	56 / 57	57 / 58	58 / 59	58 / 59	57 / 58	Rec.	-	None warranted – Below ADOT NAC
R4	27+15	125 ft. South	McCormick Railroad Park Northeast ramada	60 / 61	61 / 62	62 / 63	62 / 63	61 / 62	Rec.	-	None warranted – Below ADOT NAC
R5	33+75	125 ft. South	Ride-N-Rock Ranchos – Lot 1 6838 North Rocking Road	60 / 61	61 / 62	63 / 64	63 / 64	61 / 62	SF	1	See discussions in text
R6	37+50	115 ft. South	Ride-N-Rock Ranchos – Lot 10 5907 North Rocking Road	60 / 61	62 / 63	63 / 64	63 / 64	63 / 64	SF	1	See discussions in text
R7	33+70	140 ft. North	McCormick Ranch Golf Club	59 / 59	61 / 61	60 / 60	60 / 60	61 / 61	Rec.	-	None warranted – Below ADOT NAC
R8	41+15	260 ft. North	McCormick Ranch Golf Club	55 / 55	57 / 57	56 / 56	56 / 56	57 / 57	Rec.	-	None warranted – Below ADOT NAC
R9	52+00	140 ft. North	McCormick Ranch Golf Club	59 / 60	59 / 58	57 / 57	57 / 57	60 / 60	Rec.	-	None warranted – Below ADOT NAC
R10	40+70	220 ft. South	Sienna Condominiums 7575 East Indian Bend # 1005	56 / 57	57 / 58	58 / 59	58 / 59	57 / 58	Condo	4	None warranted – Below ADOT NAC
R11	43+25	290 ft. South	Sienna Condominiums 7575 East Indian Bend - Clubhouse	54 / 55	56 / 57	56 / 57	56 / 57	55 / 56	Condo	-	None warranted – Below ADOT NAC
R12	45+10	280 ft. South	Sienna Condominiums 7575 East Indian Bend # 1144	54 / 55	57 / 59	57 / 58	57 / 58	56 / 57	Condo	4	None warranted – Below ADOT NAC
R13	56+50	230 ft. South	Camelview Greens – Lot 127 7712 East Pepper Tree Lane	54 / 55	60 / 62	57 / 58	57 / 58	56 / 57	Condo	4	None warranted – Below ADOT NAC
R14	58+10	200 ft. South	Camelview Greens – Lot 132 7732 East Pepper Tree Lane	55 / 56	60 / 62	58 / 59	58 / 59	57 / 58	Condo	5	None warranted – Below ADOT NAC
R15	59+55	165 ft. South	Camelview Greens – Lot 137 7752 East Pepper Tree Lane	56 / 57	59 / 61	58 / 59	58 / 59	58 / 59	Condo	5	None warranted – Below ADOT NAC
R16	61+00	135 ft. South	Camelview Greens – Lot 92 7772 East Pepper Tree Lane	57 / 58	59 / 60	59 / 60	59 / 60	58 / 60	Condo	5	None warranted – Below ADOT NAC
R17	62+60	100 ft. South	Camelview Greens – Lot 97 7792 East Pepper Tree Lane	59 / 60	59 / 61	60 / 61	60 / 61	60 / 61	Condo	5	None warranted – Below ADOT NAC

(Table Continued on Next Page)

EXHIBIT 3 (Cont.)

Rec #	Station	Distance from Existing Centerline (feet)	Receiver Description	Existing Condition	Alternative A	Alternative B1	Alternative B2	Alternative C	Noise Sensitive Area Data		Mitigation	Considerations
				Peak 2004 (Modeled) AM / PM	Peak 2020 (Modeled) AM / PM	Land Use	# Units					
R18	64+00	80 ft. South	Camelview Greens – Lot 112 6955 North 78 th Street	59 / 60	60 / 61	60 / 61	60 / 61	60 / 61	Condo	1	None warranted	– Below ADOT NAC
R19	59+60	65 ft. North	Via La Playa – Lot 7 7785 East Via de Belleza	60 / 60	60 / 60	60 / 60	60 / 60	61 / 61	SF	1	None warranted	– Below ADOT NAC
R20	61+10	65 ft. North	Via La Playa – Lot 5 7797 East Via de Belleza	60 / 60	60 / 60	61 / 61	60 / 60	61 / 61	SF	2	None warranted	– Below ADOT NAC
R21	62+50	65 ft. North	Via La Playa – Lot 3 7811 East Via de Belleza	60 / 60	60 / 60	61 / 61	61 / 61	61 / 61	SF	2	None warranted	– Below ADOT NAC
R22	64+00	65 ft. North	Via La Playa – Lot 1 7823 East Via de Belleza	59 / 60	61 / 61	61 / 61	61 / 61	61 / 61	SF	2	None warranted	– Below ADOT NAC
R23	65+40	65 ft. South	Camelview Greens – Lot 1 6950 North 78 th Place	60 / 61	61 / 63	61 / 63	61 / 62	62 / 63	Condo	1	None warranted	– Below ADOT NAC
R24	67+35	60 ft. South	Camelview Greens – Lot 10 7916 East Pepper Tree Lane	60 / 61	61 / 63	61 / 63	61 / 63	61 / 63	Condo	5	None warranted	– Below ADOT NAC
R25	68+95	60 ft. South	Camelview Greens – Lot 15 7936 East Pepper Tree Lane	59 / 60	60 / 62	60 / 62	60 / 62	60 / 62	Condo	5	None warranted	– Below ADOT NAC
R26	70+60	65 ft. South	Camelview Greens – Lot 20 7956 East Pepper Tree Lane	60 / 61	61 / 63	61 / 62	61 / 62	61 / 62	Condo	6	None warranted	– Below ADOT NAC
R27	65+45	70 ft. North	Via La Playa – Lot 87 7835 East Via de Belleza	58 / 59	60 / 61	60 / 61	60 / 61	60 / 61	SF	2	None warranted	– Below ADOT NAC
R28	66+95	70 ft. North	Via La Playa – Lot 85 7847 East Via de Belleza	59 / 59	61 / 61	61 / 61	61 / 61	61 / 61	SF	2	None warranted	– Below ADOT NAC
R29	68+40	70 ft. North	Via La Playa – Lot 83 7911 East Via de Belleza	58 / 59	60 / 60	60 / 61	60 / 60	60 / 60	SF	2	None warranted	– Below ADOT NAC
R30	71+00	70 ft. North	Via La Playa – Lot 81 7923 East Via de Belleza	58 / 59	60 / 60	60 / 61	60 / 60	60 / 61	SF	2	None warranted	– Below ADOT NAC

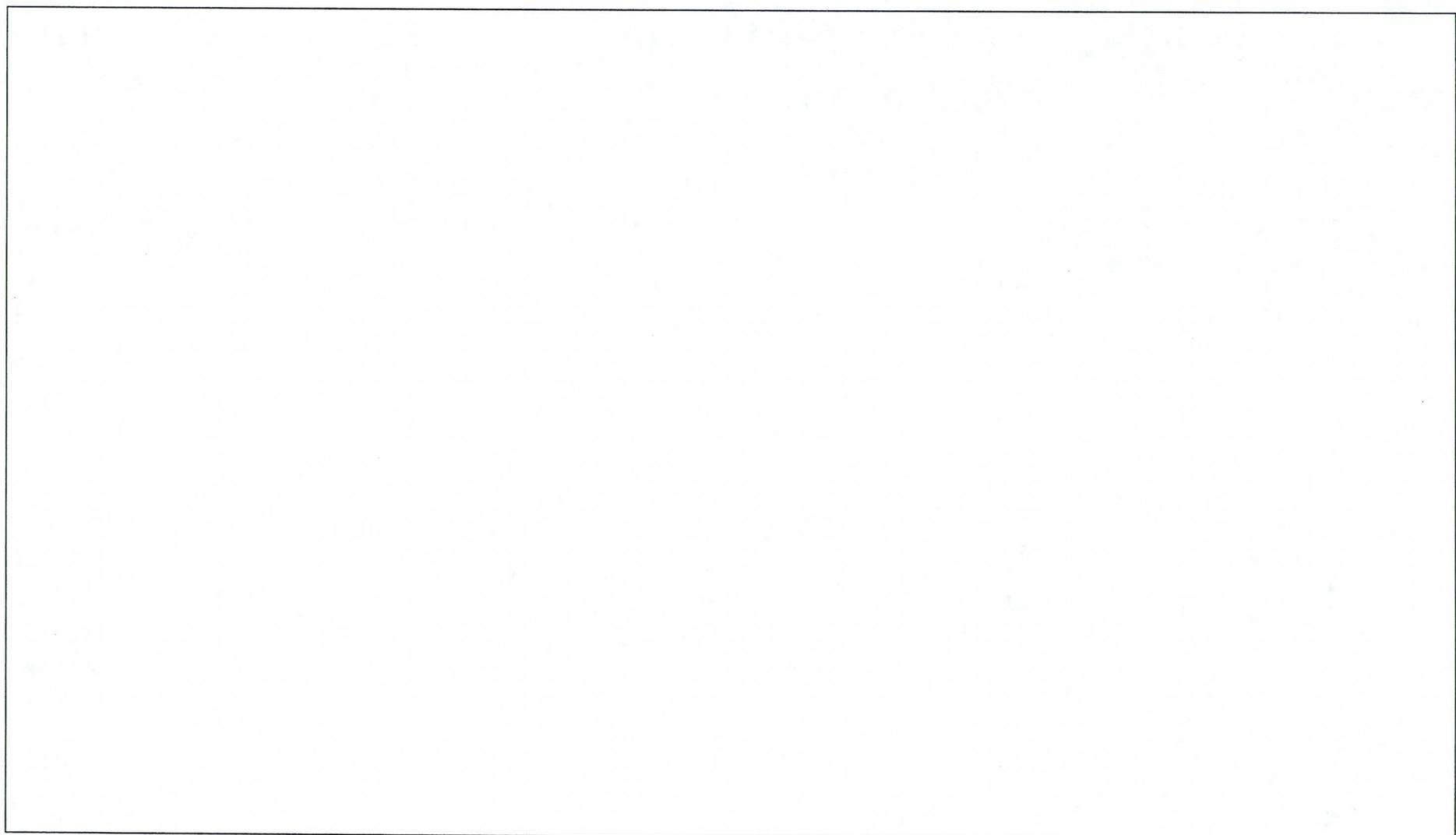
NOTES FOR TABLES:

- SF Single-Family Residential
- Condo Condominium Residential
- Rec. Recreation – Golf Course or Park

Bolding indicates noise level exceeds ADOT criteria of 64 dBA for residential properties, parks, and golf courses. However, the project will incorporate a rubberized asphalt surface, which will reduce noise levels by at least 3 dBA from those shown in the table.

APPENDIX A

**MONITORING SITES AND
RECEIVER LOCATIONS**



**APPENDIX A
MONITORING SITES & RECEIVER LOCATIONS**

APPENDIX B

TRAFFIC DATA

TRAFFIC DATA

Vehicle Mix:

Automobiles	97%
Medium Trucks	2%
Heavy Trucks	1%

Operating Speeds:

Existing	40 MPH
Future	40 MPH

2004 Existing Peak Hour Volumes:

AM Peak:

Westbound – 940 to 953 Total Vehicles
Eastbound – 458 to 487 Total Vehicles

PM Peak:

Westbound – 763 to 769 Total Vehicles
Eastbound – 851 to 908 Total Vehicles

2020 Peak Hour Traffic Volumes:

AM Peak:

Westbound – 1311 to 1336 Total Vehicles
Eastbound – 630 to 680 Total Vehicles

PM Peak:

Westbound – 993 to 1079 Total Vehicles
Eastbound – 1158 to 1264 Total Vehicles

APPENDIX C
GLOSSARY OF TERMS

Ambient Noise Level: The noise level existing in an area before introduction of the proposed roadway improvement project. This quantity is measured in dBA and expressed as Leq ambient noise levels.

At-Grade Roadway: A roadway element that is level with the immediate surrounding terrain.

Automobiles: All vehicles with two axles and four wheels designed primarily for passenger transportation or cargo (light trucks). Generally, the gross vehicle weight is less than 10,000 pounds.

Average Daily Traffic (ADT): The number of vehicles that pass over a given roadway during a one-day period. The average daily traffic is calculated by determining the total number of vehicles during a given period of whole days and dividing by the number of days in the period.

Average Highway Speed (AHS): The weighted average design speeds within a roadway segment.

Barrier: A solid wall or earth berm located between the roadway and receiver location, which breaks the line-of-sight between the receiver and the roadway sources.

Depressed Roadway: A roadway that is constructed below the immediate surrounding terrain.

Decibel (dB): A logarithmic "unit" that indicates the ratio between two powers. A ratio of 10 in power corresponds to a difference of 10 decibels.

Design Noise Level: Noise levels for various activities or land uses which represent the upper limit of acceptable traffic noise level conditions. These levels are used to determine the degree of impact of traffic noise on human activities.

Design Year: The future year used to determine the probable traffic volume for which a highway is designed.

Elevated Roadway: A roadway that is constructed above the immediate surrounding terrain, either on a landfill or a structure.

Existing Noise Levels: The noise resulting from the natural and mechanical sources and human activity usually present in a particular area.

Heavy Trucks: All vehicles having three or more axles and designed for the transportation of cargo. Generally, the gross weight is greater than 26,400 pounds.

Leq: The equivalent steady-state, A-weighted sound level which, in a stated period of time, would contain the same acoustical energy as the time-varying sound levels during the same period.

LAeq1h: The Leq for one hour.

Medium Trucks: All vehicles having two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 10,000 pounds but less than 26,400 pounds.

Noise Level Reduction: The change in noise level at an observer location due to the presence of a shielding element between the roadway and the observer.

Receiver: The person at the location at which noise levels are computed and analyzed, also called "receptor" or "observer".

Right-of-way: Used here to designate any frontage road, arterial highway, expressway, freeway, or parkway for which the analyses developed in this report are applicable.

Shielding: Any construction or natural barrier which, when interposed between the roadway and the observer, will provide an excess reduction in roadway noise.

Sound Level (Noise Level): Weighted sound level measured with a sound-level meter having metering characteristics and a frequency weighting of A, B, or C, as specified in the sound-level meter standard.

Speed: The rate of movement of vehicular traffic, in miles per hour (mph).

Traffic Noise impacts: Impacts which occur when the predicted traffic noise equals or exceeds the noise abatement criteria levels.

APPENDIX B

TRAFFIC OPERATIONS ANALYSIS REPORT

DRAFT

INDIAN BEND ROAD TRAFFIC OPERATIONS ANALYSIS REPORT



Prepared for
The City of Scottsdale

Prepared by

URS



May 12, 2004

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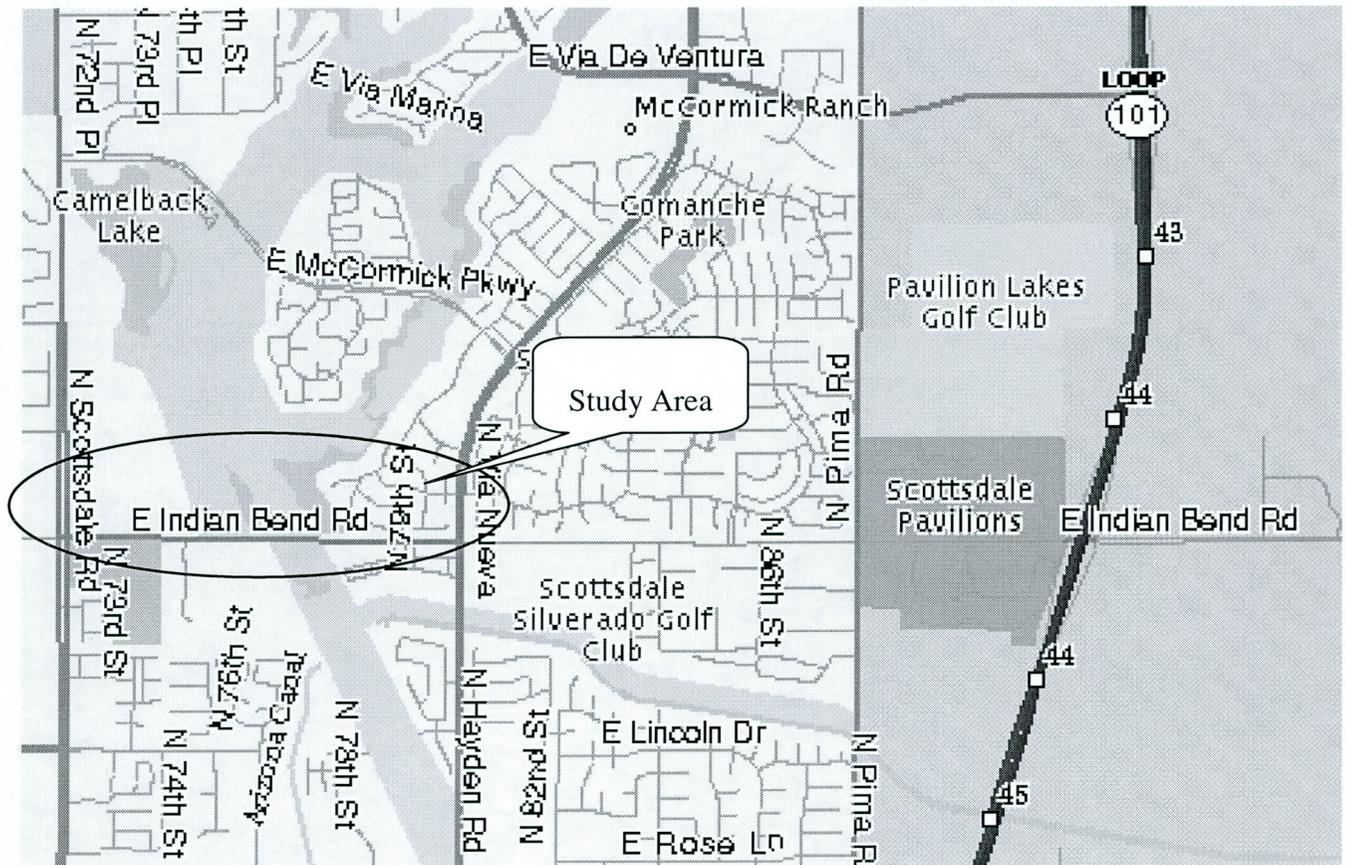
1.0 BACKGROUND

The Indian Bend Road project consists of widening and reconstruction of the roadway from Scottsdale Road to Hayden Road. Classified as a minor arterial street, Indian Bend Road will consist of two lanes in each direction, bike lanes and a raised, landscaped median. Realignment of the roadway and construction of a drainage structure at the Indian Bend Wash crossing is planned. Four alignment alternatives for Indian Bend Road are under consideration. An initial goal of this project is to develop consensus on an approved alignment through the public involvement process. The project will improve safety and traffic flow for vehicles and pedestrians.

