CHAPTER 4 – TRAFFIC ENGINEERING STANDARDS

4.1 GENERAL INFORMATION

1. All proposed street and intersection designs are subject to review by the City Engineer or designee for applicability, capacity, and safety.
2. The contractor must have approved plans prior to conducting the work.
3. All new developments are responsible for the cost, design, and installation of pavement markings on city streets adjacent to the development project. This includes the removal of all existing pavement markings that are in conflict with the new pavement markings adjacent to or impacted by the development project and associated improvements.
4. Full median breaks shall be limited to the 1/4 mile point. At a maximum, median breaks for left turns into the adjacent site may be allowed at the 1/8 mile point (left turns out are not allowed).
5. Continuous raised medians are required on all streets that are designated as parkways or arterials. Refer to Supplemental Standard Details for cross sections.
6. Right of way shall be dedicated on all arterial streets for far side bus bays (turnouts) at intersections per detail 3-14. Right-of-way shall be dedicated between intersections at half mile intervals on arterial streets and parkways as directed by the City Engineer or designee.
7. Signal modifications that are a result of street widening or recommended in the Traffic Impact Analysis related to the development are the responsibility of the developer.
8. Where speed humps are permitted, they shall be in accordance with the City of Surprise Neighborhood Traffic Management Plan.

4.2 STREET AND LANE CLOSURE PERMITS

All work in the city Right-of-Way that requires the restriction and/or closure of any pedestrian or vehicular traveled way shall require an approved Traffic Control Plan by the City Engineer or designee. It is the responsibility of the contractor to obtain the approval of a Traffic Control Plan. All Traffic Control Plans must be date and time specific to the work being performed. All Traffic Control Plan submittals shall be from a contractor that is certified with the City of Surprise to place and remove temporary traffic control in the City of Surprise. It is the responsibility of each of the developer's contractors to follow the City of Surprise Temporary Work Zone Traffic Management Policy.

4.3 TRAFFIC IMPACT ANALYSIS PROCEDURES

It is the responsibility of the developer to provide a Traffic Impact Analysis report, regardless of the size of the development. It is the responsibility of the developer's consultant to follow the attached Traffic Impact Analysis procedures in Appendix 4-1.

4.4 TRAFFIC CONTROL POLICIES AND PROCEDURES

For city traffic control policies and requirements refer to the following city documents:

1. Temporary Work Zone Traffic Management Policy, which can be found at http://www.surpriseaz.gov/documentview.aspx?did=6280

For information regarding the following items contact traffic.control@surpriseaz.gov

2. Temporary Traffic Control Device Installation and Removal, Certification Application – Annual Permit Application
3. Traffic Control Plan Review For Traffic Restrictions – Submittal Form TE-1
4. Traffic Control Plan Review For Road Closures – Submittal Form TE-2

APPENDIX 4-1

TRAFFIC IMPACT ANALYSIS (TIA)

Traffic Impact Analysis (TIA) Procedures

A. INTRODUCTION

Goal three of the City of Surprise Strategic Plan is to provide a seamless, comprehensive and safe transportation system. The review and management of development-generated traffic is an integral part of operating and maintaining a safe and efficient roadway system and meeting this goal. The Traffic Impact Procedures as outlined in this document have been established to meet this objective. The Traffic Impact Procedures establish a range of traffic impact study categories based on the characteristics of the development and the estimated peak hour traffic volumes. The procedures also outline the analysis approach and methods.

A Traffic Impact Analysis, TIA, identifies existing traffic volumes and conditions, development traffic volumes and conditions and their combined impacts on the existing and future roadway system. The TIA is a useful tool for early identification of potential traffic problems and can play an important part in the success of a development. When insufficient attention is given to the assessment of traffic impacts, the following problems may result:

- On-site congestion and/or congestion on adjacent roadways
- Inadequate site access
- High accident experience
- Limited flexibility to modify the development to eliminate problems or adjust to changed conditions

These problems can negatively affect the success of a development and can damage the marketability and return on investment of the development. The performance of a TIA provides an opportunity for the city and the developer to share information and jointly address traffic related problems. It provides a means of balancing development needs with the functional integrity of the roadways that serve both the development and the region.

The need for a Traffic Impact Study should be assessed as early as possible in the development process when there is maximum flexibility for eliminating traffic-related problems. Preparation of a TIA, at this stage in the development process, is also recommended in Chapter 2 “Site Planning” of the Institute of Transportation Engineers publication ‘Transportation and Land Development’.

The procedures contained herein are provided to:

- Assist developers through the approval process by outlining the requirements and level of detail of traffic analysis that will be required of them during the approval process.
- Standardize the types and details of analysis required in the assessment of traffic impacts for developments with similar levels of size and intensity.
- Ensure consistency in the preparation and review of a TIA through standardization of the reports.

A TIA per the following guidelines will be required of all developments or additions to existing developments. A Traffic Impact Statement is required for developments generating lower peak hour volumes to determine where current traffic problems or concerns may exist. It should include at a minimum: The existing condition analysis, including any existing driveways or intersections in the vicinity, a sight distance evaluation, the traffic generation, the access number and spacing, an access queuing evaluation, and an onsite circulation evaluation.

If a TIA was done for the project at a master site plan level or a PAD level, an addendum or update will be required if the original study is greater than two years old, if additional intersections or driveways are being added, if the new development is different from what was assumed in the master study causing an increase in trips generated, or if surrounding development has changed the background assumptions in the original study.

The City Engineer or designee, in accordance with the intent of these guidelines, will determine the scope for the initial TIA or the need for a revised TIA. This can be done through the city's development review process or through a separate meeting for this purpose.

An engineering firm selected by the developer may prepare the Traffic Impact Analysis.

The first step for any TIA is to determine the size and scope of TIA required for the site.

B. TIA EVALUATION

A TIA per the following guidelines will be required of all developments or additions to existing developments. The specific analysis requirements and level of detail are determined by the following categories:

1. **A TRAFFIC IMPACT STATEMENT:** Required for developments generating less than 100 trips in the peak hour. It shall include at a minimum: The existing condition analysis, including any existing driveways or intersections in the vicinity, a sight distance evaluation, the traffic generation, the access number and spacing, an access queuing evaluation, and an onsite circulation evaluation.
2. **CATEGORY I:** Developments which generate 100 or more peak hour trips but fewer than 500 trips during the morning or afternoon peak hour.
3. **CATEGORY II**: Developments which generate 500 or more peak hour trips but fewer than 1,000 trips during the morning or afternoon peak hour.
4. **CATEGORY III**: Developments which generate 1,000 or more peak hour trips but fewer than 1,500 trips during the morning or afternoon peak hour.
5. **CATEGORY IV**: Developments which generate more than 1,500 trips during the morning or afternoon peak hour.

The developer must first estimate the number of vehicle trips generated by the proposed development using the procedure(s) outlined in this document. The

developer must obtain the concurrence of the City Engineer or a designated representative on the number of trips generated by the development, and the appropriate analysis category.

C. ANALYSIS APPROACH AND METHODS

The traffic analysis approach and methods are presented below.

1. STUDY AREA

The minimum study area will be determined by project type and size in accordance with the criteria in Table 1. The City Engineer may require expansion of the study area when the minimum study areas identified in Table 1 do not provide sufficient information to meet the intent of the Traffic Impact Analysis guidelines. For example, a large development in a rural area located two miles from a freeway interchange from which most of the trips are anticipated to access the development may require an enlarged study area to include assessment of the freeway interchange.

2. STUDY HORIZON YEARS

The study horizon year is the future year that should be studied with the development. The existing background traffic shall be adjusted to provide a reasonable estimation of the traffic without the site in the horizon year. The horizon years are determined by the project type and size in accordance with the criteria in Table 1.

a. Assume full occupancy and build-out for single-phase developments. Multi-phase developments may require assessment of up to three (3) horizon years corresponding to key phases as directed by the City Engineer.

b. An enlarged study area may be required when the minimum study areas identified in Table 1 do not provide sufficient information to meet the intent of the TIA guidelines.

TABLE 1

Analysis Category	Development Characteristic	Study Horizons (a)	Minimum Study Area (b)
I	Traffic Impact Statement 1-100 peak trips Small Development 100-499 peak trips	1. Opening Year	1. Site access drives 2. Adjacent signal controlled intersections within ¼ mile and/or major street intersections without signal control and driveways within 500 feet
II	Moderate Development 500-999 peak hour trips	1. Opening year 2. 5 years after opening	1. Site access drives 2. All signal controlled intersections within ½ mile and/or major street intersections without signal control and major driveways within ½ mile
III	Large Development 1,000-1,500 peak hour trips	1. Opening year 2. 20 years after opening	1. Site access drives 2. All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile
IV	Regional Development > 1,500 peak hour trips	1. Opening year 2. 20 years after opening	1. Site access drives 2. Key signal controlled intersections and major street intersections without signal control within 3 miles

3. ANALYSIS TIME PERIOD

a. Both the morning and afternoon weekday peak hours are to be analyzed. If the proposed project is expected to generate no trips or a very low number of trips during either the morning or evening peak periods, the requirement to analyze one or both of these periods may be waived by the City Engineer or designee.

b. Where the peak traffic hour in the study area occurs during a time period other than the normal morning or afternoon peak travel periods (for example midday), or occurs on a weekend, or the proposed project has unusual peaking characteristics, these peak hours must also be analyzed.

4. SEASONAL ADJUSTMENTS

The traffic volumes for the analysis hours should be adjusted for the peak season if appropriate. The City Engineer shall approve use of seasonal adjustment factors. The intent is not to assess maximum peak hourly volumes, such as the day after Christmas for a retail development, but to address peak seasonal volumes. If traffic counts were collected in a retirement community in July, and the peak traffic period occurs during the winter months, the counts shall be adjusted to winter months.

5. DATA COLLECTION REQUIREMENTS

All data is to be collected in accordance with the latest edition of the ITE Manual of Transportation Engineering Studies or as directed by the City Engineer if not specifically covered in the ITE Manual.

a. Turning movement counts shall be obtained for all existing cross-street intersections to be analyzed during the morning, noon and evening peak periods. Available turning movement counts may be extrapolated a maximum of two years with concurrence of the City Engineer.

b. The current and projected daily traffic volumes shall be presented in the report. Available daily count data may be obtained from the city and extrapolated a maximum of two years with the concurrence of the City Engineer. Where daily count data are not available, mechanical counts may be required at the City Engineer's discretion.

c. Roadway geometric information shall be obtained including roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, both adjacent and across the street and lane configuration at intersections.

d. The location and type of traffic controls shall be identified.

6. TRIP GENERATION AND DISTRIBUTION

a. The latest edition of ITE's Trip Generation shall be used for selecting trip generation rates. The guidelines contained in the Trip Generation shall be used to determine whether the average trip generation rate or equation should be used.

b. Other rates may be used with the approval of the City Engineer in cases where Trip Generation does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have been shown to differ from the ITE rates.

c. Projected trips shall be distributed and added to the projected non-site traffic based on engineering judgment, existing traffic patterns and conversations with city staff if needed.

7. CAPACITY ANALYSIS

a. Level of service shall be computed for signal controlled and non-signal controlled intersections as identified in the Study Area in Table 1, in accordance with the latest edition of the Highway Capacity Manual.

b. For signal-controlled intersections, operational analyses shall be performed for time horizons up to 5 years. Operational analyses shall also be performed for street sizing. The planning method will be acceptable for time horizons beyond 5 years and is also acceptable for Traffic Impact Analysis prepared at the Development Master Plan level, unless used for street sizing.

c. For urban roadways, and rural highways where signal controlled intersections are at or less than 1 mile apart, the capacity of the roadway is generally dominated by the capacity of the adjacent signal controlled intersections. Roadway levels of service need not be computed for these facilities.

d. For rural highways where the signal-controlled intersections are more than 1 mile apart, the level of service on the highway shall be estimated in accordance with the latest edition of the Highway Capacity Manual.

8. TRAFFIC SIGNAL NEEDS

a. A traffic signal needs study shall be conducted for all arterial/arterial, arterial/collector and collector/collector intersections within the Study Area for the opening year. If the warrants are not met for the opening year, they should be evaluated for a 5-year horizon for Categories II, III and IV.

b. Traffic Signal needs studies shall be conducted per the MUTCD.

9. QUEUING ANALYSIS

A queuing analysis shall be conducted for all turn lanes under stop or signal control within the study area. Examples for estimating queue lengths for signal controlled and non-signal controlled intersections are given below.

For signal controlled intersections, find the number of vehicles arriving at the intersection (ADOT Traffic Impact Analysis for Proposed Development)

Vehicles/cycle (for random arrivals) = (vehicles/hour)/(cycles/hour)

Storage length =2 x vehicles/cycle x 25 feet

Example: *Find the storage length required for 150 vph turning left if the signal cycle is 90 seconds.*

Vehicles/cycle = (150 veh/hr)/(1 cycle/90 sec)/(3600 sec/hr)= 3.75 veh/cycle

Storage length = 2 x 3.75 veh/cycle x 25 feet = 187.5 feet

USE 200 feet

For non-signal controlled intersections, find the number of vehicles per average 2-minute period (AASHTO Green Book)

Vehicles/2 min period = (vehicles/hour)/(30 periods/hour)

Storage length = vehicles/2 min period x 25 feet

Example: *Find the storage length required for 150 vehicles turning left at a non-signal controlled intersection.*

Vehicles/2 min period = (150 veh/hr)/(30 periods/hr) = 5 vehicles

Storage length = 5 veh x 25 feet = 125 feet

USE 125 feet

10. SPEED CONSIDERATIONS

Vehicle speed is used to estimate safe stopping and cross-corner sight distances. Sight distance shall conform to the American Association of State Highway and Transportation Officials (AASHTO) standards. The design speed used shall be ten miles above the posted speed limit.

11. IMPROVEMENT ANALYSIS

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

a. Where an intersection will operate at a level of service below D, alternatives which mitigate these impacts shall be evaluated and included as part of the study.

b. Where a highway will operate at a level of service below D, alternatives which mitigate these impacts shall be evaluated and included as part of the study.

12. CERTIFICATION

The Traffic Impact Analysis shall be prepared under the supervision of a Professional Engineer (Civil) registered in the State of Arizona.

D. STUDY AND REPORT FORMAT

1. INTRODUCTION AND SUMMARY

a. Purpose of report and study objectives

b. Executive Summary

- Site location and study area
- Development description
- Principal findings
- Conclusions/Recommendations

2. PROPOSED DEVELOPMENT (Site and Nearby)

a. Site location

b. Land use and intensity

c. Site plan (copy must be legible)

- Access geometrics

d. Development phasing and timing

3. STUDY AREA CONDITIONS

a. Study area

- Area of significant traffic impact (including road segments, intersections and driveways)
- Market area

b. Land use

- Existing land use
- Anticipated future development

c. Site accessibility

- Existing and future area roadway system
- Site circulation

4. ANALYSIS OF EXISTING CONDITIONS

a. Physical characteristics

- Roadway characteristics (number of lanes, classification, etc.)
- Traffic control devices
- Transit service
- Pedestrian/bicycle facilities
- Nearby driveways

b. Traffic volumes

- Daily, morning, afternoon peak periods and others as required

c. Level of service
   - Morning peak hour, afternoon peak hour, and others as required

d. Safety related deficiencies, crash experience

e. Data sources

5. PROJECTED TRAFFIC

a. Site traffic forecasting (each horizon year)
   - Trip generation
   - Mode split (if applicable)
   - Pass-by traffic (if applicable)
   - Trip distribution
   - Trip assignment

b. Non-site traffic forecasting (each horizon year)
   - Projections of non-site traffic by Maricopa Association of Governments Association of Governments Transportation Planning Office (MAGTPO) may be used. For larger developments and study areas, a transportation planning model run may be required.
   - Total traffic (each horizon year)

6. TRAFFIC AND IMPROVEMENTS ANALYSIS

a. Site access

b. Level of service analysis
   - Without project (including programmed improvements for each horizon year)
   - With project (including programmed improvements for each horizon year)

c. Roadway improvements
   - Improvements by City of Surprise or others to accommodate non-site traffic
   - Additional improvements necessary to accommodate site traffic

d. Traffic safety
   - Sight distance
   - Acceleration/deceleration lanes, left-turn lanes
   - Adequacy of location and design of driveway access

e. Pedestrian considerations

f. Speed considerations

g. Traffic control needs

h. Traffic signal needs (base plus 5-year horizon)

i. Effect on Signal Progression if applicable

7. INTERNAL PROJECT SITE CIRCULATION (IF APPLICABLE)

a. Conflict points
- Vehicle/vehicle
- Vehicle/pedestrian
- Sight distances
- Building access delivery points
- Drive-through lanes

b. Design features
- Widths of internal circulation roadways
- Parking dimensions
- Sight distance per AASHTO Standards

c. Other features
- Fire lanes
- Delivery truck circulation/truck docks
- Access to waste containers

8. CONCLUSIONS / RECOMMENDATIONS

a. Roadway improvements
- Phasing

b. Site access

c. Internal site circulation

d. Transportation demand management actions (if appropriate)

e. Other

9. APPENDICES (Shall be included on a CD, not printouts)

a. Traffic counts

b. Capacity analyses worksheets

c. