

Flashing Yellow Arrow Traffic Signal Operation:

A Clinical Methodology for Field Conversion

by

Susan Elizabeth Chambers

A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved November 2016 by the
Graduate Supervisory Committee:

Kamil Kaloush, Co-Chair
Michael Mamlouk, Co-Chair
Daniel Hartig
Yingyan Lou

ARIZONA STATE UNIVERSITY

December 2016

ABSTRACT

This study examines the methodology for converting protected, permissive, and protected/permissive left-turn operation to flashing yellow arrow left-turn operation. This study addresses construction-related considerations, including negative offsets, lateral traffic signal head position, left-turn accident rates, crash modification factors and crash reductions factors. A total of 85 intersections in Glendale, Arizona were chosen for this study. These intersections included 45 “arterial to arterial” intersections (a major road intersecting with a major road) and 40 “arterial to collector” intersections (a major road intersecting with a minor road).

This thesis is a clinical study of the field conversion to flashing yellow arrow traffic signals and is not a study of the merits of flashing yellow arrow operation. This study included six categories: 1. High accident intersections (for inclusion in Highway Safety Improvement Program (HSIP) funding); 2. Signal head modifications only; 3. Signal head replacement with median modifications; 4. Signal head and mast arm replacement; 5. Signal head, signal pole and mast arm replacement; and 6. Intersections where flashing yellow arrow operation is not recommended. Compliance with the Manual on Uniform Traffic Control Devices (MUTCD) played a large part in determining conversion costs because the standard for lateral position of the left-turn traffic signal greatly influenced the construction effort. Additionally, the left-turning vehicle’s sight distance factored into cost considerations. It’s important for agencies to utilize this study to understand all of the financial commitments and construction requirements for conversion to flashing yellow arrow operation, and ultimately to appreciate that the process is not purely a matter of swapping traffic signal heads.

DEDICATION

The author would like to extend a personal thank you to Dr. Kamil Kaloush who was a tremendous advocate. Without his determination and encouragement, the author would not have been able to attain her Master's in Civil Engineering. In addition, Dr. Michael Mamlouk added his much needed support with words of encouragement and guidance. Both of these professors extended unexpected kindnesses to the author, and she is forever thankful to them.

The author would also like to thank Marisa Romero, a classmate she met by happenstance in a graduate school course. Marisa gave the author immense encouragement with her engaging demeanor, constant support, and unrelenting determination. Her willingness to graciously assist the author by teaching her technical skills was unlimited, and when the author uses "Control F" and the snipping tool, she is eternally grateful to Marisa.

Special appreciation and gratitude are extended to the author's children, Katie, Jenna, and Mason for being gracious when time was diverted from them in order for the author to pursue her dream of achieving a Master's Degree. The author would also like to extend thanks to her friends and loved ones, especially Brian Kolbus, for their endless support, positive encouragement, and patience. All were vital to making this degree attainable.

ACKNOWLEDGMENTS

With regard to this document, the author wishes to express her deep and sincere appreciation to Dr. Kamil Kaloush, her graduate mentor, for the positive guidance and constructive feedback offered in various phases of this study, as well as for the review of this manuscript. Special thanks and gratitude are also extended to Dr. Michael Mamlouk for his guidance and assistance. Additional thanks are extended to Daniel Hartig, for his review and mentorship. Dr. Yingyan Lou of the School of Sustainable Engineering and the Built Environment at Arizona State University was also an instrumental member of the author's committee.

This study was partially funded by the City of Glendale, and special thanks are extended to the following City employees for their efforts in providing data necessary for analysis. Without the help of these individuals, this work could not have been as thorough and complete.

- Kiran Guntupalli P.E.: Transportation Engineer, City of Glendale
- Debbie Albert P.E.: Transportation Engineer, City of Glendale
- Purab Adabala.: Senior Transportation Analyst, City of Glendale

This study was completed in conjunction with Dibble Engineering, with contributions by Tim Wolfe, P.E., Drew Spear, P.E., Ever Sanchez, Hunter Venne, and Vicente Solis.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	vii
LIST OF FIGURES	viii
1.0 INTRODUCTION	1
1.1 Study Objective.....	4
2.0 LITERATURE REVIEW	6
2.1 FHWA Studies	6
2.2 Crash Modification Factors and Crash Reduction Factors.....	8
2.3 MUTCD Operational Requirements	9
2.3.1 Signal Face Arrangement	9
2.3.2 Signal Head Position and Arrangement	10
2.4 Case Studies	12
3.0 DATA COLLECTION	16
3.1 Method for Selecting Intersections	16
3.2 Current Signal Configuration	16
3.3 Data Collection.....	22
3.4 Data Review and Collection.....	25
3.5 Field Survey Data Collection	25
3.6 Field Visits	26
4.0 DATA ANALYSIS.....	27

	Page
4.1.1 Crash Rates and Severity Indices Calculations	29
4.2 Sight Distance Calculations	30
4.3 Method of Determining Recommendations	34
4.3.1 Sight Distance.....	34
4.3.2 Signal Control – Permissive	35
4.3.3 Signal Control – Protected.....	35
4.3.4 Signal Control – Protected-Permissive.....	36
4.3.5 Mast Arm Length	36
4.3.6 Poles	36
4.3.7 Primary Heads	36
4.3.8 Malfunction Management Unit Replacement	37
4.3.9 Reprogram the Controller for FYA	37
4.4 Determining Cost Estimate	37
4.4.1 Furnish and Install Temporary Traffic Control Devices	38
4.4.2 Remove Traffic Signals.....	38
4.4.3 Traffic Signal Face	38
4.4.4 “Left Turn Yield on FYA” Sign.....	38
4.4.5 Retro-Reflective Tape	38
4.4.6 Reconfigure Mounting Assembly.....	38
4.4.7 Malfunction Management Unit (MMU).....	39
4.4.8 Mobilization	39

	Page
4.4.9 Equipment Installation and/or Relocation	39
4.4.10 Contingency.....	39
4.4.11 Design.....	39
4.4.12 Construction Administration	39
4.4.13 Median Modifications	40
4.5 Prioritization Method	43
4.6 Categories.....	43
5.0 PRIORITIZED INTERSECTIONS	45
6.0 SUMMARY AND CONCLUSIONS	55
6.1 Recommendations for Future Research	57
REFERENCES	59
APPENDIX.....	61
INTERSECTION DATA COLLECTION SHEETS	61

LIST OF TABLES

Table	Page
1.1: Total Number of Intersections Considered for FYA Conversion.....	4
2.1: CMFs and CRFs for FYA.....	9
2.2: City of Federal Way Before and After FYA Installation Collision Analysis.....	15
3.1: City of Glendale Signal Control and Crash Ranking for A-A Intersections	18
3.2: City of Glendale Signal Control and Crash Ranking for A-C Intersections.....	20
3.3: A, Q, and R Pole Descriptions.....	22
3.4: Data Collection Sheet for 59th Ave & Bell Rd	24
4.1: Sample Collision Total and Summary	28
4.2: Intersection Sight Distance Calculation – 59 th Ave and Northern Avenue	34
4.3: Data Reduction Summary Sheet, Page 1	41
4.4: Data Reduction Summary Sheet, Page 2	42
5.1: Category 1 - Intersections In Process of Implementation.....	47
5.2: Category 2 - Intersections Requiring Signal Head Modifications Only.....	48
5.3: Category 3 - Signal Head Replacement with Median Modifications	49
5.4: Category 4 - Signal Head Replacement with Mast Arm Replacement.....	49
5.5: Category 5 - Signal Head, Mast Arm, and Pole Replacement.....	51
5.6: Category 6 - Signal Head Replacement with Mast Arms and Poles	51
5.7: Prioritization Summary.....	54
6.1: Prioritization Summary.....	57

LIST OF FIGURES

Figure	Page
1.1: Flashing Yellow Arrow Study Locations	3
2.1: Signal Face Arrangement for Flashing Yellow Arrow	10
2.2: Typical Position for Protected-Permissive and Protected Only Modes.....	11
2.3: Typical Position for Permissive Only Modes	11
2.4: Before/After Data, City of Federal Way, Washington	14
3.1: Flashing Yellow Arrow Study Locations	17
4.1: 5-Year Crash Summary by Collision Type.....	28
4.2: Median Offset	32
4.3: Sight Distance Calculations	33
5.1 Glendale FYA Intersection Priorities.....	46

1.0 INTRODUCTION

The City of Glendale has expressed an interest in converting left-turn movements at signalized intersections to flashing yellow arrow (FYA) operation with the purpose of reducing left-turn crashes. Flashing yellow arrow operation was developed by traffic engineers due to concerns that drivers turning left on a permissive circular green (CG) signal indication might inadvertently assume the right-of-way. Research performed by the Federal Highway Administration (FHWA) has determined that FYA operation has a safer fail condition – meaning that left-turning drivers who are unsure of right-of-way assignment will yield at a flashing yellow arrow, whereas a left-turning driver may incorrectly assume the right-of-way and proceed on a circular green.

The City of Glendale chose to conduct this FYA study to evaluate the safety, effectiveness and cost of converting left-turn operation at 85 of the 192 total signalized intersections within the city to flashing yellow arrow operation. Ultimately, the City would like to evaluate the conversion of all signalized left-turn movements within the city to flashing yellow arrow operation, with the exception of three locations where dual left-turns exist.

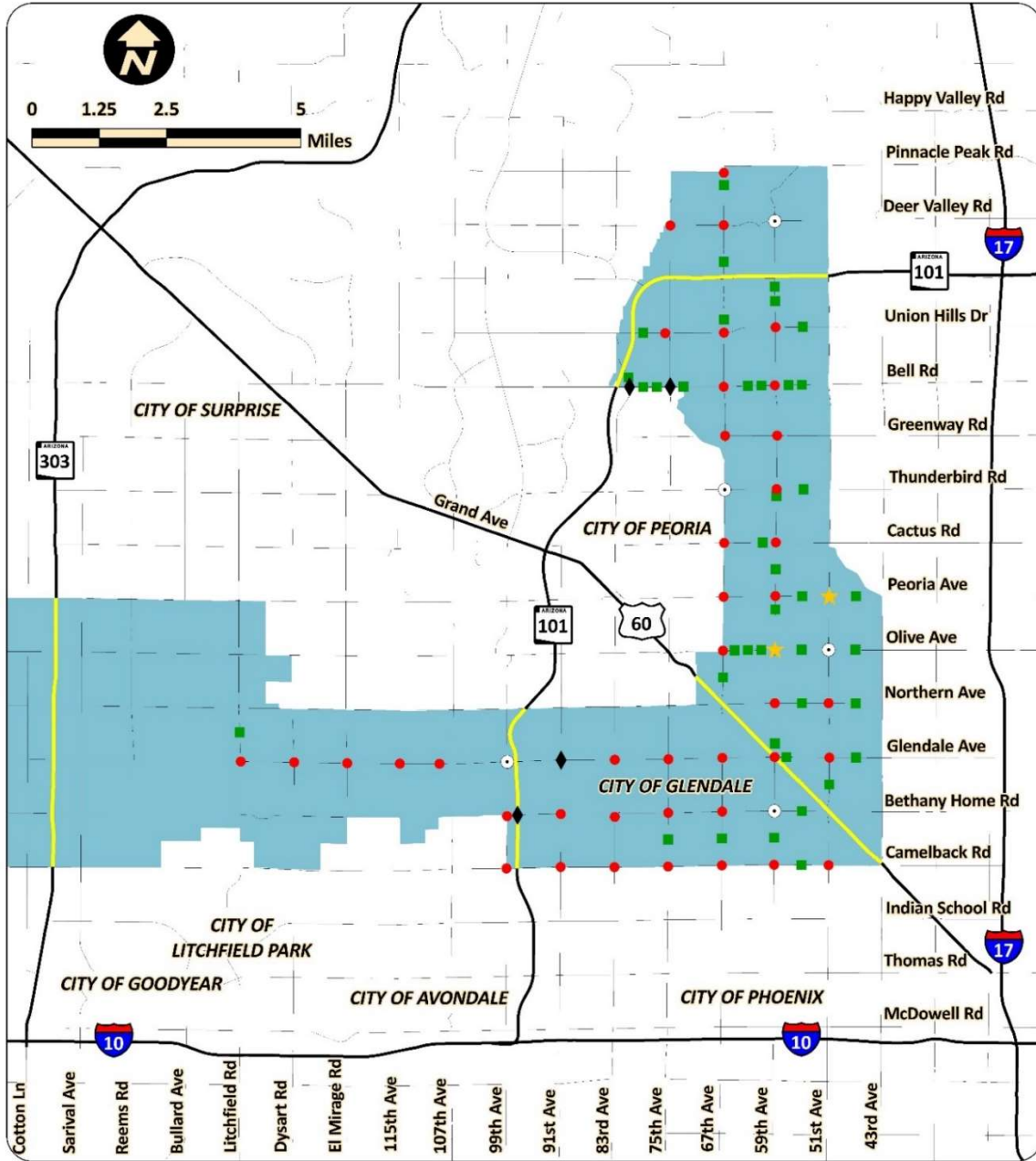
Prior to this study, a Pilot Flashing Yellow Arrow Study was accomplished for the City of Glendale. This study considered conversion to FYA operation at five intersections within the city: one in each of the six council districts (one signal was on the border of two council districts). This pilot study was important for developing the criteria and processes for evaluating and ranking the 192 signals for conversion to FYA. The pilot study laid the foundation for this more extensive study herein. These criteria and processes will be described in detail throughout the body of this thesis.

This study, in its totality, consisted of three components: a Pilot Study, Phase 1, and Phase 2. Each part is described briefly below.

- Pilot Study: Five intersections were studied. This pilot study was instrumental in determining the methodology for developing criteria and prioritization of left-turn conversion to FYA operation.
- Phase 1: This phase focused on data collection, calculations, recommendations, and cost estimation for FYA conversion on the remaining 40 arterial-arterial (A-A) intersections within the city.
- Phase 2: This phase focused on data collection, calculations, recommendations, and cost estimation for FYA conversion on the 40 arterial-collector (A-C) intersections within the city.

Glendale has completed the conversion to FYA at two intersections, 51st Avenue & Peoria Avenue and 59st Avenue & Olive Avenue. In addition, the two intersections that currently operate as FYA, 51st Avenue and Peoria as well as 59th Avenue and Olive, were added to the scope to ensure that the overhead signal head locations comply with the 2009 Manual on Uniform Traffic Devices (MUTCD). The costs for installing the retro-reflective tape at these two intersections were included into the total FYA cost estimate. A map of the locations is shown in **Figure 1.1**.

To better understand the number and type of intersections being considered for FYA modifications, **Table 1.1** shows the distribution of intersections by type, current FYA status, and dual left-turn lane geometry (all approaches).




	EXHIBIT TITLE		LEGEND	
	Flashing Yellow Arrow Study		★ Existing FYA	◆ Dual Left
	DATE	PROJECT NO	⊙ Pilot Locations	● Phase 1
	August 2015	N/A	■ Phase 2	■ Glendale City Limits
SCALE	PAGE NO	TOTAL PAGES		
1-Inch = 2.5-Miles	1	1		

Figure 1.1: Flashing Yellow Arrow Study Locations

Table 1.1: Total Number of Intersections Considered for FYA Conversion

Intersection Type	Quantity	No. of Intersections Currently FYA	No. of Intersections Currently Dual Left-Turns on All Approaches *	Flashing Yellow Arrow Study Intersections
Arterial-Arterial (A-A)	50	2	3	45
Arterial- Collector (A-C)	40	0	0	40
Total Intersections Considered For Flashing Yellow Conversion	90	(-2)	(-3)	85

* Not considered for FYA operation

Throughout the course of this study, extensive field data was collected and thorough research was performed to determine valid and consistent recommendations for FYA conversion. Crash data at each intersection was examined to determine the number and severity of left-turn related crashes – left-turn crashes are the type of crashes that FYA has been effective reducing. Sight distances were calculated for each of the intersections. Costs to convert operation to FYA were calculated, which included replacing 3- and 5-section heads to 4-section flashing yellow arrow signal heads, modifying pole locations and mast arm lengths, modifying medians, removing and relocating median signs and pull boxes, adding pedestrian push buttons, manhands, and countdown timers, and providing traffic control. Each of these study components will be described in detail in this study.

1.1 Study Objective

The overall goal of this study was to evaluate the safety, effectiveness, and cost of converting left-turn operation from either protected only operation, protected-permissive operation, and/or permissive only operation to FYA. Due to the magnitude of this project,

it was necessary to divide the FYA conversion recommendations into categories and prioritize the signals within each category. The categories are as follows:

- **Category 1:** Intersections with the highest Maricopa Association of Governments (MAG) crash ranking (Highway Safety Improvement Program (HSIP) funds pending)
- **Category 2:** Intersections with signal head modifications only
- **Category 3:** Intersections with signal head and median modifications only
- **Category 4:** Intersections with signal head and mast arm replacement
- **Category 5:** Intersections with signal head, pole, and mast arm replacement
- **Category 6:** Intersections not recommended for FYA

2.0 LITERATURE REVIEW

The following sections summarize research, data, and requirements for implementation of flashing yellow arrow signal control as determined by the Federal Highway Administration (FHWA), the Crash Modification Factors Clearinghouse, and the Manual on Uniform Traffic Control Devices (MUTCD).

2.1 FHWA Studies

In the mid 1990's, the National Cooperative Highway Research Program (NCHRP) initiated Project 3-54, *The Evaluation of Traffic Signals for Protected/Permissive Left-Turn Control*. The findings were published in NCHRP Report 493, (FHWA, 2003). These findings included the following:

- FYA is the desired permissive only indication when using protected-permissive left-turn (PPLT) signal phasing.
- FYA has a high-level of driver comprehension.
- FYA overcame many of the human factor issues with permissive only left-turns.
- When the FYA is displayed in a separate signal face it offers more versatility for various modes of left-turn operation by time of day.
- FYA can be programmed to avoid the “Yellow Trap” associated with some permissive turns.
- FYA had a desired failure outcome: if the driver did not understand, the driver tended to yield, whereas when a driver did not understand the circular green (CG), the driver tended to incorrectly assume the right-of-way.

Interim Approval for Optional Use of Flashing Yellow Arrow for Permissive Left-Turns (IA-10) (MUTCD) (Paniati, J. for FHWA, 2006) granted interim approval for the optional use of flashing yellow arrows for permissive left-turns. A follow-up interpretation letter was issued to provide clarification of the optional use of Flashing Yellow Arrows (Furst, A. for FHWA, 2007). In addition, a comprehensive study of the before and after safety conditions (crash experience) and driver behavior before and after the installation of the FYA was determined to be necessary to assist traffic engineers considering implementing FYA into the transportation system.

Subsequent to the NCHRP Report 493, several research studies and experiments were completed that led to questions regarding the implementation of FYA operation. Specifically, questions remained as to how the implementation of FYA has impacted the safety of the intersections. Of the 300 intersections operating with FYA at the time, 120 intersections had adequate data to complete before- and after- analysis. The intersections varied widely with respect to size and type, but conclusions could be drawn based on the data collected for crash experience, signal phasing, vehicle flow rates, posted speed limits, and intersection geometry.

The research resulted in three general conclusions:

- Safety was improved at intersections that operated with protected-permissive left-turn (PPLT) phasing prior to field implementation of the FYA permissive indication with PPLT phasing.

- Safety was not improved at intersections that operated with protected only left-turn phasing prior to field implementation of the FYA permissive indication with PPLT phasing.
- No conclusions could be made at intersections that operated with permissive only left-turn phasing prior to implementation of the FYA indication, due to a minimal number of implementation sites and data.

Therefore, FHWA considers FYA to be safe and the benefits warrant implementation.

2.2 Crash Modification Factors and Crash Reduction Factors

The FHWA has developed a system of analyzing countermeasures for recognizable safety concerns. These countermeasures are contained within the Crash Modification Factors Clearinghouse. The Clearinghouse is maintained by a team of engineers experienced in safety research. The team develops and fine-tunes crash modification factors (CMFs) and crash reduction factors (CRFs) for approved countermeasures based on published reports. These CMFs are given a Star Quality Rating that correlates to the quality (or confidence) in the results of the studies producing the CMF. Study design, sample size, standard error, potential bias, and data source are factors in the development of the Star Quality Rating (FHWA, 2015). The star rating is based on a scale of 1-5, where 5 indicates the highest or most reliable rating. The CMFs and CRFs for flashing yellow arrow operation are based on the manner of initial control; i.e., originally either:

- Protected-Permissive Control
- Permissive Control
- Protected Control

In addition the CMFs and CRFs are developed using either “All Crashes” or “Left-Turn Only” crashes. The approved CMFs and CRFs are summarized in **Table 2.1**.

Table 2.1: CMFs and CRFs for FYA (FHWA, 2015)

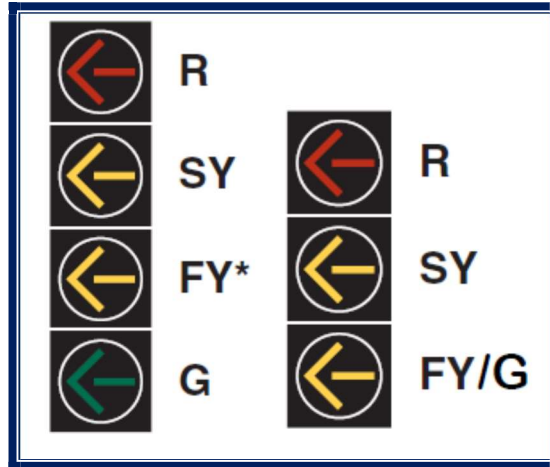
Signal Control	CMF		CRF		Star Rating
	All Crashes	Left-Turn Crashes	All Crashes	Left-Turn Crashes	
Protected-Permissive	0.922	0.806	7.8	19.4	5
Permissive	0.753	0.635	24.7	36.5	4
Protected	1.338	2.242	-33.8	-124.2	5

2.3 MUTCD Operational Requirements

If an agency chooses to implement FYA operation, the design and operational requirements must follow the MUTCD. Important conditions to be met are the number of primary heads, the required number of over-lane heads, and the lateral placement of those overhead signals.

2.3.1 Signal Face Arrangement

It is recommended that at least one separate 4-section (left-turn) signal face and two 3-section (thru) signal faces be provided with FYA operation. A dual-arrow signal section (FYA and yellow arrow) may be used under certain conditions as shown in **Figure 2.1**.



*Shall not be displayed when operating in the protected only mode.

Figure 2.1: Signal Face Arrangement for Flashing Yellow Arrow (MUTCD, 2009)

2.3.2 Signal Head Position and Arrangement

Typical position and arrangement of the signal faces for FYA operation is specified in Chapter 4 of the 2009 Edition of the MUTCD. **Figure 2.2** and **Figure 2.3** show the typical arrangement for protected-permissive/protected only and permissive only signal operations, respectively (MUTCD, 2009).

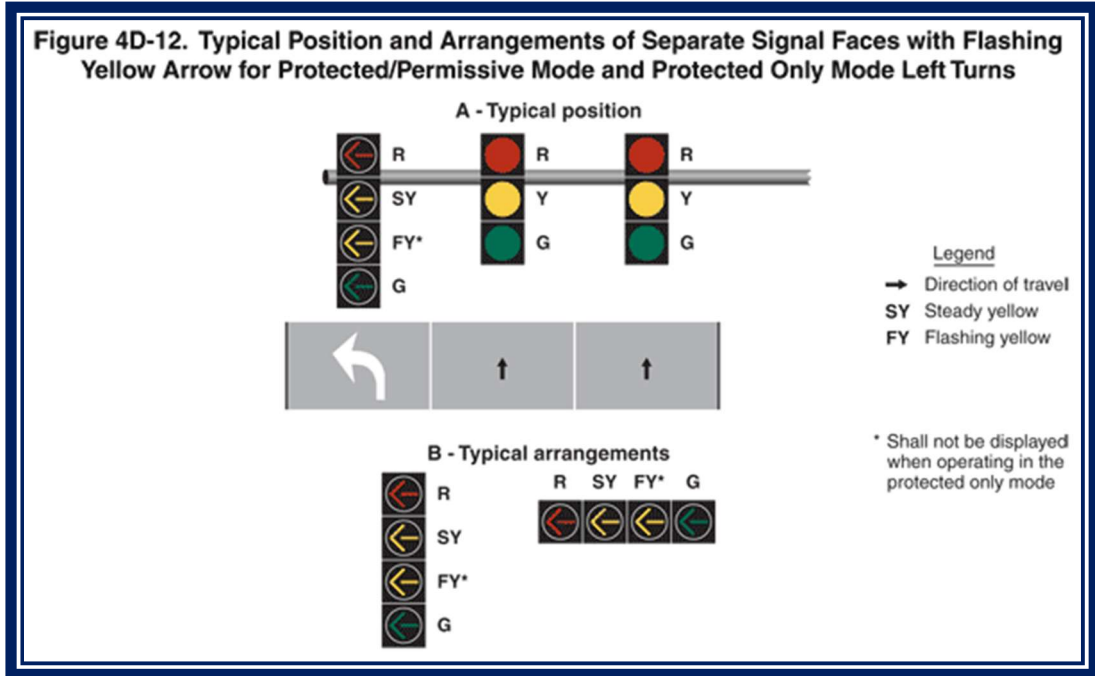


Figure 2.2: Typical Position for Protected-Permissive and Protected Only Modes (MUTCD, 2009)

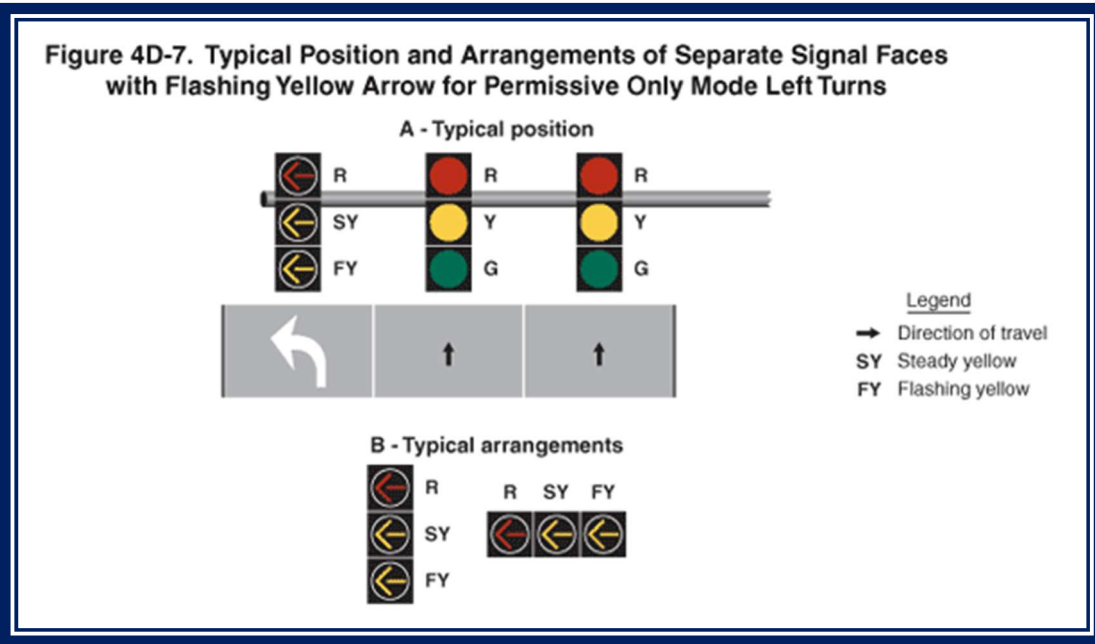


Figure 2.3: Typical Position for Permissive Only Modes (MUTCD, 2009)

2.4 Case Studies

Additional research on methodologies used by other agencies for converting left-turn operation to FYA was researched. Through this supplemental research, it was determined that many agencies converted to FYA as a general new standard for left-turn operation. In some cases, spot intersections were converted to FYA with the intent to either increase capacity or to decrease the number of crashes. The City of Federal Way, Washington, implemented FYA operation with the intent to increase level-of-service and reduce delay. The City took advantage of Washington State Department of Transportation's (WSDOT) statewide Interim Approval to implement a pilot project in 2006. In 2010, the City of Federal Way published the results of the before and after analysis at the intersections where FYA operation was implemented. This collected and evaluated collision data three years prior to installation of FYA and three years after installation found that the FYA conversion had both expected and unexpected reductions in both left-turn and overall intersection collisions. Results showed, in some cases, the rate of collisions increased in the one year immediately following the installation of FYA. However, in general, beginning in Year 2, the collision rates dropped to below installation rates.

Overall findings by the City of Federal Way support the FHWA findings and are summarized below (Perez, R., 2010):

- Conversion from protected/permmissive operation to FYA operation has significant safety benefits.
- Conversion from protected phasing to FYA should be reviewed closely because in the short term, collisions can be expected to increase.

Subsequent research by the City of Federal Way provides additional supporting documentation and an introduction to the idea of converting protected phasing to FYA operation only in the off-peak (by time of day (TOD)). The City of Federal Way provided supplementary data for use in this study in April 2015. This data provided additional insight into the trends for collisions per year, injuries per year, and severity rate per year for the period three years prior to installation and three years post installation of FYA's. This data is shown in **Figure 2.4**.

Overall, the study conducted by the City produced the following findings:

- A 9% reduction in collision rates
- An 8% reduction in severity rates
- An increase in fixed object collisions (unspecified percentage)
- An increase in approach turn collisions (unspecified percentage)
- An increase in pedestrian collisions (unspecified percentage)

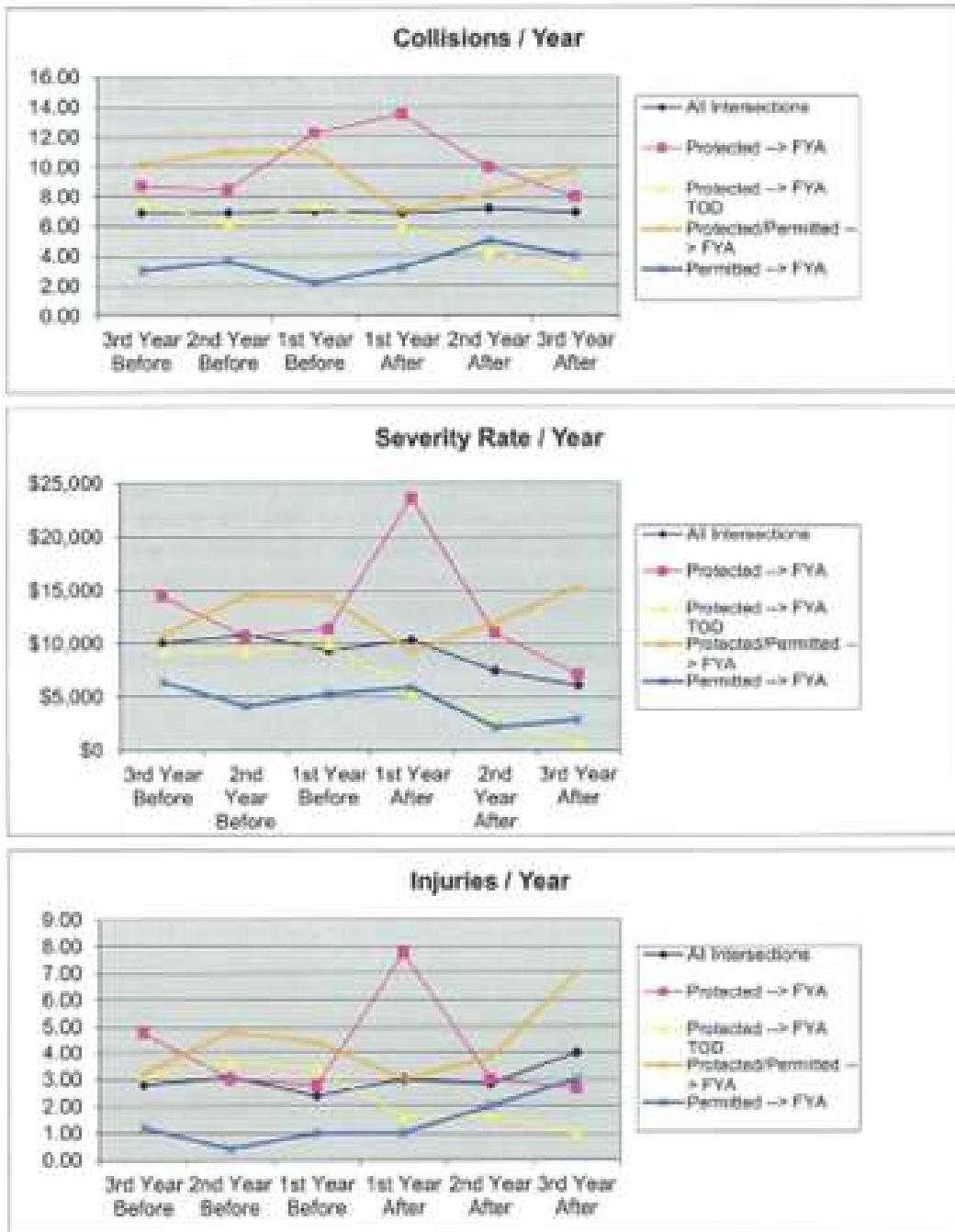


Figure 2.4: Before/After Data, City of Federal Way, Washington (Perez, R. 2010)

However, recognizing that the type of phasing prior to switching to FYA may have an effect on the overall results, the City of Federal Way reviewed the data stratified by pre-FYA operation. Results are shown in **Table 2.2**.

Table 2.2: City of Federal Way Before and After FYA Installation Collision Analysis (Perez, R., 2010)

Protected Left-Turns to Flashing Yellow Arrow		
Data Type	Including 1 st Year Post FYA Data	Not Including 1 st Year Post FYA Data
Collision Rates	15% Increase	8% Reduction
Severity	41% Increase	22% Reduction
Approach Turn Collisions	341% Increase	161% Increase
Fixed Object Collisions	189% Increase	179% Increase
Rear Ends	37% Reduction	73% Reduction
Right Angle	24% Reduction	17% Reduction
Backing	Eliminated	Eliminated
Head-on	Eliminated	Eliminated
Pedestrian	Not Reported	Increase from 0 to 6
Protected Left-Turns to Flashing Yellow Arrow		
Data Type	Including 1 st Year Post FYA Data	Not Including 1 st Year Post FYA Data
Collision Rates	39% Reduction	Not Reported
Severity	64% Reduction	Not Reported
Approach Turn Collisions	77% Reduction	Not Reported
Fixed Object Collisions	233% Increase	Not Reported
Rear Ends	56% Increase	Not Reported
Right Angle	68% Reduction	Not Reported
Backing	Not Reported	Not Reported
Head-on	Eliminated	Not Reported
Pedestrian	61% Reduction	Not Reported

3.0 DATA COLLECTION

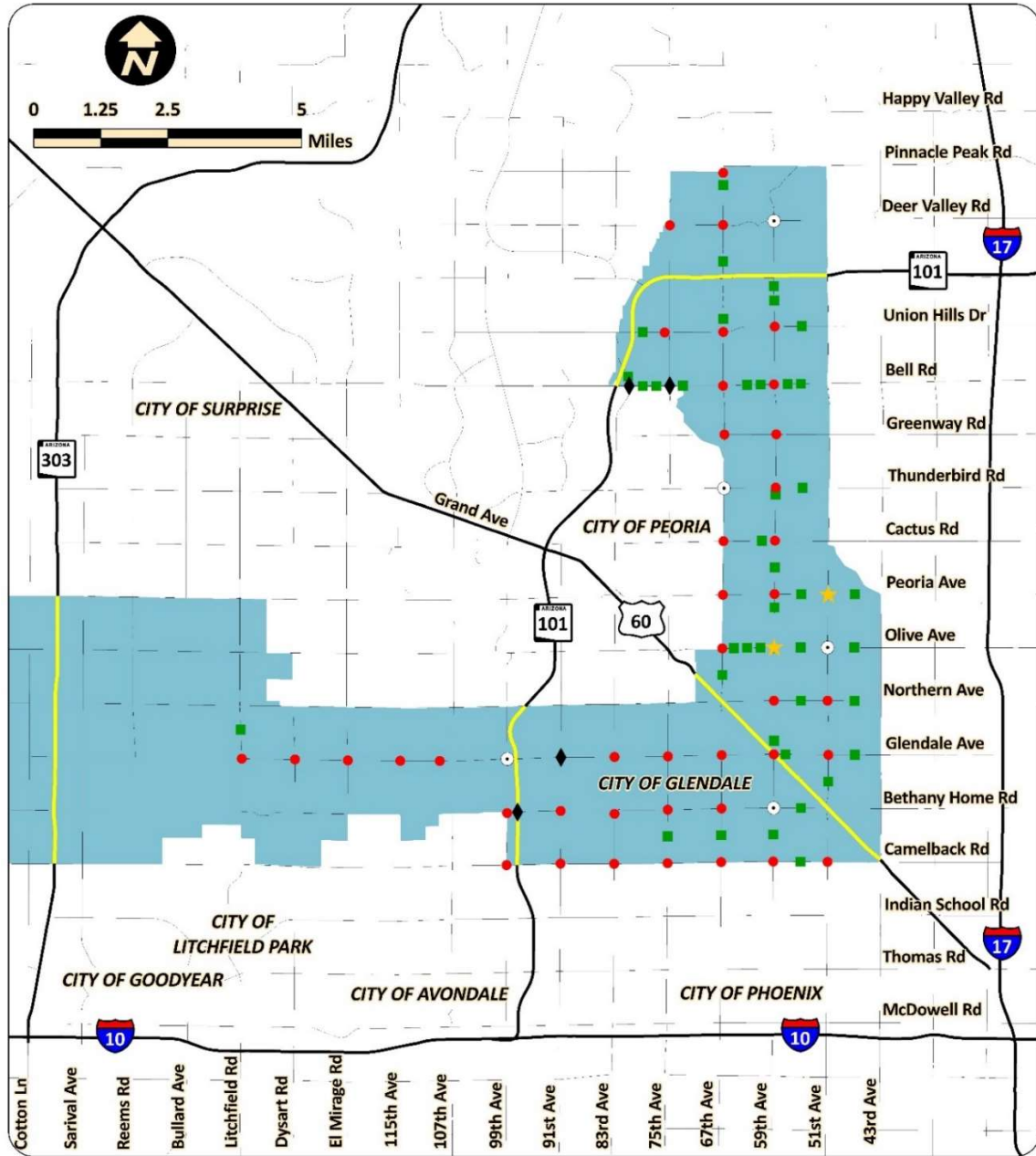
3.1 Method for Selecting Intersections

Prior to this Flashing Yellow Arrow Study, a Pilot Flashing Yellow Arrow Study was performed for the City of Glendale. The pilot study considered FYA conversion at five intersections within the city: one in each of the six council districts (one signal was on the border of two council districts). This pilot study was important for developing the criteria and processes for evaluating and ranking the signals citywide for conversion to FYA. The pilot study laid the foundation for this more extensive study herein.

This expanded study evaluates the safety, effectiveness, and cost of converting left-turn operation at 85 intersections within the city to FYA operation. The City would like to evaluate conversion of all signalized left-turn movements within the city to FYA operation, except locations where dual left-turns exist. In the interim, the intersections were evaluated systemically, first as arterial-arterial (A-A) intersections (Phase 1, 45 intersections) and secondly as arterial-collector (A-C) intersections (Phase 2, 40 intersections). **Figure 3.1** shows the locations of the intersections under study. Two additional intersections, 59th Avenue and Olive Avenue and 51st Avenue and Peoria Avenue, have already been converted to FYA, but were also evaluated for any other necessary modifications.

3.2 Current Signal Configuration

The signal control for each left-turn lane for A-A intersections, the signal control for A-C intersections (City of Glendale, Department of Transportation, 2015), and the Maricopa Association of Government's (MAG) crash rankings (MAG, 2015) are tabulated by approach in **Table 3.1** and **Table 3.2**.




	EXHIBIT TITLE			LEGEND ★ Existing FYA ◆ Dual Left ⊕ Pilot Locations ● Phase 1 ■ Phase 2 ■ Glendale City Limits
	Flashing Yellow Arrow Study			
	DATE	PROJECT NO		
	August 2015	N/A		
SCALE	PAGE NO	TOTAL PAGES		
1-Inch = 2.5-Miles	1	1		

Figure 3.1: Flashing Yellow Arrow Study Locations

Table 3.1: City of Glendale Signal Control and Crash Ranking for A-A Intersections

Intersection	Northbound LT Signal Control	Southbound LT Signal Control	Eastbound LT Signal Control	Westbound LT Signal Control	MAG Crash Rank
51st Ave & Camelback Rd	P/P	P/P	P/P	P/P	173
51st Ave & Glendale Ave	P/P	P/P	P/P	P/P	253
51st Ave & Northern Ave	P/P	P/P	P/P	P/P	102
59th Ave & Bell Rd	Prot	P/P	P/P	P/P	53
59th Ave & Cactus Rd	P/P	P/P	P/P	P/P	266
59th Ave & Camelback Rd	P/P	P/P	P/P	P/P	598
59th Ave & Glendale Ave	P/P	P/P	P/P	P/P	322
59th Ave & Greenway Rd	P/P	P/P	P/P	P/P	312
59th Ave & Northern Ave	P/P	P/P	P/P	P/P	6
59th Ave & Peoria Ave	P/P	P/P	P/P	P/P	54
59th Ave & Thunderbird Rd	P/P	P/P	P/P	P/P	30
59th Ave & Union Hills Dr	P/P	P/P	P/P	P/P	221
67th Ave & Bell Rd	Prot	Prot	P/P	P/P	69
67th Ave & Bethany Home Rd	Prot	Prot	Prot	Prot	327
67th Ave & Cactus Rd	Prot	Prot	Prot	Prot	2206
67th Ave & Camelback Rd	P/P	P/P	P/P	P/P	304
67th Ave & Deer Valley Rd	P/P	P/P	P/P	P/P	597
67th Ave & Glendale Ave	P/P	P/P	P/P	P/P	59
67th Ave & Greenway Rd	P/P	P/P	Prot	P/P	638
67th Ave & Olive Ave	Prot	Prot	Prot	Prot	77
67th Ave & Parkside Lane	P/P	P/P	Perm	Perm	5131
67th Ave & Peoria Ave	Prot	Prot	Prot	Prot	336

Intersection	Northbound LT Signal Control	Southbound LT Signal Control	Eastbound LT Signal Control	Westbound LT Signal Control	MAG Crash Rank
67th Ave & Union Hills Dr	P/P	P/P	Prot	Prot	354
75th Ave & Bethany Home Rd	P/P	P/P	P/P	P/P	570
75th Ave & Camelback Rd	P/P	P/P	P/P	P/P	338
75th Ave & Deer Valley Rd	Prot	Prot	P/P	Prot	1247
75th Ave & Glendale Ave	P/P	P/P	P/P	P/P	111
75th Ave & Union Hills Dr	P/P	P/P	Prot	Prot	897
83rd Ave & Bethany Home Rd	NA	P/P	NA	Perm	1404
83rd Ave & Camelback Rd	P/P	P/P	P/P	P/P	319
83rd Ave & Glendale Ave	P/P	P/P	P/P	P/P	625
91st Ave & Bethany Home Rd	Prot	Perm	NA	Prot	2042
91st Ave & Camelback Rd	P/P	P/P	P/P	P/P	1189
99th Ave & Bethany Home Rd	NA	P/P	NA	Perm	7342
99th Ave & Camelback Rd	P/P	P/P	P/P	P/P	410
Dysart Rd & Glendale Ave	P/P	P/P	P/P	P/P	1097
El Mirage Rd & Glendale Ave	P/P	P/P	P/P	P/P	1916
Glen Harbor Blvd & Glendale Rd	Perm	Perm	Perm	Perm	4329
Landfill Rd & Glendale Ave	Prot	Prot	P/P	P/P	NA
Litchfield Rd & Glendale Ave	Perm	Prot	NA	Prot	1661
51st Ave & Olive Ave	P/P	P/P	P/P	P/P	116
59th Ave & Bethany Home Rd	P/P	P/P	Perm	Perm	20
59th Ave & Deer Valley Rd	P/P	P/P	Perm	Perm	2164
67th Ave & Thunderbird Rd	Prot	Prot	Prot	Prot	909
99th Ave & Glendale Ave	P/P	P/P	P/P	P/P	662

LEGEND

P/P: Protected-Permissive Left-Turn Operation

Prot: Protected Left-Turn Operation

Perm: Permissive Left-Turn Operation

Table 3.2: City of Glendale Signal Control and Crash Ranking for A-C Intersections

Intersection	Northbound LT Signal Control	Southbound LT Signal Control	Eastbound LT Signal Control	Westbound LT Signal Control	MAG Crash Rank
47th Ave & Glendale Ave	Perm	Perm	Perm	Perm	1508
47th Ave & Northern Ave	P/P	P/P	P/P	P/P	479
47th Ave & Olive Ave	Perm	Perm	Perm	Perm	241
47th Ave & Peoria Ave	Perm	Perm	Perm	Perm	530
51st Ave & Maryland Ave	P/P	P/P	P/P	P/P	1098
55th Ave & Bell Rd	P/P	P/P	P/P	P/P	1435
55th Ave & Beth. Home Rd	Perm	Perm	Perm	Perm	1410
55th Ave & Camelback Rd	Perm	Perm	Perm	Perm	1361
55th Ave & Northern Ave	Perm	Perm	P/P	P/P	925
55th Ave & Olive Ave	Perm	Perm	Perm	Perm	1252
55th Ave & Peoria Ave	Perm	Perm	Perm	Perm	1331
55th Ave & Thunderbird Rd	Perm	Perm	Perm	P/P	189
55th Ave & Union Hills Dr	Perm	Perm	Perm	Perm	1479
57th Ave & Bell Rd	P/P	Prot	P/P	P/P	1081
57th Dr & Glendale Ave	Perm	Perm	Perm	Perm	1258
59th Ave & Behrend Dr	P/P	P/P	Perm	Perm	1074
59th Ave & Brown St	P/P	Perm	Perm	Perm	1029
59th Ave & Cholla St	Perm	Perm	Perm	Perm	1467
59th Ave & Eugie Ave	Perm	P/P	Perm	Perm	1091

Intersection	Northbound LT Signal Control	Southbound LT Signal Control	Eastbound LT Signal Control	Westbound LT Signal Control	MAG Crash Rank
59th Ave & Missouri Ave	Prot	Prot	Perm	Perm	1269
59th Ave & Myrtle Ave	P/P	P/P	Perm	Perm	943
59th Ave & Utopia Rd	P/P	P/P	Perm	Perm	1349
61st Ave & Bell Rd	Perm	Perm	Perm	Perm	1348
61st Ave & Cactus Rd	Perm	Perm	Perm	Perm	668
61st Ave & Olive Ave	Perm	Perm	Perm	Perm	748
63rd Ave & Bell Rd	Perm	Perm	P/P	P/P	572
63rd Ave & Olive Ave	Perm	Perm	Perm	Perm	1234
65th Ave & Olive Ave	Perm	Perm	Perm	Perm	1439
67th Ave & Arrowhead Rd	P/P	P/P	P/P	P/P	714
67th Ave & Butler Dr	Perm	Perm	Perm	Perm	478
67th Ave & Missouri Ave	Perm	Perm	Perm	Perm	489
67th Ave & Patrick Ln	P/P	P/P	Perm	Perm	1494
67th Ave & Sack Dr	Perm	Perm	Perm	Perm	689
73rd Ave & Bell Rd	Perm	Perm	P/P	P/P	1197
75th Ave & Missouri Ave	Perm	Perm	Perm	Perm	725
77th Ave & Bell Rd	P/P	P/P	Prot	Prot	673
79th Ave & Bell Rd	P/P	P/P	Prot	Prot	650
79th Ave & Union Hills Dr	P/P	Perm	P/P	P/P	1393
83rd Ave & Camp Bello Dr	Prot	Prot	Prot	Prot	1489
Litchfield & Lightning St	P/P	P/P	Perm	Perm	754

LEGEND

P/P: Protected-Permissive Left-Turn Operation

Prot: Protected Left-Turn Operation

Perm: Permissive Left-Turn Operation

The City of Glendale uses standard A, Q, and R traffic signal poles as well as Q-104, Q-106, Q-108, Q-114, and Q-116 style poles. Standard pole, mast arm, and foundation information for those pole types (if applicable) are tabulated in **Table 3.3**.

Table 3.3: A, Q, and R Pole Descriptions (ADOT, 2014)

Pole Type	Pole Height to Luminaire	Pole Height to Mast Arm	Height of End of Mast Arm	Mast Arm Length (Range) *	Foundation Diameter	Foundation Depth
A	N/A	N/A	N/A	N/A	2'-0"	3'-0"
Q	30'-0"	14'-0"	21'-0"	25' – 40'	3'-0"	10'-0"
R	30'-0"	14'-0"	21'-0"	45' – 55'	3'-0"	10'-0"

*Mast arms are manufactured in five foot increments. A-poles do not have a mast arm.

3.3 Data Collection

Based on the MUTCD, FHWA, and NCHRP research and standards, combined with interviews with other agencies using FYA operation, a list of required/recommended data was developed and approved by the City of Glendale.

To meet the federal requirements and to provide optimum motorist safety, an extensive amount of data was needed at each intersection. To ensure compliance with the MUTCD, the left-turn signal control (protected, protected-permissive, or permissive), mast arm lengths, pole type and location, signal head types, signal head location (lateral), and the presence of pedestrian heads, pushbuttons, and manhands/count down timers were necessary data for FYA evaluation.

To ensure that sight distance requirements were met, it was necessary to gather and analyze the following data: the presence of a raised median, the median width, the number of opposing through lanes, the posted speed limit, and the approach grades.

In addition, calculation of accurate cost estimates required inclusion of median cutbacks when needed to obtain a “no offset” condition (no opposing left-turning vehicle restricting the sight distance, see **Figure 4.2: Median Offset**). Therefore, any equipment in the median needed to be noted, such as R4-7 signs (Keep Right), object markers, and pull boxes.

To meet controller capability requirements, controller and the Malfunction Management Unit (MMU) type were recorded to confirm the controller’s ability to be perform FYA operation. Lastly, Annual Average Daily Traffic (AADT) data for each leg of the intersection was gathered from City and ADOT (City of Glendale, 2013), (ADOT, 2015) sources and included in the data collection table. A sample data collection sheet is shown in **Table 3.4**.

Table 3.4: Data Collection Sheet for 59th Ave & Bell Rd

59th Ave & Bell Road					
Data	Intersection				
	59th Ave		Bell Rd		
	NB	SB	EB	WB	
Control	Prot	P/P	P/P	P/P	
Mast Arm Head Types	R,F,F	Q, F, F	Q,F,F	Q, F, F	
Pole Head Types (outboard left/far right)	R, F (far), F(near)	Q, none	Q, none	Q, none	
Median Width (feet)	4	NA	4	4	
Median Negative Offset (feet)	NA	NA	5.95	5.95	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	3	3	3	
R4-7, Object Marker, Pull Box in Median	N,N,N	Y, Y, Y	Y, Y, Y	Y, Y, Y	
AADT	26,700	29,000	42,500	45,500	
Posted Speed Limit (mph)	40	40	40	40	
Grade	0	0	0	0	
Mast Arm Length	40	40	55	45	
LT Head Centered Over Lane	Y	Y	N	N	
Thru Heads Centered Over Lane	Y	Y	N	N	
Controller Type					ASC3
MMU Upgrade Required					Yes
Conductors (Per Pole)					
PPB, M/H, Countdown	Y,Y,Y	Y, Y, Y	N,Y,Y	N, Y, Y	
Other					

3.4 Data Review and Collection

Existing signal control and field (in place) signal equipment data was requested from the City (City of Glendale, 2015). The signalized intersections were classified as arterial-arterial, arterial-collector, or collector-collector according to their purpose. In general, mile streets were classified as arterials and half-mile and/or quarter-mile streets were classified as collector streets. The roadway classifications were then sorted to determine the Phase 1 study intersections (arterial-arterial streets) and the Phase 2 study intersections (arterial-collector streets).

The City-provided signal head and pole type information was verified using Google Maps, and where conflicts occurred, field visits were conducted. In cases of conflicting information, field verified data prevailed.

The MUTCD contains specific standards for traffic signal head placement for left-turn conditions. Therefore, it is important to locate the overhead signal heads with respect to the lane(s) that the signal serves, specifically the location of the overhead left-turn signal head. The MUTCD requires that a signal head used exclusively for the left-turn lane shall be located within the extension of the left-turn lane. For permissive or protected/permission operation, the signal should be located near the extension of the lane line between the left turn lane and the Number 1 thru lane (MUTCD, 2009).

3.5 Field Survey Data Collection

To ensure utmost accuracy, surveyors were engaged to field locate the traffic signal heads with respect to the travel lanes. Overhead signal heads with respect to the left-turn and thru lane lines must be precisely located so that any changes to left-turn signal control will meet

the current (2009) MUTCD requirements. For each intersection, the survey crew setup the GPS rover on the CORS network, using the Arizona State Plane Coordinate System, and tied in the monument located at the center of the intersection. Once control was established, one quarter of the intersection was focused on at a time to precisely locate the striping and lane extension on the outbound side of the intersection, and then to precisely locate the signal poles and each overhead signal head (noting Type F, R, Q, and Q1 heads). These data points were then brought into AutoCAD and dynamic traffic signal blocks were inserted on top of the survey points to accurately show the location of each signal head and pole.

Because survey data captured the outbound lane lines at each intersection, insertion of the aerial map ensured that the survey points for the lane lines aligned with the aerial image.

3.6 Field Visits

As described above, extensive data was needed to successfully complete this FYA study. Some of the data could be gathered in-house or was provided by the City. However some data needed to be gathered and/or verified in the field. Field data was collected between April 2015 and July 2015. The data was then incorporated into the data collection sheets and includes: control type, mast arm signal head types, pole mounted head types (outbound left and far right), number of opposing thru lanes, posted speed limits, and the presence of pedestrian push buttons, manhands, and countdown timers.

4.0 DATA ANALYSIS

The City of Glendale provided the five-year Accident Location Identification Surveillance System (ALISS) for all signalized intersections within the city (2009 through 2013) (ADOT, 2015). Where intersection crash data was missing, additional data was provided from Glendale Police (City of Glendale, Arizona, 2015). This data included:

- The total number of collisions tabulated by manner-of-impact (collision type)
- The total number of Fatalities, Incapacitating, Non-incapacitating, Possible Injury, and Property Damage Only collisions that occurred each year

Using the above information, a bar graph was created as a visual representation of the information. This graph showed the Manner-of-Impact (collision type) crashes at each study intersection, see **Figure 4.1**. Next, (within that graph) the left-turn accidents were highlighted in red, as these are accidents that FYA operation has potential to mitigate.

Maricopa Association of Governments (MAG) provided a list of the MAG rankings for each intersection in Glendale (MAG 2015). The ranks were pulled from that list for each of the 85 intersections. In order to prioritize the intersections in comparison to other Glendale intersections, an associated Glendale rank was given to each intersection. Both the MAG and the City crash ranks were noted on each of the collision tables as shown on the sample in **Table 4.1**.

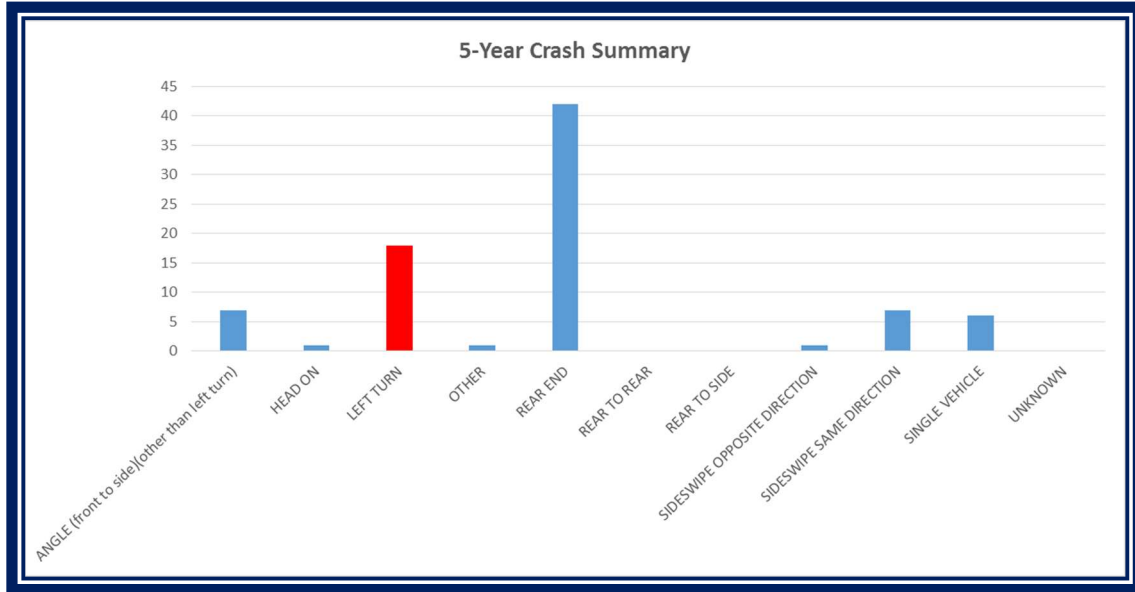


Figure 4.1: 5-Year Crash Summary by Collision Type (ADOT 2015)

Table 4.1: Sample Collision Total and Summary (ADOT, 2015)

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 20	K	A	B	C	O	
Glendale Rank: 4						
2013	0	0	6	4	22	32
2012	0	0	5	6	23	34
2011	0	0	2	7	21	30
2010	1	0	2	5	30	38
2009	1	1	3	4	25	34
Totals:	2	1	18	26	121	168
Crash Rate						2.177
Left-Turn Crash Rate						0.531
Left-Turn Severity Index						6.986
Severity Index						15.016

4.1.1 Crash Rates and Severity Indices Calculations

Crash rate is defined as the number of crashes per million vehicle miles traveled (vmt). For this study, the crash rates were calculated using the (5-year) crash totals and the AADT values. These calculations are shown on the summary sheets compiled in Appendix A and are for reference only. In order to obtain the Annual Average Daily Traffic (AADT) value totals for each intersection, the average between northbound (NB) and southbound (SB) AADTs along with the average between eastbound (EB) and westbound (WB) AADTs were calculated and used for the crash rate calculations. Next, a crash rate for the total number of crashes during the 5-year period at a given intersection was calculated, as well as a crash rate for the total number of accidents associated with left-turns. Crash rate equations are shown below:

$$Crash\ Rate = \frac{N_{(crashes)}}{\Sigma (ADT_{(NB/SB)}, ADT_{(EB/WB)}) \cdot (365) \cdot (N_{(years)})} \cdot 1,000,000\ vmt$$

A severity index was then calculated for each intersection, using the total number of fatalities, injuries, and non-injuries, along with their associated factors. The severity rate equation is as follows:

$$Severity\ Index = \frac{(N_{(fatality)} \cdot Factor_{(fatality)}) \cdot (N_{(injury)} \cdot Factor_{(injury)}) \cdot (N_{(PDO)} \cdot Factor_{(PDO)})}{1,000,000\ vmt}$$

Where:

PDO = Property Damage Only (Non-Injury)

Factor_(fatality) = 5.8 million (represents dollars)

Factor_(injury) = 80,000 (represents dollars)

Factor_(PDO) = 4,000 (represents dollars)

NOTE: AADTs were only available for arterial streets. None were available for collector streets.

4.2 Sight Distance Calculations

The implementation of flashing yellow arrow controlled intersections requires adequate sight distances. The AASHTO *Policy on Geometric Design of Highways and Streets*, 2011, 6th Edition states, “The driver of a vehicle approaching an intersection should have an unobstructed view of the entire intersection, including any traffic-control devices, and sufficient lengths along the highway to permit the driver to anticipate and avoid potential collisions.” Intersection sight distance for this report conforms to the following: AASHTO *Policy on Geometric Design of Highways and Streets*, 2011, 6th Edition, and physical assumptions formed in coordination with the City of Glendale representatives.

AASHTO policy recommends that intersection sight distances vary with the type of traffic control used at the intersection. This study used procedures found in *Chapter 9: “Case F – Left-Turns from the Major Road.”* (AASHTO, 2011.)

Assumptions formed in coordination with the City of Glendale include:

- Analysis was conducted for a 6-foot wide passenger vehicle
- The decision-making vehicle is assumed to have a decision-making location such that vehicle is stopped behind the intersection stop bar, offset 1 foot from its left side lane barrier
- The decision making vehicle location shall move at least 3 feet toward its left side barrier when medians of 4 feet or greater are pulled back for purposes of offset removal
- All median removals with the purpose of negative offset removal shall conform to City of Glendale specifications

Existing geometric conditions were established in order to supplement intersection sight distance calculations. The following geometric parameters were used:

- Stop bar to stop bar distance
- Directional median widths
- Directional left-turn and thru lane widths
- Lane offsets
- Intersection geometric skews

Physical attributes of each intersection play an important role in flashing yellow arrow implementation potential. The presence of a raised median and whether it presents a “negative offset” for the left-turning driver is vital when considering modifying a left-turn movement from protected to protected/permissive FYA. Median offset is shown

graphically in **Figure 4.2** for the three conditions: negative offset, no offset, and positive offset.

Sight distance for each left-turning vehicle on each approach was calculated using procedures set forth in **Figure 4.3**.

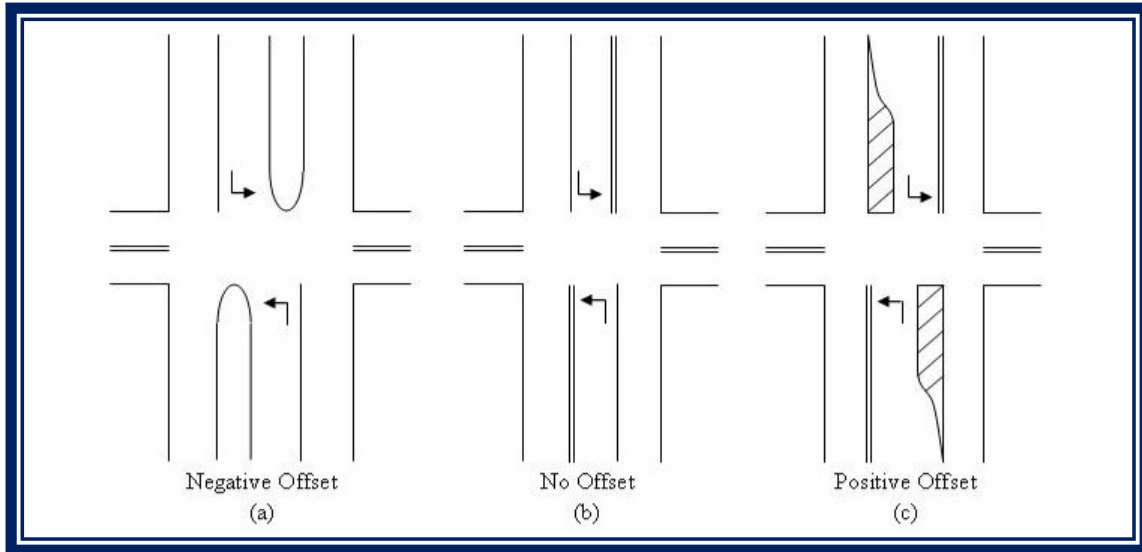


Figure 4.2: Median Offset (Amjadi, R. for FHWA, 2009)

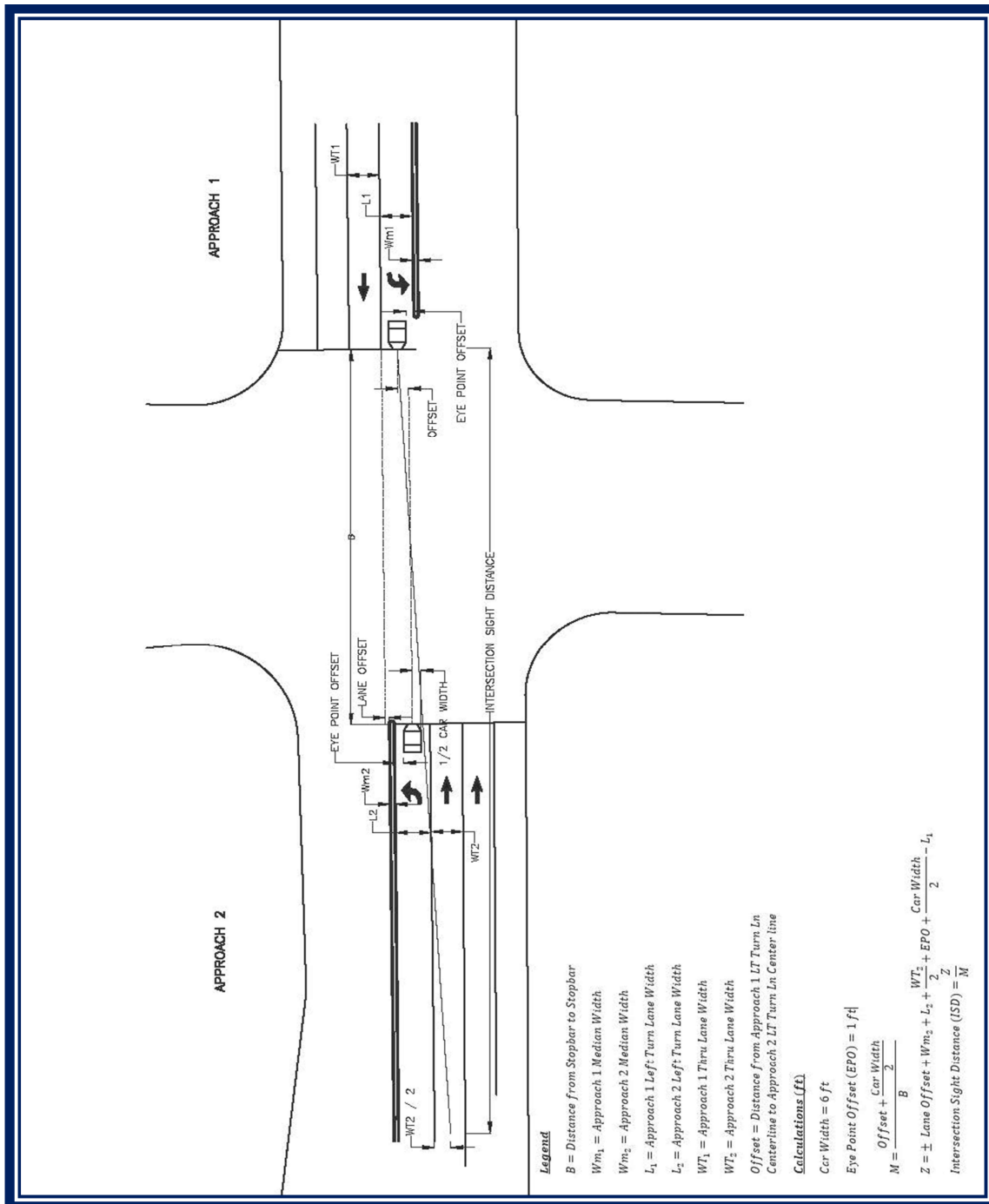


Figure 4.3: Sight Distance Calculations

A sample sight distance calculation where sight distance requirements are met is shown in **Table 4.2**.

Table 4.2: Intersection Sight Distance Calculation – 59th Ave and Northern Avenue

Input		NB	SB	EB	WB
	Stop Bar to Stop Bar (ft)	117	117	122	122
	Approach Thru Lane Width	11	11	11	11
	Left Turn Lane 1 Width	12	10.5	11	11
	Approach Median Width	0	0	0	0
	Approach Lane Offset	0	0	0.753	0.5
	Lt Tn Ln Offset from Opposing Lt Tn Ln	-4	-2.5	-2.5	-2.247
	Left Turn Lane Width 2	10.5	12	11	11
	Opposing Median Width	0	0	0	0
	Y1	8	6.5	7	7
	Y2	4	4	4.753	4.5
	m	-0.01	0.00	0.01	0.00
	z	8	11	10.253	10
ISD=	Intersection Sight Distance	-936	2574	1661	2440
		Meets ISD	Meets ISD	Meets ISD	Meets ISD

4.3 Method of Determining Recommendations

The procedure for developing recommendations for FYA operation conversion was developed in the pilot study and was followed in this expanded study.

4.3.1 Sight Distance

Sight distance calculations were performed to determine if the required sight distance was met in the current geometric conditions for the condition of the opposing left-turning vehicle as an obstruction. The importance of the intersection sight distance for left-turning vehicles is the ability to see oncoming vehicles in the Number 1 opposing lane (the lane closest to the median). The sight distance is calculated under the scenario that an opposing

left-turning vehicle will be the obstruction to the sight distance. This is a conservative approach to the sight distance, but the intersections were evaluated to determine the need to move left-turning vehicles closer to a raised median so that the opposing left-turning car would be less of an obstacle.

The obstruction of the opposing left-turning vehicles can be reduced by two methods. First, by removing the median nose to 20 feet in advance of the stop bar (per the City of Glendale Standard Detail G-411), which would remove the shy distance from the median curb. Second, adding a longitudinal channelization carrot for the left-turn bay, which would provide a visual cue for the driver in the left-turn lane to move further left.

4.3.2 Signal Control – Permissive

At intersections with a circular green (permissive) left-turn or left/thru signal indication, the study data was inconclusive that changing the indication to FYA would provide safety and/or capacity benefits. In general, the permissive indication would not be converted to FYA unless those fully permissive-controlled intersections which have a high crash rate or have a high crash severity index would be reviewed on a case-by-case basis.

4.3.3 Signal Control – Protected

On intersection legs with existing protected left-turns, each leg was considered for Time-of-Day (TOD) FYA. In the Time-of Day FYA, the peak hours would remain protected while the off-peak times would be run as FYA. The signal head is the same 4-section FYA head, but the controller will need to be programmed based on the time of day.

Dual left-turn-protected signal control (full intersection or by approach) was not recommended for FYA without further traffic engineering study.

4.3.4 Signal Control – Protected-Permissive

Most of the FYA studies show that safety is improved at intersections that operate with protected-permissive left-turn (PPLT) phasing. These intersections were reviewed for compliance with the 2009 MUTCD requirements.

4.3.5 Mast Arm Length

In accordance with 2009 MUTCD, since FYA exclusively controls the left-turn lane separately from the thru signals, the signal face shall not be positioned any further to the right than the extension of the right-hand edge of the turn lane. This requirement does not apply to existing protected/permissive signal heads, so in many cases, the mast arm must be replaced with a longer mast arm.

4.3.6 Poles

Where a mast arm must be replaced, the existing pole was evaluated. An existing Q-pole can support a maximum 40-foot mast arm per ADOT Standard Detail T.S. 4-28. An R-pole is used to support 45-foot to 55-foot mast arms and uses the same foundation as a Q-pole. If a 60-foot or 65-foot mast arm is required, then an ADOT V-pole (no luminaire riser) or W-pole (with luminaire riser) is used. The V and W pole use the same foundation which is different than the Q and R foundation.

4.3.7 Primary Heads

In accordance with 2009 MUTCD Section 4D.11 and Table 4D-1, at least two primary signal faces for thru movements will be required for one or two thru-lane approaches. For three thru-lane approaches, a third primary face shall be required. The third signal face can

be pole- or mast arm-mounted. The pole-mount was chosen if placing the new head required significant changes to the existing signal face locations.

4.3.8 Malfunction Management Unit Replacement

The City of Glendale stated that the MMU must be updated when converting the signal to FYA.

4.3.9 Reprogram the Controller for FYA

Intersections recommended for FYA will require controller reprogramming for either full-time FYA or Time-of-Day FYA. For cost estimation, it was assumed that the City forces would complete this work.

4.4 Determining Cost Estimate

An itemized cost estimate was prepared for each study intersection where FYA operation was recommended. For cost analysis purposes, the two existing FYA intersections were included because of construction (relocation of pole and mast arm) and/or installation of retro-reflective tape costs. The number of intersections with associated costs is 87 (85 non-FYA and two FYA).

The costs are based on a contractor design-bid-build contract procurement with multiple intersections grouped together in the project. Job-Order-Contracting (JOC) would have similar costs. Some intersections could be completed with City maintenance forces which would potentially lower the costs as shown. The basic itemized costs are included as follows.

4.4.1 Furnish and Install Temporary Traffic Control Devices

For signal head work, truck mounted attenuators and advance signing were included. Where mast arm replacements were needed, short term (one day per mast arm) lanes closures were estimated. For pole replacements/new installation, long-term movable traffic control setup was estimated. For median removals, a long-term lane closure setup was estimated.

4.4.2 Remove Traffic Signals

This item refers to the removal of signal heads (with back plates and mounting assemblies) to be replaced by new FYA heads.

4.4.3 Traffic Signal Face

This item includes new signal heads of the type noted. In general, any existing signal head was considered as a relocation if it could be used elsewhere on the intersection. All new signal faces shall have retro-reflective tape included in the item.

4.4.4 “Left Turn Yield on FYA” Sign

This item includes the installation of a new sign on each mast arm that is converted to FYA.

4.4.5 Retro-Reflective Tape

This item refers to the field application of new retro-reflective tape on existing signals. This countermeasure was requested by the City of Glendale based on the CMF and CRF developed by FHWA and shall be installed on both existing and new signal heads.

4.4.6 Reconfigure Mounting Assembly

This item refers to adapting an existing Type, V, VI, VII, or XI pole mounting assembly from either a 3-section head or 5-section head to a FYA 4-section head.

4.4.7 Malfunction Management Unit (MMU)

All intersections that are proposed to be converted to FYA will require an upgraded MMU, per the City of Glendale.

4.4.8 Mobilization

Mobilization was estimated at 8 - 10% of the construction value.

4.4.9 Equipment Installation and/or Relocation

Some intersections required one or more of the mast arms and poles be replaced. Bid Items for new poles, mast arms, mountings, conductors, and foundations were included. Internally illuminated street name signs, signal heads, manhand signals, luminaires and mast arms, pre-emption devices and video detection were noted as relocated, as necessary. For the latter two items, new cables from the controller were quantified.

4.4.10 Contingency

A 30% contingency was added to allow for unforeseen items such as: utility conflicts, minor right-of-way acquisition, and minor equipment relocations.

4.4.11 Design

Design was estimated at 10% of the construction cost.

4.4.12 Construction Administration

Construction administration, management and post design services were estimated at 15% of the construction cost.

4.4.13 Median Modifications

Some intersections recommended removing a portion of the median curb in conformance with the City of Glendale standards. This work is itemized under: remove curb, concrete median, pavement, object marker and pull boxes, pavement patching, concrete single curb, median nose, and new signs.

Using the standard ADOT Bid Item List and the E2C2 Historical Unit Price (E2C2, 2015), cost estimates were developed. Appendix A shows the full data collection and reduction. A sample is provided in **Table 4.3** and **Table 4.4**.

Table 4.3: Data Reduction Summary Sheet, Page 1

67th Avenue and Arrowhead Loop, Data Sheet 1

Protected/permissive control all legs.

67th Avenue and Arrowhead Loop						
Data	Intersection					
	67th Avenue		Arrowhead Loop			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	4	4	5	3		
Median Negative Offset (feet)	4.5	4.5	6.2	6.2		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	3	2	1	1		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,Y	Y,Y,N		
ADT	-	-	-	-		
Posted Speed Limit (mph)	40	40	25	25		
Grade	0	0	0	0		
Mast Arm Length	40	55	40	35		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	No	No	Yes		
Satisfies MUTCD Requirements	Yes	Yes	Yes	Yes		
MMU Upgrade Required					Y	
PPB, M/H, Countdown	N,Y,N	N,Y,N	Y,Y,N	Y,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 714	K	A	B	C	O	
Glendale Rank: 47						
2013	0	0	3	2	12	17
2012	0	0	1	4	8	13
2011	0	1	1	2	7	11
2010	0	0	1	4	8	13
2009	0	0	1	3	11	15
Totals:	0	1	7	15	46	69
Left-Turn Severity Index						0.908
Severity Index						1.774

Table 4.4: Data Reduction Summary Sheet, Page 2

67th Avenue and Arrowhead Loop, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$12,500.00	\$12,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Ped Push Button	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	3	Ea	\$100.00	\$300.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Mast Arm (45')	1	Ea	\$1,200.00	\$1,200.00
Conductors	275	LF	\$2.50	\$687.50
Mobilization	1	LS	\$3,500.00	\$3,500.00
Concrete Sidewalk	20	SF	\$30	\$600.00
Subtotal				\$42,455.50
Contingency (30%)				\$12,737.00
Construction Total				\$55,192.50
Design (10%)				\$5,519.00
Construction Management (15%)				\$8,279.00
Total				\$68,990.50

4.5 Prioritization Method

The development of the priorities used all 87 intersections and were based on the following factors. The factors were categorized by type of work involved; then each grouping was further categorized and prioritized by the factors described below.

4.6 Categories

At the time of this report, the City of Glendale had submitted an application for Highway Safety Improvement (HSIP) funds. In order to comply with federal guidelines for HSIP's "systemic" approach (FHWA, 2015), all arterial-arterial intersections were required for inclusion into the application, but the process was subdivided into phases. Phase 1 encompassed the 12 highest MAG-ranked intersections. Phase 2 encompassed 11 intersections that could be converted to FYA with in-house funds and with City forces. Phase 3 encompassed the remainder of the arterial-arterial intersections.

The overall goal of this study was to evaluate the safety, effectiveness, and cost of converting left-turn operation from either protected only operation, protected-permissive operation, and/or permissive only operation to FYA. Due to the magnitude of this project, it was necessary to divide the FYA conversion recommendations into categories and prioritize the signals within each category. The categories are as follows:

- **Category 1:** Intersections with the highest MAG crash ranking (HSIP funds pending)
- **Category 2:** Intersections with signal head modifications only
- **Category 3:** Intersections with signal head and median modifications only

- **Category 4:** Intersections with signal head and mast arm replacement
- **Category 5:** Intersections with signal head, pole, and mast arm replacement
- **Category 6:** Intersections not recommended for FYA

5.0 PRIORITIZED INTERSECTIONS

Eighty-five of the 192 total signalized intersections within the City were evaluated for the potential of converting left-turn signal phasing to FYA. The two existing signals within the city that are currently operating as FYA in all directions were evaluated to ensure compliance with the MUTCD; therefore, the total number of intersections evaluated throughout the course of this study is 87. The city has three intersections with dual left-turns on all approaches (operating in protected mode), but these three intersections were omitted from this study as dual left-turns are not recommended for FYA operation.

Figure 5.1 shows the locations of the signals and the categories. Category 1 represents the highest priority projects while Category 5 represents the lowest of the recommended FYA intersections. Category 6 represents the intersections not recommended for FYA. The categories were developed based on the type of improvement: signal head replacements only, signal head replacement and median modifications, signal head replacement and mast arm replacement, and signal head replacement with pole and mast arm relocations.

Tables 5.1 through **5.6** show each category and the intersection rankings within each category. A summary of priority ranking Categories is shown in **Table 5.7**. In each table, the intersections are prioritized first based on Functional Class, where arterial-arterial are ranked highest. Then the intersections are further sorted based on their Maricopa Association of Governments (MAG) intersection ranking.

Table 5.1 presents the Category 1 intersections recommended for FYA that are currently being implemented based on MAG Crash Rank. These are the 12 highest ranked crash intersections in the City and conversion to FYA is partially funded with HSIP funding.

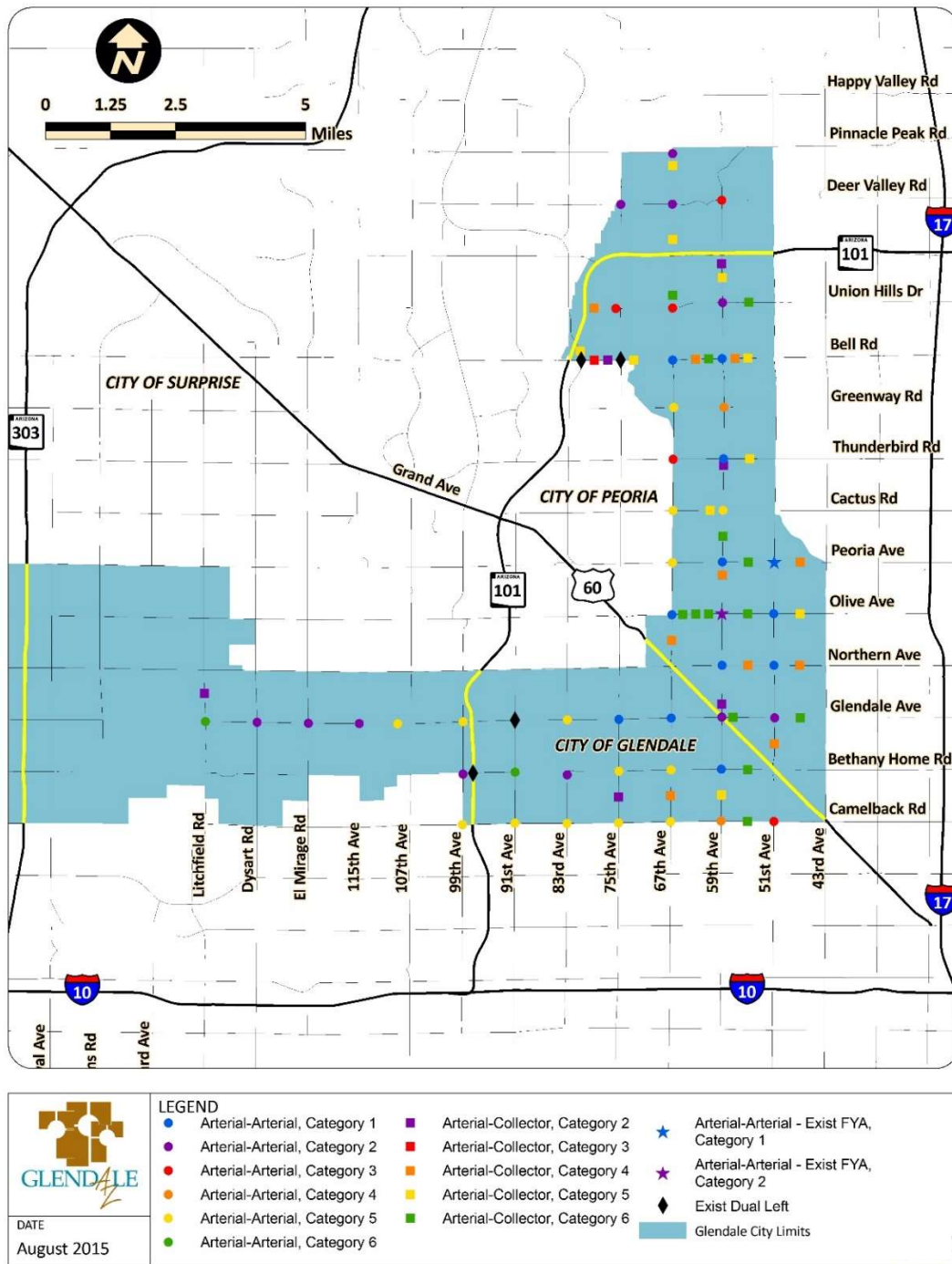


Figure 5.1 Glendale FYA Intersection Priorities

Table 5.1 presents the Category 1 intersections recommended for FYA that are currently being implemented based on MAG Crash Rank. These are the 12 highest ranked crash intersections in the City, and conversion to FYA is partially funded with HSIP funding.

Table 5.1: Category 1 - Intersections In Process of Implementation

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
51st Ave & Peoria Ave	Arterial-Arterial	All	1	-	-	\$32,582.00
59th Ave & Northern Ave	Arterial-Arterial	N,S	6	12.074	1	\$96,922.00
59th Ave & Bethany Home Rd	Arterial-Arterial	All	20	15.016	2	\$79,280.00
59th Ave & Thunderbird Rd	Arterial-Arterial	All	30	6.388	0	\$90,778.00
59th Ave & Bell Rd	Arterial-Arterial	E,W	53	3.702	0	\$34,567.00
59th Ave & Peoria Ave	Arterial-Arterial	N,S	54	6.178	0	\$44,657.00
67th Ave & Glendale Ave	Arterial-Arterial	All	59	6.062	0	\$94,959.00
67th Ave & Bell Rd	Arterial-Arterial	E,W	69	4.170	0	\$43,141.50
67th Ave & Olive Ave	Arterial-Arterial	All	77	4.804	0	\$71,976.00
51st Ave & Northern Ave	Arterial-Arterial	All	102	3.762	0	\$53,573.00
75th Ave & Glendale Ave	Arterial-Arterial	All	111	8.070	1	\$106,314.00
51st Ave & Olive Ave	Arterial-Arterial	All	116	3.104	0	\$83,220.00
No. of Intersections	12				TOTAL	\$831,969.50

Table 5.2 presents the Category 2 intersections recommended for FYA that have only signal head replacements involved.

Table 5.2: Category 2 - Intersections Requiring Signal Head Modifications Only

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
59th Ave & Olive Ave	Arterial-Arterial	NA	3	-	-	\$4,225.00
59th Ave & Union Hills Dr	Arterial-Arterial	All	221	2.902	0	\$29,163.50
51st Ave & Glendale Ave	Arterial-Arterial	All	253	2.398	0	\$31,975.00
59th Ave & Glendale Ave	Arterial-Arterial	All	322	2.064	0	\$24,619.00
67th Ave & Deer Valley Rd	Arterial-Arterial	All	597	1.922	0	\$29,692.00
Dysart Rd & Glendale Ave	Arterial-Arterial	All	1097	1.368	0	\$26,670.00
75th Ave & Deer Valley Rd	Arterial-Arterial	E,W	1247	1.348	0	\$22,317.00
83rd Ave & Bethany Home Rd	Arterial-Arterial	All	1404	0.984	0	\$10,157.00
El Mirage Rd & Glendale Ave	Arterial-Arterial	All	1916	0.476	0	\$26,508.00
67th Ave & Parkside Ln/Pinnacle Pk	Arterial-Arterial	N,S	5131	0.078	0	\$21,245.50
99th Ave & Bethany Home Rd	Arterial-Arterial	S	7342	0.112	0	\$12,025.00
Landfill Rd & Glendale Ave	Arterial-Arterial	E,W	NA	0.000	0	\$18,291.00
77th Ave & Bell Rd	Arterial-Collector	N,S	673	2.048	0	\$22,516.00
75th Ave & Missouri Ave	Arterial-Collector	All	725	5.958	1	\$25,614.00
Litchfield Rd & Lightning St	Arterial-Collector	N,S	754	6.022	1	\$21,125.00
59th Ave & Myrtle Ave	Arterial-Collector	N,S	943	1.762	0	\$20,392.50
59th Ave & Behrend Dr	Arterial-Collector	N,S	1074	1.022	0	\$21,053.00
59th Ave & Eugie Ave	Arterial-Collector	S	1091	1.252	0	\$10,410.00
No. of Intersections	18				TOTAL	\$377,998.50

Table 5.3 presents the Category 3 intersections that have both signal head replacements and median modifications.

Table 5.3: Category 3 - Signal Head Replacement with Median Modifications

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
51st Ave & Camelback Rd	Arterial-Arterial	All	173	9.04	1	\$68,541.00
67th Ave & Union Hills Dr	Arterial-Arterial	All	354	2.29	0	\$103,351.00
75th Ave & Union Hills Dr	Arterial-Arterial	All	897	1.66	0	\$72,902.00
67th Ave & Thunderbird Rd	Arterial-Arterial	All	909	2.218	0	\$43,814.00
59th Ave & Deer Valley Rd	Arterial-Arterial	N,S	2164	7.368	1	\$41,165.00
79th Ave & Bell Rd	Arterial-Collector	N,S	650	1.812	0	\$43,864.00
No. of Intersections	6				TOTAL	\$373,637.00

Table 5.4 presents the Category 4 intersection that need signal head replacements and mast arm replacements.

Table 5.4: Category 4 - Signal Head Replacement with Mast Arm Replacement

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
59th Ave & Greenway Rd	Arterial-Arterial	All	312	3.484	0	\$39,784.00
59th Ave & Camelback Rd	Arterial-Arterial	All	598	2.844	0	\$71,414.00
67th Ave & Butler Dr	Arterial-Collector	N,S	478	6.648	1	\$33,527.00
47th Ave & Northern Ave	Arterial-Collector	All	479	2.760	0	\$51,025.00

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
67th Ave & Missouri Ave	Arterial-Collector	All	489	6.332	1	\$58,035.00
47th Ave & Peoria Ave	Arterial-Collector	All	530	6.214	1	\$57,111.50
63rd Ave & Bell Rd	Arterial-Collector	S,E,W	572	1.866	0	\$63,901.50
55th Ave & Northern Ave	Arterial-Collector	All	925	1.782	0	\$63,007.00
59th Ave & Brown St	Arterial-Collector	N	1029	1.678	0	\$25,389.50
57th Ave & Bell Rd	Arterial-Collector	N,E,W	1081	1.736	0	\$85,342.50
51st Ave & Maryland Ave	Arterial-Collector	All	1098	1.060	0	\$45,724.00
79th Ave & Union Hills Dr	Arterial-Collector	N,E,W	1393	0.578	0	\$66,719.00
No. of Intersections	12				TOTAL	\$660,980.00

Table 5.5 presents the Category 5 intersections that need signal head replacements, mast arm replacements and pole relocations or replacements.

Table 5.5: Category 5 - Signal Head, Mast Arm, and Pole Replacement

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
59th Ave & Cactus Rd	Arterial-Arterial	All	266	3.800	0	\$110,726.00
67th Ave & Camelback Rd	Arterial-Arterial	All	304	3.252	0	\$58,033.00
83rd Ave & Camelback Rd	Arterial-Arterial	All	319	3.464	0	\$173,225.00
67th Ave & Bethany Home Rd	Arterial-Arterial	All	327	1.946	0	\$108,823.00
67th Ave & Peoria Ave	Arterial-Arterial	All	336	2.454	0	\$67,355.00
75th Ave & Camelback Rd	Arterial-Arterial	All	338	3.462	0	\$152,970.00
99th Ave & Camelback Rd	Arterial-Arterial	All	410	3.642	0	\$96,715.00
75th Ave & Bethany Home Rd	Arterial-Arterial	All	570	2.720	0	\$67,194.00
83rd Ave & Glendale Ave	Arterial-Arterial	All	625	1.782	0	\$84,370.00
67th Ave & Greenway Rd	Arterial-Arterial	N,S,W	638	2.136	0	\$86,499.00
99th Ave & Glendale Ave	Arterial-Arterial	All	662	2.188	0	\$202,101.00
91st Ave & Camelback Rd	Arterial-Arterial	All	1189	3.786	0	\$218,969.00
67th Ave & Cactus Rd	Arterial-Arterial	All	2206	1.286	0	\$65,791.00
Glen Harbor Blvd & Glend. Ave	Arterial-Arterial	All	4329	0.154	0	\$133,488.00
55th Ave & Thunderbird Rd	Arterial-Collector	All	189	7.820	1	\$68,100.00
47th Ave & Olive Ave	Arterial-Collector	All	241	7.784	1	\$73,524.50
61st Ave & Cactus Rd	Arterial-Collector	E,W	668	5.954	1	\$58,683.00

Intersection	Functional Class	FYA Direction	MAG Crash Rank	Severity Index	Fatalities	Project Cost
67th Ave & Arrowhead Loop Rd	Arterial-Collector	All	714	1.774	0	\$68,990.50
73rd Ave & Bell Rd	Arterial-Collector	E,W	1197	1.420	0	\$120,008.00
59th Ave & Missouri Ave	Arterial-Collector	N,S	1269	1.426	0	\$65,782.00
59th Ave & Utopia Rd	Arterial-Collector	N,S	1349	1.384	0	\$63,272.00
55th Ave & Bell Rd	Arterial-Collector	E,W	1435	1.068	0	\$77,815.00
83rd Ave & Campo Bello Dr	Arterial-Collector	N	1489	0.822	0	\$12,776.00
67th Ave & Patrick Ln	Arterial-Collector	N,S	1494	0.654	0	\$52,439.50
No. of Intersections	24				TOTAL	\$2,287,649.00

Table 5.6 presents the intersections that were not considered for FYA.

Table 5.6: Category 6 – Flashing Yellow Arrow Not Recommended

Intersection	Functional Class	MAG Crash Rank	Severity Index	Reasons for Not Recommended
Litchfield Rd & Glendale Ave	Arterial-Arterial	1661	0.778	Permissive Phasing, Low Severity Index
91st Ave & Bethany Home Rd	Arterial-Arterial	2042	0.794	Tee intersection, Dual Right Turn Lanes and Left Turn Lanes
67th Ave & Sack Dr	Arterial-Collector	689	6.076	Permissive Phasing, Sack Dr does not have exclusive left turn lane, disproportionate medians
61st Ave & Olive Ave	Arterial-Collector	748	1.110	Permissive Phasing, Low Severity Index
63rd Ave & Olive Ave	Arterial-Collector	1234	1.518	Permissive Phasing, Low Crash History
55th Ave & Olive Ave	Arterial-Collector	1252	1.160	Permissive Phasing, Low Severity Index
57th Dr & Glendale Ave	Arterial-Collector	1258	0.742	Permissive Phasing, Low Severity Index
55th Ave & Peoria Ave	Arterial-Collector	1331	1.220	Permissive Phasing, Low Crash History
61st Ave & Bell Rd	Arterial-Collector	1348	1.054	Permissive Phasing, Low Severity Index
55th Ave & Camelback Rd	Arterial-Collector	1361	0.810	Permissive Phasing, Low Severity Index
55th Ave & Beth Home Rd	Arterial-Collector	1410	1.254	Permissive Phasing, Low Crash History
65th Ave & Olive Ave	Arterial-Collector	1439	1.216	Permissive Phasing, Low Severity Index
59th Ave & Cholla St	Arterial-Collector	1467	1.546	Permissive Phasing, Low Crash History
55th Ave & Union Hills Dr	Arterial-Collector	1479	1.210	Permissive Phasing, Low Severity Index
47th Ave & Glendale Ave	Arterial-Collector	1508	0.736	Permissive Phasing, Low Severity Index
No. of Intersections	15			

A summary of priority ranking Categories is shown in **Table 5.7**.

Table 5.7: Prioritization Summary

Category	Total Intersections	Sum of Project Costs
Priority 1	12	\$831,969.50
Priority 2	18	\$377,998.50
Priority 3	6	\$373,637.00
Priority 4	12	\$660,980.00
Priority 5	24	\$2,287,649.00
Priority 6	15	\$0.00
Total	87	\$4,532,234.00

6.0 SUMMARY AND CONCLUSIONS

The City of Glendale has expressed an interest in converting left-turn movements at signalized intersections to flashing yellow arrow (FYA) operation with the purpose of reducing left-turn crashes. Flashing yellow arrow operation was developed by traffic engineers due to concerns that drivers turning left on a permissive circular green (CG) signal indication might inadvertently assume the right-of-way. Research performed by the Federal Highway Administration (FHWA) has determined that FYA operation is safer – meaning that left-turning drivers who are unsure of right-of-way assignment will yield at a flashing yellow arrow, whereas left-turning drivers may incorrectly assume the right-of-way and proceed on a circular green.

The City of Glendale chose to conduct this FYA study to evaluate the safety, effectiveness, and cost of converting left-turn operation at 85 intersections within the city to flashing yellow arrow operation. Ultimately, the City would like to evaluate the conversion of all signalized left-turn movements within the city to flashing yellow arrow operation, with the exception of three locations where dual left-turns exist.

This study detailed the methodology and findings of a city-wide signal operation analysis to determine the suitability of FYA for the arterial-arterial and arterial-collector intersections within the city.

Of the 85 intersections studied, 70 intersections were recommended for FYA signal phasing -- 43 arterial-arterial (A-A) intersections and 27 arterial-collector (A-C) intersections. There were 15 intersections not recommended for FYA. Two additional

arterial-arterial (A-A) intersections had been converted to FYA prior to the study, but miscellaneous costs for construction/retro-reflective tape installation were included.

Twenty intersections are currently fully permissive controlled. Of these, 13 were not considered candidates for flashing yellow arrow due primarily to low crash rates or geometric issues; five were candidates for all four legs; and two were candidates for two legs to be converted to flashing yellow arrow.

Twenty-nine intersections are currently fully protected/permissive controlled. Of these, 26 were considered for FYA on all legs and three were considered candidates for two of the legs.

Seven intersections are currently fully protected controlled. Of these, six were considered as candidates for FYA on all legs, and one was considered as a candidate on one leg. All seven intersections were considered as Time-of-Day FYA for off-peak hours.

Twenty-nine intersections currently have a mixture of two signal controls. Of these, two intersections were not considered as candidates for FYA; five were considered for FYA on all legs; four for three legs; 15 for two legs; and three for one leg of the intersection. Two intersections were considered for FYA Time-of-Way usage for the off-peak hours.

For the purposes of this study, the priorities parallel the HSIP application. The breakdown of prioritization is presented below:

- Priority Category 1: Intersections with the highest MAG crash ranking (HSIP funds pending)
- Priority Category 2: Intersections with signal head modifications only

- Priority Category 3: Intersections with signal head and median modifications only
- Priority Category 4: Intersections with signal head and mast arm replacement
- Priority Category 5: Intersections with signal head, pole, and mast arm replacement
- Priority Category 6: Intersections not recommended for FYA

The total cost of conversion to FYA (including the intersection modifications at the two intersections already operating as FYA) is approximately \$4,532,235. The breakdown by category is summarized in **Table 6.1**.

Table 6.1: Prioritization Summary

Category	Total Intersections	Sum of Project Costs
Priority 1	12	\$831,969.50
Priority 2	18	\$377,998.50
Priority 3	6	\$373,637.00
Priority 4	12	\$660,980.00
Priority 5	24	\$2,287,649.00
Priority 6	15	\$0.00
Total	87	\$4,532,234.00

6.1 Recommendations for Future Research

The following are a number of recommendations for future studies for flashing yellow arrow studies or implementation strategies:

1. Collect additional collision data for a minimum of five years prior and five years post FYA conversion to ensure that FYA operation is safer than protected and/or protected/permissive left-turn operation.

2. Perform extensive analysis of the “one year post installation” collision increase anomaly to mitigate collisions in this post-installation time frame.
3. Pursue more data on FYA comprehension for ages: under 30 years old (millennials: learners and ages where the circular green ball is less ingrained), 30-55 years old (“simpler retrainability”), and 55 and older (ages where the circular green ball may be more understandable and retrainability may be slower) to determine if there are variances in safety in these age ranges.
4. Develop educational and awareness material for the public to better understand FYA operation. Incorporate education into driver training and testing.
5. Develop FYA signage and time requirements for signage posting since agencies vary widely on sign type and sign mounting duration.
6. Further study the three-section head for FYA operation as research is underdeveloped. A three-section head may be optimal when clearance is minimal.

REFERENCES

- American Association of State Highway and Transportation Officials (AASHTO) (2011). "Green Book." "A Policy on Geometric Design of Highways and Streets, 6th Edition." AASHTO, Washington, D.C.
- Amjadi, R. (2009). "Safety Evaluation of Offset Improvements for Left-Turn Lanes." Federal Highway Administration. Washington, D.C.
- Arizona Department of Transportation (2014 Revision), "Traffic Signal and Lighting Standard Drawings." Arizona Department of Transportation, Phoenix, Arizona.
- Arizona Department of Transportation (2015). "Accident Location Identification Surveillance System" (ALISS) Data. Arizona Department of Transportation, Phoenix, Arizona.
- Arizona Department of Transportation (2015). "E2C2 Historical Unit Price." Arizona Department of Transportation, Phoenix, Arizona.
- Arizona Department of Transportation (2015). Transportation Data Management System, "Average Annual Daily Traffic" Map. ADOT Multimodal Planning, Phoenix, Arizona.
- City of Glendale, Arizona (2013). "Average Daily Traffic" Map. City of Glendale Department of Transportation, Glendale, Arizona.
- City of Glendale Police Department (2015). "Accident Records." City of Glendale Department of Public Safety, Glendale, Arizona.
- City of Glendale, Arizona (2015). "Traffic Signal Inventory List." City of Glendale Department of Transportation, Glendale, Arizona.
- Federal Highway Administration (FHWA) Report 493 (2003). National Cooperative Highway Research Program (NCHRP) Project 3-54, "The Evaluation of Traffic Signals for Protected/Permissive Left-Turn Control." Federal Highway Administration, Washington, D.C.
- Federal Highway Administration (FHWA) (2009). "Manual on Uniform Traffic Control Devices." Federal Highway Administration, Washington, D.C.
- Federal Highway Administration (FHWA) (2015). "Highway Safety Improvement Program" Application and Requirements. Federal Highway Administration, Washington, D.C.

- Federal Highway Administration (FHWA) Crash Modification Factors Clearinghouse (2015). "Crash Modification Factors." Federal Highway Administration, Washington, D.C.
- Furst, Anthony T. (2007). "Interpretation Letter 4-320(I), Steady Yellow Arrow After Flashing Yellow Arrow" Federal Highway Administration, Washington, D.C.
- Maricopa Association of Governments (MAG), MAG Region Crash Data (2015). Maricopa Association of Governments, Phoenix, Arizona.
- Paniati, Jeffrey T. (2006). "MUTCD – Interim Approval for Optional Use of Flashing Yellow Arrow for Permissive Left-Turns (IA-10)." Federal Highway Administration, Washington, D.C.
- Perez, R. (2010). "Safety Implications of Conversions to Flashing Yellow Arrow Indications." City of Federal Way Department of Transportation, Federal Way, Washington.

APPENDIX
INTERSECTION DATA COLLECTION SHEETS

47th Avenue and Glendale Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

47 th Avenue and Glendale Avenue					
Data	Intersection				
	47 th Avenue		Glendale Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F, F	F, F	F, F	F, F	
Pole Head Types (Outboard Lt, Far Rt)	F	F	F	F	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	2	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	35	35	
LT Head Centered Over Lane	No	No	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y, Y, Y	Y, Y, Y	Y, Y, Y	Y, Y, Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1508	K	A	B	C	O	
Glendale Rank: 81						
2013	0	0	1	1	2	4
2012	0	0	0	3	3	6
2011	0	0	1	2	5	8
2010	0	0	2	2	7	11
2009	0	0	0	0	3	3
Totals:	0	0	4	8	20	32
Left-Turn Crash Rate						
Left-Turn Severity Index						0.328
Severity Index						0.736

47th Avenue and Northern Avenue, Data Sheet 1

Protected/Permissive control all legs.

47 th Avenue and Northern Avenue					
Data	Intersection				
	47 th Avenue		Northern Avenue		
	NB	SB	EB	WB	
Control	P/P	P/P	P/P	P/P	
Mast Arm Head Types	Q, F	Q, F	Q, F	Q, F, F	
Pole Head Types (Outboard Lt, Far Rt)	Q	Q	Q	Q	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40*	40*	
Grade	0	0	0	0	
Mast Arm Length	30	35	35	45	
LT Head Centered Over Lane	No	Yes	Yes	No	
Thru Heads Centered Over Lane	No	No	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other	*School Zone				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 479	K	A	B	C	O	
Glendale Rank: 33						
2013	0	0	1	2	5	8
2012	0	2	2	6	5	15
2011	0	0	2	3	5	10
2010	0	1	3	3	4	11
2009	0	0	3	0	4	7
Totals:	0	3	11	14	23	51
Left-Turn Severity Index						1.14
Severity Index						2.76

47th Avenue and Northern Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Traffic Control Devices	1	LS	\$9,000.00	\$9,000.00
Flagging Service (Off-Duty Police)	40	Hr	\$32.00	\$1,280.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	3	Ea	\$100.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	400	LF	\$2.50	\$1,000.00
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$31,400.00
Contingency (30%)				\$9,420.00
Construction Total				\$40,820.00
Design (10%)				\$4,082.00
Construction Management (15%)				\$6,123.00
Total				\$51,025.00

47th Avenue and Olive Avenue, Data Sheet 1

Permissive control all legs.

47 th Avenue and Olive Avenue					
Data	Intersection				
	47 th Avenue		Olive Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F, F	F, F	F, F	F, F	
Pole Head Types (Outboard Lt, Far Rt)	F	F	F	F	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	30	30	40	
LT Head Centered Over Lane	No	No	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 241	K	A	B	C	O	
Glendale Rank: 19						
2013	1	2	0	6	6	16
2012	0	0	2	3	6	11
2011	0	0	0	0	3	3
2010	0	0	2	4	7	13
2009	0	0	1	3	5	9
Totals:	1	2	5	16	28	52
Left-Turn Severity Index						6.094
Severity Index						7.784

47th Avenue and Olive Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Remove Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Remove Mast Arm	4	Ea	\$1,000.00	\$4,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Traffic Control Devices	1	LS	\$12,500.00	\$12,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	7	Ea	\$50.00	\$350.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	9	Ea	\$100.00	\$900.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	3	Ea	\$1,000.00	\$3,000.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	475	LF	\$2.50	\$1,187.50
Subtotal				\$45,245.50
Contingency (30%)				\$13,574.00
Construction Total				\$58,819.50
Design (10%)				\$5,882.00
Construction Management (15%)				\$8,823.00
Total				\$73,524.50

47th Avenue and Peoria Avenue, Data Sheet 1

Permissive control all legs.

47 th Avenue and Peoria Avenue					
Data	Intersection				
	47 th Avenue		Peoria Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F, F	F, F	F, F	F, F, F	
Pole Head Types (Outboard Lt, Far Rt)	F	F	F	F	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	1.5	1.5	NA	NA	
Median No Offset (feet)	NA	NA	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	35	35	45	
LT Head Centered Over Lane	No	Yes	No	No	
Thru Heads Centered Over Lane	Yes	No	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 530	K	A	B	C	O	
Glendale Rank: 35						
2013	0	0	0	0	1	1
2012	0	0	1	1	2	4
2011	0	0	1	0	3	4
2010	1	0	1	1	3	6
2009	0	0	0	1	3	4
Totals:	1	0	3	3	12	19
Left-Turn Severity Index						0.126
Severity Index						6.214

47th Avenue and Peoria Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Remove Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$12,000.00	\$12,000.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	2	Ea	\$1,000.00	\$2,000.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	395	LF	\$2.50	\$987.50
Mobilization	1	LS	\$3,200.00	\$3,200.00
Subtotal				\$35,145.50
Contingency (30%)				\$10,544.00
Construction Total				\$45,689.50
Design (10%)				\$4,569.00
Construction Management (15%)				\$6,853.00
Total				\$57,111.50

51st Avenue and Camelback Road, Data Sheet 1

Protected/Permissive control all legs.

51 st Avenue and Camelback Road						
Data	Intersection					
	51 st Avenue		Camelback Rd			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	3	0	7	6		
Median Negative Offset (feet)	3	3	5.5	5.5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	2	3		
R4-7, Object Marker, PB in Median	Y,Y,Y	N,N,N	Y,Y,Y	Y,Y,Y		
ADT	21,300	21,300	24,200	23,600		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	50	50	50		
LT Head Centered Over Lane	Yes	Yes	No	Yes		
Thru Heads Centered Over Lane	No	Yes	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 173	K	A	B	C	O	
Glendale Rank: 16						
2013	0	0	3	7	21	31
2012	0	0	1	5	15	21
2011	0	0	3	5	14	22
2010	1	0	3	7	32	43
2009	0	2	0	4	34	40
Totals:	1	2	10	28	116	157
Crash Rate						1.466
Left-Turn Crash Rate						0.339
Left-Turn Severity Index						0.760
Severity Index						9.040

51st Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	101	LF	\$5.00	\$505.00
Remove Concrete Median	330	SF	\$3.00	\$990.00
Remove Pavement	250	SF	\$5.00	\$1,250.00
Remove Pull Box	1	Ea	\$500.00	\$500.00
Remove and Replace R4-7, Object Marker	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Pavement Patch	520	SF	\$16.00	\$8,320.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Striping (White/Yellow Thermoplastic) (4")	1,472	LF	\$1.00	\$1,472.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Remove/Reconfigure Mounting Assembly	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	50	LF	\$2.50	\$125.00
Concrete Single Curb	27	LF	\$25.00	\$675.00
Concrete Median Nose	57	SF	\$20.00	\$1,140.00
Mobilization	1	LS	\$7500.00	\$7,500.00
Subtotal				\$42,179.00
Contingency (30%)				\$12,654.00
Construction Total				\$54,833.00
Design (10%)				\$5,483.00
Construction Management (15%)				\$8,225.00
Total				\$68,541.00

51st Avenue and Maryland Avenue, Data Sheet 1

Protected/Permissive control all legs.

51 st Avenue and Maryland Avenue					
Data	Intersection				
	51 st Avenue		Maryland Avenue		
	NB	SB	EB	WB	
Control	P/P	P/P	P/P	P/P	
Mast Arm Head Types	Q, F	Q, F	Q, F	Q, F	
Pole Head Types (Outboard Lt, Far Rt)	Q	Q	Q	Q	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	2	2	
No. Opposing Thru Lanes	2	3	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	35	35	35	30	
LT Head Centered Over Lane	No	Yes	No	Yes	
Thru Heads Centered Over Lane	No	No	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1098	K	A	B	C	O	
Glendale Rank: 60						
2013	0	0	1	1	8	10
2012	0	1	0	1	12	14
2011	0	0	0	1	4	5
2010	0	0	1	5	8	14
2009	0	0	0	0	9	9
Totals:	0	1	2	8	41	52
Left-Turn Severity Index						0.074
Severity Index						1.060

51st Avenue and Maryland Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	2	Ea	\$1,000.00	\$2,000.00
Conductors	360	LF	\$2.50	\$900.00
Mobilization	1	LS	\$3,000.00	\$3,000.00
Subtotal				\$28,138.00
Contingency (30%)				\$8,441.00
Construction Total				\$36,579.00
Design (10%)				\$3,658.00
Construction Management (15%)				\$5,487.00
Total				\$45,724.00

51st Avenue and Glendale Avenue, Data Sheet 1

Protected/Permissive control all legs.

51 st Avenue and Glendale Avenue					
Data	Intersection				
	51 st Avenue		Glendale Avenue		
	NB	SB	EB	WB	
Control	P/P	P/P	P/P	P/P	
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	2	2	
R4-7, Object Marker, PB in Median	N,N,N	N,N,N	N,N,N	N,N,N	
ADT	24,000	24,600	26,700	17,100	
Posted Speed Limit (mph)	40	40	35	40	
Grade	0	0	0	0	
Mast Arm Length	45	45	50	50	
LT Head Centered Over Lane	Yes	Yes	Yes	Yes	
Thru Heads Centered Over Lane	No	No	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 253	K	A	B	C	O	
Glendale Rank: 20						
2013	0	0	4	1	7	12
2012	0	0	2	3	15	20
2011	0	1	4	6	20	31
2010	0	0	1	3	20	24
2009	0	0	1	4	19	24
Totals:	0	1	12	17	81	111
Left-Turn Severity Index						1.230
Severity Index						2.398

51st Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,800.00	\$4,800.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Remove/Reconfigure Mounting Assembly	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	30	LF	\$2.50	\$75.00
Mobilization	1	LS	\$3,000.00	\$3,000.00
Subtotal				\$19,677.00
Contingency (30%)				\$5,903.00
Construction Total				\$25,580.00
Design (10%)				\$2,558.00
Construction Management (15%)				\$3,837.00
Total				\$31,975.00

51st Avenue and Northern Avenue, Data Sheet 1

Protected/Permissive control all legs.

51 st Avenue and Northern Avenue						
Data	Intersection					
	51 st Avenue		Northern Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	3	3	2.5	2.5		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	23,600	24,000	26,600	25,100		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	50	50	50	45		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1508	K	A	B	C	O	
Glendale Rank: 81						
2013	0	0	5	11	21	37
2012	0	0	4	8	22	34
2011	0	0	3	6	26	35
2010	0	0	3	2	20	25
2009	0	1	4	6	25	36
Totals:	0	1	19	33	114	167
Crash Rate						1.841
Left-Turn Crash Rate						0.3639
Left-Turn Severity Index						1.006
Severity Index						3.762

51st Avenue and Northern Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea.	\$300.00	\$2,400.00
Remove Mast Arm	2	Ea.	\$1,000.00	\$2,000.00
Relocate IISNS	2	Ea.	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$10,000.00	\$10,000.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	2	Ea	\$1,800.00	\$3,600.00
Conductors	400	LF	\$2.50	\$1,000.00
Mobilization	1	LS	\$3,000.00	\$3,000.00
Subtotal				\$32,968.00
Contingency (30%)				\$9,890.00
Construction Total				\$42,858.00
Design (10%)				\$4,286.00
Construction Management (15%)				\$6,429.00
Total				\$53,573.00

51st Avenue and Olive Avenue, Data Sheet 1

Protected control all legs.

51 st Avenue and Olive Avenue						
Data	Intersection					
	51 st Avenue			Olive Avenue		
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Type (Outbrd Lt, Far Rt)	R, None	R, None	R, None	R, None		
Median Width (feet)	2	2	2	2		
Median Negative Offset (feet)	-3	-3	-2.2	-2.2		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	3	2		
R4-7, Object Marker, PB in Median	Yes	Yes	Yes	Yes		
ADT	-	-	-	-		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	50	45	55		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	No	Yes	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	N,Y,Y	N,Y,Y		
Other	Rt lane on departure side, all legs					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 116	K	A	B	C	O	
Glendale Rank: 15						
2013	0	0	2	6	22	30
2012	0	0	2	13	38	53
2011	0	1	2	8	31	42
2010	0	0	0	6	25	31
2009	0	0	0	7	21	27
Totals:	0	1	6	40	136	183
Crash Rate						1.703
Left-Turn Crash Rate						0.112
Left-Turn Severity Index						0.162
Severity Index						3.104

51st Avenue and Olive Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	4	Ea	\$400.00	\$1,600.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Traffic Signal Face (Ped, M/H, Countdown)	2	Ea	\$400.00	\$800.00
Ped Push Button (PPB)	2	Ea	\$200.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	4	Ea	\$120.00	\$480.00
Traffic Signal Mounting Assembly (Type V)	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate IISNS	1	Ea	\$200.00	\$200.00
Luminaire	2	Ea	\$500.00	\$1,000.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Mast Arm (20')	2	Ea	\$600.00	\$1,200.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Electrical Conduit (2 1/2" w/ 1/4" Pull Rope)	20	LF	\$11.00	\$220.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$51,212.00
Contingency (30%)				\$15,364.00
Construction Total				\$66,576.00
Design (10%)				\$6,658.00
Construction Management (15%)				\$9,986.00
Total				\$83,220.00

51st Avenue and Peoria Avenue, Data Sheet 1

FYA control all legs.

51 st Avenue and Peoria Avenue					
Data	Intersection				
	51 st Avenue		Peoria Avenue		
	NB	SB	EB	WB	
Control	FYA	FYA	FYA	FYA	
Mast Arm Head Types	FYA,F, F	FYA,F, F	FYA,F, F	FYA,F, F	
Pole Head Types (Outboard Lt, Far Rt)	FYA, None	Q, None	Q, None	Q, None	
Median Width (feet)	2	2	2	2	
Median Negative Offset (feet)	NA	NA	-2.5	-2.5	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	13	13	NA	NA	
No. Opposing Thru Lanes	2	3	3	3	
R4-7, Object Marker, PB in Median	Yes	Yes	Yes	Yes	
ADT	12,961	12,724	15,722	14,543	
Posted Speed Limit (mph)	40	40	40	40	
Grade	0	0	0	0	
Mast Arm Length	55	45	50	55	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Yes	Yes	Yes	Yes	
Other	ASC3 Controller				

51st Avenue and Peoria Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Removal of Pole Foundation	1	Ea	\$2,000.00	\$2,000.00
Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	3	Ea	\$400.00	\$1,200.00
Retro-Reflective Tape	16	Ea	\$50.00	\$800.00
Retro-Reflective Tape (New)	3	Ea	\$10.00	\$30.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Electrical Conduit (2 1/2" w/ 1/4" Pull Rope)	20	LF	\$11.00	\$220.00
Conductors	250	LF	\$250.00	\$625.00
Mobilization	1	LS	\$2,500.00	\$2,500.00
Subtotal				\$25,063.00
Contingency (30%)				\$7,518.00
Total				\$32,581.00

55th Avenue and Camelback Road, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

55 th Avenue and Camelback Avenue					
Data	Intersection				
	55 th Avenue		Camelback Road		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F	F,F*	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,F	F	F	F	
Median Width (feet)	60	0	0	0	
Median Negative Offset (feet)	28.4	28.4	NA	NA	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	2	2	
R4-7, Object Marker, PB in Median	NA	Y,Y,Y	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	30	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	20	25	35	35	
LT Head Centered Over Lane	No	Yes	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other	*SB F head is located on end of EB mast arm				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1361	K	A	B	C	O	
Glendale Rank: 71						
2013	0	0	1	1	9	11
2012	0	0	0	1	3	4
2011	0	0	1	1	4	6
2010	0	0	1	2	5	8
2009	0	0	1	4	7	12
Totals:	0	0	4	9	28	41
Left-Turn Severity Index						0.188
Severity Index						0.810

55th Avenue and Bethany Home Road, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

55 th Avenue and Bethany Home Road					
Data	Intersection				
	55 th Avenue		Bethany Home		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F (far rt)	F (far rt)	F (far rt)	F (far rt)	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	1	2	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	35	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	30	35	35	
LT Head Centered Over Lane	Yes	No	No	Yes	
Thru Heads Centered Over Lane	No	Yes	Yes	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1410	K	A	B	C	O	
Glendale Rank: 74						
2013	0	0	2	3	3	8
2012	0	0	2	1	6	9
2011	0	0	0	2	2	4
2010	0	0	0	2	4	6
2009	0	1	1	1	4	7
Totals:	0	1	5	9	19	34
Left-Turn Severity Index						0.164
Severity Index						1.254

55th Avenue and Northern Avenue, Data Sheet 1

Permissive control on the north and south legs, protected/permissive on the east and west legs.

55 th Avenue and Northern Avenue					
Data	Intersection				
	55 th Avenue		Northern Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	P/P	P/P	
Mast Arm Head Types	F,F	F,F	Q,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F, None	F, None	Q, None	Q, None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	45	45	45	
LT Head Centered Over Lane	Yes	No	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 925	K	A	B	C	O	
Glendale Rank: 53						
2013	0	0	0	3	3	6
2012	0	0	0	2	3	5
2011	0	0	0	1	7	8
2010	0	0	1	5	5	11
2009	0	2	2	4	10	18
Totals:	0	2	3	15	28	48
Left-Turn Severity Index						0.122
Severity Index						1.782

55th Avenue and Northern Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$12,500.00	\$12,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$300.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	5	Ea	\$100.00	\$500.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	3	Ea	\$1,800.00	\$5,400.00
Conductors	486	LF	\$2.50	\$1,215.00
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$38,773.00
Contingency (30%)				\$11,632.00
Construction Total				\$50,405.00
Design (10%)				\$5,041.00
Construction Management (15%)				\$7,561.00
Total				\$63,007.00

55th Avenue and Olive Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

55 th Avenue and Olive Avenue					
Data	Intersection				
	55 th Avenue		Olive Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	30	35	45	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1252	K	A	B	C	O	
Glendale Rank: 65						
2013	0	0	2	2	5	9
2012	0	0	0	1	3	4
2011	0	0	1	4	4	9
2010	0	0	0	3	6	9
2009	0	1	0	0	7	8
Totals:	0	1	3	10	25	39
Left-Turn Severity Index						0.042
Severity Index						1.160

55th Avenue and Peoria Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

55 th Avenue and Peoria Avenue					
Data	Intersection				
	55 th Avenue		Peoria Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	2	2	
Median Negative Offset (feet)	NA	NA	1.78	1.78	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,N	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	35	40	
LT Head Centered Over Lane	No	No	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1331	K	A	B	C	O	
Glendale Rank: 68						
2013	0	1	2	0	4	7
2012	0	0	0	4	0	4
2011	0	0	2	3	7	12
2010	0	0	0	2	5	7
2009	0	0	0	1	4	5
Totals:	0	1	4	10	20	35
Left-Turn Severity Index						0.260
Severity Index						1.220

55th Avenue and Thunderbird Road, Data Sheet 1

Permissive control on the north and south and east legs and protected/permissive control on the west leg.

55 th Avenue and Thunderbird Road					
Data	Intersection				
	55 th Avenue		Thunderbird Rd		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	P/P	
Mast Arm Head Types	F,F	F,F	F,F	Q,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	Q,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	35	35	
LT Head Centered Over Lane	No	No	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 189	K	A	B	C	O	
Glendale Rank: 17						
2013	0	0	1	5	6	12
2012	1	0	1	3	7	12
2011	0	0	0	2	14	16
2010	0	1	1	0	5	7
2009	0	1	2	6	5	14
Totals:	1	2	5	16	37	61
Left-Turn Severity Index						6.038
Severity Index						7.820

55th Avenue and Thunderbird Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Removal of Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Remove Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$10,000.00	\$10,000.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	3	Ea	\$400.00	\$1,200.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Ped Push Button	2	Ea	\$200.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (35')	1	Ea	\$800.00	\$800.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mobilization	1	LS	\$3,750.00	\$3,750.00
Subtotal				\$41,908.00
Contingency (30%)				\$12,572.00
Construction Total				\$54,480.00
Design (10%)				\$5,448.00
Construction Management (15%)				\$8,172.00
Total				\$68,100.00

55th Avenue and Bell Road, Data Sheet 1

Protected/Permissive control all legs.

55 th Avenue and Bell Road					
Data	Intersection				
	55 th Avenue		Bell Road		
	NB	SB	EB	WB	
Control	P/P	P/P	P/P	P/P	
Mast Arm Head Types	Q,F	Q,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,F	Q,None	Q,None	
Median Width (feet)	NA	NA	5	4.5	
Median Negative Offset (feet)	NA	NA	5.5	5.5	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	4	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	3	
R4-7, Object Marker, PB in Median	NA	Y,Y,N	Y,Y,Y	Y,Y,Y	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	30	45	55	
LT Head Centered Over Lane	No	Yes	Yes	No	
Thru Heads Centered Over Lane	No	Yes	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	N,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1435	K	A	B	C	O	
Glendale Rank: 75						
2013	0	0	0	0	6	6
2012	0	0	0	1	4	5
2011	0	1	1	4	4	10
2010	0	0	0	1	4	5
2009	0	0	2	2	5	9
Totals:	0	1	3	8	23	35
Left-Turn Severity Index						0.210
Severity Index						1.068

55th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	92	LF	\$5.00	\$460.00
Remove Concrete Median	174	SF	\$3.00	\$522.00
Remove Pavement	214	SF	\$5.00	\$1,070.00
Remove Pull Box	1	Ea	\$500.00	\$500.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Removal of Pole Foundations	1	Ea	\$2,000.00	\$2,000.00
Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Pavement Patch	380	SF	\$16.00	\$6,080.00
Furnish/Install Temp Traffic Control	1	LS	\$15,000.00	\$15,000.00
Flagging Services, Off-Duty Police	32	Hr	\$32.00	\$1,024.00
Striping (White/Yellow Thermoplastic) (4")	95	LF	\$1.00	\$95.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Conductors	190	LF	\$2.50	\$475.00
Concrete Single Curb	14	LF	\$25.00	\$350.00
Concrete Median Nose	50	SF	\$20.00	\$1,000.00
Mobilization	1	LS	\$3000.00	\$3,000.00
Concrete Sidewalk	7	SF	30	\$210.00
Subtotal				\$47,886.00
Contingency (30%)				\$14,366.00
Construction Total				\$62,252.00
Design (10%)				\$6,225.00
Construction Management (15%)				\$9,338.00
Total				\$77,815.00

55th Avenue and Union Hills Drive, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

55 th Avenue and Union Hills Drive					
Data	Intersection				
	55 th Avenue		Union Hills Dr		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None		F,None	
Median Width (feet)	0	0	7	7	
Median Negative Offset (feet)	NA	NA	6.3	6.3	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	3	
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,N	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	NA*	40	40	
Grade	0	0	0	0	
Mast Arm Length	40	30	35	35	
LT Head Centered Over Lane	Yes	NA	No	No	
Thru Heads Centered Over Lane	Yes	NA	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,N	
Other	*SB is not a thru street. Unpaved, no striping.				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1479	K	A	B	C	O	
Glendale Rank: 78						
2013	0	0	1	3	1	5
2012	0	0	0	1	3	4
2011	0	0	0	0	1	1
2010	0	0	1	1	4	6
2009	0	2	0	0	1	3
Totals:	0	2	2	5	10	19
Left-Turn Severity Index						0.248
Severity Index						1.210

57th Drive and Glendale Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

47 th Avenue and Glendale Avenue					
Data	Intersection				
	47 th Avenue		Glendale Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	16	16	10.4	10.4	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	2	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	25	25	
Grade	0	0	0	0	
Mast Arm Length	25	25	30	30	
LT Head Centered Over Lane	NA	NA	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	No	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1508	K	A	B	C	O	
Glendale Rank: 81						
2013	0	0	2	2	4	8
2012	0	0	0	1	9	10
2011	0	0	2	3	6	11
2010	0	0	0	1	8	9
2009	0	0	0	0	5	5
Totals:	0	0	4	7	32	43
Left-Turn Severity Index						0.146
Severity Index						0.742

57th Avenue and Bell Road, Data Sheet 1

Protected/permissive control on the north, east, and west legs and protected control on the south leg.

57 th Avenue and Bell Road						
Data	Intersection					
	57 th Avenue		Bell Road			
	NB	SB	EB	WB		
Control	P/P	Prot	P/P	P/P		
Mast Arm Head Types	Q,F,F	R,F,F	Q,F,F	Q,F,F		
Pole Head Type (Outbrd Lt, Far Rt)	Q,None	R,None	Q,None	Q,None		
Median Width (feet)	4	0	4.5	3.5		
Median Negative Offset (feet)	NA	NA	5.1	5.1		
Median No Offset (feet)	Yes	Yes	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	1	1	3	3		
R4-7, Object Marker, PB in Median	NA	Yes	Yes	No		
ADT	-	-	-	-		
Posted Speed Limit (mph)	25	25	40	40		
Grade	0	0	0	0		
Mast Arm Length	35	35	45	45		
LT Head Centered Over Lane	No	No	No	No		
Thru Heads Centered Over Lane	No	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	N,Y,N	N,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1081	K	A	B	C	O	
Glendale Rank: 57						
2013	0	0	0	0	5	5
2012	0	0	0	3	7	10
2011	0	1	3	2	6	12
2010	0	0	0	3	9	12
2009	0	1	3	0	3	7
Totals:	0	2	6	8	30	46
Left-Turn Severity Index						0.760
Severity Index						1.736

57th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	85	LF	\$5.00	\$425.00
Remove Concrete Median	147	SF	\$3.00	\$441.00
Remove Pavement	194	SF	\$5.00	\$970.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Remove/Relocate Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Pavement Patch	342	SF	\$16.00	\$5,472.00
Furnish/Install Temp Traffic Control	1	LS	\$18,000.00	\$18,000.00
Flagging Services, Off-Duty Police	40	Hr	\$32.00	\$1,280.00
Striping (White/Yellow Thermoplastic) (4")	118	LF	\$1.00	\$118.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$300.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	6	Ea	\$600.00	\$3,600.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	535	LF	\$2.50	\$1,337.50
Concrete Single Curb	15	LF	\$25.00	\$375.00
Concrete Median Nose	15	SF	\$20.00	\$300.00
Mobilization	1	LS	\$5,000.00	\$5,000.00
Subtotal				\$52,518.50
Contingency (30%)				\$15,756.00
Construction Total				\$68,274.50
Design (10%)				\$6,827.00
Construction Management (15%)				\$10,241.00
Total				\$85,342.50

59th Avenue and Camelback Road, Data Sheet 1

Protected/permissive control all legs.

59 th Avenue and Camelback Road						
Data	Intersection					
	59 th Avenue		Camelback Rd			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	5	0	4	4		
Median Negative Offset (feet)	0	0	5	5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	N,N,N	Y,Y,Y	Y,Y,Y		
ADT	23,200	23,200	23,600	22,800		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	45	50	35	40		
LT Head Centered Over Lane	Yes	No	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 598	K	A	B	C	O	
Glendale Rank: 39						
2013	0	0	3	9	22	34
2012	0	0	2	5	12	19
2011	0	0	2	1	12	15
2010	0	0	0	7	19	26
2009	0	1	2	10	30	43
Totals:	0	1	9	32	95	137
Crash Rate						1.617
Left-Turn Crash Rate						0.330
Left-Turn Severity Index						0.492
Severity Index						2.844

59th Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	121	LF	\$5.00	\$605.00
Remove Concrete Median	150	SF	\$3.00	\$450.00
Remove Pavement	238	SF	\$5.00	\$1,190.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Pavement Patch	460	SF	\$16.00	\$7,360.00
Furnish/Install Temp Traffic Control	1	LS	\$8,000.00	\$8,000.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Striping (White/Yellow Thermoplastic) (4")	280	LF	\$1.00	\$280.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Pull Box (No. 7 w/ Ext)	2	Ea	\$500.00	\$1,000.00
Conductors	200	LF	\$2.50	\$500.00
Concrete Single Curb	30	LF	\$25.00	\$750.00
Concrete Median Nose	65	SF	\$20.00	\$1,300.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$43,947.00
Contingency (30%)				\$13,184.00
Construction Total				\$57,131.00
Design (10%)				\$5,713.00
Construction Management (15%)				\$8,570.00
Total				\$71,414.00

59th Avenue and Missouri Avenue, Data Sheet 1

Protected control on the north and south legs and permissive control on the east and west legs.

59 th Avenue and Missouri Avenue					
Data	Intersection				
	59 th Avenue		Missouri Avenue		
	NB	SB	EB	WB	
Control	Prot	Prot	Perm	Perm	
Mast Arm Head Types	R,F,F	R,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	F,None	F,None	
Median Width (feet)	4	4	0	0	
Median Negative Offset (feet)	5.3	5.3	2.7	2.7	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	1	1	
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	40	40	
Grade	0	0	0	0	
Mast Arm Length	45	40	35	35	
LT Head Centered Over Lane	Yes	No	No	Yes	
Thru Heads Centered Over Lane	No	No	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1269	K	A	B	C	O	
Glendale Rank: 67						
2013	0	0	1	2	4	7
2012	0	0	0	2	6	8
2011	0	1	1	1	4	7
2010	0	0	0	2	2	4
2009	0	1	0	2	6	9
Totals:	0	2	2	9	22	35
Left-Turn Severity Index						0.488
Severity Index						1.426

59th Avenue and Missouri Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	90	LF	\$5.00	\$450.00
Remove Concrete Median	157	SF	\$3.00	\$471.00
Remove Pavement	208	SF	\$5.00	\$1,040.00
Remove Signs	1	Ea	\$250.00	\$250.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Pre-emption/Traffic Device	2	Ea	\$200.00	\$400.00
Pavement Patch	365	SF	\$16.00	\$5,840.00
Furnish/Install Temp Traffic Control	1	LS	\$10,000.00	\$10,000.00
Flagging Services, Off-Duty Police	32	Hr	\$32.00	\$1,024.00
Striping (White/Yellow Thermoplastic) (4")	106	LF	\$1.00	\$106.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Pedestrian Push Button	2	Ea	\$200.00	\$400.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Mast Arm (50')	2	Ea	\$1,500.00	\$3,000.00
Conductors	360	LF	\$2.50	\$900.00
Concrete Single Curb	12	LF	\$25.00	\$300.00
Concrete Median Nose	15	SF	\$20.00	\$300.00
Mobilization	1	LS	\$3,600.00	\$3,600.00
Subtotal				\$40,481.00
Contingency (30%)				\$12,144.00
Construction Total				\$52,625.00
Design (10%)				\$5,263.00
Construction Management (15%)				\$7,894.00
Total				\$65,782.00

59th Avenue and Bethany Home Road, Data Sheet 1

Protected/permissive control all legs.

59 th Avenue and Bethany Home Road						
Data	Intersection					
	59 th Avenue		Bethany Home			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	4	4	0	0		
Median Negative Offset (feet)	-3.5	-3.5	NA	NA		
Median No Offset (feet)	NA	NA	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	-	-	-	-		
ADT	-	-	-	-		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	45	55	40		
LT Head Centered Over Lane	Yes	No	Yes	No		
Thru Heads Centered Over Lane	Yes	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 20	K	A	B	C	O	
Glendale Rank: 4						
2013	0	0	6	4	22	32
2012	0	0	5	6	23	34
2011	0	0	2	7	21	30
2010	1	0	2	5	30	38
2009	1	1	3	4	25	34
Totals:	2	1	18	26	121	168
Crash Rate						2.177
Left-Turn Crash Rate						0.531
Left-Turn Severity Index						6.986
Severity Index						15.016

59th Avenue and Bethany Home Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	108	LF	\$5.00	\$540.00
Remove Concrete Median	200	SF	\$3.00	\$600.00
Remove Pavement	112	SF	\$5.00	\$560.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Remove/Relocate Mast Arm	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Pavement Patch	336	SF	\$16.00	\$5,376.00
Furnish/Install Temp Traffic Control	1	LS	\$5,200.00	\$5,200.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Striping (White/Yellow Thermoplastic) (4")	500	LF	\$1.00	\$500.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	200	LF	\$2.50	\$500.00
Concrete Single Curb	28	LF	\$25.00	\$700.00
Concrete Median Nose	40	SF	\$20.00	\$800.00
Mobilization	1	LS	\$5,000.00	\$5,000.00
Subtotal				\$48,788.00
Contingency (30%)				\$14,636.00
Construction Total				\$63,424.00
Design (10%)				\$6,342.00
Construction Management (15%)				\$9,514.00
Total				\$79,280.00

59th Avenue and Glendale Avenue, Data Sheet 1

Protected/Permissive control all legs.

59 th Avenue and Glendale Avenue						
Data	Intersection					
	59 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,F,F (near)	Q,F,F (near)	Q,F,F (near)	Q,F,F (near)		
Median Width (feet)	4	4	5	4		
Median Negative Offset (feet)	NA	NA	2	2		
Median No Offset (feet)	Yes	Yes	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	22,000	20,200	17,100	20,400		
Posted Speed Limit (mph)	35	35	35	35		
Grade	0	0	0	0		
Mast Arm Length	40	40	35	40		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	ASC2 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 322	K	A	B	C	O	
Glendale Rank: 26						
2013	0	0	4	2	9	15
2012	0	0	2	7	20	29
2011	0	0	3	3	16	22
2010	0	0	0	4	22	26
2009	0	0	1	6	18	25
Totals:	0	0	10	22	85	117
Crash Rate						1.608
Left-Turn Crash Rate						0.275
Left-Turn Severity Index						0.498
Severity Index						2.064

59th Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	9	Ea.	\$300.00	\$2,700.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	12	Ea	\$600.00	\$7,200.00
Retro-Reflective Tape	15	Ea	\$50.00	\$750.00
Remove/Reconfigure Mounting Assembly	8	Ea	\$100.00	\$800.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$15,150.00
Contingency (30%)				\$4,545.00
Construction Total				\$19,695.00
Design (10%)				\$1,970.00
Construction Management (15%)				\$2,954.00
Total				\$24,619.00

59th Avenue and Myrtle Avenue, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

59 th Avenue and Myrtle Avenue					
Data	Intersection				
	59 th Avenue		Myrtle Avenue		
	NB	SB	EB	WB	
Control	P/P	P/P	Perm	Perm	
Mast Arm Head Types	Q,F,F	Q,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	5.4	5.4	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	3	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	35	35	25	25	
Grade	0	0	0	0	
Mast Arm Length	45	45	30	30	
LT Head Centered Over Lane	Yes	No	No	Yes	
Thru Heads Centered Over Lane	No	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 943	K	A	B	C	O	
Glendale Rank: 54						
2013	0	0	2	3	4	9
2012	0	0	0	2	9	11
2011	0	2	0	1	3	6
2010	0	0	2	2	6	10
2009	0	0	1	3	3	7
Totals:	0	2	5	11	25	43
Left-Turn Severity Index						0.488
Severity Index						1.762

59th Avenue and Myrtle Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea.	\$300.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$4,000.00	\$4,000.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	175	LF	\$2.50	\$437.50
Mobilization	1	LS	\$1,000.00	\$1,000.00
Subtotal				\$12,549.50
Contingency (30%)				\$3,765.00
Construction Total				\$16,314.50
Design (10%)				\$1,631.00
Construction Management (15%)				\$2,447.00
Total				\$20,392.50

59th Avenue and Northern Avenue, Data Sheet 1

Protected/permissive control all legs.

59 th Avenue and Northern Avenue						
Data	Intersection					
	59 th Avenue		Northern Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	2	2		
R4-7, Object Marker, PB in Median	N,N,N	N,N,N	N,N,N	N,N,N		
ADT	23,400	22,000	25,100	13,600		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	40	40	55	40		
LT Head Centered Over Lane	No	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 6	K	A	B	C	O	
Glendale Rank: 3						
2013	1	2	8	6	28	45
2012	0	0	9	17	23	49
2011	0	0	3	5	23	31
2010	0	0	2	6	24	32
2009	0	3	3	9	19	34
Totals:	1	5	25	43	117	191
Crash Rate						2.487
Left-Turn Crash Rate						0.573
Left-Turn Severity Index						1.788
Severity Index						12.074

59th Avenue and Northern Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	2	Ea	\$8,000.00	\$16,000.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Temp Traffic Control	1	LS	\$12,000.00	\$12,000.00
Flagging Service (Off-Duty Police)	32	Hr	\$32.00	\$1,024.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Pedestrian Push Button	4	Ea	\$200.00	\$800.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	8	Ea	\$100.00	\$800.00
Luminaire	1	Ea	\$500.00	\$500.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	2	Ea	\$1,900.00	\$3,800.00
Mast Arm (20')	1	Ea	\$600.00	\$600.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	680	LF	\$2.50	\$1,700.00
Mobilization	1	LS	\$6,000.00	\$6,000.00
Subtotal				\$59,644.00
Contingency (30%)				\$17,893.00
Construction Total				\$77,537.00
Design (10%)				\$7,754.00
Construction Management (15%)				\$11,631.00
Total				\$96,922.00

59th Avenue and Brown Street, Data Sheet 1

Protective/permissive control on the north leg and permissive control on south, east, and west legs.

47 th Avenue and Glendale Avenue					
Data	Intersection				
	59 th Avenue		Brown Road		
	NB	SB	EB	WB	
Control	P/P	Perm	Perm	Perm	
Mast Arm Head Types	Q,F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	F,None	F,None	F,None	
Median Width (feet)	0	4	0	0	
Median Negative Offset (feet)	2.42	2.42	NA	NA	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	3	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	50	35	30	25	
LT Head Centered Over Lane	No	Yes	Yes	Yes	
Thru Heads Centered Over Lane	Yes	No	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1029	K	A	B	C	O	
Glendale Rank: 55						
2013	0	0	0	0	3	3
2012	0	0	1	4	0	5
2011	0	1	0	0	6	7
2010	0	0	2	5	10	17
2009	0	1	1	2	5	9
Totals:	0	2	4	11	24	41
Left-Turn Severity Index						0.496
Severity Index						1.678

59th Avenue and Brown Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	2	Ea	\$300.00	\$600.00
Remove/Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$5,000.00	\$5,000.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	5	SF	\$20.00	\$100.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	2	Ea	\$600.00	\$1,200.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	205	LF	\$2.50	\$512.50
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$15,624.50
Contingency (30%)				\$4,687.00
Construction Total				\$20,311.50
Design (10%)				\$2,031.00
Construction Management (15%)				\$3,047.00
Total				\$25,389.50

59th Avenue and Peoria Avenue, Data Sheet 1

Protected/permissive control on all legs.

59 th Avenue and Peoria Avenue						
Data	Intersection					
	59 th Avenue		Peoria Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Type (Outbrd Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	4	4	4	4		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	-7.5	-7.5	-7.5	-7.5		
No. Opposing Thru Lanes	3	3	3	3		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	27,600	28,400	29,700	28,400		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	55	55	55		
LT Head Centered Over Lane	Yes	No	No	No		
Thru Heads Centered Over Lane	No	Yes	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 54	K	A	B	C	O	
Glendale Rank: 8						
2013	0	1	4	4	29	38
2012	0	1	2	4	16	23
2011	0	0	3	8	27	38
2010	0	3	5	10	21	39
2009	0	2	3	11	23	39
Totals:	0	7	17	37	116	177
Crash Rate						1.968
Left-Turn Crash Rate						0.422
Left-Turn Severity Index						1.456
Severity Index						6.178

59th Avenue and Peoria Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	50	LF	\$5.00	\$250.00
Remove Concrete Median	120	SF	\$3.00	\$360.00
Remove Pavement	190	SF	\$5.00	\$950.00
Remove Pull Box	1	Ea	\$500.00	\$500.00
Remove and Replace R4-7, Object Marker	1	Ea	\$250.00	\$250.00
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Pavement Patch	240	SF	\$16.00	\$3,840.00
Furnish/Install Temp Traffic Control	1	LS	\$5,000.00	\$5,000.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Striping (Yellow Thermoplastic) (4'')	20	LF	\$1.00	\$20.00
Striping (Paint)	8	LF	\$0.50	\$4.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	4	Ea	\$400.00	\$1,600.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Retro-Reflective Tape (New)	12	Ea	\$10.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	4	Ea	\$200.00	\$800.00
Remove Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	150	LF	\$2.50	\$375.00
Concrete Median Nose	15	SF	\$20.00	\$300.00
Mobilization	1	LS	\$2,400.00	\$2,400.00
Subtotal				\$27,481.00
Contingency (30%)				\$8,244.00
Construction Total				\$35,725.00
Design (10%)				\$3,573.00
Construction Management (15%)				\$5,359.00
Total				\$44,657.00

59th Avenue and Cholla Street, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

59 th Avenue and Cholla Street					
Data	Intersection				
	59 th Avenue		Cholla Street		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	2	2	0	0	
Median Negative Offset (feet)	1.38	1.38	NA	NA	
Median No Offset (feet)	NA	NA	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	3	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	35	35	35	35	
LT Head Centered Over Lane	No	No	No	No	
Thru Heads Centered Over Lane	No	Yes	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1467	K	A	B	C	O	
Glendale Rank: 77						
2013	0	1	1	1	2	5
2012	0	0	1	1	4	6
2011	0	0	0	1	3	4
2010	0	0	0	0	1	1
2009	0	2	0	0	5	7
Totals:	0	3	2	3	15	23
Left-Turn Severity Index						0.008
Severity Index						1.546

59th Avenue and Cactus Road, Data Sheet 1

Protected/permissive control all legs.

59 th Avenue and Cactus Road						
Data	Intersection					
	59 th Avenue		Cactus Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	3	NA	2	2		
Median Negative Offset (feet)	NA	NA	2.82	2.82		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	3	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	NA	Y,Y,Y	Y,Y,Y		
ADT	28,900	27,600	25,900	25,000		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	50	35	55		
LT Head Centered Over Lane	No	Yes	No	No		
Thru Heads Centered Over Lane	Yes	No	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 266	K	A	B	C	O	
Glendale Rank: 22						
2013	0	1	6	5	14	26
2012	0	1	2	2	16	21
2011	0	2	1	2	7	12
2010	0	0	4	5	13	22
2009	0	0	1	6	10	17
Totals:	0	4	14	20	60	98
Crash Rate						0.999
Left-Turn Crash Rate						0.286
Left-Turn Severity Index						1.382
Severity Index						3.800

59th Avenue and Cactus Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundations	2	Ea	\$2,000.00	\$4,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	2	Ea	\$8,000.00	\$16,000.00
Relocate IISNS	3	Ea	\$400.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$18,000.00	\$18,000.00
Flagging Service (Off-Duty Police)	32	Hr	\$32.00	\$1,024.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	10	Ea	\$100.00	\$1,000.00
Relocate Luminaire	4	Ea	\$300.00	\$1,200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	2	Ea	\$1,400.00	\$2,800.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Conductors	870	LF	\$2.50	\$2,175.00
Mobilization	1	LS	\$7,500.00	\$7,500.00
Concrete Sidewalk	30	SF	\$30.00	\$900.00
Subtotal				\$68,139.00
Contingency (30%)				\$20,442.00
Construction Total				\$88,581.00
Design (10%)				\$8,858.00
Construction Management (15%)				\$13,287.00
Total				\$110,726.00

59th Avenue and Eugie Avenue, Data Sheet 1

Permissive control on the north, east, and west legs and protected/permissive on the south leg.

59 th Avenue and Eugie Avenue					
Data	Intersection				
	59 th Avenue		Eugie Avenue		
	NB	SB	EB	WB	
Control	Perm	P/P	Perm	Perm	
Mast Arm Head Types	F,F	Q,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	Q,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	18.8	18.8	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	3	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	NA	25	
Grade	0	0	0	0	
Mast Arm Length	40	35	40	35	
LT Head Centered Over Lane	No	Yes	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1091	K	A	B	C	O	
Glendale Rank: 58						
2013	0	0	1	4	3	8
2012	0	0	4	3	5	12
2011	0	0	0	0	8	8
2010	0	0	2	3	8	13
2009	0	0	1	2	3	6
Totals:	0	0	8	12	27	47
Left-Turn Severity Index						0.592
Severity Index						1.252

59th Avenue and Eugie Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	2	Ea	\$300.00	\$300.00
Furnish and Install Temp Traffic Control Devices	1	LS	\$1,500.00	\$1,500.00
Flagging Service (Off-Duty Police)	8	Hr	\$32.00	\$256.00
Left-Turn Yield on FYA Sign	5	SF	\$20.00	\$100.00
Traffic Signal Face (Type FYA) (LED)	2	Ea	\$600.00	\$1,200.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$750.00	\$750.00
Subtotal				\$6,406.00
Contingency (30%)				\$1,922.00
Construction Total				\$8,328.00
Design (10%)				\$833.00
Construction Management (15%)				\$1,249.00
Total				\$10,410.00

59th Avenue and Thunderbird Road, Data Sheet 1

Protected/permissive control on all legs.

59 th Avenue and Thunderbird Road						
Data	Intersection					
	59 th Avenue		Thunderbird Rd			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	2	0	0	0		
Median Negative Offset (feet)	1.24	1.24	NA	NA		
Median No Offset (feet)	Yes	Yes	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	3	2		
R4-7, Object Marker, PB in Median	Y,Y,N	N,N,N	N,N,N	N,N,N		
ADT	30,800	28,900	32,000	26,700		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	40	55	40	40		
LT Head Centered Over Lane	No	No	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	N,Y,Y	N,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 30	K	A	B	C	O	
Glendale Rank: 5						
2013	0	0	3	9	27	39
2012	0	0	2	5	23	30
2011	0	2	7	7	29	45
2010	0	3	6	12	32	53
2009	0	1	5	5	27	38
Totals:	0	6	23	38	138	205
Crash Rate						1.896
Left-Turn Crash Rate						0.407
Left-Turn Severity Index						1.560
Severity Index						6.388

59th Avenue and Thunderbird Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove and Salvage Traffic Signals	8	Ea.	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	2	Ea.	\$8,000.00	\$16,000.00
Remove Mast Arm	2	Ea.	\$1,000.00	\$2,000.00
Relocate IISNS	2	Ea.	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$10,000.00	\$10,000.00
Flagging Service (Off-Duty Police)	32	Hr	\$32.00	\$1,024.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	8	Ea	\$100.00	\$800.00
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	2	Ea	\$1,900.00	\$3,800.00
Mast Arm (55')	2	Ea	\$1,800.00	\$3,600.00
Conductors	400	LF	\$2.50	\$1,000.00
Mobilization	1	LS	\$5,000.00	\$5,000.00
Subtotal				\$55,864.00
Contingency (30%)				\$16,759.00
Construction Total				\$72,623.00
Design (10%)				\$7,262.00
Construction Management (15%)				\$10,893.00
Total				\$90,778.00

59th Avenue and Greenway Road, Data Sheet 1

Protected/permissive control all legs.

59 th Avenue and Greenway Road						
Data	Intersection					
	59 th Avenue		Greenway Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	NA	3	NA	NA		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	3.4	3.4	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	2	2		
R4-7, Object Marker, PB in Median	N,N,N	Y,Y,Y	N,N,N	N,N,N		
ADT	29,000	30,800	18,400	14,200		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	45	40	45	50		
LT Head Centered Over Lane	No	Yes	Yes	Yes		
Thru Heads Centered Over Lane	No	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 312	K	A	B	C	O	
Glendale Rank: 24						
2013	0	0	1	8	16	25
2012	0	1	1	4	10	16
2011	0	2	0	5	12	19
2010	0	0	3	4	8	15
2009	0	1	1	7	11	20
Totals:	0	4	6	28	57	95
Crash Rate						1.126
Left-Turn Crash Rate						0.190
Left-Turn Severity Index						0.292
Severity Index						3.484

59th Avenue and Greenway Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$5,200.00	\$5,200.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	700	LF	\$2.50	\$1,750.00
Mobilization	1	LS	\$3,000.00	\$3,000.00
Subtotal				\$24,482.00
Contingency (30%)				\$7,345.00
Construction Total				\$31,827.00
Design (10%)				\$3,183.00
Construction Management (15%)				\$4,774.00
Total				\$39,784.00

59th Avenue and Bell Road, Data Sheet 1

Protected/permissive control on the south, east, and west legs and protected control on the north leg.

59 th Avenue and Bell Road						
Data	Intersection					
	59 th Avenue		Bell Road			
	NB	SB	EB	WB		
Control	Prot	P/P	P/P	P/P		
Mast Arm Head Types	R,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,F(far) F(near)	Q,None	Q,None	Q,None		
Median Width (feet)	4	NA	4	4		
Median Negative Offset (feet)	NA	NA	5.95	5.95		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	3	3		
R4-7, Object Marker, PB in Med	N,N,N	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	26,700	29,000	42,500	45,500		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	40	40	55	45		
LT Head Centered Over Lane	Yes	Yes	No	No		
Thru Heads Centered Over Lane	Yes	Yes	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 53	K	A	B	C	O	
Glendale Rank: 7						
2013	0	1	2	7	36	46
2012	0	1	2	8	35	46
2011	0	0	0	6	22	28
2010	0	0	6	4	38	48
2009	0	0	2	6	29	37
Totals:	0	2	12	31	160	205
Crash Rate						1.562
Left-Turn Crash Rate						0.297
Left-Turn Severity Index						1.160
Severity Index						3.702

59th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove/Salvage Traffic Signals	4	Ea	\$300.00	\$1,200.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Preemption/Traffic Device	2	Ea	\$200.00	\$400.00
Furnish/Install Temp Traffic Control	1	LS	\$5,200.00	\$5,200.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Retro-Reflective Tape (New)	6	Ea	\$10.00	\$60.00
Traffic Signal Mounting Assembly (Type II)	5	Ea	\$120.00	\$600.00
Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	280	LF	\$2.50	\$700.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$21,272.00
Contingency (30%)				\$6,382.00
Construction Total				\$27,654.00
Design (10%)				\$2,765.00
Construction Management (15%)				\$4,148.00
Total				\$34,567.00

59th Avenue and Union Hills Drive, Data Sheet 1

Protected/permissive control on all legs.

59 th Avenue and Union Hills Drive						
Data	Intersection					
	59 th Avenue		Union Hills Dr			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	4	4	4	5		
Median Negative Offset (feet)	4	4	5.5	5.5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	2	2		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
ADT	33500	26700	22200	20900		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	55	55	55		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	N,Y,Y	N,Y,Y		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 221	K	A	B	C	O	
Glendale Rank: 18						
2013	0	0	2	6	19	27
2012	0	1	12	7	16	26
2011	0	1	2	2	13	18
2010	0	0	1	6	24	31
2009	0	0	2	4	11	17
Totals:	0	0	2	4	11	17
Crash Rate						1.262
Left-Turn Crash Rate						0.254
Left-Turn Severity Index						1.062
Severity Index						2.902

59th Avenue and Union Hills Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea.	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,000.00	\$4,000.00
Flagging Service (Off-Duty Police)	12	Hr	\$32.00	\$384.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	3	Ea	\$100.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	145	LF	\$2.50	\$362.50
Mobilization	1	LS	\$2,500.00	\$2,500.00
Subtotal				\$17,946.50
Contingency (30%)				\$5,384.00
Construction Total				\$23,330.50
Design (10%)				\$2,333.00
Construction Management (15%)				\$3,500.00
Total				\$29,163.50

59th Avenue and Utopia Road, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

59 th Avenue and Utopia Road					
Data	Intersection				
	59 th Avenue		Utopia Road		
	NB	SB	EB	WB	
Control	P/P	P/P	Perm	Perm	
Mast Arm Head Types	Q,F,F	Q,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	F,None	F,None	
Median Width (feet)	4	4	4	5	
Median Negative Offset (feet)	4.2	4.2	6.89	6.89	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	3	3	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	50	55	35	35	
LT Head Centered Over Lane	Yes	No	Yes	Yes	
Thru Heads Centered Over Lane	No	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1349	K	A	B	C	O	
Glendale Rank: 70						
2013	0	0	1	2	7	10
2012	0	0	1	0	8	9
2011	0	1	1	1	3	6
2010	0	0	0	2	2	4
2009	0	1	0	1	3	5
Totals:	0	1	0	1	3	5
Left-Turn Severity Index						0.420
Severity Index						1.384

59th Avenue and Utopia, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	58	LF	\$5.00	\$290.00
Remove Concrete Median	102	SF	\$3.00	\$306.00
Remove Pavement	128	SF	\$5.00	\$640.00
Remove and Replace R4-7, Object Marker	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Removal of Pole Foundations	1	Ea	\$2,000.00	\$2,000.00
Remove/Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Pavement Patch	230	SF	\$16.00	\$3,680.00
Furnish/Install Temp Traffic Control	1	LS	\$9,000.00	\$9,000.00
Flagging Services, Off-Duty Police	24	Hr	\$32.00	\$768.00
Striping (White/Yellow Thermoplastic) (4")	87	LF	\$1.00	\$87.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Conductors	240	LF	\$2.50	\$600.00
Concrete Single Curb	7	LF	\$25.00	\$175.00
Concrete Median Nose	7	SF	\$20.00	\$140.00
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$38,936.00
Contingency (30%)				\$11,681.00
Construction Total				\$50,617.00
Design (10%)				\$5,062.00
Construction Management (15%)				\$7,593.00
Total				\$63,272.00

59th Avenue and Behrend Drive, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

59 th Avenue and Behrend Drive					
Data	Intersection				
	59 th Avenue		Behrend Drive		
	NB	SB	EB	WB	
Control	P/P	P/P	Perm	Perm	
Mast Arm Head Types	Q,F,F	Q,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	F,None	F,None	
Median Width (feet)	4	4	3.5	0	
Median Negative Offset (feet)	2.4	2.4	4.6	NA	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	3	3	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	NA	Y,Y,Y	
ADT	-	-	-	-	
Posted Speed Limit (mph)	45	45	35	35	
Grade	0	0	0	0	
Mast Arm Length	45	45	35	35	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	No	No	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other	WB street is a dead end.				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1074	K	A	B	C	O	
Glendale Rank: 56						
2013	0	0	0	3	12	15
2012	0	0	1	4	16	21
2011	0	0	1	5	8	14
2010	0	0	2	1	3	6
2009	0	0	0	0	0	0
Totals:	0	0	4	13	39	56
Left-Turn Severity Index						0.388
Severity Index						1.022

59th Avenue and Behrend Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea.	\$300.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$4,000.00	\$4,000.00
Flagging Service (Off-Duty Police)	8	Hr	\$32.00	\$256.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$2,500.00	\$2,500.00
Subtotal				\$12,956.00
Contingency (30%)				\$3,887.00
Construction Total				\$16,843.00
Design (10%)				\$1,684.00
Construction Management (15%)				\$2,526.00
Total				\$21,053.00

59th Avenue and Deer Valley Road, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

59 th Avenue and Deer Valley Road						
Data	Intersection					
	59 th Avenue		Deer Valley Road			
	NB	SB	EB	WB		
Control	P/P	P/P	Perm	Perm		
Mast Arm Head Types	Q,F,F	Q,F,F	F,F	F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q.None	F,None	F,None		
Median Width (feet)	4	4	0	0		
Median Negative Offset (feet)	-3.5	-3.5	-8.6	-8.6		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	1	1		
R4-7, Object Marker, PB in Med	-	-	-	-		
ADT	16700	20100	-	-		
Posted Speed Limit (mph)	40	35	25	25		
Grade	0	0	0	0		
Mast Arm Length	45	40	35	35		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	Outboard signals are on light poles					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 2164	K	A	B	C	O	
Glendale Rank: 85						
2013	0	0	0	0	0	0
2012	0	0	2	2	2	6
2011	0	0	0	0	4	4
2010	0	0	0	1	6	7
2009	0	0	0	1	2	3
Totals:	0	0	2	4	14	20
Crash Rate						0.499
Left-Turn Crash Rate						0.150
Left-Turn Severity Index						0.138
Severity Index						0.384

59th Avenue and Deer Valley Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	108	LF	\$5.00	\$540.00
Remove Concrete Median	200	SF	\$3.00	\$600.00
Remove Pavement	112	SF	\$5.00	\$560.00
Remove Signs	2	Ea	\$250.00	\$500.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Pavement Patch	336	SF	\$16.00	\$5,376.00
Furnish/Install Temp Traffic Control	1	LS	\$4,200.00	\$4,200.00
Flagging Services, Off-Duty Police	8	Hr	\$32.00	\$256.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Concrete Single Curb	28	LF	\$25.00	\$700.00
Concrete Median Nose	40	SF	\$20.00	\$800.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$25,332.00
Contingency (30%)				\$7,600.00
Construction Total				\$32,932.00
Design (10%)				\$3,293.00
Construction Management (15%)				\$4,940.00
Total				\$41,165.00

61st Avenue and Olive Avenue, Data Sheet 1

Permissive control on all legs. Not a candidate for FYA.

61 st Avenue and Olive Avenue					
Data	Intersection				
	61 st Avenue		Olive Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F	F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,F	F,F	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	15	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	25	25	
LT Head Centered Over Lane	Yes	Yes	No	No	
Thru Heads Centered Over Lane	No	Yes	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown					
Other	Y,Y,N	Y,Y,N	N,Y,N	N,Y,N	

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 748	K	A	B	C	O	
Glendale Rank: 49						
2013	0	0	1	4	10	15
2012	0	0	1	2	9	12
2011	0	0	1	4	9	14
2010	0	0	0	2	6	8
2009	0	0	1	3	6	10
Totals:	0	0	4	15	40	59
Left-Turn Severity Index						0.330
Severity Index						1.110

61st Avenue and Cactus Road, Data Sheet 1

Permissive control on all legs.

61 st Avenue and Cactus Road					
Data	Intersection				
	61 st Avenue		Cactus Road		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	6.8	6.8	NA	NA	
Median No Offset (feet)	NA	NA	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	35	40	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	No	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 668	K	A	B	C	O	
Glendale Rank: 44						
2013	1	0	0	2	1	4
2012	0	0	0	0	2	2
2011	0	0	0	0	1	1
2010	0	0	0	0	2	2
2009	0	0	0	1	1	2
Totals:	1	0	0	3	7	11
Left-Turn Severity Index						0.328
Severity Index						0.736

61st Avenue and Cactus Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Removal of Pole Foundations	2	Ea	\$2,000.00	\$4,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	160	LF	\$2.50	\$400.00
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$36,112.00
Contingency (30%)				\$10,834.00
Construction Total				\$46,946.00
Design (10%)				\$4,695.00
Construction Management (15%)				\$7,042.00
Total				\$58,683.00

61st Avenue and Bell Road, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

61st Avenue and Bell Road					
Data	Intersection				
	61 st Avenue		Bell Road		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F,F	F,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	4.5	4.5	
Median Negative Offset (feet)	NA	NA	5.5	5.5	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	3	
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,N	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	35	50	45	
LT Head Centered Over Lane	Yes	No	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	No	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	N,Y,N	N,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1348	K	A	B	C	O	
Glendale Rank: 69						
2013	0	0	0	1	6	7
2012	0	0	0	2	7	9
2011	0	0	1	1	5	7
2010	0	1	0	0	8	9
2009	0	0	3	1	5	9
Totals:	0	1	4	5	31	41
Left-Turn Severity Index						0.466
Severity Index						1.054

63rd Avenue and Olive Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

63rd Avenue and Olive Avenue					
Data	Intersection				
	63rd Avenue		Olive Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	30	30	30	30	
LT Head Centered Over Lane	No	No	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	N,Y,N	N,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1508	K	A	B	C	O	
Glendale Rank: 81						
2013	0	1	1	4	2	8
2012	0	1	1	1	2	5
2011	0	0	0	1	6	7
2010	0	0	1	1	6	8
2009	0	0	1	0	10	11
Totals:	0	2	4	7	26	39
Left-Turn Severity Index						0.328
Severity Index						0.736

63rd Avenue and Bell Road, Data Sheet 1

Permissive control on the north and south legs and protected/permissive on the east and west legs.

63 rd Avenue and Bell Road					
Data	Intersection				
	63 rd Avenue		Bell Road		
	NB	SB	EB	WB	
Control	Perm	Perm	P/P	P/P	
Mast Arm Head Types	F,F	F,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	Q,None	Q,None	
Median Width (feet)	0	0	4	4	
Median Negative Offset (feet)	NA	NA	7.3	7.3	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	3	
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,N	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	30	45	45	
LT Head Centered Over Lane	Yes	No	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 572	K	A	B	C	O	
Glendale Rank: 37						
2013	0	0	1	4	11	16
2012	0	0	4	0	11	15
2011	0	0	3	1	11	15
2010	0	0	1	2	11	14
2009	0	1	2	2	8	13
Totals:	0	1	11	9	52	73
Left-Turn Severity Index						0.462
Severity Index						1.866

63rd Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	100	LF	\$5.00	\$500.00
Remove Concrete Median	165	SF	\$3.00	\$495.00
Remove Pavement	240	SF	\$5.00	\$1,200.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Pavement Patch	485	SF	\$16.00	\$7,760.00
Furnish/Install Temp Traffic Control	1	LS	\$9,000.00	\$9,000.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	6	Ea	\$600.00	\$3,600.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	3	Ea	\$100.00	\$300.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	235	LF	\$2.50	\$500.00
Concrete Single Curb	20	LF	\$25.00	\$500.50
Concrete Median Nose	80	SF	\$20.00	\$1,600.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$39,324.50
Contingency (30%)				\$11,797.00
Construction Total				\$51,121.50
Design (10%)				\$5,112.00
Construction Management (15%)				\$7,668.00
Total				\$63,901.50

65th Avenue and Olive Avenue, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

65 th Avenue and Olive Avenue					
Data	Intersection				
	65 th Avenue		Olive Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	25	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	20	30	25	30	
LT Head Centered Over Lane	No	Yes	No	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1439	K	A	B	C	O	
Glendale Rank: 76						
2013	0	0	1	2	6	9
2012	0	1	2	0	2	5
2011	0	0	1	1	3	5
2010	0	0	1	0	4	5
2009	0	0	1	3	6	10
Totals:	0	1	6	6	21	34
Left-Turn Severity Index						0.336
Severity Index						1.216

67th Avenue and Camelback Road, Data Sheet 1

Protected/permissive control on all legs.

47 th Avenue and Glendale Avenue						
Data	Intersection					
	47 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	2	0	4	6		
Median Negative Offset (feet)	0	0	0	1		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Med	Y,Y,N	N,N,N	Y,Y,N	Y,Y,N		
ADT	23,200	23,200	22,800	22,800		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	45	55	55		
LT Head Centered Over Lane	Yes	No	Yes	Yes		
Thru Heads Centered Over Lane	No	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 304	K	A	B	C	O	
Glendale Rank: 23						
2013	0	2	4	7	20	33
2012	0	0	2	8	8	18
2011	0	0	2	5	25	32
2010	0	0	3	5	12	20
2009	0	0	1	3	14	18
Totals:	0	2	12	28	79	121
Crash Rate						1.440
Left-Turn Crash Rate						0.333
Left-Turn Severity Index						1.154
Severity Index						3.252

67th Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundations	1	Ea	\$2,000.00	\$2,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$8,000.00	\$8,000.00
Furnish/Install Temp Traffic Control	1	LS	\$18,000.00	\$18,000.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Mobilization	1	LS	\$7,500.00	\$7,500.00
Subtotal				\$35,712.00
Contingency (30%)				\$10,714.00
Construction Total				\$46,426.00
Design (10%)				\$4,643.00
Construction Management (15%)				\$6,964.00
Total				\$58,033.00

67th Avenue and Missouri Avenue, Data Sheet 1

Permissive control all legs.

67 th Avenue and Missouri Avenue					
Data	Intersection				
	67 th Avenue		Missouri Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	0	0	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	30	30	30	30	
LT Head Centered Over Lane	No	No	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 489	K	A	B	C	O	
Glendale Rank: 34						
2013	1	0	1	0	0	2
2012	0	0	0	2	4	6
2011	0	0	1	1	2	4
2010	0	0	1	3	2	6
2009	0	0	0	0	2	2
Totals:	1	0	3	6	10	20
Left-Turn Severity Index						0.042
Severity Index						6.332

67th Avenue and Missouri Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Relocate Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$13,500.00	\$13,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$1,024.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	2	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	5	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (40')	3	Ea	\$1,000.00	\$3,000.00
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$35,714.00
Contingency (30%)				\$10,714.00
Construction Total				\$46,428.00
Design (10%)				\$4,643.00
Construction Management (15%)				\$6,964.00
Total				\$58,035.00

67th Avenue and Bethany Home Road, Data Sheet 1

Protected control on all legs.

47 th Avenue and Glendale Avenue						
Data	Intersection					
	67 th Avenue		Bethany Home			
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	R,None	R,None		
Median Width (feet)	5	5	5	5		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	NA	NA	NA	Yes		
Median Positive Offset (feet)	5.25	5.25	6.5	6.5		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	23300	23800	20400	23200		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	50	40	40	45		
LT Head Centered Over Lane	No	Yes	No	No		
Thru Heads Centered Over Lane	No	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 327	K	A	B	C	O	
Glendale Rank: 27						
2013	0	0	0	3	21	24
2012	0	1	0	9	16	26
2011	0	0	0	3	17	20
2010	0	0	2	2	20	24
2009	0	0	2	4	12	18
Totals:	0	1	4	21	86	112
Crash Rate						1.352
Left-Turn Crash Rate						0.048
Left-Turn Severity Index						0.092
Severity Index						1.946

67th Avenue and Bethany Home Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	4	Ea	\$250.00	\$1,000.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	2	Ea	\$8,000.00	\$16,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Traffic Control Devices	1	LS	\$18,000.00	\$18,000.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Pedestrian Push Button	4	Ea	\$200.00	\$800.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	8	Ea	\$100.00	\$800.00
Relocate Luminaire	4	Ea	\$300.00	\$1,200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	2	Ea	\$1,900.00	\$3,800.00
Mast Arm (45°)	2	Ea	\$1,200.00	\$2,400.00
Conductors	1,200	LF	\$2.50	\$3,000.00
Mobilization	1	LS	\$8,000.00	\$8,000.00
Subtotal				\$66,968.00
Contingency (30%)				\$20,090.00
Construction Total				\$87,058.00
Design (10%)				\$8,706.00
Construction Management (15%)				\$13,059.00
Total				\$108,823.00

67th Avenue and Glendale Avenue, Data Sheet 1

Protected/permissive control all legs.

67 th Avenue and Glendale Avenue						
Data	Intersection					
	67 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	2	2	4	4		
Median Negative Offset (feet)	2	2	4.5	4.5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	3	2		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
ADT	23,300	23,800	20,400	23,200		
Posted Speed Limit (mph)	40	40	40	35		
Grade	0	0	0	0		
Mast Arm Length	50	50	45	55		
LT Head Centered Over Lane	No	No	No	No		
Thru Heads Centered Over Lane	Yes	No	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 59	K	A	B	C	O	
Glendale Rank: 9						
2013	0	2	1	6	14	23
2012	0	2	2	8	19	31
2011	0	2	5	6	15	28
2010	0	0	9	8	16	33
2009	0	1	2	7	4	14
Totals:	0	7	19	35	68	129
Crash Rate						1.558
Left-Turn Crash Rate						0.531
Left-Turn Severity Index						3.350
Severity Index						6.062

67th Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	100	LF	\$5.00	\$500.00
Remove Concrete Median	100	SF	\$3.00	\$300.00
Remove Pavement	352	SF	\$5.00	\$1,760.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundation	1	Ea	\$2,000.00	\$2,000.00
Remove/Relocate Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Relocate Pre-emption/Traffic Device	2	Ea	\$200.00	\$400.00
Pavement Patch	320	SF	\$16.00	\$5,120.00
Furnish/Install Temp Traffic Control	1	LS	\$13,500.00	\$13,500.00
Flagging Services, Off-Duty Police	48	Hr	\$32.00	\$1,536.00
Pavement Marking (Yellow Thermoplastic) (4")	80	LF	\$1.00	\$80.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	600	LF	\$2.50	\$1,500.00
Concrete Median Nose	12	SF	\$20.00	\$240.00
Median Pavers	30	SF	\$30.00	\$900.00
Mobilization	1	LS	\$4,400.00	\$4,400.00
Subtotal				\$58,436.00
Contingency (30%)				\$17,531.00
Construction Total				\$75,967.00
Design (10%)				\$7,597.00
Construction Management (15%)				\$11,395.00
Total				\$94,959.50

67th Avenue and Butler Drive, Data Sheet 1

Permissive control on all legs.

67 th Avenue and Butler Drive					
Data	Intersection				
	67 th Avenue		Butler Drive		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	0	0	8	0	
Median Negative Offset (feet)	NA	NA	7.85	7.85	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	45	45	30	30	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 478	K	A	B	C	O	
Glendale Rank: 32						
2013	1	0	0	2	2	5
2012	0	0	1	1	5	7
2011	0	0	1	0	1	2
2010	0	1	0	1	0	2
2009	0	0	0	2	1	3
Totals:	1	1	2	6	9	19
Left-Turn Severity Index						0.042
Severity Index						6.648

67th Avenue and Butler Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	4200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	200		\$2.50	\$500.00
Mobilization	1	LS	\$2,500.00	\$2,500.00
Subtotal				\$20,632.00
Contingency (30%)				\$6,190.00
Construction Total				\$26,822.00
Design (10%)				\$2,682.00
Construction Management (15%)				\$4,023.00
Total				\$33,527.00

67th Avenue and Olive Avenue, Data Sheet 1

Protected control on all legs.

67 th Avenue and Olive Avenue						
Data	Intersection					
	67 th Avenue		Olive Avenue			
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	R,None	R,None		
Median Width (feet)	3.5	4	0	0		
Median Negative Offset (feet)	3	3	NA	NA		
Median No Offset (feet)	NA	NA	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	N,N,N	N,N,N		
ADT	25300	25700	34500	34500		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	45	55	55	35		
LT Head Centered Over Lane	Yes	Yes	No	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 77	K	A	B	C	O	
Glendale Rank: 11						
2013	0	0	3	6	27	36
2012	0	2	2	5	20	29
2011	0	1	2	10	25	38
2010	0	0	3	6	29	38
2009	0	2	3	3	25	33
Totals:	0	5	13	30	126	174
Crash Rate						1.588
Left-Turn Crash Rate						0.338
Left-Turn Severity Index						0.794
Severity Index						4.804

67th Avenue and Olive Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	4	Ea	\$250.00	\$1,000.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Removal of Pole Foundations	1	Ea	\$2,000.00	\$2,000.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Traffic Control Devices	1	LS	\$7,800.00	\$7,800.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Luminaire	2	Ea	\$500.00	\$1,000.00
Remove Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	2	Ea	\$1,900.00	\$1,900.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Pole (20')	2	Ea	\$600.00	\$1,200.00
Mast Arm (45')	1	Ea	\$1,200.00	\$1,200.00
Conductors	250	LF	\$2.50	\$625.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$44,293.00
Contingency (30%)				\$13,288.00
Construction Total				\$57,581.00
Design (10%)				\$5,758.00
Construction Management (15%)				\$8,637.00
Total				\$71,976.00

67th Avenue and Peoria Avenue, Data Sheet 1

Protected control on all legs.

67 th Avenue and Peoria Avenue						
Data	Intersection					
	67 th Avenue		Peoria Avenue			
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	R,None	R,None		
Median Width (feet)	4	4	3	2		
Median Negative Offset (feet)	4	4	4	4		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	22800	25300	28400	28400		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	50	40	45	40		
LT Head Centered Over Lane	No	No	Yes	No		
Thru Heads Centered Over Lane	No	No	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 336	K	A	B	C	O	
Glendale Rank: 28						
2013	0	0	1	6	21	28
2012	0	0	2	4	23	29
2011	0	1	1	6	15	23
2010	0	0	2	3	14	19
2009	0	0	3	4	19	26
Totals:	0	1	9	23	92	125
Crash Rate						1.305
Left-Turn Crash Rate						0.115
Left-Turn Severity Index						0.196
Severity Index						2.454

67th Avenue and Peoria Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	4	Ea	\$250.00	\$1,000.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Traffic Control Devices	1	LS	\$8,000.00	\$8,000.00
Flagging Service (Off-Duty Police)	32	Hr	\$32.00	\$1024.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	8	Ea	\$100.00	\$800.00
Remove Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	650	LF	\$2.50	\$1,625.00
Mobilization	1	LS	\$4,500.00	\$4,500.00
Subtotal				\$41,449.00
Contingency (30%)				\$12,435.00
Construction Total				\$53,884.00
Design (10%)				\$5,388.00
Construction Management (15%)				\$8,083.00
Total				\$67,355.00

67th Avenue and Cactus Road, Data Sheet 1

Protected control on all legs.

67 th Avenue and Cactus Road						
Data	Intersection					
	67 th Avenue		Cactus Road			
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	R,None	R,None		
Median Width (feet)	4	4	NA	NA		
Median Negative Offset (feet)	3.9	3.9	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	N,N,N	N,N,N		
ADT	21700	22800	25000	25000		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	50	55	55	40		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
Other	Large power line at NW corner					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 2206	K	A	B	C	O	
Glendale Rank: 86						
2013	0	0	1	2	9	12
2012	0	0	1	3	15	19
2011	0	0	3	3	13	19
2010	0	0	0	4	11	15
2009	0	0	1	1	17	19
Totals:	0	0	6	13	65	84
Crash Rate						0.974
Left-Turn Crash Rate						0.046
Left-Turn Severity Index						0.054
Severity Index						1.286

67th Avenue and Cactus Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Sidewalk	39	SF	\$5.00	\$195.00
Remove Signs	4	Ea	8\$250.00	\$1,000.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Traffic Control Devices	1	LS	\$7,200.00	\$7,200.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (45')	1	Ea	\$1,200.00	\$1,200.00
Conductors	180	LF	\$2.50	\$450.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Concrete Sidewalk	31	SF	\$30.00	\$930.00
Subtotal				\$40,487.00
Contingency (30%)				\$12,146.00
Construction Total				\$52,633.00
Design (10%)				\$5,263.00
Construction Management (15%)				\$7,895.00
Total				\$65,791.00

67th Avenue and Thunderbird Road, Data Sheet 1

Protected control on all legs.

67 th Avenue and Thunderbird Road						
Data	Intersection					
	67 th Avenue		Thunderbird Road			
	NB	SB	EB	WB		
Control	Prot	Prot	Prot	Prot		
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	R,None	R,None		
Median Width (feet)	4	4	0	0		
Median Negative Offset (feet)	-4	-4	NA	NA		
Median No Offset (feet)	NA	NA	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	N,N,N	N,N,N		
ADT	25000	21700	26700	26700		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	50	55	50	45		
LT Head Centered Over Lane	No	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
Other	Outboard signals are on light poles.					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 909	K	A	B	C	O	
Glendale Rank: 52						
2013	0	0	0	2	16	18
2012	0	0	1	2	9	12
2011	0	1	1	3	13	18
2010	0	0	3	5	22	30
2009	0	1	0	5	16	22
Totals:	0	2	5	17	76	100
Crash Rate						1.094
Left-Turn Crash Rate						0.066
Left-Turn Severity Index						0.062
Severity Index						2.218

67th Avenue and Thunderbird Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	108	LF	\$5.00	\$540.00
Remove Concrete Median	200	SF	\$3.00	\$600.00
Remove Pavement	112	SF	\$5.00	\$560.00
Remove Signs	2	Ea	\$250.00	\$500.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,800.00	\$4,800.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Striping (White Thermoplastic) (4")	100	LF	\$1.00	\$100.00
Permanent Pavement Marking (Painted)	100	LF	\$0.50	\$50.00
Paint Bull Nose	2	Ea	\$100.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Traffic Signal Face (Pedestrian Countdown)	8	Ea	\$400.00	\$3,200.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Concrete Single Curb	28	LF	\$25.00	\$700.00
Concrete Median Nose	40	SF	\$20.00	\$800.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$26,962.00
Contingency (30%)				\$8,089.00
Construction Total				\$35,051.00
Design (10%)				\$3,505.00
Construction Management (15%)				\$5,258.00
Total				\$43,814.00

67th Avenue and Greenway Road, Data Sheet 1

Protected/permissive control on the north, south, and west legs and protected control on the east leg.

67 th Avenue and Greenway Road						
Data	Intersection					
	67 th Avenue		Greenway Road			
	NB	SB	EB	WB		
Control	P/P	P/P	Prot	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	R,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	R, None	Q, None		
Median Width (feet)	3	3	NA	NA		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	1	2		
R4-7, Object Marker, PB in Med	Y,Y,N	Y,Y,N	N,N,N	N,N,N		
ADT	23,600	25,000	14,200	14,200		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	50	45	40		
LT Head Centered Over Lane	Yes	Yes	No	No		
Thru Heads Centered Over Lane	Yes	Yes	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	Y,Y,Y	Y,Y,Y	Y,N,Y		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 638	K	A	B	C	O	
Glendale Rank: 41						
2013	0	0	3	5	16	24
2012	0	1	1	1	11	14
2011	0	0	0	3	8	11
2010	0	0	2	1	8	11
2009	0	1	0	6	3	10
Totals:	0	2	6	16	46	70
Crash Rate						0.996
Left-Turn Crash Rate						0.185
Left-Turn Severity Index						0.432
Severity Index						2.136

67th Avenue and Greenway Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Traffic Control Devices	1	LS	\$18,000.00	\$18,000.00
Flagging Service (Off-Duty Police)	40	Hr	\$32.00	\$1,280.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$300.00
Traffic Signal Face (Type FYA) (LED)	6	Ea	\$600.00	\$3,600.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Pedestrian Push Button	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	600	LF	\$2.50	\$1,500.00
Mobilization	1	LS	\$8,500.00	\$8,500.00
Subtotal				\$53,230.00
Contingency (30%)				\$15,969.00
Construction Total				\$69,199.00
Design (10%)				\$6,920.00
Construction Management (15%)				\$10,380.00
Total				\$86,499.00

67th Avenue and Bell Road, Data Sheet 1

Protected control on the north and south legs and protected/permissive on the east and west legs.

67 th Avenue and Bell Road						
Data	Intersection					
	67 th Avenue		Bell Road			
	NB	SB	EB	WB		
Control	Prot	Prot	P/P	P/P		
Mast Arm Head Types	R,F,F	R,F,F	Q,F,F	Q,F,F,F		
Pole Head Types (Outboard Lt, Far Rt)	R,None	R,None	Q,None (F near)	Q,None (F near)		
Median Width (feet)	6	5	6	6		
Median Negative Offset (feet)	21.1	21.1	6.2	6.2		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	3	2	3	3		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	21700	23600	45500	48800		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	55	45	55		
LT Head Centered Over Lane	Y*	N	N	Y		
Thru Heads Centered Over Lane	N*	N	N	Y		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 69	K	A	B	C	O	
Glendale Rank: 10						
2013	0	0	3	3	28	34
2012	0	0	2	5	29	36
2011	0	2	9	5	37	53
2010	0	1	1	7	29	38
2009	0	0	2	5	17	24
Totals:	0	3	17	25	140	185
Crash Rate						1.451
Left-Turn Crash Rate						0.290
Left-Turn Severity Index						1.228
Severity Index						4.17

67th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	80	LF	\$5.00	\$400.00
Remove Concrete Median	200	SF	\$3.00	\$600.00
Remove Pavement	184	SF	\$5.00	\$920.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Pavement Patch	424	SF	\$16.00	\$6,784.00
Furnish/Install Temp Traffic Control	1	LS	\$5,000.00	\$5,000.00
Obliteration Pavement Markings	310	LF	\$1.00	\$310.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Pavement Marking (Painted) (4")	620	LF	\$0.50	\$310.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	25	LF	\$2.50	\$62.50
Concrete Single Curb	8	LF	\$25.00	\$200.00
Concrete Median Nose	15	SF	\$20.00	\$300.00
Mobilization	1	LS	\$3,000.00	\$3,000.00
Subtotal				\$26,548.50
Contingency (30%)				\$7,965.00
Construction Total				\$34,513.50
Design (10%)				\$3,451.00
Construction Management (15%)				\$5,177.00
Total				\$43,141.50

67th Avenue and Union Hills Drive, Data Sheet 1

Protected/permissive control on the north and south legs and protected on the east and west legs.

47 th Avenue and Glendale Avenue						
Data	Intersection					
	47 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	Prot	Prot		
Mast Arm Head Types	Q,F,F	Q,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	R, None	R, None		
Median Width (feet)	2	4	15	18		
Median Negative Offset (feet)	4	4	17	17		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	3	2	2		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,N	Y,Y,N		
ADT	25,000	21,700	20,900	19,300		
Posted Speed Limit (mph)	40	40	40	60		
Grade	0	0	0	0		
Mast Arm Length	55	55	45	40		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,N	N,Y,N	N,Y,N	N,Y,N		
Other	ASC3 Controller					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 354	K	A	B	C	O	
Glendale Rank: 30						
2013	0	1	1	4	11	17
2012	0	0	4	3	19	26
2011	0	0	5	3	10	18
2010	0	0	3	1	18	22
2009	0	0	0	2	18	20
Totals:	0	1	13	13	76	103
Crash Rate						1.300
Left-Turn Crash Rate						0.252
Left-Turn Severity Index						0.346
Severity Index						2.290

67th Avenue and Union Hills Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	289	LF	\$5.00	\$1,445.00
Remove Concrete Median	62	SF	\$3.00	\$186.00
Remove Pavement	884	SF	\$5.00	\$4,420.00
Remove Signs	2	Ea	\$250.00	\$500.00
Remove and Replace R4-7, Object Marker	3	Ea	\$250.00	\$750.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Pavement Patch	1,525	SF	\$16.00	\$24,400.00
Furnish/Install Temp Traffic Control	1	LS	\$9,500.00	\$9,500.00
Obliteration Pavement Markings	1,320	LF	\$1.00	\$1,320.00
Flagging Services, Off-Duty Police	80	Hr	\$32.00	\$2,560.00
Striping (White/Yellow Thermoplastic) (4")	1,470	LF	\$1.00	\$1,470.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Remove Mounting Assembly	1	Ea	\$100.00	\$100.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$63,601.00
Contingency (30%)				\$19,080.00
Construction Total				\$82,681.00
Design (10%)				\$8,268.00
Construction Management (15%)				\$12,402.00
Total				\$103,351.00

67th Avenue and Sack Drive, Data Sheet 1

Permissive control all legs. Not a candidate for FYA.

67 th Avenue and Sack Drive					
Data	Intersection				
	67 th Avenue		Sack Drive		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F,F	F,F,F	F,F	F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	4	4	0	12	
Median Negative Offset (feet)	3.97	3.97	25	25	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	3	3	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,N	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	50	45	35	30	
LT Head Centered Over Lane	No	Yes	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 689	K	A	B	C	O	
Glendale Rank: 46						
2013	0	0	0	1	2	3
2012	0	0	0	1	0	1
2011	0	0	0	1	1	2
2010	0	0	0	1	1	2
2009	1	0	1	0	3	5
Totals:	1	0	1	4	7	13
Left-Turn Severity Index						0.008
Severity Index						6.076

67th Avenue and Arrowhead Loop, Data Sheet 1

Protected/permissive control all legs.

67 th Avenue and Arrowhead Loop					
Data	Intersection				
	67 th Avenue		Arrowhead Loop		
	NB	SB	EB	WB	
Control	P/P	P/P	P/P	P/P	
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,	Q,F,	
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None	
Median Width (feet)	4	4	5	3	
Median Negative Offset (feet)	4.5	4.5	6.2	6.2	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	3	2	1	1	
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,Y	Y,Y,N	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	25	
Grade	0	0	0	0	
Mast Arm Length	40	55	40	35	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	No	No	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,N	N,Y,N	Y,Y,N	Y,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 714	K	A	B	C	O	
Glendale Rank: 47						
2013	0	0	3	2	12	17
2012	0	0	1	4	8	13
2011	0	1	1	2	7	11
2010	0	0	1	4	8	13
2009	0	0	1	3	11	15
Totals:	0	1	7	15	46	69
Left-Turn Severity Index						0.908
Severity Index						1.774

67th Avenue and Arrowhead Loop, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Relocate IISNS	2	Ea	\$400.00	\$800.00
Furnish/Install Temp Traffic Control	1	LS	\$12,500.00	\$12,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	1	Ea	\$400.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Ped Push Button	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	3	Ea	\$100.00	\$300.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (40')	1	Ea	\$1,000.00	\$1,000.00
Mast Arm (45')	1	Ea	\$1,200.00	\$1,200.00
Conductors	275	LF	\$2.50	\$687.50
Mobilization	1	LS	\$3,500.00	\$3,500.00
Concrete Sidewalk	20	SF	\$30	\$600.00
Subtotal				\$42,455.50
Contingency (30%)				\$12,737.00
Construction Total				\$55,192.50
Design (10%)				\$5,519.00
Construction Management (15%)				\$8,279.00
Total				\$68,990.50

67th Avenue and Deer Valley Road, Data Sheet 1

Protected/permissive control on all legs.

67 th Avenue and Deer Valley Road						
Data	Intersection					
	67 th Avenue		Deer Valley Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,	Q,F,F	Q,F,	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	4	4	4	4		
Median Negative Offset (feet)	4	4	5.5	5.5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	3	2	1	1		
R4-7, Object Marker, PB in Median	Y,Y,N	Y,Y,N	Y,Y,Y	Y,Y,N		
ADT	28800	34300	11,000	11,000		
Posted Speed Limit (mph)	40	40	35	25		
Grade	0	0	0	0		
Mast Arm Length	45	55	40	50		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,N	N,Y,N	Y,Y,N	Y,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 597	K	A	B	C	O	
Glendale Rank: 38						
2013	0	1	1	3	13	18
2012	0	0	0	3	12	15
2011	0	1	0	3	6	10
2010	0	0	0	6	14	20
2009	0	0	1	2	17	20
Totals:	0	2	2	17	62	83
Crash Rate						1.068
Left-Turn Crash Rate						0.232
Left-Turn Severity Index						0.696
Severity Index						1.922

67th Avenue and Deer Valley Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,200.00	\$4,200.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	24	LF	\$2.50	\$60.00
Mobilization	1	LS	\$2,250.00	\$2,250.00
Subtotal				\$18,272.00
Contingency (30%)				\$5,482.00
Construction Total				\$23,754.00
Design (10%)				\$2,375.00
Construction Management (15%)				\$3,563.00
Total				\$29,692.00

67th Avenue and Patrick Lane, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

67 th Avenue and Patrick Lane					
Data	Intersection				
	67 th Avenue		Patrick Lane		
	NB	SB	EB	WB	
Control	P/P	P/P	Perm	Perm	
Mast Arm Head Types	Q,F	Q,F,F	F,F,	F,F,	
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	F, None	F, None	
Median Width (feet)	0	0	0	5	
Median Negative Offset (feet)	NA	NA	2.7	2.7	
Median No Offset (feet)	Y	Y	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	1	1	
R4-7, Object Marker, PB in Median	NA	NA	N,N,N	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	25	NA	
Grade	0	0	0	0	
Mast Arm Length	45	40	40	30	
LT Head Centered Over Lane	Yes	No	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	No	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1494	K	A	B	C	O	
Glendale Rank: 80						
2013	0	0	0	4	5	19
2012	0	0	1	1	1	3
2011	0	0	0	1	8	9
2010	0	0	0	3	8	11
2009	0	0	1	0	7	8
Totals:	0	0	2	9	29	40
Left-Turn Severity Index						0.092
Severity Index						0.654

67th Avenue and Patrick Lane, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Removal of Signal Poles and Bases	1	Ea	\$6,000.00	\$6,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Furnish/Install Temp Traffic Control	1	LS	\$9,500.00	\$9,500.00
Flagging Service (Off-Duty Police)	24	Hr	\$32.00	\$768.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Ped Push Button	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	2	Ea	\$120.00	\$240.00
Traffic Signal Mounting Assembly (Type V)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	185	LF	\$2.50	\$462.50
Mobilization	1	LS	\$3,500.00	\$3,500.00
Subtotal				\$32,270.50
Contingency (30%)				\$9,681.00
Construction Total				\$41,951.50
Design (10%)				\$4,195.00
Construction Management (15%)				\$6,293.00
Total				\$52,439.50

67th Avenue and Pinnacle Peak Road, Data Sheet 1

Protected/permissive control on the north and south legs and permissive control on the east and west legs.

67 th Avenue and Pinnacle Peak						
Data	Intersection					
	67 th Avenue		Pinnacle Peak			
	NB	SB	EB	WB		
Control	P/P	P/P	Perm	Perm		
Mast Arm Head Types	Q,F,F	Q,F,F	F,F,	F,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	F, None	F, None		
Median Width (feet)	NA	NA	NA	NA		
Median Negative Offset (feet)	NA	NA	7	7		
Median No Offset (feet)	Y	Y	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	1	1		
R4-7, Object Marker, PB in Med	NA	NA	NA	NA		
ADT	-	-	-	-		
Posted Speed Limit (mph)	50	50	30	35		
Grade	0	0	0	0		
Mast Arm Length	45	40	40	30		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,N	N,Y,N	Y,Y,N	Y,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 5131	K	A	B	C	O	
Glendale Rank: 89						
2013	0	0	0	0	2	2
2012	0	0	0	0	4	4
2011	0	0	0	0	0	0
2010	0	0	0	0	2	2
2009	0	0	0	1	1	2
Totals:	0	0	0	1	9	10
Crash Rate						0.191
Left-Turn Severity Index						0.019
Left-Turn Severity Index						0.004
Severity Index						0.078

67th Avenue and Pinnacle Peak Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$4,800.00	\$4,800.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$300.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Conductors	65	LF	\$2.50	\$162.50
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$13,074.50
Contingency (30%)				\$3,922.00
Construction Total				\$16,995.50
Design (10%)				\$1,700.00
Construction Management (15%)				\$2,549.00
Total				\$21,245.50

73rd Avenue and Bell Road, Data Sheet 1

Permissive control on the north and south legs and protected/permissive control on the east and west legs.

73 rd Avenue and Bell Road					
Data	Intersection				
	73 rd Avenue		Bell Road		
	NB	SB	EB	WB	
Control	Perm	Perm	P/P	P/P	
Mast Arm Head Types	F,F	F,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F, F (near)	F,F (near)	Q, None	Q, None	
Median Width (feet)	0	0	16	8	
Median Negative Offset (feet)	4.6	4.6	13	13	
Median No Offset (feet)	NA	NA	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	3	3	
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,Y	Y,Y,Y	
ADT	-	-	-	-	
Posted Speed Limit (mph)	NA*	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	35	45	50	55	
LT Head Centered Over Lane	Yes	Yes	Yes	No	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1197	K	A	B	C	O	
Glendale Rank: 62						
2013	0	0	1	1	6	8
2012	0	0	2	3	6	11
2011	0	1	1	5	6	13
2010	0	0	0	5	10	15
2009	0	0	0	0	0	0
Totals:	0	1	4	14	28	47
Left-Turn Severity Index						0.740
Severity Index						1.420

73rd Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	193	LF	\$5.00	\$965.00
Remove Concrete Median	952	SF	\$3.00	\$2,856.00
Remove Pavement	473	SF	\$5.00	\$2,365.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Removal of Pole Foundation	1	Ea	\$2,000.00	\$2,000.00
Remove/Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Pavement Patch	1540	SF	\$16.00	\$24,640.00
Furnish/Install Temp Traffic Control	1	LS	\$11,500.00	\$11,500.00
Obliterate Pavement Markings (Stripe)	387	LF	\$1.00	\$387.00
Flagging Services, Off-Duty Police	24	Hr	\$32.00	\$768.00
Pavement Marking (White/Yellow Thermoplastic) (4")	1250	LF	\$1.00	\$1,250.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	1	Ea	\$120.00	\$120.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Luminaire	1	Ea	\$500.00	\$500.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Conductors	200	LF	\$2.50	\$500.00
Concrete Single Curb	30	SF	\$25.00	\$750.00
Mobilization	1	LS	\$7,500.00	\$7,500.00
Subtotal				\$73,851.00
Contingency (30%)				\$22,155.00
Construction Total				\$96,006.00
Design (10%)				\$9,601.00
Construction Management (15%)				\$14,401.00
Total				\$120,008.00

75th Avenue and Camelback Road, Data Sheet 1

Protected/permissive control on all legs.

75 th Avenue and Camelback Road						
Data	Intersection					
	75 th Avenue		Camelback Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,	Q,F	Q,F,	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	N,N,N	N,N,N	N,N,N	N,N,N		
ADT	17200	17200	22800	23,000		
Posted Speed Limit (mph)	45	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	30	30	30	35		
LT Head Centered Over Lane	No	No	No	No		
Thru Heads Centered Over Lane	Yes	No	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	N,Y,N	N,Y,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 338	K	A	B	C	O	
Glendale Rank: 29						
2013	0	1	3	6	23	33
2012	0	0	3	8	16	27
2011	0	0	1	7	5	13
2010	0	0	3	7	16	26
2009	0	1	1	7	18	27
Totals:	0	2	11	35	78	126
Crash Rate						1.721
Left-Turn Crash Rate						0.423
Left-Turn Severity Index						0.808
Severity Index						3.462

75th Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	3	Ea	\$250.00	\$750.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	3	Ea	\$2,000.00	\$6,000.00
Remove Mast Arm	3	Ea	\$1,000.00	\$3,000.00
Remove Existing Signal Pole	3	Ea	\$6,000.00	\$18,000.00
Furnish/Install Traffic Control Devices	1	LS	\$13,000.00	\$13,000.00
Flagging Service (Off-Duty Police)	100	Hr	\$32.00	\$3,200.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal (IISNS)	3	Ea	\$1,100.00	\$3,300.00
Traffic Signal Face (Type F) (LED)	4	Ea	\$400.00	\$1,600.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Face (Ped, M/H, Countdown)	3	Ea	\$400.00	\$1,200.00
Pedestrian Push Button	3	Ea	\$200.00	\$600.00
Traffic Signal Mounting Assembly (Type II)	3	Ea	\$120.00	\$360.00
Traffic Signal Mounting Assembly (Type VII)	3	Ea	\$200.00	\$600.00
Traffic Signal Mounting Assembly (Type XI)	3	Ea	\$250.00	\$750.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Relocate Luminaire	3	Ea	\$300.00	\$900.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type Q)	3	Ea	\$1,800.00	\$5,400.00
Pole Foundation (Type Q)	3	Ea	\$1,400.00	\$4,200.00
Mast Arm (20')	3	Ea	\$600.00	\$1,800.00
Mast Arm (40')	3	Ea	\$1,000.00	\$3,000.00
Concrete Single Curb	315	LF	\$25.00	\$7,875.00
Mobilization	1	LS	\$8,000.00	\$8,000.00
Subtotal				\$94,135.00
Contingency (30%)				\$28,241.00
Construction Total				\$122,376.00
Design (10%)				\$12,238.00
Construction Management (15%)				\$18,356.00
Total				\$152,970.00

75th Avenue and Missouri Avenue, Data Sheet 1

Permissive control on all legs.

75 th Avenue and Missouri Avenue					
Data	Intersection				
	75 th Avenue		Missouri Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F,F	F,F,	F,F,	
Pole Head Types (Outboard Lt, Far Rt)	F, None	F, None	F, F	F, None	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	15	15	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	1	1	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	540	325	25	
Grade	0	0	0	0	
Mast Arm Length	35	50	55	30	
LT Head Centered Over Lane	Yes	Yes	NA	NA	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 725	K	A	B	C	O	
Glendale Rank: 48						
2013	0	0	0	0	2	2
2012	1	0	0	0	0	1
2011	0	0	0	0	1	1
2010	0	0	0	1	4	5
2009	0	0	0	2	1	3
Totals:	1	0	0	3	8	12
Left-Turn Severity Index						5.846
Severity Index						5.958

75th Avenue and Missouri Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,000.00	\$4,000.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Traffic Signal Mounting Assembly (Type VII)	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,000.00	\$1,000.00
Subtotal				\$15,762.00
Contingency (30%)				\$4,729.00
Construction Total				\$20,491.00
Design (10%)				\$2,049.00
Construction Management (15%)				\$3,074.00
Total				\$25,614.00

75th Avenue and Bethany Home Road, Data Sheet 1

Permitted control on the north and south legs and protected/permissive control on the east and west legs.

75 th Avenue and Bethany Home Road						
Data	Intersection					
	75 th Avenue		Bethany Home			
	NB	SB	EB	WB		
Control	Perm	Perm	P/P	P/P		
Mast Arm Head Types	F,F	F,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	F, F (near)	F,F (near)	Q, None	Q, None		
Median Width (feet)	0	0	16	8		
Median Negative Offset (feet)	4.6	4.6	13	13		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	1	1	3	3		
R4-7, Object Marker, PB in Med	NA	NA	Y,Y,Y	Y,Y,Y		
ADT	-	-	-	-		
Posted Speed Limit (mph)	NA*	25	40	40		
Grade	0	0	0	0		
Mast Arm Length	35	45	50	55		
LT Head Centered Over Lane	Yes	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 570	K	A	B	C	O	
Glendale Rank: 36						
2013	0	2	1	3	4	10
2012	0	0	1	2	9	12
2011	0	0	0	4	7	11
2010	0	0	2	3	8	13
2009	0	2	1	2	5	10
Totals:	0	4	5	14	33	56
Crash Rate						0.999
Left-Turn Crash Rate						0.339
Left-Turn Severity Index						0.608
Severity Index						2.720

75th Avenue and Bethany Home Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundation	1	Ea	\$2,000.00	\$2,000.00
Relocate Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate Pre-emption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Temp Traffic Control	1	LS	\$12,000.00	\$12,000.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Traffic Signal Mounting Assembly (Type XI)	2	Ea	\$250.00	\$500.00
Remove/Reconfigure Mounting Assembly	6	Ea	\$100.00	\$600.00
Relocate Luminaire	3	Ea	\$300.00	\$900.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Conductors	500	LF	\$2.50	\$1,250.00
Mobilization	1	LS	\$5,000.00	\$5,000.00
Subtotal				\$41,350.00
Contingency (30%)				\$12,405.00
Construction Total				\$53,755.00
Design (10%)				\$5,376.00
Construction Management (15%)				\$8,063.00
Total				\$67,194.00

75th Avenue and Glendale Avenue, Data Sheet 1

Protected/permissive control all legs.

75 th Avenue and Glendale Avenue						
Data	Intersection					
	75 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	3	4.5	15	5		
Median Negative Offset (feet)	3	3	NA	NA		
Median No Offset (feet)	NA	NA	Yes	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	3	3		
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,N	Y,Y,Y	Y,Y,Y		
ADT	12900	14300	23200	22700		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	55	45	55	55		
LT Head Centered Over Lane	No	Yes	Yes	No		
Thru Heads Centered Over Lane	Yes	Yes	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 111	K	A	B	C	O	
Glendale Rank: 14						
2013	1	0	4	7	12	24
2012	0	0	2	4	8	14
2011	0	0	3	6	5	14
2010	0	0	3	3	14	20
2009	0	0	3	1	8	12
Totals:	1	0	15	21	47	84
Crash Rate						1.258
Left-Turn Crash Rate						0.344
Left-Turn Severity Index						0.700
Severity Index						8.070

75th Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	54	LF	\$5.00	\$270.00
Remove Concrete Median	108	SF	\$3.00	\$324.00
Remove Pavement	120	SF	\$5.00	\$600.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	1	Ea	\$250.00	\$250.00
Remove/Salvage Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundation	2	Ea	\$2,000.00	\$4,000.00
Relocate Existing Signal Pole	2	Ea	\$6,000.00	\$12,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Pavement Patch	253	SF	\$16.00	\$4,048.00
Furnish/Install Temp Traffic Control	1	LS	\$18,000.00	\$18,000.00
Flagging Services, Off-Duty Police	50	Hr	\$32.00	\$1,600.00
Pavement Marking (Painted) (4")	14	LF	\$0.50	\$7.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type VII)	2	Ea	\$200.00	\$400.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (Type R)	2	Ea	\$1,400.00	\$2,800.00
Conductors	320	LF	\$2.50	\$800.00
Concrete Single Curb	25	SF	\$25.00	\$625.00
Concrete Median Nose	40	SF	\$20.00	\$800.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$65,424.00
Contingency (30%)				\$19,627.00
Construction Total				\$85,051.00
Design (10%)				\$8,505.00
Construction Management (15%)				\$12,758.00
Total				\$106,314.00

75th Avenue and Deer Valley Road, Data Sheet 1

Protected control on the north, south, and west legs and protected/permissive control on the east leg.

75 th Avenue and Deer Valley Road						
Data	Intersection					
	75 th Avenue		Deer Valley Rd			
	NB	SB	EB	WB		
Control	Prot	Prot	P/P	Prot		
Mast Arm Head Types	R,F,F	R,F,F	Q,F,Q	R,F,F,		
Pole Head Types (Outboard Lt, Far Rt)	R, None	R, None	Q,NA, Q(near)	R, None		
Median Width (feet)	NA	4	NA	NA		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	1	2	2		
R4-7, Object Marker, PB in Med	Y,Y,N	N,N,N	N,N,N	N,N,N		
ADT	26900	26900	11000	11000		
Posted Speed Limit (mph)	40	35	40	40		
Grade	0	0	0	0		
Mast Arm Length	35	55	55	50		
LT Head Centered Over Lane	No	Yes	Yes	Yes		
Thru Heads Centered Over Lane	No	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1247	K	A	B	C	O	
Glendale Rank: 64						
2013	0	0	1	2	8	11
2012	0	0	1	2	6	9
2011	0	0	2	1	11	14
2010	0	0	1	2	2	5
2009	0	1	0	3	5	9
Totals:	0	1	5	10	32	48
Crash Rate						0.693
Left-Turn Severity Index						0.116
Left-Turn Severity Index						0.412
Severity Index						1.348

75th Avenue and Deer Valley Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$5,000.00	\$5,000.00
Flagging Service (Off-Duty Police)	12	Hr	\$32.00	\$384.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Relocate Signal Head	1	Ea	\$100.00	\$100.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$2,000.00	\$2,000.00
Subtotal				\$13,734.00
Contingency (30%)				\$4,120.00
Construction Total				\$17,854.00
Design (10%)				\$1,785.00
Construction Management (15%)				\$2,678.00
Total				\$22,317.00

75th Avenue and Union Hills Drive, Data Sheet 1

Protected/permissive control on the north and south legs and protected control on the east and west legs.

75 th Avenue and Union Hills Drive						
Data	Intersection					
	75 th Avenue		Union Hills Dr			
	NB	SB	EB	WB		
Control	P/P	P/P	Prot	Prot		
Mast Arm Head Types	Q,F,F	Q,F,F	R,F,F	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	R, None	R, None		
Median Width (feet)	4	4	11	16		
Median Negative Offset (feet)	3.5	3.5	15	15		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Med	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
ADT	15700	16500	19300	17700		
Posted Speed Limit (mph)	40	30	30	30		
Grade	0	0	0	0		
Mast Arm Length	50	50	40	50		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 897	K	A	B	C	O	
Glendale Rank: 51						
2013	0	0	0	2	18	20
2012	0	0	2	3	9	14
2011	0	1	0	1	7	9
2010	0	1	0	2	7	10
2009	0	0	1	2	9	12
Totals:	0	2	3	10	50	65
Crash Rate						1.029
Left-Turn Crash Rate						0.047
Left-Turn Severity Index						0.088
Severity Index						1.660

75th Avenue and Union Hills Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	133	LF	\$5.00	\$665.00
Remove Pavement	544	SF	\$5.00	\$2,720.00
Remove Signs	2	Ea	\$250.00	\$500.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Pavement Patch	951	SF	\$16.00	\$15,216.00
Furnish/Install Temp Traffic Control	1	LS	\$7,500.00	\$7,500.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Concrete Single Curb	62	SF	\$25.00	\$1,550.00
Mobilization	1	LS	\$4,500.00	\$4,500.00
Subtotal				\$44,863.00
Contingency (30%)				\$13,459.00
Construction Total				\$58,322.00
Design (10%)				\$5,832.00
Construction Management (15%)				\$8,748.00
Total				\$72,902.00

77th Avenue and Bell Road, Data Sheet 1

Protected/permissive control on the north and south legs and protected control on the east and west legs.

77 th Avenue and Bell Road						
Data	Intersection					
	77 th Avenue		Bell Road			
	NB	SB	EB	WB		
Control	P/P	P/P	Prot	Prot		
Mast Arm Head Types	Q,F,F	Q,F,F	F,F,F	F,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,F (near)	Q,F (near)	R,R(med), F(near)	R,R(med) ,F(near)		
Median Width (feet)	0	8	26	26		
Median Negative Offset (feet)	7.5	7.5	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	1	2	4	4		
R4-7, Object Marker, PB in Med	N*,N,Y	NA	N,Y,Y	N,Y,Y		
ADT	-	-	-	-		
Posted Speed Limit (mph)	35	NA*	40	40		
Grade	0	0	0	0		
Mast Arm Length	45	40	55	55		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	No	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other	NB has an R4-7a sign, SB is coming out of parking lot, EB and WB have center pole both far and near in median.					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 8673	K	A	B	C	O	
Glendale Rank: 45						
2013	0	0	1	8	14	23
2012	0	0	0	3	8	11
2011	0	1	2	3	25	31
2010	0	1	0	4	16	21
2009	0	0	0	0	0	0
Totals:	0	2	3	18	63	86
Left-Turn Severity Index						0.150
Severity Index						2.048

77th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Furnish/Install Temp Traffic Control	1	LS	\$6,000.00	\$6,000.00
Flagging Service (Off-Duty Police)	8	Hr	\$32.00	\$256.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$13,856.00
Contingency (30%)				\$4,157.00
Construction Total				\$18,013.00
Design (10%)				\$1,801.00
Construction Management (15%)				\$2,702.00
Total				\$22,516.00

79th Avenue and Bell Road, Data Sheet 1

Protected/permissive control on the north and south legs and protected control on the east and west legs.

79 th Avenue and Bell Road							
Data	Intersection						
	79 th Avenue		Bell Road				
	NB	SB	EB	WB			
Control	P/P	P/P	Prot	Prot			
Mast Arm Head Types	Q,F	Q,F	F,F,F	F,F,F			
Pole Head Type (Outbrd Lt, Far Rt)	Q,F,F (near)	Q,F,F (near)	R,R(med), F(near)	R,R(med) ,F(near)			
Median Width (feet)	19	6	20	10			
Median Negative Offset (feet)	19.5	19.5	NA	NA			
Median No Offset (feet)	NA	NA	NA	NA			
Median Positive Offset (feet)	NA	NA	NA	NA			
No. Opposing Thru Lanes	2	1	4	4			
R4-7, Object Marker, PB in Med	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y			
ADT	-	-	-	-			
Posted Speed Limit (mph)	NA*	30	40	40			
Grade	0	0	0	0			
Mast Arm Length	35	40	55	50			
LT Head Centered Over Lane	No	Yes	Yes	Yes			
Thru Heads Centered Over Lane	No	No	No	No			
MMU Upgrade Required						Y	
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y			
Other	NB exiting parking lot. EB & WB have center pole, far and near, in median with R Head.						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total	
MAG Rank: 650	K	A	B	C	O		
Glendale Rank: 42							
2013	0	0	2	8	10	20	
2012	0	0	1	7	17	25	
2011	0	1	1	3	16	21	
2010	0	0	0	2	20	22	
2009	0	0	0	0	0	0	
Totals:	0	1	4	20	63	88	
Left-Turn Severity Index						0.058	
Severity Index						1.812	

79th Avenue and Bell Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	86	LF	\$5.00	\$430.00
Remove Concrete Median	244	SF	\$3.00	\$732.00
Remove Pavement	191	SF	\$5.00	\$955.00
Remove and Replace R4-7, Object Marker	1	Ea	\$250.00	\$250.00
Remove/Salvage Traffic Signals	4	Ea	\$300.00	\$1,200.00
Pavement Patch	435	SF	\$16.00	\$6,960.00
Furnish/Install Temp Traffic Control	1	LS	\$8,000.00	\$8,000.00
Flagging Services, Off-Duty Police	16	Hr	\$32.00	\$512.00
Pavement Marking (White/Yellow Thermoplastic) (4")	104	LF	\$1.00	\$104.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Concrete Single Curb	10	SF	\$25.00	\$250.00
Concrete Median Nose	15	SF	\$20.00	\$300.00
Mobilization	1	LS	\$2,500.00	\$2,500.00
Subtotal				\$26,993.00
Contingency (30%)				\$8,098.00
Construction Total				\$35,091.00
Design (10%)				\$3,509.00
Construction Management (15%)				\$5,264.00
Total				\$43,864.00

79th Avenue and Union Hills Drive, Data Sheet 1

Protected/permissive control on the north, east, and west legs and permissive control on the south leg.

79 th Avenue and Union Hills Drive					
Data	Intersection				
	79 th Avenue		Union Hills Drive		
	NB	SB	EB	WB	
Control	P/P	Perm	P/P	P/P	
Mast Arm Head Types	Q,F,F	F,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	Q,None	F,None	Q,None	Q,None	
Median Width (feet)	4	0	4	4	
Median Negative Offset (feet)	NA	NA	4	4	
Median No Offset (feet)	Yes	Yes	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	2	2	
R4-7, Object Marker, PB in Median	NA	Y,Y,Y	N,Y,Y	N,Y,Y	
ADT	-	-	-	-	
Posted Speed Limit (mph)	30	25	40	40	
Grade	0	0	0	0	
Mast Arm Length	40	45	45	50	
LT Head Centered Over Lane	Yes	Yes	No	No	
Thru Heads Centered Over Lane	Yes	No	No	No	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	N,Y,N	N,Y,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1393	K	A	B	C	O	
Glendale Rank: 72						
2013	0	0	0	3	8	11
2012	0	0	0	2	6	8
82011	0	0	1	2	7	10
2010	0	0	0	2	9	11
2009	0	0	0	0	0	0
Totals:	0	0	1	9	30	40
Left-Turn Severity Index						0.008
Severity Index						0.578

79th Avenue and Union Hills Drive, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	104	LF	\$5.00	\$520.00
Remove Concrete Median	167	SF	\$3.00	\$501.00
Remove Pavement	237	SF	\$5.00	\$1,185.00
Remove Pull Box	2	Ea	\$500.00	\$1,000.00
Remove and Replace R4-7, Object Marker	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	6	Ea	\$300.00	\$1,800.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Pavement Patch	424	SF	\$16.00	\$6,784.00
Furnish/Install Temp Traffic Control	1	LS	\$11,500.00	\$11,500.00
Flagging Services, Off-Duty Police	24	Hr	\$32.00	\$768.00
Pavement Marking (Yellow Thermoplastic) (4")	200	LF	\$1.00	\$200.00
Left-Turn Yield on FYA Sign	15	SF	\$20.00	\$300.00
Traffic Signal Face (Type FYA) (LED)	6	Ea	\$600.00	\$3,600.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Pedestrian Push Button	1	Ea	\$200.00	\$200.00
Remove/Reconfigure Mounting Assembly	3	Ea	\$100.00	\$300.00
Relocate Signal Head	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Conductors	200	LF	\$2.50	\$500.00
Concrete Single Curb	12	SF	\$25.00	\$300.00
Concrete Median Nose	80	SF	\$20.00	\$1,600.00
Mobilization	1	LS	\$4,000.00	\$4,000.00
Subtotal				\$41,058.00
Contingency (30%)				\$12,317.00
Construction Total				\$53,375.00
Design (10%)				\$5,338.00
Construction Management (15%)				\$8,006.00
Total				\$66,719.00

83rd Avenue and Camelback Road, Data Sheet 1

Protected/permissive control on all legs.

83 rd Avenue and Camelback Road						
Data	Intersection					
	83 rd Avenue		Camelback Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,	Q,F,F	Q,F,	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	3	3		
R4-7, Object Marker, PB in Med	N,N,N	N,N,N	Y,Y,N	Y,Y,Y		
ADT	16200	16200	25500	23,000		
Posted Speed Limit (mph)	45	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	40	25	35	30		
LT Head Centered Over Lane	No	No	No	No		
Thru Heads Centered Over Lane	Yes	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y/N,Y, Y	N,Y,Y	Y/N,Y, N	Y/N,Y, N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 319	K	A	B	C	O	
Glendale Rank: 25						
2013	0	1	2	7	19	29
2012	0	0	3	6	10	19
2011	0	1	2	6	14	23
2010	0	0	5	6	14	25
2009	0	0	2	5	14	21
Totals:	0	2	14	30	71	117
Crash Rate						1.584
Left-Turn Crash Rate						0.474
Left-Turn Severity Index						1.654
Severity Index						3.464

83rd Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	4	Ea	\$250.00	\$1,000.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundations	3	Ea	\$200.00	\$6,000.00
Remove/Relocate Mast Arm	4	Ea	\$1,000.00	\$4,000.00
Remove Existing Signal Pole	4	Ea	\$6,000.00	\$24,000.00
Relocate Antenna	1	Ea	\$2,000.00	\$2,000.00
Furnish/Install Traffic Control Devices	1	LS	\$15,000.00	\$15,000.00
Flagging Service (Off-Duty Police)	80	Hr	\$32.00	\$2,560.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal (IISNS)	4	Ea	\$1,100.00	\$4,400.00
Traffic Signal Face (Type F) (LED)	4	Ea	\$400.00	\$1,600.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Face (Ped, M/H, Countdown)	1	Ea	\$400.00	\$400.00
Pedestrian Push Button	3	Ea	\$200.00	\$600.00
Traffic Signal Mounting Assembly (Type II)	12	Ea	\$120.00	\$1,440.00
Relocate Signal Head	12	Ea	\$100.00	\$1,200.00
Luminaire	4	Ea	\$500.00	\$2,000.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type Q)	3	Ea	\$1,800.00	\$5,400.00
Pole Foundation (Type Q)	3	Ea	\$1,400.00	\$4,200.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Mast Arm (20')	3	Ea	\$600.00	\$1,800.00
Mast Arm (40')	3	Ea	\$1,000.00	\$3,000.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	1400	LF	\$2.50	\$3,500.00
Mobilization	1	LS	\$10,000.00	\$10,000.00
Subtotal				\$106,600.00
Contingency (30%)				\$31,980.00
Construction Total				\$138,580.00
Design (10%)				\$13,858.00
Construction Management (15%)				\$20,787.00
Total				\$173,225.00

83rd Avenue and Bethany Home Road, Data Sheet 1

Protected/permissive control on the south leg and permissive control on the north and west legs.

83 rd Avenue and Bethany Home Road							
Data	Intersection						
	83 rd Avenue		Bethany Home Road				
	NB	SB	EB	WB			
Control	Perm	P/P	NA	Perm			
Mast Arm Head Types	F,F	Q,F,F	NA	F,F,F			
Pole Head Types (Outboard Lt, Far Rt)	F,F	Q,None	NA	F,None			
Median Width (feet)	NA	NA	NA	NA			
Median Negative Offset (feet)	11.67	11.67	NA	NA			
Median No Offset (feet)	NA	NA	NA	NA			
Median Positive Offset (feet)	NA	NA	NA	NA			
No. Opposing Thru Lanes	NA	2	NA	2			
R4-7, Object Marker, PB in Med	N,N,N	N,N,N	NA	N,N,N			
ADT	14000	16200	11500	11500			
Posted Speed Limit (mph)	40	40	NA	40			
Grade	0	0	0	0			
Mast Arm Length	50	50	NA	50			
LT Head Centered Over Lane	No	Yes	NA	Yes			
Thru Heads Centered Over Lane	No	Yes	NA	Yes			
MMU Upgrade Required						Y	
PPB, M/H, Countdown	Y,Y,N	N/Y,N/ Y,N	N/Y,Y,N	N/Y,N/Y, N			
Other	Pole on the SW corner has no M/H, PPB.						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total	
MAG Rank: 1404	K	A	B	C	O		
Glendale Rank: 73							
2013	0	0	0	1	4	5	
2012	0	0	2	2	5	9	
2011	0	0	1	6	6	13	
2010	0	0	0	4	3	7	
2009	0	0	1	1	1	3	
Totals:	0	0	4	14	19	37	
Crash Rate						0.762	
Left-Turn Crash Rate						0.247	
Left-Turn Severity Index						0.504	
Severity Index						0.984	

83rd Avenue and Bethany Home Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	2	Ea	\$300.00	\$600.00
Furnish/Install Temp Traffic Control	1	LS	\$1,200.00	\$1,200.00
Left-Turn Yield on FYA Sign	5	SF	\$20.00	\$100.00
Traffic Signal Face (Type FYA) (LED)	2	Ea	\$600.00	\$1,200.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,000.00	\$1,000.00
Subtotal				\$6,250.00
Contingency (30%)				\$1,875.00
Construction Total				\$8,125.00
Design (10%)				\$813.00
Construction Management (15%)				\$1,219.00
Total				\$10,157.00

83rd Avenue and Glendale Avenue Data Sheet 1

Protected/permissive control on all legs.

83 rd Avenue and Glendale Avenue						
Data	Intersection					
	83 rd Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F	Q,F,F	Q,F,	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, None	Q, None		
Median Width (feet)	0	0	5	6		
Median Negative Offset (feet)	NA	NA	-2.5	-2.5		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	3	3		
R4-7, Object Marker, PB in Median	N,N,N	N,N,N	Y,Y,N	Y,Y,Y		
ADT	9000	14000	22700	23700		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	45	55	45	40		
LT Head Centered Over Lane	No	Yes	No	No		
Thru Heads Centered Over Lane	No	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	N,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 625	K	A	B	C	O	
Glendale Rank: 40						
2013	0	0	2	3	14	19
2012	0	0	3	3	5	11
2011	0	0	0	5	12	17
2010	0	0	1	2	8	11
2009	0	1	1	2	9	13
Totals:	0	1	7	15	48	71
Crash Rate						1.120
Left-Turn Crash Rate						0.174
Left-Turn Severity Index						0.234
Severity Index						1.782

83rd Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Remove Existing Signal Pole	1	Ea	\$6,000.00	\$6,000.00
Relocate IISNS	3	Ea	\$400.00	\$1,200.00
Furnish/Install Traffic Control Devices	1	LS	\$12,000.00	\$12,000.00
Flagging Service (Off-Duty Police)	80	Hr	\$32.00	\$2,560.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type F) (LED)	5	Ea	\$400.00	\$2,000.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	5	Ea	\$50.00	\$250.00
Pedestrian Push Button	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	8	Ea	\$120.00	\$960.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Remove/Reconfigure Mounting Assembly	4		\$100.00	\$400.00
Relocate Signal Head	9	Ea	\$100.00	\$900.00
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (55')	2	Ea	\$1,800.00	\$3,600.00
Conductors	480	LF	\$2.50	\$1,200.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$51,920.00
Contingency (30%)				\$15,576.00
Construction Total				\$67,496.00
Design (10%)				\$6,750.00
Construction Management (15%)				\$10,124.00
Total				\$84,370.00

83rd Avenue and Campo Bello Drive, Data Sheet 1

Protected control on all legs.

83 rd Avenue and Campo Bello Drive					
Data	Intersection				
	83 rd Avenue		Campo Bello Dr		
	NB	SB	EB	WB	
Control	Prot	Prot	Prot	Prot	
Mast Arm Head Types	R,F,F	R,F,F	R,F,F	R,F,Q	
Pole Head Types (Outboard Lt, Far Rt)	R,Q	R,F*,F*	R,None	R,Q (near)	
Median Width (feet)	6	8	0	6	
Median Negative Offset (feet)	10	10	-	NA	
Median No Offset (feet)	NA	NA	-	NA	
Median Positive Offset (feet)	NA	NA	-	NA	
No. Opposing Thru Lanes	2	2	NA	1	
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,N	Y,Y,Y	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	40	40	30	30	
Grade	0	0	0	0	
Mast Arm Length	45	55	55	45	
LT Head Centered Over Lane	Yes	Yes	Yes	Yes	
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,Y,N	N,Y,N	Y,Y,N	Y,Y,N	
Other	*Two SB F heads mounted on the back of NB mast arm				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1489	K	A	B	C	O	
Glendale Rank: 79						
2013	0	0	1	2	6	9
2012	0	1	0	0	7	8
2011	0	0	0	1	16	17
2010	0	0	0	2	4	6
2009	0	0	0	0	0	0
Totals:	0	1	1	5	33	40
Left-Turn Severity Index						0.462
Severity Index						0.822

83rd Avenue and Campo Bello, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	1	Ea	\$250.00	\$250.00
Remove Traffic Signals	2	Ea	\$300.00	\$600.00
Furnish/Install Traffic Control Devices	1	LS	\$2,500.00	\$2,500.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	5	SF	\$20.00	\$100.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Relocate Signal Head	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$7,862.00
Contingency (30%)				\$2,359.00
Construction Total				\$10,221.00
Design (10%)				\$1,022.00
Construction Management (15%)				\$1,533.00
Total				\$12,776.00

91st Avenue and Camelback Road, Data Sheet 1

Protected/permissive control on all legs.

91 st Avenue and Camelback Road						
Data	Intersection					
	91 st Avenue		Camelback Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F	Q,F,F	Q,F,	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, F	Q, None	Q, None	Q, None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Med	N,N,N	N,N,N	N,N,N	N,N,N		
ADT	7000	7000	25500	25900		
Posted Speed Limit (mph)	40	40	40	40		
Grade	0	0	0	0		
Mast Arm Length	30	55	30	30		
LT Head Centered Over Lane	No	No	Yes	No		
Thru Heads Centered Over Lane	No	No	Yes	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N/Y,Y, Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1189	K	A	B	C	O	
Glendale Rank: 61						
2013	0	2	4	5	17	28
2012	0	0	3	3	9	15
2011	0	1	3	6	17	27
2010	0	0	1	3	11	15
2009	0	1	2	4	12	19
Totals:	0	4	13	21	66	104
Crash Rate						1.742
Left-Turn Crash Rate						0.486
Left-Turn Severity Index						1.554
Severity Index						3.786

91st Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	3	Ea	\$250.00	\$750.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Signal Poles and Bases	4	Ea	\$8,000.00	\$32,000.00
Removal of Pole Foundations	4	Ea	\$2,000.00	\$8,000.00
Remove/Relocate Mast Arm	4	Ea	\$1,000.00	\$4,000.00
Relocate IISNS	4	Ea	\$400.00	\$1600.00
Relocate CCTV and Antenna	1	Ea	\$5,000.00	\$5,000.00
Furnish/Install Traffic Control Devices	1	LS	\$20,000.00	\$20,000.00
Flagging Service (Off-Duty Police)	160	Hr	\$32.00	\$5,120.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal (IISNS)	3	Ea	\$1,100.00	\$3,300.00
Traffic Signal Face (Type F) (LED)	2	Ea	\$400.00	\$800.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Pedestrian Push Button	1	Ea	\$200.00	\$200.00
Traffic Signal Mounting Assembly (Type II)	9	Ea	\$120.00	\$1,080.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Luminaire	3	Ea	\$500.00	\$1,500.00
Relocate Luminaire	1	Ea	\$300.00	\$300.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type Q)	3	Ea	\$1,800.00	\$5,400.00
Pole (Type W)	1	Ea	\$3,200.00	\$3,200.00
Pole Foundation (Type Q)	3	Ea	\$1,400.00	\$4,200.00
Pole Foundation (Type W)	1	Ea	\$1,800.00	\$1,800.00
Pole Foundation (for SL-1 Pole)	1	Ea	\$800.00	\$800.00
Mast Arm (20')	3	Ea	\$600.00	\$1,800.00
Mast Arm (40')	3	Ea	\$1,000.00	\$3,000.00
Mast Arm (65')	1	Ea	\$3,200.00	\$3,200.00
Conductors	2000	LF	\$2.50	\$5,000.00
Mobilization	1	LS	\$12,000.00	\$12,000.00
Subtotal				\$134,750.00
Contingency (30%)				\$40,425.00
Construction Total				\$175,175.00
Design (10%)				\$17,518.00
Construction Management (15%)				\$26,276.00
Total				\$218,969.00

91st Avenue and Camelback Road, Data Sheet 1

Protected control on the north and west leg and permissive on the south leg.

91 st Avenue and Camelback Road						
Data	Intersection					
	91 st Avenue		Camelback Road			
	NB	SB	EB	WB		
Control	Prot	Perm	NA	Prot		
Mast Arm Head Types	R,F,F,F	F,F,F,F	NA	R,R,F,F		
Pole Head Type (Outbrd Lt, Far Rt)	R,None	NA, None	NA	R,None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	3	2	NA	NA		
R4-7, Object Marker, PB in Med	N,N,N	N,N,N	NA	N,N,N		
ADT	7300	7000	NA	3400		
Posted Speed Limit (mph)	40	40	NA	40		
Grade	0	0	0	0		
Mast Arm Length	45	55	55	NA		
LT Head Centered Over Lane	No	NA	Yes	NA		
Thru Heads Centered Over Lane	Yes	Yes	Yes	NA		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N/Y,N/ Y,Y	N/Y,N/ Y,Y	N/Y,N/ Y,Y	NA		
Other	NB and EB Dual Left-turn lane					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 2042	K	A	B	C	O	
Glendale Rank: 84						
2013	0	0	0	1	1	2
2012	0	0	0	1	2	3
2011	0	0	2	0	0	2
2010	0	1	0	1	0	2
2009	0	0	0	2	3	5
Totals:	0	1	2	5	6	14
Crash Rate						0.727
Left-Turn Crash Rate						0
Left-Turn Severity Index						0
Severity Index						0.794

99th Avenue and Camelback Road, Data Sheet 1

Protected/permissive control on all legs.

99 th Avenue and Camelback Road						
Data	Intersection					
	99 th Avenue		Camelback Road			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F	Q,F,		
Pole Head Types (Outboard Lt, Far Rt)	Q, None	Q, None	Q, F	Q, F		
Median Width (feet)	0	0	0	4		
Median Negative Offset (feet)	NA	NA	3.9	3.9		
Median No Offset (feet)	NA	NA	Yes	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Med	N,N,N	N,N,N	N,N,N	Y,Y,Y		
ADT	7000	7000	25900	25900		
Posted Speed Limit (mph)	50	50	45	40		
Grade	0	0	0	0		
Mast Arm Length	45	45	25	25		
LT Head Centered Over Lane	Yes	Yes	No	No		
Thru Heads Centered Over Lane	Yes	Yes	Yes	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,N	Y,Y,N	Y,Y,N	N/Y,Y, N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 410	K	A	B	C	O	
Glendale Rank: 31						
2013	0	1	4	2	9	16
2012	0	1	4	7	15	27
2011	0	0	2	5	12	19
2010	0	1	5	4	5	15
2009	0	0	2	3	9	14
Totals:	0	3	17	21	50	91
Crash Rate						1.515
Left-Turn Crash Rate						0.433
Left-Turn Severity Index						1.656
Severity Index						3.642

99th Avenue and Camelback Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Signs	2	Ea	\$250.00	\$500.00
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Removal of Pole Foundations	2	Ea	\$2,000.00	\$4,000.00
Remove Mast Arm	2	Ea	\$1,000.00	\$2,000.00
Remove Existing Signal Pole	2	Ea	\$6,000.00	\$12,000.00
Relocate Preemption/Traffic Device	1	Ea	\$200.00	\$200.00
Furnish/Install Traffic Control Devices	1	LS	\$8,500.00	\$8,500.00
Flagging Service (Off-Duty Police)	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal (IISNS)	2	Ea	\$1,100.00	\$2,200.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	4	Ea	\$120.00	\$4800.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	6	Ea	\$100.00	\$600.00
Luminaire	2	Ea	\$500.00	\$1,000.00
Remove Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type Q)	2	Ea	\$1,800.00	\$3,600.00
Pole Foundation (Type Q)	2	Ea	\$1,400.00	\$2,800.00
Mast Arm (20')	2	Ea	\$600.00	\$1,200.00
Mast Arm (40')	2	Ea	\$1,000.00	\$2,000.00
Conductors	250	LF	\$2.50	\$625.00
Mobilization	1	LS	\$6,500.00	\$6,500.00
Subtotal				\$59,517.00
Contingency (30%)				\$17,855.00
Construction Total				\$77,372.00
Design (10%)				\$7,737.00
Construction Management (15%)				\$11,606.00
Total				\$96,715.00

99th Avenue and Bethany Home Road, Data Sheet 1

Protected/permissive control on the south leg and permissive control on the west leg.

99 th Avenue and Bethany Home Road						
Data	Intersection					
	99 th Avenue			Bethany Home Road		
	NB	SB	EB	WB		
Control	NA	P/P	NA	Perm		
Mast Arm Head Types	F,F,F	Q,F,F	NA	F,F		
Pole Head Types (Outboard Lt, Far Rt)	NA	Q,None	NA	None,F		
Median Width (feet)	0	0	0	5		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	NA	2	NA	NA		
R4-7, Object Marker, PB in Median	NA	NA	Y,Y,N	NA		
ADT	5200	7000	3400	2000		
Posted Speed Limit (mph)	50	50	NA	40		
Grade	0	0	0	0		
Mast Arm Length	50	55	NA	40		
LT Head Centered Over Lane	NA	Yes	NA	No		
Thru Heads Centered Over Lane	Yes	No	NA	No		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,N,N	N,N,N	N,N,N	N,N,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 7342	K	A	B	C	O	
Glendale Rank: 90						
2013	0	0	0	0	2	2
2012	0	0	0	0	0	0
2011	0	0	0	0	2	2
2010	0	0	0	1	0	1
2009	0	0	0	1	3	4
Totals:	0	0	0	2	7	9
Crash Rate						0.560
Left-Turn Crash Rate						0.062
Left-Turn Severity Index						0.004
Severity Index						0.112

99th Avenue and Bethany Home Road, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	2	Ea	\$300.00	\$600.00
Furnish/Install Temp Traffic Control	1	LS	\$2,500.00	\$2,500.00
Left-Turn Yield on FYA Sign	5	SF	\$20.00	\$100.00
Traffic Signal Face (Type FYA) (LED)	2	Ea	\$600.00	\$1,200.00
Retro-Reflective Tape	2	Ea	\$50.00	\$100.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,000.00	\$1,000.00
Subtotal				\$7,400.00
Contingency (30%)				\$2,200.00
Construction Total				\$9,620.00
Design (10%)				\$962.00
Construction Management (15%)				\$1,443.00
Total				\$12,025.00

99th Avenue and Glendale Avenue, Data Sheet 1

Protected/permissive control on all legs.

99 th Avenue and Glendale Avenue						
Data	Intersection					
	99 th Avenue		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Type (Outbrd Lt, Far Rt)	Q, F	Q,None	Q,None	Q,F		
Median Width (feet)	4	4	8	0		
Median Negative Offset (feet)	-4	-4	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	0.5	0.5		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Med.	Yes	Yes	Yes	No		
ADT	5200	5200	24400	20400		
Posted Speed Limit (mph)	45	45	40	45		
Grade	0	0	0	0		
Mast Arm Length	55	50	55	55		
LT Head Centered Over Lane	No	No	No	No		
Thru Heads Centered Over Lane	Yes	No	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	N,Y,Y		
Other	EB A pole in center median with Q head. NB, WB right head is near-side. NE and SE corner outboard on light pole					
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 662	K	A	B	C	O	
Glendale Rank: 43						
2013	0	0	1	4	7	12
2012	0	0	2	3	8	13
2011	0	1	3	3	9	16
2010	0	0	2	2	9	13
2009	0	0	3	6	5	14
Totals:	0	1	11	18	38	68
Crash Rate						1.349
Left-Turn Crash Rate						0.278
Left-Turn Severity Index						0.718
Severity Index						2,188

99th Avenue and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	2	Ea	\$300.00	\$600.00
Removal of Signal Poles and Bases	3	Ea	\$8,000.00	\$24,000.00
Furnish/Install Traffic Control Devices	1	LS	\$18,000.00	\$18,000.00
Flagging Service (Off-Duty Police)	60	Hr	\$32.00	\$1,920.00
Traffic Signal (IISNS)	3	Ea	\$1,100.00	\$3,300.00
Traffic Signal Face (Type F) (LED)	6	Ea	\$400.00	\$2,400.00
Traffic Signal Face (Type FYA) (LED)	10	Ea	\$600.00	\$6,000.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Traffic Signal Face (Ped, M/H, Countdown)	6	Ea	\$400.00	\$2,400.00
Pedestrian Push Button	6	Ea	\$200.00	\$1,200.00
Traffic Signal Mounting Assembly (Type II)	9	Ea	\$120.00	\$1,080.00
Traffic Signal Mounting Assembly (Type VII)	3	Ea	\$200.00	\$600.00
Traffic Signal Mounting Assembly (Type XI)	3	Ea	\$250.00	\$750.00
Remove/Reconfigure Mounting Assembly	1	Ea	\$100.00	\$100.00
Luminaire	3	Ea	\$500.00	\$1,500.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type W)	3	Ea	\$3,200.00	\$9,600.00
Pole Foundation (Type R)	1	Ea	\$1,400.00	\$1,400.00
Pole Foundation (Type W)	3	Ea	\$1,800.00	\$5,400.00
Mast Arm (20')	3	Ea	\$600.00	\$1,800.00
Mast Arm (55')	1	Ea	\$1,800.00	\$1,800.00
Mast Arm (60')	3	Ea	\$2,400.00	\$7,200.00
Electrical Conduit (2 ½") (with ¼" Pull Rope)	120	LF	\$11.00	\$1,320.00
Conductors	4,000	LF	\$2.50	\$10,000.00
Mobilization	1	LS	\$20,000.00	\$20,000.00
Subtotal				\$124,370.00
Contingency (30%)				\$37,311.00
Construction Total				\$161,681.00
Design (10%)				\$16,168.00
Construction Management (15%)				\$24,252.00
Total				\$202,101.00

Glenn Harbor and Glendale Avenue, Data Sheet 1

Permissive control all legs.

Glenn Harbor and Glendale Avenue					
Data	Intersection				
	Glen Harbor		Glendale Avenue		
	NB	SB	EB	WB	
Control	Perm	Perm	Perm	Perm	
Mast Arm Head Types	F,F	F,F	F,F,F	F,F,F	
Pole Head Types (Outboard Lt, Far Rt)	F,None	F,None	F,None	F,None	
Median Width (feet)	11	11	7	8	
Median Negative Offset (feet)	8.5	8.5	6	6	
Median No Offset (feet)	-1.5	0	NA	NA	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	2	2	2	2	
R4-7, Object Marker, PB in Median	Y,Y,Y	Y,Y,Y	Y,Y,Y	NA Y,Y,Y	
ADT	-	-	-	-	
Posted Speed Limit (mph)	30	40	45	45	
Grade	0	0	0	0	
Mast Arm Length	35	40	45	40	
LT Head Centered Over Lane					
Thru Heads Centered Over Lane					
MMU Upgrade Required					Y
PPB, M/H, Countdown	N,N,N	N,N,N	N,N,N	N,N,N	
Other					

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 4329	K	A	B	C	O	
Glendale Rank: 88						
2013	0	0	0	1	0	1
2012	0	0	0	0	2	2
2011	0	0	1	0	1	2
2010	0	0	0	0	5	5
2009	0	0	0	0	0	0
Totals:	0	0	1	1	8	10
Left-Turn Severity Index						0.004
Severity Index						0.154

Glenn Harbor and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Curb	223	LF	\$5.00	\$1,115.00
Remove Concrete Median	517	SF	\$3.00	\$1,551.00
Remove Pavement	330	SF	\$5.00	\$1,650.00
Remove and Replace Marquee Signs	2		\$750.00	\$1,500.00
Remove Pull Box	4		\$500.00	\$2,000.00
Remove and Replace R4-7, Object Marker	4	Ea	\$250.00	\$1,000.00
Remove Traffic Signals	7	Ea	\$300.00	\$2,100.00
Removal of Signal Poles and Bases	1	Ea	\$8,000.00	\$8,000.00
Remove Mast Arm	1	Ea	\$1,000.00	\$1,000.00
Relocate IISNS	1	Ea	\$400.00	\$400.00
Pavement Patch	1278	SF	\$16.00	\$20,448.00
Furnish/Install Temp Traffic Control	1	LS	\$15,000.00	15,000.00
Flagging Services, Off-Duty Police	24	Hr	\$32.00	\$768.00
Striping (Yellow Thermoplastic) (4")	154	LF	\$1.00	\$154.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Traffic Signal Mounting Assembly (Type II)	3	Ea	\$120.00	\$360.00
Traffic Signal Mounting Assembly (Type XI)	1	Ea	\$250.00	\$250.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Relocate Signal Head	3	Ea	\$100.00	\$300
Relocate Luminaire	2	Ea	\$300.00	\$600.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Pole (Type R)	1	Ea	\$1,900.00	\$1,900.00
Mast Arm (50')	1	Ea	\$1,500.00	\$1,500.00
Conductors	500	LF	\$2.50	\$1,250.00
Concrete Single Curb	44	LF	\$25.00	\$1,100.00
Concrete Median Nose	145	SF	\$20.00	\$2,900.00
Mobilization	1	LS	\$7,500.00	\$7,500.00
Subtotal				\$82,146.00
Contingency (30%)				\$24,644.00
Construction Total				\$106,790.00
Design (10%)				\$10,679.00
Construction Management (15%)				\$16,019.00
Total				\$133,488.00

Dysart Road and Glendale Avenue, Data Sheet 1

Protected/permissive control on all legs.

Dysart Road and Glendale Avenue						
Data	Intersection					
	Dysart Road		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F,F	Q,F,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	0	0	0	0		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	2	2		
R4-7, Object Marker, PB in Median	NA	NA	NA	NA		
ADT	18000	18000	20300	211900		
Posted Speed Limit (mph)	45	40	35	45		
Grade	0	0	0	0		
Mast Arm Length	45	45	40	45		
LT Head Centered Over Lane	Yes	Yes	No	No		
Thru Heads Centered Over Lane	Yes	Yes	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	N,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1097	K	A	B	C	O	
Glendale Rank: 59						
2013	0	1	1	2	7	11
2012	0	0	0	3	7	10
2011	0	0	3	1	10	14
2010	0	0	0	4	7	11
2009	0	0	0	2	5	7
Totals:	0	1	4	12	36	53
Crash Rate						0.851
Left-Turn Crash Rate						0.161
Left-Turn Severity Index						0.192
Severity Index						1.368

Dysart Road and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,200.00	\$4,200.00
Flagging Service, Off-Duty Police	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	8	Ea	\$50.00	\$400.00
Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$16,412.00
Contingency (30%)				\$4,924.00
Construction Total				\$21,336.00
Design (10%)				\$2,134.00
Construction Management (15%)				\$3,200.00
Total				\$26,670.00

El Mirage Road and Glendale Avenue, Data Sheet 1

Protected/permissive control on all legs.

El Mirage Road and Glendale Avenue						
Data	Intersection					
	El Mirage Road		Glendale Avenue			
	NB	SB	EB	WB		
Control	P/P	P/P	P/P	P/P		
Mast Arm Head Types	Q,F	Q,F	Q,F,F	Q,F,F		
Pole Head Types (Outboard Lt, Far Rt)	Q,None	Q,None	Q,None	Q,None		
Median Width (feet)	NA	NA	NA	NA		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	Yes	Yes	Yes	Yes		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	1	1	2	2		
R4-7, Object Marker, PB in Median	N,N,N	N,N,N	N,N,N	N,N,N		
ADT	7700	9700	20500	20300		
Posted Speed Limit (mph)	45	45	45	45		
Grade	0	0	0	0		
Mast Arm Length	50	55	55	55		
LT Head Centered Over Lane	Yes	Yes	No	Yes		
Thru Heads Centered Over Lane	Yes	Yes	No	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,N,N	N,N,N	N,N,N	N,N,N		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1916	K	A	B	C	O	
Glendale Rank: 83						
2013	0	0	1	0	3	4
2012	0	0	1	1	6	8
2011	0	0	0	2	0	2
2010	0	0	1	0	5	6
2009	0	0	0	1	3	4
Totals:	0	0	3	4	17	24
Crash Rate						0.452
Left-Turn Crash Rate						0.113
Left-Turn Severity Index						0.100
Severity Index						0.476

El Mirage Road and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	8	Ea	\$300.00	\$2,400.00
Furnish/Install Temp Traffic Control	1	LS	\$4,200.00	\$4,200.00
Flagging Service, Off-Duty Police	16	Hr	\$32.00	\$512.00
Left-Turn Yield on FYA Sign	20	SF	\$20.00	\$400.00
Traffic Signal Face (Type FYA) (LED)	8	Ea	\$600.00	\$4,800.00
Retro-Reflective Tape	6	Ea	\$50.00	\$300.00
Remove/Reconfigure Mounting Assembly	4	Ea	\$100.00	\$400.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,500.00	\$1,500.00
Subtotal				\$16,312.00
Contingency (30%)				\$4,894.00
Construction Total				\$21,206.00
Design (10%)				\$2,121.00
Construction Management (15%)				\$3,181.00
Total				\$26,508.00

Landfill Road and Glendale Avenue, Data Sheet 1

Protected control on the north and south legs and protected/permissive on the east and west legs.

Landfill Road and Glendale Avenue					
Data	Intersection				
	Landfill Road		Glendale Avenue		
	NB	SB	EB	WB	
Control	Prot	Prot	P/P	P/P	
Mast Arm Head Types	R,F	R,Q,F	Q,F,F	Q,F,F	
Pole Head Types (Outboard Lt, Far Rt)	R,F	R,F (near)	Q,NA,F (near)	Q,F (near)	
Median Width (feet)	NA	NA	NA	NA	
Median Negative Offset (feet)	NA	NA	NA	NA	
Median No Offset (feet)	Yes	Yes	Yes	Yes	
Median Positive Offset (feet)	NA	NA	NA	NA	
No. Opposing Thru Lanes	1	1	2	2	
R4-7, Object Marker, PB in Median	NA	NA	NA	NA	
ADT	-	-	-	-	
Posted Speed Limit (mph)	15	10	45	45	
Grade	0	0	0	0	
Mast Arm Length	25	35	55	45	
LT Head Centered Over Lane	NA	Yes	Yes	Yes	
Thru Heads Centered Over Lane	NA	Yes	Yes	Yes	
MMU Upgrade Required					Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y,	Y,Y,Y	
Other	T-intersection (NB, SB, WB)				

Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank:	K	A	B	C	O	
Glendale Rank:						
2013						
2012						
2011						
2010						
2009						
Totals:						
Left-Turn Severity Index						
Severity Index						

No collision data available.

Landfill Road and Glendale Avenue, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Furnish/Install Traffic Control Devices	1	LS	\$4,200.00	\$4,200.00
Flagging Service (Off-Duty Police)	8	Hr	\$32.00	\$256.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$1,000.00	\$1,000.00
Subtotal				\$11,256.00
Contingency (30%)				\$3,377.00
Construction Total				\$14,633.00
Design (10%)				\$1,463.00
Construction Management (15%)				\$2,195.00
Total				\$18,291.00

Litchfield Road and Glendale Avenue, Data Sheet 1

Permissive control on the north leg and protected control on the south and west legs.

Litchfield Road and Glendale Avenue						
Data	Intersection					
	Litchfield Road			Glendale Avenue		
	NB	SB	EB	WB		
Control	Perm	Prot	NA	Prot		
Mast Arm Head Types	F	R,F	NA	R,F,F		
Pole Head Types (Outboard Lt, Far Rt)	NA,F	R,F	NA	R,R		
Median Width (feet)	NA	NA	NA	NA		
Median Negative Offset (feet)	NA	NA	NA	NA		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	NA	NA		
R4-7, Object Marker, PB in Median	NA	NA	NA	NA		
ADT	17300	16000	11900	11900		
Posted Speed Limit (mph)	35	35	NA	35		
Grade	0	0	0	0		
Mast Arm Length	25	30	NA	30		
LT Head Centered Over Lane	No	NA	NA	Yes		
Thru Heads Centered Over Lane	No	Yes	NA	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 1661	K	A	B	C	O	
Glendale Rank: 82						
2013	0	0	0	1	5	6
2012	0	0	1	0	9	10
2011	0	0	1	1	3	5
2010	0	1	0	1	4	6
2009	0	0	0	0	2	2
Totals:	0	1	2	3	23	29
Crash Rate						0.556
Left-Turn Crash Rate						0.058
Left-Turn Severity Index						0.012
Severity Index						0.778

Litchfield Road and Lightning Street, Data Sheet 1

Protected/permissive control on the north & south legs, permissive control on the east & west legs.

Litchfield Road and Lightning Street						
Data	Intersection					
	Litchfield Road		Lightning Street			
	NB	SB	EB	WB		
Control	P/P	P/P	Perm	Perm		
Mast Arm Head Types	Q,F,F	Q,F,F	F,F	F,F		
Pole Head Type (Outbrd Lt, Far Rt)	Q,None	Q,None	F,None	F,None		
Median Width (feet)	0	0	7	11		
Median Negative Offset (feet)	5	5	20	20		
Median No Offset (feet)	NA	NA	NA	NA		
Median Positive Offset (feet)	NA	NA	NA	NA		
No. Opposing Thru Lanes	2	2	1	2		
R4-7, Object Marker, PB in Median	NA	NA	N,N,N	N,N,N		
ADT	-	-	-	-		
Posted Speed Limit (mph)	35	35	15	415		
Grade	0	0	0	0		
Mast Arm Length	45	40	40	35		
LT Head Centered Over Lane	Yes	Yes	Yes	Yes		
Thru Heads Centered Over Lane	Yes	Yes	Yes	Yes		
MMU Upgrade Required						Y
PPB, M/H, Countdown	N,Y,Y	N,Y,Y	Y,Y,Y	Y,Y,Y		
Other						
Year	Fatal	Incap. Injury	Non Incap. Injury	Possible Injury	PDO	Total
MAG Rank: 754	K	A	B	C	O	
Glendale Rank: 50						
2013	0	0	1	2	1	4
2012	1	0	0	0	0	1
2011	0	0	0	1	2	3
2010	0	0	0	0	1	1
2009	0	0	0	0	0	0
Totals:	1	0	1	3	4	9
Crash Rate						1.562
Left-Turn Crash Rate						0.297
Left-Turn Severity Index						0.050
Severity Index						6.022

Litchfield Road and Lightning Street, Data Sheet 2

Item	Quantity	Unit	Unit Cost	Amount
Remove Traffic Signals	4	Ea	\$300.00	\$1,200.00
Furnish/Install Traffic Control Devices	1	LS	\$5,000.00	\$5,000.00
Left-Turn Yield on FYA Sign	10	SF	\$20.00	\$200.00
Traffic Signal Face (Type FYA) (LED)	4	Ea	\$600.00	\$2,400.00
Retro-Reflective Tape	4	Ea	\$50.00	\$200.00
Remove/Reconfigure Mounting Assembly	2	Ea	\$100.00	\$200.00
Malfunction Management Unit (MMU)	1	Ea	\$1,800.00	\$1,800.00
Mobilization	1	LS	\$2,000.00	\$2,000.00
Subtotal				\$13,000.00
Contingency (30%)				\$3,900.00
Construction Total				\$16,900.00
Design (10%)				\$1,690.00
Construction Management (15%)				\$2,535.00
Total				\$21,125.00