A thorough evaluation of existing and future traffic conditions along Indian Bend Road is key to determining the roadway facility needs. Requirements for right and left turn lanes at the major intersections as well as additional traffic signals along the corridor were studied and recommendations made. The scope of this traffic study includes data collection including AM and PM peak hour counts at key intersections. Traffic projections for the year 2020 were developed based on traffic data provided by the City of Scottsdale and the application of an appropriate growth factor. Roadway features were recommended including verification of the number of through lanes, turn lanes, lane widths, tapers, and modifications to side streets. The existing major intersections were evaluated for reconfiguration to accommodate additional turn lanes. A signal warrant analysis was performed at the existing unsignalized intersections to determine the need for additional traffic signals.

2.0 STUDY AREA

The Indian Bend Road study area is located in Scottsdale, Arizona. The section of roadway addressed in this study is bounded by Scottsdale Road on the west and Hayden Road on the east. Scottsdale Road and Hayden Road are both major north-south arterials, and Indian Bend Road is a minor east-west arterial. The study area is shown in Figure 1 below.



3.0 EXISTING CONDITIONS

The segment of Indian Bend Road between Hayden Road and Scottsdale Road is a two-lane minor, east-west arterial. The posted speed limit for Indian Bend Road is 40 miles per hour (mph). The lane configuration for the roadway consists of one 12-foot lane in each direction with turn lanes provided at most of the intersections along the corridor. See Figure 2.

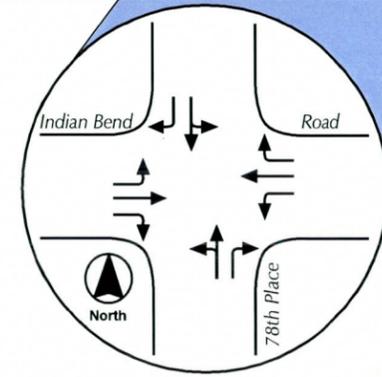
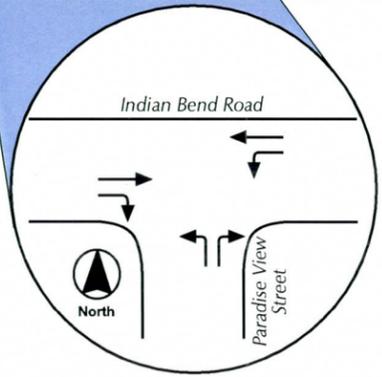
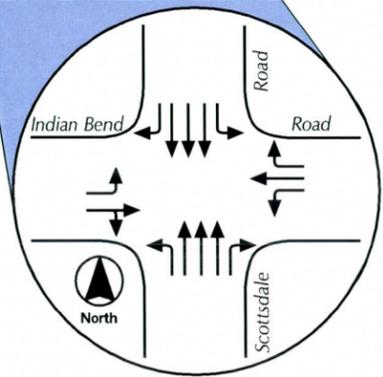
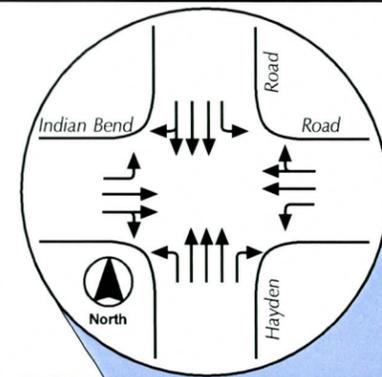
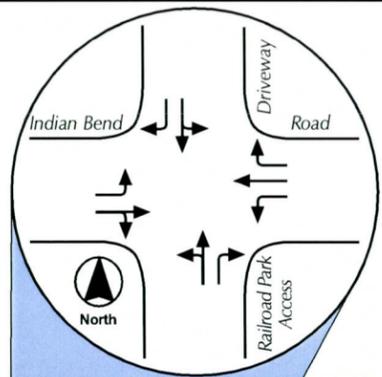
3.1 EXISTING TRAFFIC VOLUMES

Existing Year 2004 daily traffic counts along Indian Bend Road and peak hour (AM and PM) turning movement counts at key study intersections were conducted by Traffic Research and Analysis, Inc. (TRA). TRA collected the traffic data on January 8, 2004 with supplemental data collected on February 5, 2004. The key intersections where peak hour turning movement counts were conducted included:

- Scottsdale Road
- East Drive of McCormick-Stillman Railroad Park
- Holiday Inn Driveway
- 78th Place
- Hayden Road

Figure 2 shows existing conditions lane configurations at the above five intersections. Traffic counts conducted by TRA were adjusted to reflect average traffic conditions using monthly adjustment factors. The monthly adjustment factors were provided by the City of Scottsdale and are shown in Appendix A. The unadjusted (raw) traffic count sheets provided by TRA are shown in Appendix B.

It is important to note that during this study, Scottsdale Road immediately adjacent to Indian Bend Road was under construction. Therefore, traffic patterns that would normally be observed may have changed, particularly at the Indian Bend Road/Scottsdale Road intersection. Pre-construction tube counts and turning movement counts taken in February 2003 and June 2001, respectively, were compared to the counts conducted in January 2004. The comparison showed that the construction primarily affected the northbound and southbound through movement volumes on Scottsdale Road and the southbound left-turn volume at the intersection of Indian Bend Road/Scottsdale Road. The remaining turning movement volumes at this intersection had



Draft: April 5, 2004

Figure 2
Existing Year 2004
Intersection Geometrics

INDIAN BEND ROADWAY IMPROVEMENTS



either an increase or no change. The effect of construction on the traffic volumes along Indian Bend Road and the turning movements at Indian bend Road onto Scottsdale Road were small and no adjustments ere made to the traffic volumes.

Figure 3 shows existing daily traffic count along Indian Bend Road, along with existing AM and PM peak hour turning movement volumes at the five study area intersections.

3.2 EXISTING TRAFFIC ANALYSIS

3.2.1 Level of Service Analysis

A Level of Service (LOS) analysis was performed to measure the current performance of Indian Bend Road and five key intersections within the study area. The LOS analysis is based on procedures outlined in the *Highway Capacity Manual* (2000) published by the Transportation Research Board. The analysis assigns a letter value based on capacity and delay experienced on the roadway or at the intersections. The letter value ranges from A (best) to F (worst). A summary and definition of different LOS is provided in Table 1 for both signalized and unsignalized intersections.

Table 1. Intersection Level of Service Definitions

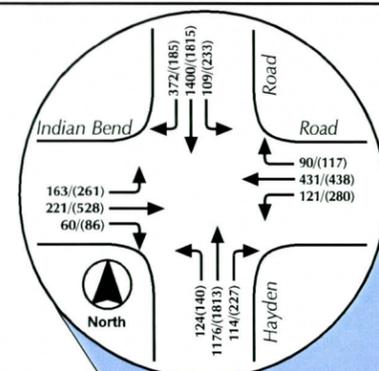
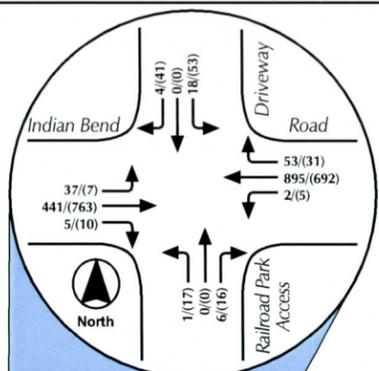
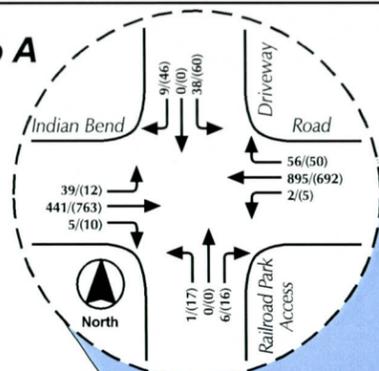
Level of Service	Control Delay (seconds/vehicle)		Description
	Signalized Intersection	Unsignalized Intersection	
A	≤10	≤10	Favorable progression
B	>10-20	>10-15	Good progression
C	>20-35	>15-25	Fair progression
D	>35-55	>25-35	Noticeable congestion
E	>55-80	>35-50	Limit of acceptable delay
F	>80	>50	Unacceptable delay

Source: Highway Capacity manual, Transportation Research Board, 2000

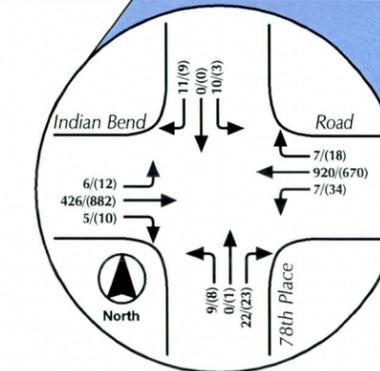
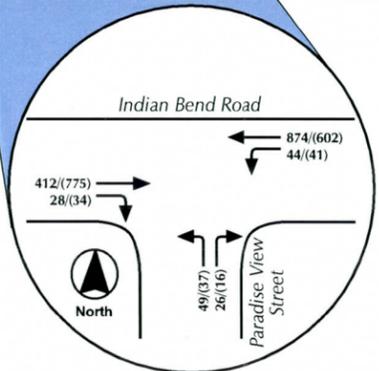
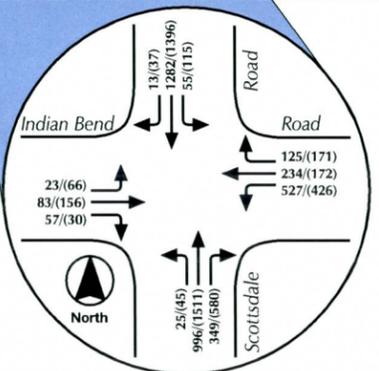
The existing LOS results at signalized intersections within the study area are shown in Table 2. Table 3 shows the LOS results at unsignalized intersections within the study area. The LOS summary sheets for both signalized and unsignalized intersections are provided in Appendix C.

Scenario A

Note: Scenario A indicates estimated peak hour turning movement volumes after the construction of condominiums immediately north of Indian Bend Road is completed by the end of year 2004.



Legend
 XXXXX Daily Total Traffic Volumes
 XXX/(YYY) AM/(PM) Peak Hour Traffic Volumes



Draft: April 5, 2004

Figure 3
 Existing Year 2004 Traffic Volumes
 INDIAN BEND ROADWAY IMPROVEMENTS



Table 2. Existing 2004 Signalized Intersection LOS

Intersection	AM Peak		PM Peak	
	LOS	Control Delay (sec)	LOS	Control Delay (sec)
Indian Bend Road/Scottsdale Road	D	44.3	D	42.4
Indian Bend Road/Hayden Road	C	29.2	D	47.9
Indian Bend Road/McCormick-Stillman RR Park East Driveway (Scenario A)	A	6.7	A	7.3

Table 3. Existing 2004 Unsignalized Intersection LOS

Intersection	Movement	AM Peak		PM Peak	
		LOS	Delay (sec)	LOS	Delay (sec)
Indian Bend Road/McCormick-Stillman RR Park East Driveway	EB Left	B	10.9	A	9.4
	WB Left	A	8.3	A	9.6
	NB Through Left	F	50.9	F	91.0
	NB Right	B	11.4	C	15.5
	SB Through Left	F	66.7	F	157.0
	SB Right	C	17.7	C	15.1
Indian Bend Road/McCormick-Stillman RR Park East Driveway (Scenario A)	EB Left	B	11.0	A	9.5
	WB Left	A	8.3	A	9.6
	NB Through Left	F	52.7	F	97.2
	NB Right	B	11.4	C	15.5
	SB Through Left	F	97.3	F	193.8
	SB Right	C	17.9	C	15.2
Indian Bend Road/Holiday Inn/Condominium Access	WB Left	A	8.4	A	9.9
	NB Left	F	63.7	F	89.7
	NB Right	B	11.2	C	15.7
Indian Bend Road/78 th Place	EB Left	B	11.4	A	9.2
	WB Left	A	8.3	B	10.2
	NB Through Left	D	30.5	D	33.9
	NB Right	D	30.5	D	33.9
	SB Left	F	75.9	F	75.9
	SB Right	C	20.8	B	13.7

The LOS analysis for the signalized intersections was based on the following assumptions:

- Based on direction provided by the City of Scottsdale, a cycle length of 120 seconds was assumed at all signalized intersections during both AM and PM peak hours. Each signalized intersection was evaluated as a semi-actuated, uncoordinated (east-west)

system. Semi-actuated uncoordinated operation involves dedicating a majority amount of time to the main street (Hayden Road or Scottsdale Road) and only when a vehicle appears on the minor street (Indian Bend Road) will the minor street be serviced.

- Yellow and all red change interval times were defaulted to be 3.5 seconds of yellow and 0.5 seconds of all red.
- Arterial speed limits along Indian Bend Road, Scottsdale Road, and Hayden Road were coded as 40 mph in both directions.
- A lane width of 12 feet was assumed for all lanes within the study area.

At the intersection of Indian Bend Road/McCormick Stillman Railroad Park Access East Driveway, existing conditions LOS analysis was conducted for an additional scenario (Scenario A), which took into consideration the trips generated by 112 condominiums to be constructed immediately north of the intersection, behind the Seville development, by the end of year 2004. See Figure 3. This intersection was analyzed as an unsignalized intersection under existing year 2004 conditions and Scenario A (end of year 2004), and as a signalized intersection under Scenario A (end of year 2004). A trip generation summary can be seen in Appendix D.

The existing LOS analysis shows that the two signalized intersections of Indian Bend Road/Scottsdale Road and Indian Bend Road/Hayden Road operate at acceptable levels of service under existing conditions during both AM and PM peak hours. The intersection of Indian Bend Road/McCormick Stillman Railroad Park Access East Driveway under Scenario A (end of year 2004) operates at LOS A during both AM and PM peak hours.

The unsignalized intersections operate well overall. However, the left-turn movements on the minor streets show a LOS of F, with the exception of the northbound through left at 78th Place, which is a LOS D.

A LOS analysis was also performed for Indian Bend Road between Hayden Road and Scottsdale Road. This analysis is based on the travel speed and the delay attributed to the signalized intersections. Table 4 displays the arterial LOS.

Table 4. Level of Service Arterial Summary (2004)

Approach Roadway	LOS	
	AM	PM
Eastbound – Indian Bend Road	C	C
Westbound – Indian Bend Road	C	C

As shown in Table 4, the existing LOS during both AM and PM peak hours along Indian Bend Road in eastbound and westbound directions is acceptable.

3.2.2 Signal Warrant Analysis

In addition to the LOS analysis, a peak hour signal warrant analysis was performed at each of the key unsignalized intersections under existing conditions. The peak hour warrant followed the standards as outlined by the *Manual of Uniform Traffic Control Devices* (MUTCD), published by the Federal Highway Administration (FHWA). The peak hour warrant (Warrant 3 of the MUTCD) compares the highest volume or peak hour against the criteria for two categories A or B (as described in the MUTCD). To meet the MUTCD warrant, one of the categories A or B must be met. More details of the warrant analysis may be seen in Appendix D.

The following details the existing peak hour signal warrant analysis at the three unsignalized study intersections which include: Indian Bend Road/McCormick Stillman Railroad Park East Driveway, Indian Bend Road/Paradise View Street, and Indian Bend Road/78th Place.

3.2.2.1 Intersection of Indian Bend Road and McCormick Stillman Railroad Park Access

This intersection has been analyzed previously for possible signalization. In a June 2002 study, the City of Scottsdale commissioned a consultant to investigate the parking and traffic needs of the McCormick-Stillman Railroad Park. The 2002 study concluded that the east driveway of the park was warranted based upon peak event pedestrian traffic and peak hour traffic for a typical weekday.

The following are the results of the peak hour signal warrant analyses for the McCormick-Stillman Railroad Park east driveway:

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (total of both approaches): 1,508 vehicles per hour (vph)
- Minor Street (high volume approach): 94 vph

**Table 5. Existing 2004 Signal Warrant Summary for
Indian Bend Road and Railroad Park Access**

Peak Hour Category A Warrant	Condition	Peak Hour Volume Needed to Warrant Signal (vph)	Existing Volume in the Peak Hour (vph)
	Minor Street Approach Volume (one direction only)	100	94
	Total Intersection Entering Volume	800	1,635

From Table 5, it can be observed that the first condition of Category A is not satisfied. The minor street volume did not meet the minimum of 100 vph.

Category B of the peak hour warrant did not meet the minimum threshold for traffic volumes on the minor street as well, thereby not satisfying Category B of the warrant. Therefore, the intersection of Indian Bend Road and McCormick-Stillman RR Park East Access does not meet the peak hour signal warrant. See Appendix D.

3.2.2.2 Intersection of Indian Bend Road and Railroad Park Access (Scenario A – Completion of Construction of 112 Condominium Units Immediately North of the Intersection)

The peak hour approach volumes at this intersection under existing conditions (end of year 2004), with completed construction of the 112 condominium units immediately north of this intersection, are as follows:

- Major Street (total of both approaches): 1,532 vph
- Minor Street (high volume approach): 106 vph

**Table 6. Existing 2004 Peak Hour Warrant Summary for
Indian Bend Road and Railroad Park Access**

Peak Hour Category A Warrant	Condition	Peak Hour Volume Needed to Warrant Signal (vph)	Existing Volume in the Peak Hour (vph)
	Minor Street Approach Volume (one direction only)	100	106
	Total Intersection Entering Volume	800	1,532

From Table 6, it can be observed that conditions for Category A are satisfied. In addition, the conditions for Category B are also satisfied. Therefore, the intersection of Indian Bend Road and the McCormick-Stillman RR Park East Entrance warrants a traffic signal under the peak hour

warrant. This warrant is dependant upon the completion of the proposed 112 unit condominium project. See Appendix D.

3.2.2.3 Intersection of Indian Bend Road and Paradise View Street

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (total of both approaches): 1,452 vph
- Minor Street (high volume approach): 53 vph

Table 7. Existing 2004 Signal Warrant Summary for Indian Bend Road and Paradise View Street

Peak Hour Category A Warrant	Condition	Peak Hour Volume Needed to Warrant Signal (vph)	Existing Volume in the Peak Hour (vph)
	Minor Street Approach Volume (one direction only)	100	53
	Total Intersection Entering Volume	800	1,505

From Table 7, it can be observed that the first condition of Category A is not satisfied. The minor street volume did not meet the minimum of 100 vph.

Category B of the peak hour warrant did not meet the minimum threshold for traffic volumes on the minor street as well, thereby not satisfying Category B of the warrant. Therefore, the intersection of Indian Bend Road and Paradise View Street does not meet the peak hour signal warrant. See Appendix D.

3.2.2.4 Intersection of Indian Bend Road and 78th Place

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (total of both approaches): 1,626 vph
- Minor Street (high volume approach): 32 vph

Table 8. Existing 2004 Signal Warrant Summary for Indian Bend Road and 78th Place

Peak Hour Category A Warrant	Condition	Peak Hour Volume Needed to Warrant Signal (vph)	Existing Volume in the Peak Hour (vph)
	Minor Street Approach Volume (one direction only)	100	32
	Total Intersection Entering Volume	800	1,670

From Table 8, it can be observed that the first condition of Category A is not satisfied. The minor street volume did not meet the minimum of 100 vph.

Category B of the peak hour warrant did not meet the minimum threshold for traffic volumes on the minor street as well, thereby not satisfying Category B of the warrant. Therefore, the intersection of Indian Bend Road and 78th Place does not meet the peak hour signal warrant. See Appendix D.

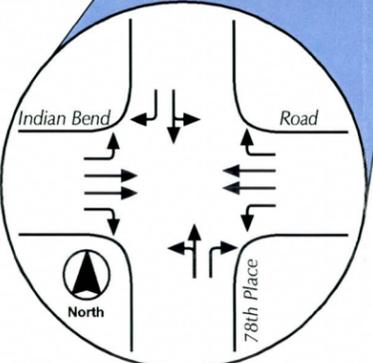
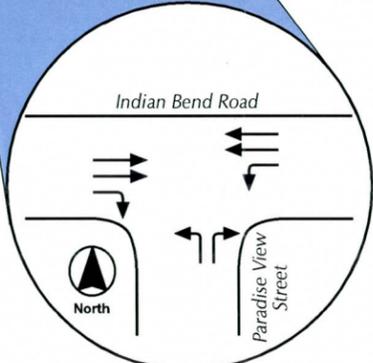
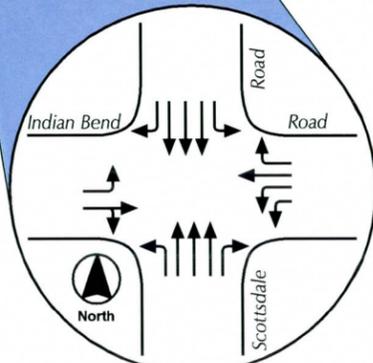
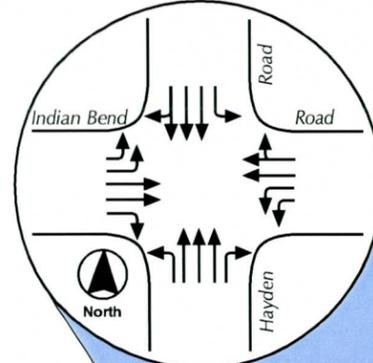
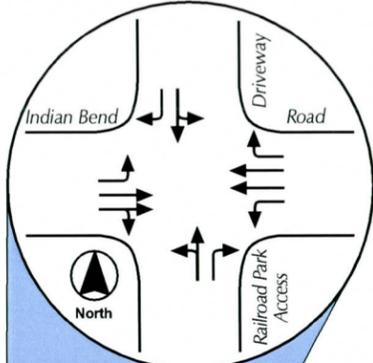
4.0 FUTURE CONDITIONS

4.1 FUTURE TRAFFIC VOLUMES

The City of Scottsdale has determined that the design year for the Indian Bend Road Improvement project is 2020. To develop future 2020 traffic volumes, growth rates were determined. The City of Scottsdale supplied URS with model projections from the Maricopa Association of Governments (MAG) with correction factors for specific streets in the study area. The yearly traffic growth rates derived from the MAG and Scottsdale City data were determined to be 2.14 % for Indian Bend Road and 0.5% for Scottsdale Road and Hayden Road.

In addition to the yearly growth rates, a future proposed development was also considered. Currently, the City of Scottsdale is reviewing a proposal to remove the existing 200-room Holiday Inn and replace it with a 215-unit condominium development. In reviewing the August 2003 traffic impact study, the proposed condominium development will not add additional trips on the existing roadway network. In other words, the switch between the two land uses, resort hotel to condominium, will not result in net additional trips during the peak hours. Therefore, no additional adjustments were made to the turning volumes at Paradise View Street.

Future year 2020 intersection lane configurations were developed at each of the study area intersections. The future lane configurations can be seen in Figure 4. Future year 2020 daily segment volumes along Indian Bend Road and peak hour turning movement volumes at study area intersections are presented in Figure 5.

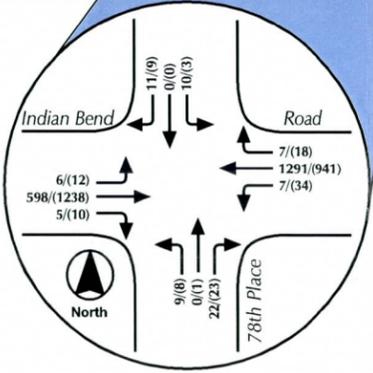
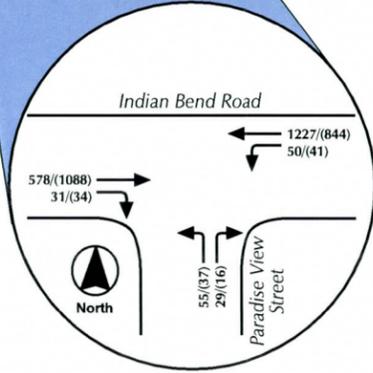
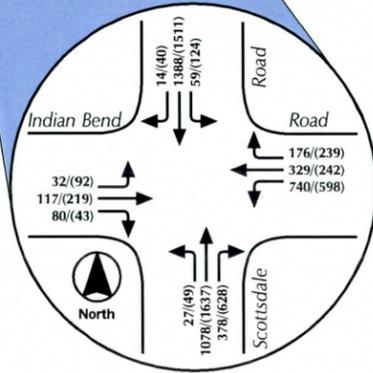
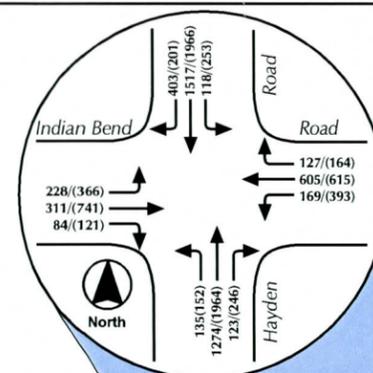
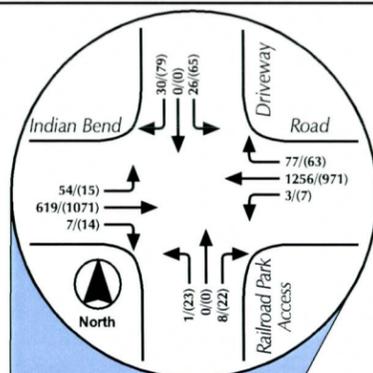


Draft: April 5, 2004

Figure 4
Future Year 2020
Intersection Geometrics

INDIAN BEND ROADWAY IMPROVEMENTS





Draft: April 5, 2004

Figure 5
Future Year 2020 Traffic Volumes
 INDIAN BEND ROADWAY IMPROVEMENTS



4.2 FUTURE TRAFFIC ANALYSIS

4.2.1 Level of Service Analysis

Each of the study intersections were analyzed with the forecasted year 2020 turning movement volumes (Figure 5) and future lane configurations (Figure 4) to determine levels of service during AM and PM peak hours. The intersection of Indian Bend Road/McCormick-Stillman RR Park was analyzed as a signalized intersection under future year 2020 conditions as it warranted a signal under Scenario A of existing conditions, and hence, it was assumed that the intersection would be signalized in the near future. A comparison of AM and PM peak hour intersection levels of service at the two signalized major intersections under existing year 2004 and future year 2020 conditions is shown in Tables 8 and 9.

The intersections of Indian Bend Road at Hayden Road and Scottsdale Road were analyzed using the same timing used in the existing analysis. The McCormick-Stillman RR Park entrance was analyzed as an uncoordinated signal with an optimized cycle length. It is important to note that better levels of service may be achieved in the future, at both Hayden Road and Scottsdale Road, based upon refinements to future corridor signal timing and other future capacity roadway improvements.

Table 9. Signalized AM Peak LOS Comparison

Indian Bend Intersection	Existing Year 2004		Future Year 2020	
	LOS	Control Delay (sec)	LOS	Control Delay (sec)
Scottsdale Road	D	44.3	C	25.7
Hayden Road	C	29.2	D	41.2
McCormick-Stillman RR Park	A ⁽¹⁾	6.7 ⁽¹⁾	A	2.1

Note: (1). Represents intersection LOS and delay when the intersection was analyzed as a signalized intersection under Scenario A of existing conditions.

Table 10. Signalized PM Peak LOS Comparison

Indian Bend Intersection	Existing Year 2004		Future Year 2020	
	LOS	Control Delay (sec)	LOS	Control Delay (sec)
Scottsdale Road	D	42.4	C	27.6
Hayden Road	D	47.9	E	75.1
McCormick-Stillman RR Park	A ⁽¹⁾	7.3 ⁽¹⁾	A	5.0

Note: (1). Represents intersection LOS and delay when the intersection was analyzed as a signalized intersection under Scenario A of existing conditions.

From Tables 8 and 9, it can be observed that under future year 2020 conditions, the two intersections of Indian Bend Road/Scottsdale Road and Indian Bend Road/Hayden Road will operate at the same or better levels of service during AM peak hour. However, during the PM peak hour, the intersection of Indian Bend Road/Hayden Road will operate at an unacceptable level of service.

As the intersection at Indian Bend Road/McCormick-Stillman RR Park is not signalized under existing conditions, signal timing parameters were assumed at this intersection for conducting the year 2020 intersection level of service. At the direction of the City, existing signal timing parameters were retained at the signalized intersections of Indian Bend Road/Scottsdale Road and Indian Bend Road/Hayden Road for conducting year 2020 intersection level of service analysis. The signal timing was not optimized at both signalized major intersections to obtain better levels of service.

The unsignalized intersections were evaluated under future year 2020 conditions. A comparison of the LOS by movement at the two unsignalized intersections of Indian Bend Road/Paradise View Street and Indian Bend Road/78th Place under existing year 2004 conditions and future year 2020 conditions is shown in Table 10.

Table 11. Unsignalized Intersection Comparison

Intersection	Movement	AM Peak		PM Peak	
		Existing	Future Year 2020	Existing	Future Year 2020
Indian Bend Road/Paradise View Street	WB Left	A/8.4	A/9.0	A/9.9	B/11.8
	NB Left	F/63.7	F/78.4	F/89.7	F/208.6
	NB Right	B/11.2	B/10.6	C/15.7	B/13.5
Indian Bend Road/78 th Place	EB Left	B/11.4	B/12.9	A/9.2	B/10.3
	WB Left	A/8.3	A/8.9	B/10.2	B/12.3
	NB Through Left	D/30.5	C/21.5	D/33.9	F/56.5
	NB Right	D/30.5	C/21.5	D/33.9	F/56.5
	SB Left	F/75.9	F/107.6	F/75.9	F/96.0
	SB Right	C/20.8	B/13.5	B/13.7	B/12.5

From Table 11, we can notice that some intersections will be impacted slightly by the additional traffic from the development, but a LOS F for an unsignalized intersection should not cause alarm as the delay experienced at an unsignalized intersection will be have a lower impact on traffic operations when compared to delays experienced at a signalized intersection.

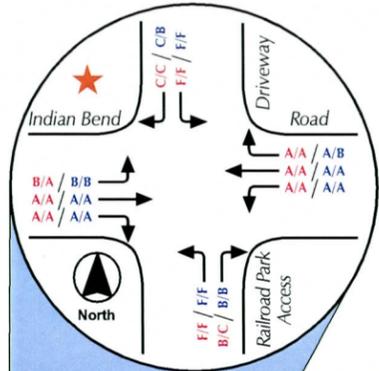
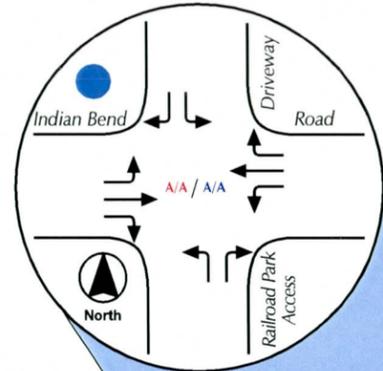
Signalized intersection levels of service along with levels of service by movement for unsignalized intersections for both existing year 2004 conditions and future year 2020 conditions are shown in Figure 6.

A LOS analysis was also performed for Indian Bend Road between Hayden Road and Scottsdale Road under future year 2020 conditions. This analysis is based on the travel speed and the delay attributed to the signalized intersections. Table 12 displays the arterial LOS.

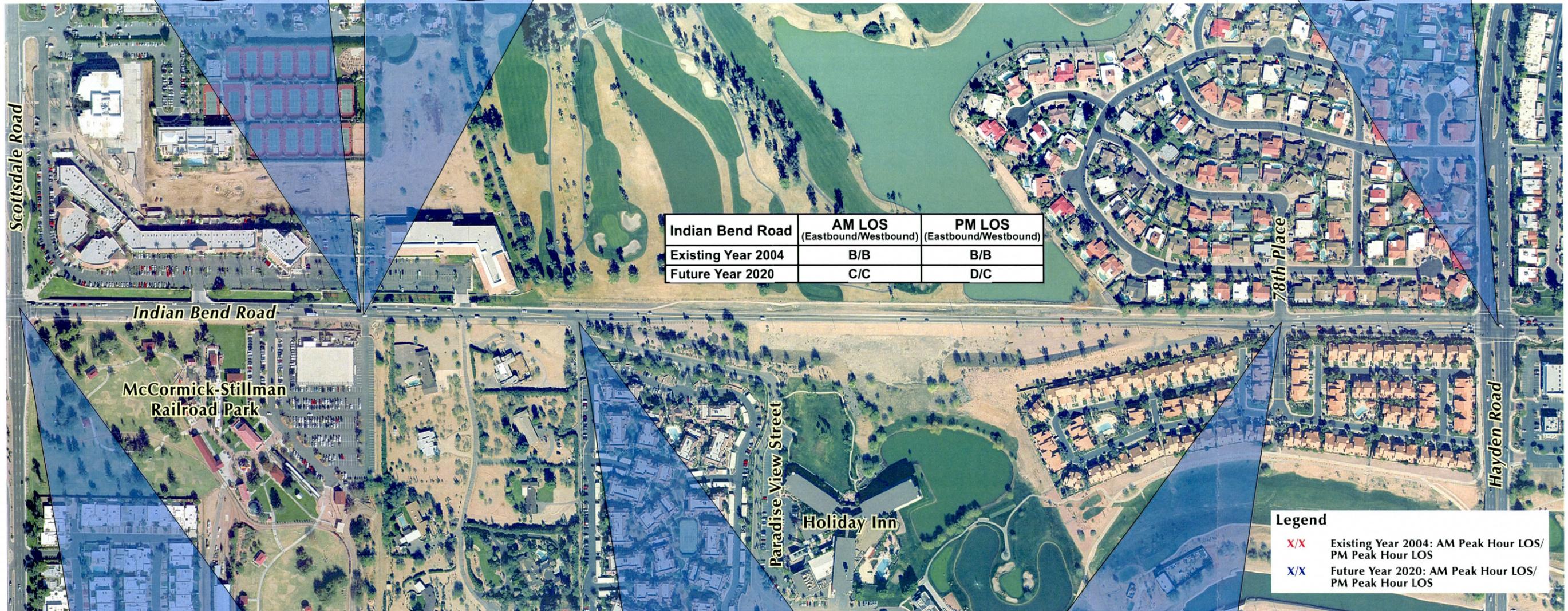
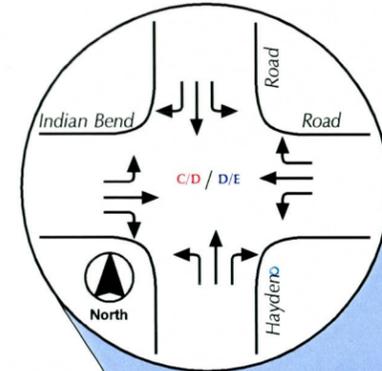
Table 12. Future Level of Service Arterial Summary (2020)

Approach Roadway	LOS	
	AM	PM
Eastbound – Indian Bend Road	C	D
Westbound – Indian Bend Road	C	C

As shown in Table 12, the future year 2020 LOS during both AM and PM peak hours along Indian Bend Road in eastbound and westbound directions are acceptable.

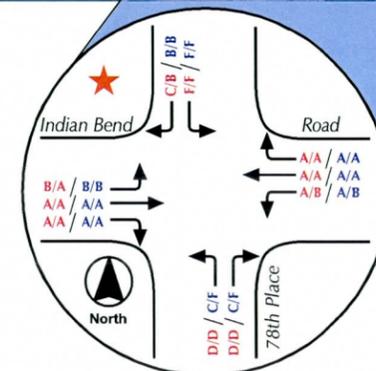
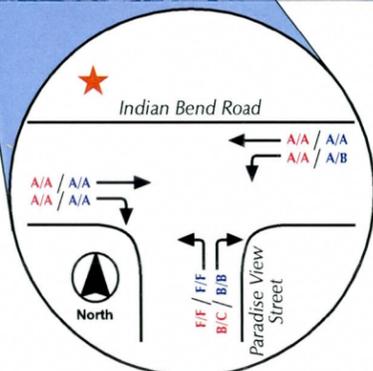
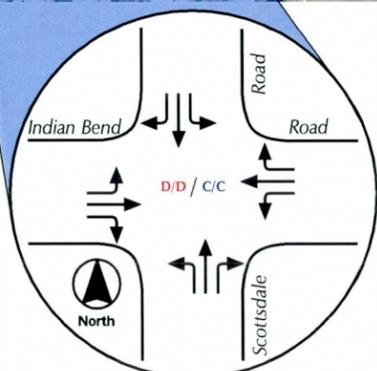


Notes: ★ Indicates that the intersection is analyzed as an unsignalized intersection under existing year 2004 and future year 2020 conditions.
 ● Indicates LOS results when the intersection is analyzed as a signalized intersection under existing year 2004 and future year 2020 conditions.



Indian Bend Road	AM LOS (Eastbound/Westbound)	PM LOS (Eastbound/Westbound)
Existing Year 2004	B/B	B/B
Future Year 2020	C/C	D/C

Legend
 X/X Existing Year 2004: AM Peak Hour LOS/
 PM Peak Hour LOS
 X/X Future Year 2020: AM Peak Hour LOS/
 PM Peak Hour LOS



Draft: April 5, 2004

Figure 6
 Existing Year 2004/Future Year 2020
 Intersection Level of Service (LOS)

INDIAN BEND ROADWAY IMPROVEMENTS



4.3 QUEUING AND STORAGE NEEDS

Based on future 2020 conditions, a queuing and storage needs analysis was conducted at each of the signalized and proposed signalized locations. The method used for this analysis is the Oppenlander method, developed by Joseph Oppenlander at the University of Vermont (ITE Journal, *Storage Requirements for Signalized Intersection Approaches*, Joseph and Jane Oppenlander, February 1996). The results of the queuing analysis are shown below in Table 13.

Table 13. 2020 Indian Bend Storage Length Requirements

Signalized Indian Bend Road Intersections	Direction							
	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
Scottsdale Road	250 ft **	100 ft	150 ft	150 ft	225 ft	100 ft	200 ft **	100 ft
Hayden Road	200 ft **	100 ft	240 ft **	120 ft	260 ft **	120 ft	150 ft	160 ft.
McCormick-Stillman RR Park	100 ft	100 ft	100 ft	100 ft	100 ft	100 ft*	100 ft	100 ft*

Notes: *Right-turns are combined with the through movement.

**Dual left-turn lanes

Turn lanes at the unsignalized intersections are recommended to be a minimum of 100 feet.

4.4 McCORMICK-STILLMAN RR PARK PEDESTRIAN NEEDS

The McCormick-Stillman RR Park has many weekend events where the parking demand exceeds available parking. To accommodate the parking demand, the park has an agreement with the Seville Office and Retail Shops across the street to utilize their parking during peak events. During these peak times, 100 or more vehicles have been utilizing the overflow parking across Indian Bend Road. This parking overflow has created pedestrian issues in crossing Indian Bend Road. A pedestrian under-pass crossing Indian Bend Road currently exists between the two RR Park driveways. However, this under-pass is rarely used due to its circuitous location, poor lighting, and susceptibility to flooding. Pedestrians usually choose to cross Indian Bend Road at grade at the east entrance to the RR Park.

Unless the under-pass is improved or replaced with a better facility, the traffic signal warranted at the RR Park's east entrance would better facilitate pedestrians as they cross Indian Bend Road. In addition, the June 2002 traffic and parking study for the RR Park concluded that the pedestrian volume on peak weekends warranted a traffic signal. Thus the warranted signal at the RR Park's east entrance will facilitate both vehicles and pedestrians more efficiently.

- Major Street (total of both approaches): 3,253 vph
- Minor Street (high volume approach): 32 vph

**Table 15. Future 2025 Signal Warrant Summary for
Indian Bend Road and 78th Place**

Peak Hour Category A Warrant	Condition	Peak Hour Volume Needed to Warrant Signal (vph)	Existing Volume in the Peak Hour (vph)
	Minor Street Approach Volume (one direction only)	100	32
Total Intersection Entering Volume	800	3,297	

From Table 15, it can be observed that the first condition of Category A is not satisfied. The minor street did not meet the minimum of 100 vph.

Category B of the peak hour warrant did not meet the minimum threshold for traffic volume on the minor street as well, thereby not satisfying Category B of the warrant. Therefore, the intersection of Indian Bend Road and 78th Place does not meet the peak hour signal warrant. See Appendix D.

Table 16 shows a comparative summary of the peak hour warrant analysis for both existing and future conditions.

Table 16. Peak Hour Warrant Summary

Intersection	Existing Year 2004 Conditions	Future Year 2020 Conditions
	Traffic Signal Warranted	
Indian Bend Road and Railroad Park Access	Yes*	Yes
Indian Bend Road and Paradise View Street	No	No
Indian Bend Road and 78 th Place	No	No

*Pending completion of the 112 condominium project

5.0 STUDY CONCLUSIONS AND RECOMMENDATIONS

Based upon the existing 2004 and future 2020 traffic volumes, the following is recommended to be included in the roadway improvements of Indian Bend Road:

- Signalize the intersection of Indian Bend Road and McCormick-Stillman RR Park East Entrance.
- Provide turning movement storage as shown in Table 13.
- Encourage the City of Scottsdale to retime the signals at the intersections with Indian Bend Road at Hayden Road and Scottsdale Road to optimize performance with the new lane geometry. This timing may be a part of an overall north-south corridor-retiming plan.

6.0 REFERENCES

Trip Generation, 6th (1998) Edition, Institute of Transportation Engineers

Manual of Uniform Traffic Control Devices (MUTCD), Millennium Edition, Federal Highway Administration

McCormick-Stillman Railroad Park Parking and Traffic Management Study, June 2002, City of Scottsdale, Arizona

City of Scottsdale 2002 Traffic Volume and Accident Rate Data, June 2002, City of Scottsdale, Arizona

APPENDIX A
CITY OF SCOTTSDALE MONTHLY ADJUSTMENT FACTORS

APPENDIX B

2003 UNADJUSTED TRAFFIC COUNTS

Start Date: 2/5/2004
Start Time: 04:00 PM
Site Code: 3157

Street Name	From North SEVILLE OFFICE DRWY				From East INDIAN BEND RD				From South McCORMICK R.R. PARK DRWY				From West INDIAN BEND RD				INTSEC	HOURL
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
4:00 PM	18	0	9	0	0	0	5	0	0	0	0	0	3	0	0	0	35	
4:15 PM	9	0	4	0	0	0	3	0	0	0	1	0	1	0	0	0	18	
4:30 PM	13	0	8	0	0	0	9	0	0	0	1	0	0	0	0	0	31	
4:45 PM	10	0	9	0	0	0	1	0	0	0	1	0	0	0	0	0	21	105
5:00 PM	17	0	25	0	0	0	6	0	1	0	1	0	3	0	0	0	53	123
5:15 PM	18	0	6	0	1	0	6	0	0	0	3	0	0	0	0	0	34	139
5:30 PM	12	0	6	0	0	0	8	0	2	0	0	0	1	0	1	0	30	138
5:45 PM	7	0	5	0	0	0	12	0	0	0	1	0	3	0	0	0	28	145
Approach Total	176				51				11				12				250	
Grand Total	104				1				3				11				250	
Approach %	59.1%	0.0%	40.9%	0.0%	2.0%	0.0%	98.0%	0.0%	27.3%	0.0%	72.7%	0.0%	91.7%	0.0%	8.3%	0.0%		
Total %	41.6%	0.0%	28.8%	0.0%	0.4%	0.0%	20.0%	0.0%	1.2%	0.0%	3.2%	0.0%	4.4%	0.0%	0.4%	0.0%		
Begin Peak Hour:	17:00																	
Peak Interval:	17:00																	
Peak Hour Vol:	54	0	42	0	1	706	32	0	3	0	5	0	7	779	1	0	145	
Percent:	37.2%	0.0%	29.0%	0.0%	0.7%	0.0%	22.1%	0.0%	2.1%	0.0%	3.4%	0.0%	4.8%	0.0%	0.7%	0.0%		
Intvl Vol:	17	0	25	0	0	0	6	0	1	0	1	0	3	0	0	0	53	
Peak Factor:																	0.6840	
High Interval:	17:00				17:45				17:15				17:00					
High Intvl Vol:	17	0	25	0	0	0	12	0	0	0	3	0	3	0	0	0		
Peak Factor:					0.5714				0.6875				0.6667					

Start Date: 2/5/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North SEVILLE OFFICE DRWY				From East INDIAN BEND RD				From South McCORMICK R.R. PARK DRWY				From West INDIAN BEND RD				INTSEC	HOURL
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
7:00 AM	1	0	1	0	0	0	14	0	0	0	0	0	6	0	0	0	22	
7:15 AM	0	0	1	0	0	0	11	0	0	0	0	0	7	0	0	0	19	
7:30 AM	4	0	0	0	2	0	11	0	1	0	1	0	7	0	0	0	26	
7:45 AM	4	0	0	0	0	0	14	0	0	0	1	0	13	0	0	0	32	99
8:00 AM	6	0	2	0	0	0	19	0	0	0	1	0	9	0	0	0	37	114
8:15 AM	4	0	2	0	0	0	10	0	0	0	3	0	9	0	0	0	28	123
8:30 AM	0	0	2	0	1	0	6	0	0	0	1	0	5	0	0	0	15	112
8:45 AM	5	0	1	0	1	0	15	0	0	0	1	0	3	0	0	0	26	106
Approach Total	33				104				9				59				205	
Grand Total	24				4				1				59				205	
Approach %	72.7%	0.0%	27.3%	0.0%	3.8%	0.0%	96.2%	0.0%	11.1%	0.0%	88.9%	0.0%	100.0%	0.0%	0.0%	0.0%		
Total %	11.7%	0.0%	4.4%	0.0%	2.0%	0.0%	48.8%	0.0%	0.5%	0.0%	3.9%	0.0%	28.8%	0.0%	0.0%	0.0%		
Begin Peak Hour:	7:30																	
Peak Interval:	8:00																	
Peak Hour Vol:	18	0	4	0	2	913	54	0	1	0	6	0	38	450	0	0	123	
Percent:	14.6%	0.0%	3.3%	0.0%	1.6%	0.0%	43.9%	0.0%	0.8%	0.0%	4.9%	0.0%	30.9%	0.0%	0.0%	0.0%		
Intvl Vol:	6	0	2	0	0	0	19	0	0	0	1	0	9	0	0	0	37	
Peak Factor:																	0.8311	
High Interval:	8:00				8:00				8:15				7:45					
High Intvl Vol:	6	0	2	0	0	0	19	0	0	0	3	0	13	0	0	0		
Peak Factor:					0.6875				0.7368				0.5833				0.7308	

Start Date: 1/8/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North HAYDEN RD				From East INDIAN BEND RD				From South HAYDEN RD				From West INDIAN BEND RD				INTSEC	HOURL
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
7:00 AM	19	158	59	0	12	94	16	0	12	153	14	0	20	41	5	0	603	
7:15 AM	29	224	74	0	20	106	25	0	16	182	18	0	31	51	13	0	789	
7:30 AM	21	328	102	0	24	98	27	0	23	312	28	0	29	53	16	0	1061	
7:45 AM	29	436	96	0	42	123	22	0	43	328	26	0	43	47	18	0	1253	3706
8:00 AM	27	405	105	0	40	108	16	0	29	310	28	0	45	56	19	0	1188	4291
8:15 AM	34	260	77	0	17	111	27	0	32	250	34	0	49	70	8	0	969	4471
8:30 AM	25	233	79	0	18	106	23	0	21	280	25	0	49	61	11	0	931	4341
8:45 AM	46	220	66	0	28	135	29	0	26	247	19	0	42	88	17	0	963	4051
Approach Total	3152				1267				2456				882				7757	
Grand Total	230	2264	658	0	201	881	185	0	202	2062	192	0	308	467	107	0	7757	
Approach %	7.3%	71.8%	20.9%	0.0%	15.9%	69.5%	14.6%	0.0%	8.2%	84.0%	7.8%	0.0%	34.9%	52.9%	12.1%	0.0%		
Total %	3.0%	29.2%	8.5%	0.0%	2.6%	11.4%	2.4%	0.0%	2.6%	26.6%	2.5%	0.0%	4.0%	6.0%	1.4%	0.0%		
Begin Peak Hour:	7:30																	
Peak Interval:	7:45																	
Peak Hour Vol:	111	1429	380	0	123	440	92	0	127	1200	116	0	166	226	61	0	4471	
Percent:	2.5%	32.0%	8.5%	0.0%	2.8%	9.8%	2.1%	0.0%	2.8%	26.8%	2.6%	0.0%	3.7%	5.1%	1.4%	0.0%		
Intvl Vol:	29	436	96	0	42	123	22	0	43	328	26	0	43	47	18	0	1253	
Peak Factor:																	0.8921	
High Interval:	7:45				7:45				7:45				8:15					
High Intvl Vol:	29	436	96	0	42	123	22	0	43	328	26	0	49	70	8	0		
Peak Factor:	0.8556				0.8757				0.9087				0.8917					

Start Date: 1/8/2004
Start Time: 04:00 PM
Site Code: 3157

Street Name	From North 78TH PLACE				From East INDIAN BEND ROAD				From South 78TH PLACE				From West INDIAN BEND ROAD				INTSEC	HOUR
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
4:00 PM	1	0	0	0	8	168	4	0	0	0	3	0	2	224	1	0	411	
4:15 PM	4	0	0	0	3	140	1	0	4	0	10	0	2	203	1	0	368	
4:30 PM	2	0	1	0	4	152	6	0	2	0	6	0	5	221	2	0	401	
4:45 PM	3	0	2	0	9	146	4	0	2	0	3	0	1	225	2	0	397	1577
5:00 PM	0	0	0	0	8	172	6	0	4	0	6	0	3	240	2	0	441	1607
5:15 PM	3	0	1	0	8	187	2	0	1	0	8	0	5	198	2	0	415	1654
5:30 PM	0	0	1	0	11	154	3	0	1	0	7	0	3	224	2	0	406	1659
5:45 PM	0	0	7	0	8	171	7	0	2	1	2	0	1	238	4	0	441	1703
Approach Total	25				1382				62				1811				3280	
Grand Total	13	0	12	0	59	1290	33	0	16	1	45	0	22	1773	16	0	3280	
Approach %	52.0%	0.0%	48.0%	0.0%	4.3%	93.3%	2.4%	0.0%	25.8%	1.6%	72.6%	0.0%	1.2%	97.9%	0.9%	0.0%		
Total %	0.4%	0.0%	0.4%	0.0%	1.8%	39.3%	1.0%	0.0%	0.5%	0.0%	1.4%	0.0%	0.7%	54.1%	0.5%	0.0%		
Begin Peak Hour:	17:00																	
Peak Interval:	17:00																	
Peak Hour Vol:	3	0	9	0	35	684	18	0	8	1	23	0	12	900	10	0	1703	
Percent:	0.2%	0.0%	0.5%	0.0%	2.1%	40.2%	1.1%	0.0%	0.5%	0.1%	1.4%	0.0%	0.7%	52.8%	0.6%	0.0%		
Intvl Vol:	0	0	0	0	8	172	6	0	4	0	6	0	3	240	2	0	441	
Peak Factor:																	0.9654	
High Interval:	17:45				17:15				17:00				17:00					
High Intvl Vol:	0	0	7	0	8	187	2	0	4	0	6	0	3	240	2	0		
Peak Factor:	0.4286				0.9353				0.8000				0.9408					

Start Date: 1/8/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North 78TH PLACE				From East INDIAN BEND ROAD				From South 78TH PLACE				From West INDIAN BEND ROAD				INTSEC	HOURL
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
7:00 AM	1	0	2	0	1	178	0	0	3	0	3	0	1	66	0	0	255	
7:15 AM	4	0	1	0	1	193	0	0	5	0	5	0	0	84	2	0	295	
7:30 AM	4	0	3	0	2	227	0	0	2	0	4	0	0	95	0	0	337	
7:45 AM	3	0	3	0	1	258	0	0	2	0	4	0	0	95	0	0	366	1253
8:00 AM	2	0	5	0	1	247	2	0	3	0	7	0	1	107	1	0	376	1374
8:15 AM	1	0	1	0	4	212	5	0	1	0	5	0	3	118	4	0	354	1433
8:30 AM	4	0	2	0	1	222	0	0	3	0	6	0	2	115	0	0	355	1451
8:45 AM	5	0	4	0	4	199	0	0	0	0	8	0	0	124	1	0	345	1430
Approach Total	45				1758				61				819				2683	
Grand Total	24	0	21	0	15	1736	7	0	19	0	42	0	7	804	8	0	2683	
Approach %	53.3%	0.0%	46.7%	0.0%	0.9%	98.7%	0.4%	0.0%	31.1%	0.0%	68.9%	0.0%	0.9%	98.2%	1.0%	0.0%		
Total %	0.9%	0.0%	0.8%	0.0%	0.6%	64.7%	0.3%	0.0%	0.7%	0.0%	1.6%	0.0%	0.3%	30.0%	0.3%	0.0%		
Begin Peak Hour:	7:45																	
Peak Interval:	8:00																	
Peak Hour Vol:	10	0	11	0	7	939	7	0	9	0	22	0	6	435	5	0	1451	
Percent:	0.7%	0.0%	0.8%	0.0%	0.5%	64.7%	0.5%	0.0%	0.6%	0.0%	1.5%	0.0%	0.4%	30.0%	0.3%	0.0%		
Intvl Vol:	2	0	5	0	1	247	2	0	3	0	7	0	1	107	1	0	376	
Peak Factor:																	0.9648	
High Interval:	8:00				7:45				8:00				8:15					
High Intvl Vol:	2	0	5	0	1	258	0	0	3	0	7	0	3	118	4	0		
Peak Factor:					0.7500				0.9199				0.7750				0.8920	

Start Date: 1/8/2004
Start Time: 04:00 PM
Site Code: 3157

Street Name	From North NONE				From East INDIAN BEND RD				From South DRWY TO HOLIDAY INN				From West INDIAN BEND RD				INTSEC	HOURL
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
4:00 PM	0	0	0	0	8	143	0	0	12	0	13	0	0	203	8	0	387	
4:15 PM	0	0	0	0	6	131	0	0	4	0	1	0	0	183	7	0	332	
4:30 PM	0	0	0	0	4	140	0	0	9	0	6	0	0	197	10	0	366	
4:45 PM	0	0	0	0	11	128	0	0	8	0	11	0	0	198	8	0	364	1449
5:00 PM	0	0	0	0	11	147	0	0	5	0	2	0	0	220	5	0	390	1452
5:15 PM	0	0	0	0	14	175	0	0	8	0	4	0	0	186	11	0	398	1518
5:30 PM	0	0	0	0	10	129	0	0	7	0	2	0	0	198	12	0	358	1510
5:45 PM	0	0	0	0	7	163	0	0	18	0	8	0	0	187	7	0	390	1536
Approach Total	0				1227				118				1640				2985	
Grand Total	0	0	0	0	71	1156	0	0	71	0	47	0	0	1572	68	0	2985	
Approach %					5.8%	94.2%	0.0%	0.0%	60.2%	0.0%	39.8%	0.0%	0.0%	95.9%	4.1%	0.0%		
Total %	0.0%	0.0%	0.0%	0.0%	2.4%	38.7%	0.0%	0.0%	2.4%	0.0%	1.6%	0.0%	0.0%	52.7%	2.3%	0.0%		
Begin Peak Hour:	17:00																	
Peak Interval:	17:15																	
Peak Hour Vol:	0	0	0	0	42	614	0	0	38	0	16	0	0	791	35	0	1536	
Percent:	0.0%	0.0%	0.0%	0.0%	2.7%	40.0%	0.0%	0.0%	2.5%	0.0%	1.0%	0.0%	0.0%	51.5%	2.3%	0.0%		
Intvl Vol:	0	0	0	0	14	175	0	0	8	0	4	0	0	186	11	0	398	
Peak Factor:																	0.9648	
High Interval:					17:15				17:45				17:00					
High Intvl Vol:					14 175 0 0				18 0 8 0				0 220 5 0					
Peak Factor:					0.8677				0.5192				0.9178					

Start Date: 1/8/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North NONE				From East INDIAN BEND RD				From South DRWY TO HOLIDAY INN				From West INDIAN BEND RD				INTSEC	HOURL			
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL			
Start Time																					
7:00 AM	0	0	0	0	7	168	0	0	7	0	5	0	0	63	11	0	261				
7:15 AM	0	0	0	0	8	187	0	0	8	0	3	0	0	77	6	0	289				
7:30 AM	0	0	0	0	4	217	0	0	9	0	8	0	0	82	4	0	324				
7:45 AM	0	0	0	0	13	238	0	0	6	0	5	0	0	93	7	0	362	1236			
8:00 AM	0	0	0	0	9	237	0	0	16	0	5	0	0	105	11	0	383	1358			
8:15 AM	0	0	0	0	11	201	0	0	9	0	5	0	0	115	5	0	346	1415			
8:30 AM	0	0	0	0	12	216	0	0	19	0	12	0	0	107	6	0	372	1463			
8:45 AM	0	0	0	0	9	188	0	0	5	0	6	0	0	110	1	0	319	1420			
Approach Total	0				1725				128				803				2656				
Grand Total	0	0	0	0	73	1652	0	0	79	0	49	0	0	752	51	0	2656				
Approach %					4.2%	95.8%	0.0%	0.0%	61.7%	0.0%	38.3%	0.0%	0.0%	93.6%	6.4%	0.0%					
Total %	0.0%	0.0%	0.0%	0.0%	2.7%	62.2%	0.0%	0.0%	3.0%	0.0%	1.8%	0.0%	0.0%	28.3%	1.9%	0.0%					
Begin Peak Hour:	7:45																				
Peak Interval:	8:00																				
Peak Hour Vol:	0	0	0	0	45	892	0	0	50	0	27	0	0	420	29	0	1463				
Percent:	0.0%	0.0%	0.0%	0.0%	3.1%	61.0%	0.0%	0.0%	3.4%	0.0%	1.8%	0.0%	0.0%	28.7%	2.0%	0.0%					
Intvl Vol:	0	0	0	0	9	237	0	0	16	0	5	0	0	105	11	0	383				
Peak Factor:																	0.9550				
High Interval:					7:45					8:30					8:15						
High Intvl Vol:					13	238	0	0	19	0	12	0	0	115	5	0					
Peak Factor:									0.9333									0.6210	0.9354		

Start Date: 1/8/2004
Start Time: 04:00 PM
Site Code: 3157

Street Name	From North NONE				From East INDIAN BEND RD				From South DRWY TO RAILROAD				From West INDIAN BEND RD				INTSEC	HOUR
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
4:00 PM	0	0	0	0	3	181	0	0	5	0	1	0	0	173	6	0	369	
4:15 PM	0	0	0	0	4	148	0	0	10	0	5	0	0	150	1	0	318	
4:30 PM	0	0	0	0	3	152	0	0	2	0	7	0	0	166	5	0	335	
4:45 PM	0	0	0	0	1	153	0	0	7	0	13	0	0	188	2	0	364	1386
5:00 PM	0	0	0	0	3	194	0	0	1	0	5	0	0	182	3	0	388	1405
5:15 PM	0	0	0	0	1	187	0	0	8	0	4	0	0	195	3	0	398	1485
5:30 PM	0	0	0	0	1	131	0	0	5	0	4	0	0	210	4	0	355	1505
5:45 PM	0	0	0	0	0	194	0	0	3	0	3	0	0	192	0	0	392	1533
Approach Total	0				1356				83				1480				2919	
Grand Total	0	0	0	0	16	1340	0	0	41	0	42	0	0	1456	24	0	2919	
Approach %					1.2%	98.8%	0.0%	0.0%	49.4%	0.0%	50.6%	0.0%	0.0%	98.4%	1.6%	0.0%		
Total %	0.0%	0.0%	0.0%	0.0%	0.5%	45.9%	0.0%	0.0%	1.4%	0.0%	1.4%	0.0%	0.0%	49.9%	0.8%	0.0%		
Begin Peak Hour:	17:00																	
Peak Interval:	17:15																	
Peak Hour Vol:	0	0	0	0	5	706	0	0	17	0	16	0	0	779	10	0	1533	
Percent:	0.0%	0.0%	0.0%	0.0%	0.3%	46.1%	0.0%	0.0%	1.1%	0.0%	1.0%	0.0%	0.0%	50.8%	0.7%	0.0%		
Intvl Vol:	0	0	0	0	1	187	0	0	8	0	4	0	0	195	3	0	0.9629	
Peak Factor:																		
High Interval:					17:00				17:15				17:30					
High Intvl Vol:					3 194 0 0				8 0 4 0				0 210 4 0					
Peak Factor:					0.9023				0.6875				0.9217					

Start Date: 1/8/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North NONE				From East INDIAN BEND RD				From South DRWY TO RAILROAD				From West INDIAN BEND RD				INTSEC	HOUR
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	TOTAL	TOTAL
Start Time																		
7:00 AM	0	0	0	0	1	173	0	0	0	0	0	0	0	90	2	0	266	
7:15 AM	0	0	0	0	2	174	0	0	0	0	0	0	0	85	0	0	261	
7:30 AM	0	0	0	0	1	241	0	0	0	0	0	0	0	90	1	0	333	
7:45 AM	0	0	0	0	0	225	0	0	0	0	0	0	0	105	0	0	330	1190
8:00 AM	0	0	0	0	0	259	0	0	1	0	0	0	0	119	4	0	383	1307
8:15 AM	0	0	0	0	0	202	0	0	0	0	0	0	0	114	1	0	317	1363
8:30 AM	0	0	0	0	0	227	1	0	0	0	0	0	0	112	0	0	340	1370
8:45 AM	0	0	0	0	3	185	0	0	0	0	0	0	0	119	1	0	308	1348
Approach Total	0				1694				1				843				2538	
Grand Total	0	0	0	0	7	1686	1	0	1	0	0	0	0	834	9	0	2538	
Approach %					0.4%	99.5%	0.1%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	98.9%	1.1%	0.0%		
Total %	0.0%	0.0%	0.0%	0.0%	0.3%	66.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.9%	0.4%	0.0%		
Begin Peak Hour:	7:45																	
Peak Interval:	8:00																	
Peak Hour Vol:	0	0	0	0	0	913	1	0	1	0	0	0	0	450	5	0	1370	
Percent:	0.0%	0.0%	0.0%	0.0%	0.0%	66.6%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	32.8%	0.4%	0.0%	383	
Intvl Vol:	0	0	0	0	0	259	0	0	1	0	0	0	0	119	4	0	0.8943	
Peak Factor:																		
High Interval:					8:00				8:00				8:00					
High Intvl Vol:					0	259	0	0	1	0	0	0	0	119	4	0		
Peak Factor:								0.8822				0.2500				0.9248		

Start Date: 1/8/2004
Start Time: 04:00 PM
Site Code: 3157

Street Name	From North SCOTTSDALE RD				From East INDIAN BEND RD				From South SCOTTSDALE RD				From West INDIAN BEND RD				INTSEC	HOUR
	Left	Thru	Right	Peds	TOTAL	TOTAL												
Start Time																		
4:00 PM	34	309	8	0	106	46	44	0	11	326	141	0	10	35	6	0	1076	
4:15 PM	33	324	2	0	117	38	26	0	5	336	156	0	5	20	4	0	1066	
4:30 PM	28	343	7	0	118	34	33	0	9	334	147	0	11	50	3	0	1117	
4:45 PM	28	310	1	0	80	41	37	0	6	417	166	0	4	49	6	0	1145	4404
5:00 PM	29	365	11	0	110	50	33	0	3	392	148	0	21	31	8	0	1201	4529
5:15 PM	30	360	10	0	121	48	59	0	10	387	146	0	15	42	12	0	1240	4703
5:30 PM	35	356	11	0	87	29	39	0	26	349	141	0	14	50	5	0	1142	4728
5:45 PM	23	343	6	0	117	49	43	0	7	414	157	0	17	36	6	0	1218	4801
Approach Total	3006				1505				4234				460				9205	
Grand Total	240	2710	56	0	856	335	314	0	77	2955	1202	0	97	313	50	0	9205	
Approach %	8.0%	90.2%	1.9%	0.0%	56.9%	22.3%	20.9%	0.0%	1.8%	69.8%	28.4%	0.0%	21.1%	68.0%	10.9%	0.0%		
Total %	2.6%	29.4%	0.6%	0.0%	9.3%	3.6%	3.4%	0.0%	0.8%	32.1%	13.1%	0.0%	1.1%	3.4%	0.5%	0.0%		
Begin Peak Hour:	17:00																	
Peak Interval:	17:15																	
Peak Hour Vol:	117	1424	38	0	435	176	174	0	46	1542	592	0	67	159	31	0	4801	
Percent:	2.4%	29.7%	0.8%	0.0%	9.1%	3.7%	3.6%	0.0%	1.0%	32.1%	12.3%	0.0%	1.4%	3.3%	0.6%	0.0%		
Intvl Vol:	30	360	10	0	121	48	59	0	10	387	146	0	15	42	12	0	1240	
Peak Factor:																	0.9679	
High Interval:	17:00				17:15				17:45				17:15					
High Intvl Vol:	29	365	11	0	121	48	59	0	7	414	157	0	15	42	12	0		
Peak Factor:	0.9747				0.8607				0.9429				0.9312					

Start Date: 1/8/2004
Start Time: 07:00 AM
Site Code: 3157

Street Name	From North SCOTTSDALE RD				From East INDIAN BEND RD				From South SCOTTSDALE RD				From West INDIAN BEND RD				INTSEC	HOURL
	Left	Thru	Right	Peds	TOTAL	TOTAL												
Start Time																		
7:00 AM	16	174	4	0	86	31	18	0	2	118	67	0	6	14	8	0	544	
7:15 AM	9	262	2	0	126	40	16	0	0	141	59	0	5	12	8	0	680	
7:30 AM	13	301	3	0	127	54	30	0	4	225	55	0	3	23	13	0	851	
7:45 AM	12	376	3	0	136	62	30	0	7	265	91	0	13	17	19	0	1031	3106
8:00 AM	18	310	2	0	137	65	36	0	5	279	104	0	5	28	17	0	1006	3568
8:15 AM	13	321	5	0	138	58	32	0	9	247	106	0	2	17	9	0	957	3845
8:30 AM	17	232	6	0	135	66	51	0	1	210	76	0	7	28	10	0	839	3833
8:45 AM	12	270	4	0	102	46	33	0	0	268	74	0	6	38	11	0	864	3666
Approach Total	2385				1655				2413				319				6772	
Grand Total	110	2246	29	0	987	422	246	0	28	1753	632	0	47	177	95	0	6772	
Approach %	4.6%	94.2%	1.2%	0.0%	59.6%	25.5%	14.9%	0.0%	1.2%	72.6%	26.2%	0.0%	14.7%	55.5%	29.8%	0.0%		
Total %	1.6%	33.2%	0.4%	0.0%	14.6%	6.2%	3.6%	0.0%	0.4%	25.9%	9.3%	0.0%	0.7%	2.6%	1.4%	0.0%		
Begin Peak Hour:	7:30																	
Peak Interval:	7:45																	
Peak Hour Vol:	56	1308	13	0	538	239	128	0	25	1016	356	0	23	85	58	0	3845	
Percent:	1.5%	34.0%	0.3%	0.0%	14.0%	6.2%	3.3%	0.0%	0.7%	26.4%	9.3%	0.0%	0.6%	2.2%	1.5%	0.0%		
Intvl Vol:	12	376	3	0	136	62	30	0	7	265	91	0	13	17	19	0	1031	
Peak Factor:																	0.9323	
High Interval:	7:45				8:00				8:00				8:00					
High Intvl Vol:	12	376	3	0	137	65	36	0	5	279	104	0	5	28	17	0		
Peak Factor:					0.8804				0.9506				0.9001				0.8300	

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

Site ID	File ID	Route	Location	Direction	Lanes	Type	Duration	Avg vol	AM Pk Hr	AM Pk Vol	AM PHF	PM Pk Hr	PM Pk Vol	PM PHF	Pct SU	Pct CB	Day Corr	Avg Split
1	0400025	INDIAN BEND RD (East of Railroad Park)	BTWN SCOTTSDALE RD & HAYDEN RD	EB	1	CLS	48	10075	11:45	796	0.8578	16:45	928	0.9831	0.9%	0.3%	0.9738	50.6%
1	0400026	INDIAN BEND RD (East of Railroad Park)	BTWN SCOTTSDALE RD & HAYDEN RD	WB	1	CLS	48	9845	7:30	963	0.8851	12:30	748	0.9492	1.2%	0.4%	0.9814	49.4%

Project: City of Scottsdale
 Description: Turning Movement Count @ Scottsdale & Indian Bend
 By: URS Corp
 Count Date: 1/8/2004

Forecast Year: 2004 & 2020

AM Peak - 7:30-8:15	Scottsdale SB				Indian Bend WB				Scottsdale NB				Indian Bend EB				Intvl Total
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	
Base Year Volume	56	1308	13	0	538	239	128	0	25	1016	356	0	23	85	58	0	3845
Growth Rate (% per year)	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	
Growth Factor	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Peak Hour Total 2004	55	1282	13	0	527	234	125	0	25	996	349	0	23	83	57	0	4417
Peak Hour Total 2020	59	1388	14	0	740	329	176	0	27	1078	378	0	32	117	80	0	
Approach Volumes	WB departure 369				EB departure 554				WB approach 1245				EB approach 228				
Peak hour Factor	0.8804				0.951				0.9				0.83				
PM Peak - 17:00-17:45	Scottsdale SB				Indian Bend WB				Scottsdale NB				Indian Bend EB				Intvl Total
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	
Base Year Volume	117	1424	38	0	435	176	174	0	46	1542	592	0	67	159	31	0	4801
Growth Rate (% per year)	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	
Growth Factor	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Peak Hour Total 2004	115	1396	37	0	426	172	171	0	45	1511	580	0	66	156	30	0	5423
Peak Hour Total 2020	124	1511	40	0	598	242	239	0	49	1637	628	0	92	219	43	0	
Approach Volumes	WB departure 331				EB departure 971				WB approach 1080				EB approach 353				
Peak hour Factor	0.9747				0.8607				0.9429				0.9312				

Project: City of Scottsdale
 Description: Turning Movement Count @ Indian Bend Road & Driveway to RailRoad
 By: URS Corp
 Count Date: 1/8/2004

Forecast Year: 2004 & 2020

AM Peak - 7:45-8:30	SB				Indian Bend WB				DRWY TO RR NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	18	0	4		2	913	54	0	1	0	6	0	38	450	5	0	1491															
Growth Rate (% per year)	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	18	0	4	0	2	895	53	0	1	0	6	0	37	441	5	0	2050															
Peak Hour Total 2020	25	0	6	0	3	1256	74	0	1	0	8	0	52	619	7	0																
Approach Volumes	WB departure				1262				EB departure				652				WB approach				1333				EB approach				678			
Peak hour Factor					0.6875								0.8822								0.25								0.9248			

PM Peak - 17:00-17:45	SB				Indian Bend WB				DRWY TO RR NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	54	0	42		5	706	32	0	17	0	16	0	7	779	10	0	1668															
Growth Rate (% per year)	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	53	0	41	0	5	692	31	0	17	0	16	0	7	763	10	0	2294															
Peak Hour Total 2020	74	0	58	0	7	971	44	0	23	0	22	0	10	1071	14	0																
Approach Volumes	WB departure				1052				EB departure				1168				WB approach				1022				EB approach				1095			
Peak hour Factor					0.5714								0.9023								0.6875								0.9217			

Project: City of Scottsdale
 Description: Turning Movement Count @ Indian Bend Road & Driveway to Holiday Inn
 By: URS Corp
 Count Date: 1/8/2004

Forecast Year: 2004 & 2020

AM Peak - 7:45-8:30	SB				Indian Bend WB				DRWY TO Hol. Inn NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume					45	892	0	0	50	0	27	0	0	420	29	0	1463															
Growth Rate (% per year)					2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor					1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	0	0	0	0	44	874	0	0	49	0	26	0	0	412	28	0	2012															
Peak Hour Total 2020	0	0	0	0	62	1227	0	0	69	0	37	0	0	578	40	0																
Approach Volumes	WB departure				1295				EB departure				615				WB approach				1289				EB approach				617			
Peak hour Factor					0.9333								0.621								0.9354											
PM Peak - 17:00-17:45	SB				Indian Bend WB				DRWY TO Hol. Inn NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume					42	614	0	0	38	0	16	0	0	791	35	0	1536															
Growth Rate (% per year)					2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor					1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	0	0	0	0	41	602	0	0	37	0	16	0	0	775	34	0	2112															
Peak Hour Total 2020	0	0	0	0	58	844	0	0	52	0	22	0	0	1088	48	0																
Approach Volumes	WB departure				897				EB departure				1110				WB approach				902				EB approach				1136			
Peak hour Factor					0.8677								0.5192								0.9178											

Project: City of Scottsdale
 Description: Turning Movement Count @ Indian Bend Road & 78th Place
 By: URS Corp
 Count Date: 1/8/2004

Forecast Year: 2004 & 2020

AM Peak - 7:45-8:30	78th Place SB				Indian Bend WB				78th Place NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	10	0	11	0	7	939	7	0	9	0	22	0	6	435	5	0	1451															
Growth Rate (% per year)	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	10	0	11	0	7	920	7	0	9	0	22	0	6	426	5	0	1995															
Peak Hour Total 2020	14	0	15	0	10	1291	10	0	12	0	30	0	8	598	7	0																
Approach Volumes	WB departure				1319				EB departure				642				WB approach				1311				EB approach				613			
Peak hour Factor	0.75				0.9199				0.775				0.892																			
PM Peak - 17:00-17:45	78th Place SB				Indian Bend WB				78th Place NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	3	0	9	0	35	684	18	0	8	1	23	0	12	900	10	0	1703															
Growth Rate (% per year)	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14																
Growth Factor	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	3	0	9	0	34	670	18	0	8	1	23	0	12	882	10	0	2342															
Peak Hour Total 2020	4	0	12	0	48	941	25	0	11	1	32	0	17	1238	14	0																
Approach Volumes	WB departure				964				EB departure				1273				WB approach				1014				EB approach				1268			
Peak hour Factor	0.4286				0.9359				0.8				0.9408																			

Project: City of Scottsdale
 Description: Turning Movement Count @ Indian Bend Road & Hayden Road
 By: URS Corp
 Count Date: 1/8/2004

Forecast Year: 2004 & 2020

AM Peak - 7:30-8:15	Hayden Rd SB				Indian Bend WB				Hayden Rd NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	111	1429	380	0	123	440	92	0	127	1200	116	0	166	226	61	0	4471															
Growth Rate (% per year)	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14																
Growth Factor	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	109	1400	372	0	121	431	90	0	124	1176	114	0	163	221	60	0																
Peak Hour Total 2020	118	1517	403	0	169	605	127	0	135	1274	123	0	228	311	84	0	5093															
Approach Volumes	WB departure				1143				EB departure				552				WB approach				901				EB approach				623			
Peak hour Factor.	0.8556				0.8757				0.9087				0.8917																			
PM Peak - 17:00-17:45	Hayden Rd SB				Indian Bend WB				Hayden Rd NB				Indian Bend EB				Intvl Total															
	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other	Left	Thru	Right	Other																
Base Year Volume	238	1852	189	0	286	447	119	0	143	1850	232	0	266	539	88	0	6249															
Growth Rate (% per year)	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14	0.50	0.50	0.50	0.50	2.14	2.14	2.14	2.14																
Growth Factor	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40	1.08	1.08	1.08	1.08	1.40	1.40	1.40	1.40																
Monthly Adjustment Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98																
Peak Hour Total 2004	233	1815	185	0	280	438	117	0	140	1813	227	0	261	528	86	0																
Peak Hour Total 2020	253	1966	201	0	393	615	164	0	152	1964	246	0	366	741	121	0	7180															
Approach Volumes	WB departure				967				EB departure				1240				WB approach				1172				EB approach				1228			
Peak hour Factor	0.8712				0.8875				0.8872				0.9792																			

APPENDIX C
SYNCHRO REPORTS

EXISTING YEAR 2004 CONDITIONS

INTERSECTION LOS

AM PEAK HOUR

Timings
1: Indian Bend Rd & Scottsdale Road

Existing Year 2004 - AM Peak Hour
4/5/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	23	83	527	234	125	25	996	349	55	1282	13
Turn Type	pm+pt		pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	1	4	1	4		3	2		3	2	
Permitted Phases	4		4		4	2		2	2		2
Detector Phases	1	4	1	4	4	3	2	2	3	2	2
Minimum Initial (s)	4.0	8.0	4.0	8.0	8.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	8.0	15.0	8.0	15.0	15.0	8.0	41.0	41.0	8.0	41.0	41.0
Total Split (s)	15.0	21.0	15.0	21.0	21.0	12.0	54.0	54.0	12.0	54.0	54.0
Total Split (%)	15%	21%	15%	21%	21%	12%	53%	53%	12%	53%	53%
Yellow Time (s)	3.0	4.7	3.0	4.7	4.7	3.0	4.4	4.4	3.0	4.4	4.4
All-Red Time (s)	1.0	2.3	1.0	2.3	2.3	1.0	1.6	1.6	1.0	1.6	1.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	Min	None	Min	Min	None	Coord	Coord	None	Coord	Coord
Act Effct Green (s)	27.6	16.6	27.6	16.6	16.6	59.2	56.0	56.0	59.2	56.0	56.0
Actuated g/C Ratio	0.27	0.16	0.27	0.16	0.16	0.58	0.55	0.55	0.58	0.55	0.55
v/c Ratio	0.10	0.54	1.69	0.82	0.36	0.15	0.40	0.37	0.24	0.53	0.02
Uniform Delay, d1	25.8	32.2	37.9	41.2	0.0	9.0	13.7	0.0	9.4	15.1	0.0
Delay	26.7	32.7	228.8	49.4	7.0	10.5	13.8	1.4	10.7	15.2	5.3
LOS	C	C	F	D	A	B	B	A	B	B	A
Approach Delay		31.8		150.1			10.6			14.9	
Approach LOS		C		F			B			B	

Intersection Summary

Cycle Length: 102
 Actuated Cycle Length: 102
 Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.69
 Intersection Signal Delay: 44.3
 Intersection Capacity Utilization 85.0%
 Intersection LOS: D
 ICU Level of Service D

Splits and Phases: 1: Indian Bend Rd & Scottsdale Road

ø1	ø2	ø3	ø4
15 s	54 s	12 s	21 s

Timings
12: Indian Bend Rd & McCormick-Stillman RR Park

Existing Year 2004 - AM Peak Hour
4/5/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↗	↗		↖	↗		↖	↗
Volume (vph)	39	441	2	895	56	1	0	6	38	0	9
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		3		3			1			1	
Permitted Phases	3		3		3	1		1	1		1
Detector Phases	3	3	3	3	3	1	1	1	1	1	1
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (%)	82%	82%	82%	82%	82%	18%	18%	18%	18%	18%	18%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	None										
Act Effect Green (s)	35.0	35.0	35.0	35.0	35.0		12.0	12.0		12.0	12.0
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.64		0.22	0.22		0.22	0.22
v/c Ratio	0.18	0.41	0.00	0.86	0.06		0.01	0.06		0.13	0.03
Uniform Delay, d1	4.1	4.9	3.5	8.0	0.0		16.8	0.0		17.3	0.0
Delay	2.7	4.3	2.0	7.5	0.7		22.0	11.0		22.1	13.4
LOS	A	A	A	A	A		C	B		C	B
Approach Delay		4.1		7.1			12.6			20.4	
Approach LOS		A		A			B			C	

Intersection Summary
 Cycle Length: 55
 Actuated Cycle Length: 55
 Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 6.7
 Intersection Capacity Utilization 70.2%
 Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 12: Indian Bend Rd & McCormick-Stillman RR Park

↕	↔
ø1	ø3
10 s	45 s

Timings

Existing Year 2004 - AM Peak Hour

2: Indian Bend Rd & Hayden Road

4/5/2004



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖	↕↔	↖	↕↔	↖	↕↕↕	↗	↖	↕↕↔
Volume (vph)	163	221	121	431	124	1176	114	109	1400
Turn Type	pm+pt		pm+pt		pm+pt		Perm	pm+pt	
Protected Phases	4	3	4	3	2	1		2	1
Permitted Phases	3		3		1		1	1	
Detector Phases	4	3	4	3	2	1	1	2	1
Minimum Initial (s)	4.0	8.0	4.0	8.0	4.0	10.0	10.0	4.0	10.0
Minimum Split (s)	8.0	27.0	8.0	27.0	8.0	67.0	67.0	8.0	67.0
Total Split (s)	10.0	27.0	10.0	27.0	16.0	67.0	67.0	16.0	67.0
Total Split (%)	8%	23%	8%	23%	13%	56%	56%	13%	56%
Yellow Time (s)	3.0	4.7	3.0	4.7	3.0	4.4	4.4	3.0	4.4
All-Red Time (s)	1.0	2.3	1.0	2.3	1.0	1.6	1.6	1.0	1.6
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Coord	Coord	None	Coord
Act Effct Green (s)	28.8	22.8	28.8	22.8	75.2	67.2	67.2	75.2	67.2
Actuated g/C Ratio	0.24	0.19	0.24	0.19	0.63	0.56	0.56	0.63	0.56
v/c Ratio	1.22	0.47	0.58	0.88	0.74	0.45	0.13	0.46	0.74
Uniform Delay, d1	49.4	39.6	38.6	45.8	35.2	15.6	2.8	12.8	18.8
Delay	151.6	39.9	40.3	51.9	35.4	16.1	4.4	16.6	19.6
LOS	F	D	D	D	D	B	A	B	B
Approach Delay		80.9		49.7		16.9			19.5
Approach LOS		F		D		B			B

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 30 (25%), Referenced to phase 1:NBSB, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 29.2

Intersection LOS: C

Intersection Capacity Utilization 88.9%

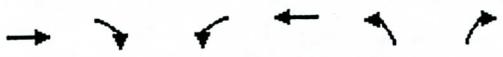
ICU Level of Service D

Splits and Phases: 2: Indian Bend Rd & Hayden Road

ø1	ø2	ø3	ø4
67 s	16 s	27 s	10 s

HCM Unsignalized Intersection Capacity Analysis
 14: Indian Bend Rd & Holiday Inn/Condominium Access

Existing Year 2004 - AM Peak Hour
 4/5/2004



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	412	28	44	874	49	26
Peak Hour Factor	0.94	0.94	0.93	0.93	0.62	0.62
Hourly flow rate (veh/h)	438	30	47	940	79	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)	1315					
pX, platoon unblocked						
vC, conflicting volume			468			438
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			468			438
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			96			93
cM capacity (veh/h)			1104			623
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	438	30	47	940	79	42
Volume Left	0	0	47	0	79	0
Volume Right	0	30	0	0	0	42
cSH	1700	1700	1104	1700	135	623
Volume to Capacity	0.26	0.02	0.04	0.55	0.59	0.07
Queue Length (ft)	0	0	3	0	74	5
Control Delay (s)	0.0	0.0	8.4	0.0	63.7	11.2
Lane LOS			A			B
Approach Delay (s)	0.0	0.4		45.5		
Approach LOS					E	
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			60.5%		ICU Level of Service B	

HCM Unsignalized Intersection Capacity Analysis
 9: Indian Bend Rd & 78th Place

Existing Year 2004 - AM Peak Hour
 4/5/2004



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖	↑	↗	↖	↑	↗		↖	↗	↖		↗	
Sign Control		Free			Free			Stop				Stop	
Grade		0%			0%			0%				0%	
Volume (veh/h)	6	426	5	7	920	7	9	0	22	10	0	11	
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.78	0.78	0.78	0.75	0.75	0.75	
Hourly flow rate (veh/h)	7	479	6	8	1000	8	12	0	28	13	0	15	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)	5												
Median type	None												
Median storage (veh)	None												
Upstream signal (ft)	760												
pX, platoon unblocked	0.81						0.81	0.81			0.81	0.81	0.81
vC, conflicting volume	1008	484					1522	1515	479	1507	1513	1000	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1009	484					1641	1632	479	1623	1630	1000	
tC, single (s)	4.1	4.1					7.1	6.5	6.2	7.1	6.5	6.2	
tC, 2 stage (s)													
tF (s)	2.2	2.2					3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	99	99					81	100	95	79	100	94	
cM capacity (veh/h)	566	1089					61	82	591	64	82	242	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2				
Volume Total	7	479	6	8	1000	8	40	13	15				
Volume Left	7	0	0	8	0	0	12	13	0				
Volume Right	0	0	6	0	0	8	28	0	15				
cSH	566	1700	1700	1089	1700	1700	210	64	242				
Volume to Capacity	0.01	0.28	0.00	0.01	0.59	0.00	0.19	0.21	0.06				
Queue Length (ft)	1	0	0	1	0	0	17	18	5				
Control Delay (s)	11.4	0.0	0.0	8.3	0.0	0.0	30.5	75.9	20.8				
Lane LOS	B	A					D	F	C				
Approach Delay (s)	0.2	0.1					30.5	47.1					
Approach LOS							D	E					
Intersection Summary													
Average Delay	1.7												
Intersection Capacity Utilization	69.3%					ICU Level of Service				B			

EXISTING YEAR 2004 CONDITIONS

INTERSECTION LOS

PM PEAK HOUR

Timings

Existing Year 2004 - PM Peak Hour

1: Indian Bend Rd & Scottsdale Rd

4/5/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	66	156	426	172	171	45	1511	580	115	1396	37
Turn Type	pm+pt		pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	1	4	1	4		3	2		3	2	
Permitted Phases	4		4		4	2		2	2		2
Detector Phases	1	4	1	4	4	3	2	2	3	2	2
Minimum Initial (s)	4.0	7.7	4.0	7.7	7.7	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	8.0	15.0	8.0	15.0	15.0	8.0	60.0	60.0	8.0	60.0	60.0
Total Split (s)	12.0	19.0	12.0	19.0	19.0	11.0	60.0	60.0	11.0	60.0	60.0
Total Split (%)	12%	19%	12%	19%	19%	11%	59%	59%	11%	59%	59%
Yellow Time (s)	3.0	4.7	3.0	4.7	4.7	3.0	4.4	4.4	3.0	4.4	4.4
All-Red Time (s)	1.0	2.6	1.0	2.6	2.6	1.0	1.6	1.6	1.0	1.6	1.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Coord	Coord	None	Coord	Coord
Recall Mode	None	None	None	None	None	None	Coord	Coord	None	Coord	Coord
Act Effct Green (s)	22.6	14.6	22.6	14.6	14.6	63.4	58.2	58.2	63.4	58.2	58.2
Actuated g/C Ratio	0.22	0.14	0.22	0.14	0.14	0.62	0.57	0.57	0.62	0.57	0.57
v/c Ratio	0.30	0.73	2.17	0.75	0.51	0.21	0.56	0.55	0.63	0.50	0.04
Uniform Delay, d1	31.4	40.1	40.9	42.0	1.7	7.4	13.7	1.7	17.6	13.1	0.0
Delay	32.9	44.6	291.1	47.8	7.1	8.9	14.2	2.4	22.1	13.5	3.5
LOS	C	D	F	D	A	A	B	A	C	B	A
Approach Delay		41.5		173.4			10.9			13.9	
Approach LOS		D		F			B			B	

Intersection Summary

Cycle Length: 102

Actuated Cycle Length: 102

Offset: 8 (8%), Referenced to phase 2:NBSB, Start of Green

Natural Cycle: 115

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.17

Intersection Signal Delay: 42.4

Intersection LOS: D

Intersection Capacity Utilization 89.2%

ICU Level of Service D

Splits and Phases: 1: Indian Bend Rd & Scottsdale Rd

ø1	ø2	ø3	ø4
12 s	60 s	11 s	19 s

Timings
12: Indian Bend Rd & RailRoad Driveway

Existing Year 2004 - PM Peak Hour
4/5/2004



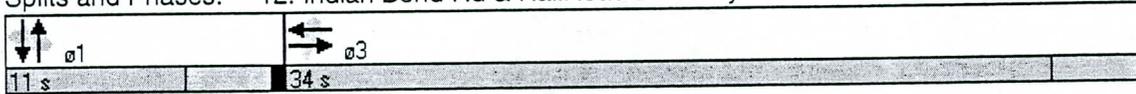
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↘	↙	↕	↗		↕	↗		↕	↗
Volume (vph)	12	763	5	692	50	17	0	16	60	0	46
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		3		3			1			1	
Permitted Phases	3		3		3	1		1	1		1
Detector Phases	3	3	3	3	3	1	1	1	1	1	1
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	34.0	34.0	34.0	34.0	34.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (%)	76%	76%	76%	76%	76%	24%	24%	24%	24%	24%	24%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	None										
Act Effct Green (s)	25.4	25.4	25.4	25.4	25.4		11.6	11.6		11.6	11.6
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56		0.26	0.26		0.26	0.26
v/c Ratio	0.04	0.80	0.02	0.73	0.06		0.07	0.05		0.18	0.11
Uniform Delay, d1	4.4	7.7	4.3	7.3	0.0		12.6	0.0		13.0	0.0
Delay	2.9	7.3	2.8	6.8	1.0		16.3	8.8		16.6	6.8
LOS	A	A	A	A	A		B	A		B	A
Approach Delay		7.2		6.4			12.7			12.3	
Approach LOS		A		A			B			B	

Intersection Summary

Cycle Length: 45
 Actuated Cycle Length: 45
 Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green
 Natural Cycle: 45
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 7.3
 Intersection Capacity Utilization 61.3%
 Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 12: Indian Bend Rd & RailRoad Driveway



Timings
2: Indian Bend Rd & HAYDEN RD

Existing Year 2004 - PM Peak Hour
4/5/2004



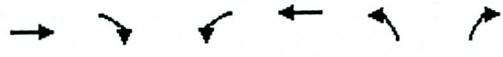
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖	↕↗	↖	↕↗	↖	↕↗↘	↖	↖	↕↗↘
Volume (vph)	261	528	280	438	140	1813	227	233	1815
Turn Type	pm+pt		pm+pt		pm+pt		Perm	pm+pt	
Protected Phases	4	3	4	3	2	1		2	1
Permitted Phases	3		3		1		1	1	
Detector Phases	4	3	4	3	2	1	1	2	1
Minimum Initial (s)	4.0	8.0	4.0	8.0	4.0	10.0	10.0	4.0	10.0
Minimum Split (s)	8.0	28.0	8.0	28.0	8.0	61.0	61.0	8.0	61.0
Total Split (s)	17.0	28.0	17.0	28.0	14.0	61.0	61.0	14.0	61.0
Total Split (%)	14%	23%	14%	23%	12%	51%	51%	12%	51%
Yellow Time (s)	3.0	4.7	3.0	4.7	3.0	4.4	4.4	3.0	4.4
All-Red Time (s)	1.0	2.3	1.0	2.3	1.0	1.6	1.6	1.0	1.6
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					
Recall Mode	None	None	None	None	None	Coord	Coord	None	Coord
Act Effct Green (s)	37.0	24.0	37.0	24.0	67.0	57.0	57.0	67.0	57.0
Actuated g/C Ratio	0.31	0.20	0.31	0.20	0.56	0.48	0.48	0.56	0.48
v/c Ratio	1.05	0.89	1.24	0.88	0.75	0.84	0.31	1.27	0.95
Uniform Delay, d1	48.0	45.6	48.0	44.7	39.2	27.6	10.3	43.9	29.9
Delay	101.2	52.5	150.2	51.0	47.9	27.9	10.6	156.8	34.8
LOS	F	D	F	D	D	C	B	F	C
Approach Delay		67.0		84.3		27.4			47.6
Approach LOS		E		F		C			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 44 (37%), Referenced to phase 1:NBSB, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.27
 Intersection Signal Delay: 47.9
 Intersection Capacity Utilization 102.5%
 Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 2: Indian Bend Rd & HAYDEN RD

61 s	14 s	28 s	17 s



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	775	34	41	602	37	16
Peak Hour Factor	0.92	0.92	0.87	0.87	0.52	0.52
Hourly flow rate (veh/h)	842	37	47	692	71	31
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)	1315					
pX, platoon unblocked						
vC, conflicting volume			879		1629	842
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			879		1629	842
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		33	92
cM capacity (veh/h)			777		106	367
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	842	37	47	692	71	31
Volume Left	0	0	47	0	71	0
Volume Right	0	37	0	0	0	31
cSH	1700	1700	777	1700	106	367
Volume to Capacity	0.50	0.02	0.06	0.41	0.67	0.08
Queue Length (ft)	0	0	5	0	85	7
Control Delay (s)	0.0	0.0	9.9	0.0	89.7	15.7
Lane LOS			A		F	C
Approach Delay (s)	0.0		0.6		67.4	
Approach LOS					F	
Intersection Summary						
Average Delay	4.3					
Intersection Capacity Utilization	54.9%		ICU Level of Service		A	

HCM Unsignalized Intersection Capacity Analysis
 9: Indian Bend Rd & 78th Place

Existing Year 2004 - PM Peak Hour
 4/5/2004

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗		↑	↗		↑	↗
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	12	882	10	34	670	18	8	1	23	3	0	9
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.80	0.80	0.80	0.43	0.43	0.43
Hourly flow rate (veh/h)	13	938	11	36	713	19	10	1	29	7	0	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2			
Volume Total	13	938	11	36	713	19	40	7	21			
Volume Left	13	0	0	36	0	0	10	7	0			
Volume Right	0	0	11	0	0	19	29	0	21			
cSH	879	1700	1700	732	1700	1700	217	58	434			
Volume to Capacity	0.01	0.55	0.01	0.05	0.42	0.01	0.18	0.12	0.05			
Queue Length (ft)	1	0	0	4	0	0	16	10	4			
Control Delay (s)	9.2	0.0	0.0	10.2	0.0	0.0	33.9	75.9	13.7			
Lane LOS	A			B			D	F	B			
Approach Delay (s)	0.1			0.5			33.9	29.2				
Approach LOS							D	D				
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
ICU Level of Service												

EXISTING YEAR 2004 CONDITIONS

ROADWAY SEGMENT LOS ALONG INDIAN BEND ROAD

AM AND PM PEAK HOURS

Arterial Level of Service: EB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Scottsdale Road	II	40	90.0	32.7	122.7	1.0	29.3	B
McCormick-Stillman R	II	40	25.9	4.3	30.2	0.2	28.1	B
Hayden Road	II	40	68.3	39.9	108.2	0.8	25.2	C
Total	II		184.2	76.9	261.1	2.0	27.5	C

Arterial Level of Service: WB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Hayden Road	II	40	90.0	51.9	141.9	1.0	25.4	C
McCormick-Stillman R	II	40	68.3	7.5	75.8	0.8	36.0	A
Scottsdale Road	II	40	25.9	49.4	75.3	0.2	11.3	F
Total	II		184.2	108.8	293.0	2.0	24.5	C

Arterial Level of Service: EB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Scottsdale Rd	II	40	90.0	44.6	134.6	1.0	26.7	C
McCormick-Stillman R	II	40	25.9	7.3	33.2	0.2	25.5	C
HAYDEN RD	II	40	68.3	52.5	120.8	0.8	22.6	C
Total	II		184.2	104.4	288.6	2.0	24.9	C

Arterial Level of Service: WB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
HAYDEN RD	II	40	90.0	51.0	141.0	1.0	25.5	C
McCormick-Stillman R	II	40	68.3	6.8	75.1	0.8	36.4	A
Scottsdale Rd	II	40	25.9	47.8	73.7	0.2	11.5	F
Total	II		184.2	105.6	289.8	2.0	24.8	C

FUTURE YEAR 2020 CONDITIONS

INTERSECTION LOS

AM PEAK HOUR

Timings
1: Indian Bend Rd & Scottsdale Road

Future Year 2020 - AM Peak Hour
5/10/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖↗	↑	↖	↖	↑↑↑	↖	↖	↑↑↑	↖
Volume (vph)	32	117	740	329	176	27	1078	378	59	1388	14
Turn Type	pm+pt		Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4	3	8		5	2		1	6	
Permitted Phases	4				8	2		2	6		6
Detector Phases	7	4	3	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	8.0	21.0	32.0	45.0	45.0	8.0	39.0	39.0	10.0	41.0	41.0
Total Split (%)	8%	21%	31%	44%	44%	8%	38%	38%	10%	40%	40%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Coord	Coord	None	Coord	Coord
Act Effct Green (s)	19.3	15.3	26.5	41.0	41.0	43.4	40.2	40.2	47.0	43.4	43.4
Actuated g/C Ratio	0.19	0.15	0.26	0.40	0.40	0.43	0.39	0.39	0.46	0.43	0.43
v/c Ratio	0.17	0.81	0.88	0.47	0.25	0.19	0.60	0.48	0.37	0.74	0.02
Uniform Delay, d1	18.9	35.3	36.2	22.4	0.6	15.5	26.5	0.0	15.7	27.2	2.3
Delay	18.5	40.4	38.3	22.8	3.5	16.4	26.3	2.6	16.5	27.2	10.7
LOS	B	D	D	C	A	B	C	A	B	C	B
Approach Delay		37.3		29.3			20.0			26.6	
Approach LOS		D		C			C			C	

Intersection Summary

Cycle Length: 102
 Actuated Cycle Length: 102
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 25.7
 Intersection LOS: C
 Intersection Capacity Utilization 82.7%
 ICU Level of Service D

Splits and Phases: 1: Indian Bend Rd & Scottsdale Road

↖ ø1	↗ ø2	↖ ø3	→ ø4
10 s	39 s	32 s	21 s
↖ ø5	↘ ø6	↗ ø7	← ø8
8 s	41 s	8 s	45 s

Timings
12: Indian Bend Rd & McCormick-Stillman RR Park

Future Year 2020 - AM Peak Hour
5/10/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↙	↕	↗		↕	↗		↕	↗
Volume (vph)	54	619	3	1256	77	1	0	8	26	0	30
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		8			2			6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phases	4	4	8	8	8	2	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	67%	67%	67%	67%	67%	33%	33%	33%	33%	33%	33%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Lead/Lag

Lead-Lag Optimize?

Recall Mode	Coord	Coord	Coord	Coord	Coord	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	45.3	45.3	45.3	45.3	45.3		6.7	6.7		6.7	6.7
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76		0.11	0.11		0.11	0.11
v/c Ratio	0.36	0.26	0.01	0.53	0.07		0.03	0.15		0.18	0.16
Uniform Delay, d1	2.5	2.2	1.7	3.0	0.0		23.8	0.0		24.1	0.0
Delay	4.1	2.4	1.0	1.2	0.1		23.0	9.9		23.8	9.8
LOS	A	A	A	A	A		C	A		C	A
Approach Delay		2.5		1.1			11.3			16.2	
Approach LOS		A		A			B			B	

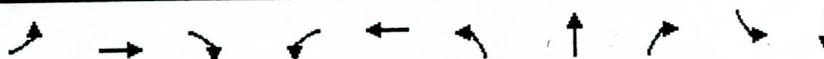
Intersection Summary

Cycle Length: 60
 Actuated Cycle Length: 60
 Offset: 13 (22%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 2.1
 Intersection Capacity Utilization 56.1%
 Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 12: Indian Bend Rd & McCormick-Stillman RR Park

↑ ø2	→ ø4
20 s	40 s
↓ ø6	← ø8
20 s	40 s

Timings
2: Indian Bend Rd & Hayden Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↗	↑↑	↗	↖↗	↖↗	↖	↑↑↑	↗	↖	↑↑↗
Volume (vph)	228	311	84	169	605	135	1274	123	118	1517
Turn Type	Prot		Perm	Prot		pm+pt		pm+ov	pm+pt	
Protected Phases	7	4		3	8	5	2	3	1	6
Permitted Phases			4			2		2	6	
Detector Phases	7	4	4	3	8	5	2	3	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	8.0	20.0	8.0	8.0	20.0
Total Split (s)	14.0	29.0	29.0	15.0	30.0	15.0	57.0	15.0	19.0	61.0
Total Split (%)	12%	24%	24%	13%	25%	13%	48%	13%	16%	51%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Coord	Max	None	Coord	Max
Act Effct Green (s)	10.0	25.5	25.5	10.5	26.0	64.0	53.0	67.5	72.0	57.0
Actuated g/C Ratio	0.08	0.21	0.21	0.09	0.22	0.53	0.44	0.56	0.60	0.48
v/c Ratio	0.90	0.46	0.23	0.64	1.09	0.66	0.62	0.14	0.45	0.94
Uniform Delay, d1	54.4	41.2	0.0	53.0	45.8	19.7	25.8	2.7	10.4	28.8
Delay	72.7	39.9	8.0	53.1	94.9	25.5	26.0	3.7	12.9	32.7
LOS	E	D	A	D	F	C	C	A	B	C
Approach Delay		47.6			87.1		24.2			31.5
Approach LOS		D			F		C			C

Intersection Summary

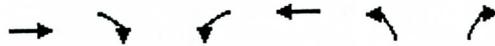
Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 30 (25%), Referenced to phase 1:SBL and 5:NBL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.09
 Intersection Signal Delay: 41.2
 Intersection Capacity Utilization 97.0%
 Intersection LOS: D
 ICU Level of Service E

Splits and Phases: 2: Indian Bend Rd & Hayden Road

↖ ø1	↑ ø2	↖↗ ø3	→ ø4
19 s	57 s	15 s	29 s
↗ ø5	↓ ø6	↗ ø7	← ø8
15 s	61 s	14 s	30 s

HCM Unsignalized Intersection Capacity Analysis
 14: Indian Bend Rd & Holiday Inn/Condominium Access

Future Year 2020 - AM Peak Hour
 5/10/2004



Movement	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Volume (veh/h)	578	31	50	1227	55	29			
Peak Hour Factor	0.94	0.94	0.93	0.93	0.62	0.62			
Hourly flow rate (veh/h)	615	33	54	1319	89	47			
Pedestrians									
Lane Width (ft)									
Walking Speed (ft/s)									
Percent Blockage									
Right turn flare (veh)									
Median type	None								
Median storage (veh)									
Upstream signal (ft)	1315								
pX, platoon unblocked									
vC, conflicting volume			648			1382 307			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol			648			1382 307			
tC, single (s)			4.1			6.8 6.9			
tC, 2 stage (s)									
tF (s)			2.2			3.5 3.3			
p0 queue free %			94			32 93			
cM capacity (veh/h)			947			130 694			
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	307	307	33	54	660	660	89	47	
Volume Left	0	0	0	54	0	0	89	0	
Volume Right	0	0	33	0	0	0	0	47	
cSH	1700	1700	1700	947	1700	1700	130	694	
Volume to Capacity	0.18	0.18	0.02	0.06	0.39	0.39	0.68	0.07	
Queue Length (ft)	0	0	0	5	0	0	94	5	
Control Delay (s)	0.0	0.0	0.0	9.0	0.0	0.0	78.4	10.6	
Lane LOS				A				F	B
Approach Delay (s)	0.0		0.4				55.0		
Approach LOS							F		
Intersection Summary									
Average Delay			3.7						
Intersection Capacity Utilization			48.1%		ICU Level of Service		A		

HCM Unsignalized Intersection Capacity Analysis
 9: Indian Bend Rd & 78th Place

Future Year 2020 - AM Peak Hour
 5/10/2004



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations	↘	↗	↘	↘	↗	↘		↗	↘		↗	↘			
Sign Control		Free			Free			Stop			Stop				
Grade		0%			0%			0%			0%				
Volume (veh/h)	6	598	5	7	1291	7	9	0	22	10	0	11			
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.78	0.78	0.78	0.75	0.75	0.75			
Hourly flow rate (veh/h)	7	672	6	8	1403	8	12	0	28	13	0	15			
Pedestrians															
Lane Width (ft)															
Walking Speed (ft/s)															
Percent Blockage															
Right turn flare (veh)	5														
Median type	None														
Median storage veh															
Upstream signal (ft)	760														
pX, platoon unblocked	0.89						0.89	0.89					0.89	0.89	0.89
vC, conflicting volume	1411	678							1417	2111	336	1768	2109	702	
vC1, stage 1 conf vol															
vC2, stage 2 conf vol															
vCu, unblocked vol	1338	678							1345	2125	336	1739	2123	541	
tC, single (s)	4.1	4.1							7.5	6.5	6.9	7.5	6.5	6.9	
tC, 2 stage (s)															
tF (s)	2.2	2.2							3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	99	99							88	100	96	72	100	97	
cM capacity (veh/h)	465	924							95	44	666	48	44	436	
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1	SB 2				
Volume Total	7	336	336	6	8	702	702	8	40	13	15				
Volume Left	7	0	0	0	8	0	0	0	12	13	0				
Volume Right	0	0	0	6	0	0	0	8	28	0	15				
cSH	465	1700	1700	1700	924	1700	1700	1700	326	48	436				
Volume to Capacity	0.01	0.20	0.20	0.00	0.01	0.41	0.41	0.00	0.12	0.28	0.03				
Queue Length (ft)	1	0	0	0	1	0	0	0	10	24	3				
Control Delay (s)	12.9	0.0	0.0	0.0	8.9	0.0	0.0	0.0	21.6	107.6	13.5				
Lane LOS	B	A							C	F	B				
Approach Delay (s)	0.1	0.0							21.6	58.3					
Approach LOS	C F														
Intersection Summary															
Average Delay	1.2														
Intersection Capacity Utilization	55.5%					ICU Level of Service				A					

FUTURE YEAR 2020 CONDITIONS

INTERSECTION LOS

PM PEAK HOUR

Timings
1: Indian Bend Road & Scottsdale Road

Future Year 2020 - PM Peak Hour
5/10/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖↗	↑	↖	↖	↑↑↑	↖	↖	↑↑↑	↖
Volume (vph)	92	219	598	242	239	49	1637	628	124	1511	40
Turn Type	pm+pt		Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4	3	8		5	2			6	
Permitted Phases	4				8	2		2	6		6
Detector Phases	7	4	3	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	10.0	22.0	27.0	39.0	39.0	8.0	43.0	43.0	10.0	45.0	45.0
Total Split (%)	10%	22%	26%	38%	38%	8%	42%	42%	10%	44%	44%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Coord	Coord	None	Coord	Coord
Act Effct Green (s)	23.3	17.2	22.5	35.8	35.8	44.2	40.1	40.1	48.6	43.7	43.7
Actuated g/C Ratio	0.23	0.17	0.22	0.35	0.35	0.43	0.39	0.39	0.48	0.43	0.43
v/c Ratio	0.34	0.88	0.92	0.43	0.43	0.35	0.88	0.68	0.72	0.72	0.06
Uniform Delay, d1	19.6	39.3	38.8	25.2	10.6	14.3	29.4	1.8	14.7	25.5	1.3
Delay	19.8	50.9	47.3	26.1	11.4	14.7	31.6	3.4	26.7	25.1	6.8
LOS	B	D	D	C	B	B	C	A	C	C	A
Approach Delay		42.8		34.6			23.6			24.8	
Approach LOS		D		C			C			C	

Intersection Summary

Cycle Length: 102
 Actuated Cycle Length: 102
 Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 27.6
 Intersection Capacity Utilization 89.1%
 Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 1: Indian Bend Road & Scottsdale Road

↖ ø1	↗ ø2	↖ ø3	→ ø4
10 s	43 s	27 s	22 s
↖ ø5	↘ ø6	↗ ø7	← ø8
8 s	45 s	10 s	39 s

Timings
12: Indian Bend Road & McCormick-Stillman RR Park

Future Year 2020 - PM Peak Hour
5/10/2004



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↙	↕	↗		↕	↗		↕	↗
Volume (vph)	15	1071	7	971	63	23	0	22	65	0	79
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		8			2			6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phases	4	4	8	8	8	2	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	25.0	25.0	25.0	25.0	25.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	56%	56%	56%	56%	56%	44%	44%	44%	44%	44%	44%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Lead/Lag

Lead-Lag Optimize?

Recall Mode	Coord	Coord	Coord	Coord	Coord	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	29.4	29.4	29.4	29.4	29.4		7.6	7.6		7.6	7.6
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65		0.17	0.17		0.17	0.17
v/c Ratio	0.07	0.51	0.03	0.47	0.06		0.14	0.11		0.31	0.28
Uniform Delay, d1	2.8	4.0	2.8	3.9	0.0		15.9	0.0		16.4	6.8
Delay	3.9	4.6	3.7	4.4	1.4		15.0	6.8		15.8	8.8
LOS	A	A	A	A	A		B	A		B	A
Approach Delay		4.6		4.2			11.0			12.0	
Approach LOS		A		A			B			B	

Intersection Summary

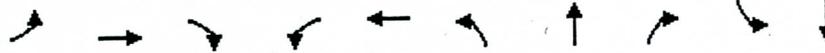
Cycle Length: 45
 Actuated Cycle Length: 45
 Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
 Natural Cycle: 45
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.51
 Intersection Signal Delay: 5.0
 Intersection Capacity Utilization 49.9%
 Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 12: Indian Bend Road & McCormick-Stillman RR Park

↕ ø2 20 s	↗ ø4 25 s
↘ ø6 20 s	↖ ø8 25 s

Timings
2: Indian Bend Road & Hayden Road

Future Year 2020 - PM Peak Hour
5/10/2004



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↖	↑↑	↗	↖↖	↑↗	↖	↑↑↑	↗	↖	↑↑↑
Volume (vph)	366	741	121	393	615	152	1964	246	253	1966
Turn Type	Prot		pm+ov	Prot		pm+pt		pm+ov	pm+pt	
Protected Phases	7	4	5	3	8	5	2	3	1	6
Permitted Phases			4			2		2	6	
Detector Phases	7	4	5	3	8	5	2	3	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0	8.0	20.0	8.0	8.0	20.0
Total Split (s)	18.0	28.0	14.0	18.0	28.0	14.0	53.0	18.0	21.0	60.0
Total Split (%)	15%	23%	12%	15%	23%	12%	44%	15%	18%	50%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	Coord	None	None	Coord	Max	None	Coord	Max
Act Effct Green (s)	14.0	24.0	34.0	14.0	24.0	59.0	49.0	63.0	70.0	56.0
Actuated g/C Ratio	0.12	0.20	0.28	0.12	0.20	0.49	0.41	0.53	0.58	0.47
v/c Ratio	0.93	1.07	0.27	1.10	1.24	0.81	1.06	0.32	0.92	1.05
Uniform Delay, d1	52.5	48.0	20.3	53.0	46.3	25.1	35.5	6.7	32.6	31.7
Delay	71.7	90.3	20.7	110.7	143.5	40.8	69.8	6.8	54.3	60.3
LOS	E	F	C	F	F	D	E	A	D	E
Approach Delay		77.9			132.5		61.4			59.7
Approach LOS		E			F		E			E

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 44 (37%), Referenced to phase 1:SBL and 5:NBL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.24
 Intersection Signal Delay: 75.1
 Intersection Capacity Utilization 107.5%
 Intersection LOS: E
 ICU Level of Service F

Splits and Phases: 2: Indian Bend Road & Hayden Road

↖ ø1	↑ ø2	→ ø4	↗ ø3
21 s	53 s	28 s	18 s
↗ ø5	↓ ø6	← ø8	↖ ø7
14 s	60 s	28 s	18 s



Movement	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Volume (veh/h)	1088	34	41	844	37	16			
Peak Hour Factor	0.92	0.92	0.87	0.87	0.52	0.52			
Hourly flow rate (veh/h)	1183	37	47	970	71	31			
Pedestrians									
Lane Width (ft)									
Walking Speed (ft/s)									
Percent Blockage									
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (ft)	1315								
pX, platoon unblocked									
vC, conflicting volume			1220			1762 591			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol			1220			1762 591			
tC, single (s)			4.1			6.8 6.9			
tC, 2 stage (s)									
tF (s)			2.2			3.5 3.3			
p0 queue free %			92			0 93			
cM capacity (veh/h)			579			71 455			
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	591	591	37	47	485	485	71	31	
Volume Left	0	0	0	47	0	0	71	0	
Volume Right	0	0	37	0	0	0	0	31	
cSH	1700	1700	1700	579	1700	1700	71	455	
Volume to Capacity	0.35	0.35	0.02	0.08	0.29	0.29	1.00	0.07	
Queue Length (ft)	0	0	0	7	0	0	130	5	
Control Delay (s)	0.0	0.0	0.0	11.8	0.0	0.0	208.6	13.5	
Lane LOS				B				F	B
Approach Delay (s)	0.0		0.5				149.7		
Approach LOS							F		
Intersection Summary									
Average Delay	6.8								
Intersection Capacity Utilization	43.3%			ICU Level of Service			A		

HCM Unsignalized Intersection Capacity Analysis
 9: Indian Bend Road & 78th Place

Future Year 2020 - PM Peak Hour
 5/10/2004

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↕	↗	↵	↕	↗		↕	↗		↕	↗
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	12	1238	10	34	941	18	8	1	23	3	0	19
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.80	0.80	0.80	0.43	0.43	0.43
Hourly flow rate (veh/h)	13	1317	11	36	1001	19	10	1	29	7	0	44
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1020			1328			1960	2435	659	1758	2427	501
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1020			1328			1960	2435	659	1758	2427	501
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			93			70	96	93	85	100	92
cM capacity (veh/h)	688			527			33	29	411	46	30	521
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1	SB 2	
Volume Total	13	659	659	11	36	501	501	19	40	7	44	
Volume Left	13	0	0	0	36	0	0	0	10	7	0	
Volume Right	0	0	0	11	0	0	0	19	29	0	44	
cSH	688	1700	1700	1700	527	1700	1700	1700	117	46	521	
Volume to Capacity	0.02	0.39	0.39	0.01	0.07	0.29	0.29	0.01	0.34	0.15	0.08	
Queue Length (ft)	1	0	0	0	6	0	0	0	34	12	7	
Control Delay (s)	10.3	0.0	0.0	0.0	12.3	0.0	0.0	0.0	56.5	96.0	12.5	
Lane LOS	B				B				F	F	B	
Approach Delay (s)	0.1				0.4				56.5	23.9		
Approach LOS									F	C		
Intersection Summary												
Average Delay	1.6											
Intersection Capacity Utilization	53.1%											
ICU Level of Service	A											

FUTURE YEAR 2020 CONDITIONS

ROADWAY SEGMENT LOS ALONG INDIAN BEND ROAD

AM AND PM PEAK HOURS

Arterial Level of Service: EB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Scottsdale Road	II	40	90.0	40.4	130.4	1.0	27.6	C
McCormick-Stillman R II		40	25.9	2.4	28.3	0.2	29.9	B
Hayden Road	II	40	68.3	40.3	108.6	0.8	25.1	C
Total	II		184.2	83.1	267.3	2.0	26.9	C

Arterial Level of Service: WB Indian Bend Rd

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Hayden Road	II	40	90.0	52.9	142.9	1.0	25.2	C
McCormick-Stillman R II		40	68.3	1.2	69.5	0.8	39.3	A
Scottsdale Road	II	40	25.9	22.8	48.7	0.2	17.4	D
Total	II		184.2	76.9	261.1	2.0	27.5	C

Arterial Level of Service: EB Indian Bend Road

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Scottsdale Road	II	40	90.0	50.9	140.9	1.0	25.6	C
McCormick-Stillman R II		40	25.9	4.6	30.5	0.2	27.8	C
Hayden Road	II	40	68.3	90.3	158.6	0.8	17.2	D
Total	II		184.2	145.8	330.0	2.0	21.8	D

Arterial Level of Service: WB Indian Bend Road

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Hayden Road	II	40	90.0	67.7	157.7	1.0	22.8	C
McCormick-Stillman R II		40	68.3	4.4	72.7	0.8	37.6	A
Scottsdale Road	II	40	25.9	26.1	52.0	0.2	16.3	E
Total	II		184.2	98.2	282.4	2.0	25.4	C

APPENDIX D
SIGNAL WARRANT ANALYSIS

APPENDIX D

SIGNAL WARRANT ANALYSIS

Existing Year 2004 Conditions

Manual of Uniform Traffic Control Devices Traffic Signal Warrant No. 3 — Peak Hour Warrant

This warrant compares the highest volume or peak hour against the criteria for two Categories A and B (as described in the MUTCD). To meet the warrant, traffic volumes must meet minimum thresholds in either Category A or B.

Intersection of Indian Bend Road and McCormick-Stillman Railroad Park East Access

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (Total of Both Approaches): 1508 VPH
- Minor Street (High Volume Approach): 94 VPH

Table A1 – Peak Hour Warrant Summary for Category A

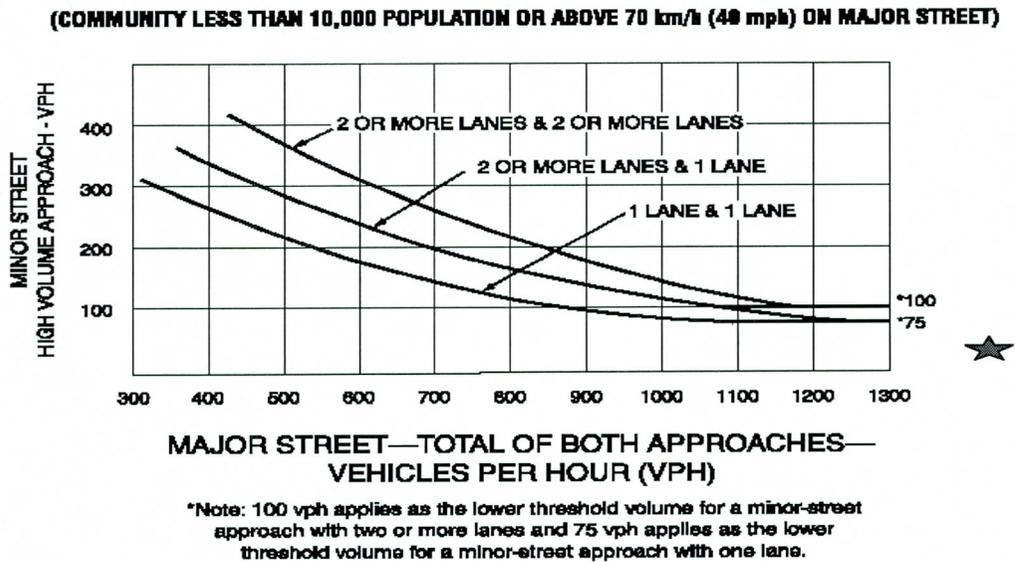
Indian Bend Road and Railroad Park Access

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	94 vph
	Total Intersection Entering Volume	800 vph	1635 vph

From Table A1, it can be observed that the first condition of Category A is not satisfied. The second condition of Category A is satisfied as the total entering volume of 1635 vph serviced at the intersection during the peak hour is higher than the entering volume criteria of 800 vph. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since the first condition of Category A is not satisfied, the intersection does not warrant a signal under Category A of Warrant 3. The plotted point (1508 VPH Vs. 94 VPH), as shown in Figure 1, representing the peak hour does not fall above the first curve (1 lane Major Street and 1 lane Minor Street) of the graph under

Category B of Warrant 3, thereby not satisfying Category B of the warrant. Therefore, the warrant is not met.

Figure A1



Scenario A: Intersection of Indian Bend Road and McCormick-Stillman Railroad Park East Access (End of Year 2004 – Completion of Construction of 112 Condo Units Immediately north of the intersection)

The peak hour approach volumes at this intersection under existing conditions (end of year 2004), with completed construction of 112 condo units immediately north of this intersection, are as follows:

- Major Street (Total of Both Approaches): 1532 VPH
- Minor Street (High Volume Approach): 106 VPH

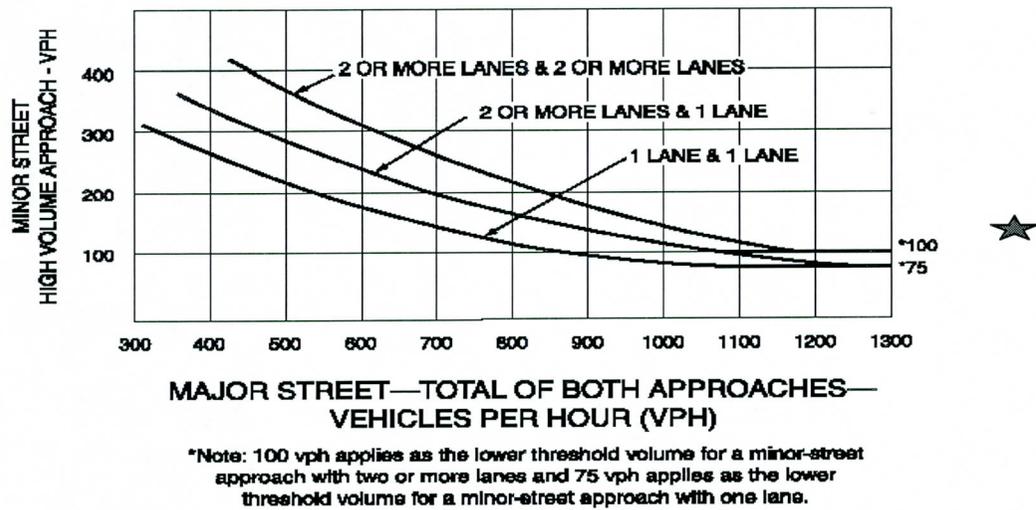
Table 1A – Peak Hour Warrant Summary for Category A

Indian Bend Road and Railroad Park Access

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	106 vph
	Total Intersection Entering Volume	800 vph	1671 vph

From Table 1A, it can be observed that both conditions of Category A are satisfied. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since both conditions of Category A are satisfied, the intersection warrants a signal under Category A of Warrant 3. The plotted point (1532 VPH Vs. 106 VPH), as shown in Figure 1A, representing the peak hour falls above the first curve (1 lane Major Street and 1 lane Minor Street) of the graph under Category B of Warrant 3, thereby satisfying Category B of the warrant. Since Categories A and B of Warrant 3 are satisfied, the intersection warrants a traffic signal under existing conditions (towards the end of Year 2004 after the construction of 112 condos is completed).

Figure 1A
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



- Major Street (Total of Both Approaches): 1452 VPH
- Minor Street-(High Volume Approach); 53 VPH

Intersection of Indian Bend Road and Paradise View Street

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (Total of Both Approaches): 1452 VPH
- Minor Street (High Volume Approach): 53 VPH

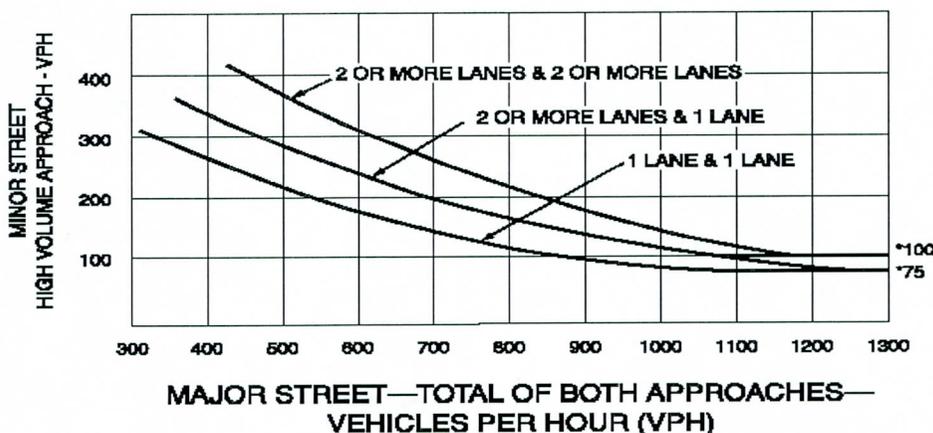
**Table A2 – Peak Hour Warrant Summary for Category A
Indian Bend Road and Paradise View Street**

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	53 vph
	Total Intersection Entering Volume	800 vph	1505 vph

From Table A2, it can be observed that the first condition of Category A is not satisfied. The second condition of Category A is satisfied as the total entering volume of 1505 vph serviced at the intersection during the peak hour is higher than the entering volume criteria of 800 vph. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since the first condition of Category A is not satisfied, the intersection does not warrant a signal under Category A of Warrant 3. The plotted point (1452 VPH Vs. 53 VPH), as shown in Figure A2, representing the peak hour does not fall above the first curve (1 lane Major Street and 1 lane Minor Street) of the graph under Category B of Warrant 3, thereby not satisfying Category B of the warrant. Therefore, the warrant is not met.

Figure A2

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Intersection of Indian Bend Road and 78th Place

The peak hour approach volumes at this intersection under existing conditions are as follows:

- Major Street (Total of Both Approaches): 1626 VPH
- Minor Street (High Volume Approach): 32 VPH

Table A3 – Peak Hour Warrant Summary for Category A

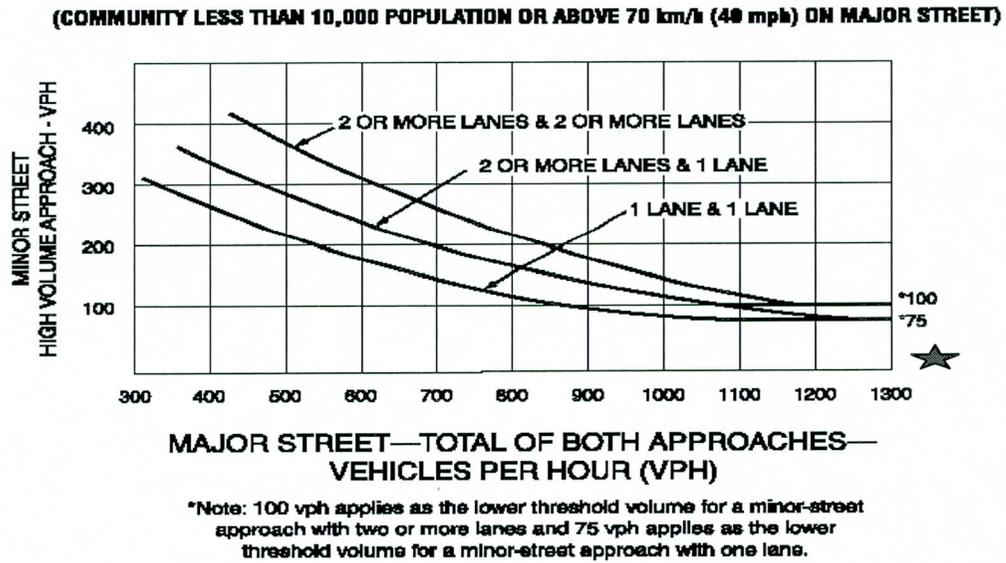
Indian Bend Road and 78th Place

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	32 vph
	Total Intersection Entering Volume	800 vph	1670 vph

From Table A3, it can be observed that the first condition of Category A is not satisfied. The second condition of Category A is satisfied as the total entering volume of 1670 vph serviced at the intersection during the peak hour is higher than the entering volume criteria of 800 vph. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since the first condition of Category A is not satisfied, the intersection does not warrant a signal under Category A of Warrant 3. The plotted point

(1626 VPH Vs. 32 VPH), as shown in Figure A3, representing the peak hour does not fall above the first curve (1 lane Major Street and 1 lane Minor Street) of the graph under Category B of Warrant 3, thereby not satisfying Category B of the warrant. Therefore, the warrant is not met.

Figure A3



Future Year 2020 Conditions

Manual of Uniform Traffic Control Devices Traffic Signal Warrant No. 3 — Peak Hour Warrant

This warrant compares the highest volume or peak hour against the criteria for either Categories A and B of Warrant 3 (as described in the MUTCD).

Intersection of Indian Bend Road and Paradise View Street

The peak hour approach volumes at this intersection under future year 2020 conditions are as follows:

- Major Street (Total of Both Approaches): 2007 VPH
- Minor Street (High Volume Approach): 53 VPH

Table A5 – Peak Hour Warrant Summary for Category A

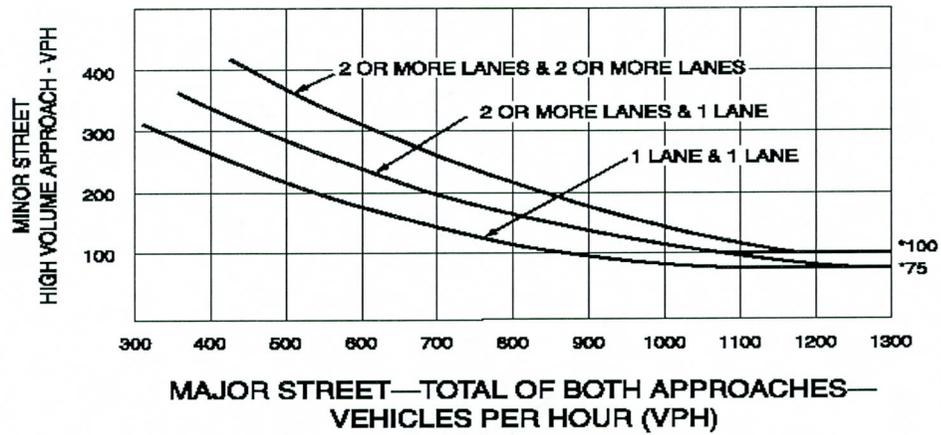
Indian Bend Road and Paradise View Street

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	53 vph
	Total Intersection Entering Volume	800 vph	2060 vph

From Table A5, it can be observed that the first condition of Category A is not satisfied. The second condition of Category A is satisfied as the total entering volume of 2060 vph serviced at the intersection during the peak hour is higher than the entering volume criteria of 800 vph. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since the first condition of Category A is not satisfied, the intersection does not warrant a signal under Category A of Warrant 3. The plotted point (2007 VPH Vs. 53 VPH), as shown in Figure A5, representing the peak hour does not fall above the second curve (2 lanes Major Street and 1 lane Minor Street) of the graph under Category B of Warrant 3, thereby not satisfying Category B of the warrant. Therefore, the warrant is not met.

FIGURE A5

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.



Intersection of Indian Bend Road and 78th Place

The peak hour approach volumes at this intersection under future year 2020 conditions are as follows:

- Major Street (Total of Both Approaches): 3253 VPH
- Minor Street (High Volume Approach): 32 VPH

Table A6 – Peak Hour Warrant Summary for Category A

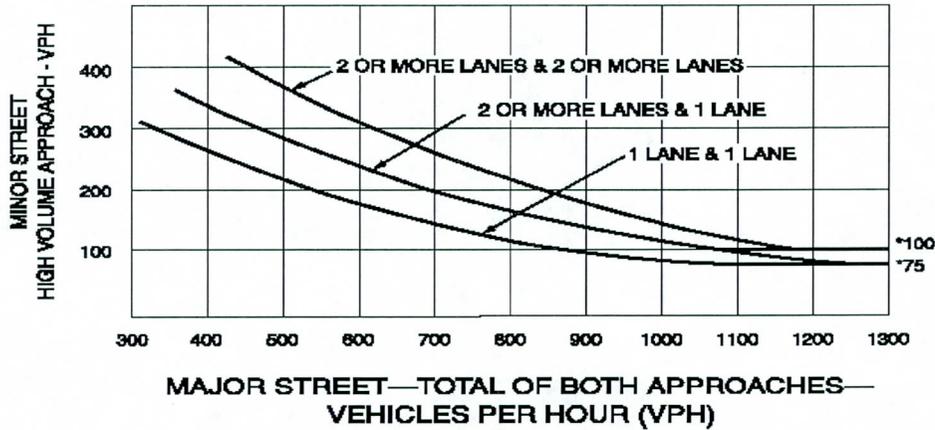
Indian Bend Road and 78th Place

Category A	Condition	Peak Hour Volume Needed to Warrant Signal	Existing Volume in the Peak Hour
	Minor Street Approach Volume (one direction only)	100 vph	32 vph
	Total Intersection Entering Volume	800 vph	3297 vph

From Table 6, it can be observed that the first condition of Category A is not satisfied. The second condition of Category A is satisfied as the total entering volume of 3297 vph serviced at the intersection during the peak hour is higher than the entering volume criteria of 800 vph. In order that a signal be warranted under Category A, both conditions have to be satisfied. Since the first condition of Category A is not satisfied, the intersection does not warrant a signal under Category A of Warrant 3. The plotted point (3253 VPH Vs. 32 VPH), as shown in Figure 6, representing the peak hour does not fall above the second curve (2 lanes Major Street and 1 lane Minor Street) of the graph under Category B of Warrant 3, thereby not satisfying Category B of the warrant. Therefore, the warrant is not met.

FIGURE A6

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

SIGNAL WARRANT ANALYSIS
SUMMARY OF RESULTS

Intersection	Existing Year 2004 Conditions	Future Year 2020 Conditions
	Traffic Signal Warranted	
Indian Bend Road and Railroad Park Access	Yes*	Yes
Indian Bend Road and Hotel/Condo Access	No	No
Indian Bend Road and 78 th Place	No	No

*Pending completion of the 112 condominium project

APPENDIX C
PRELIMINARY DRAINAGE REPORT

REPORT BOUND SEPARATELY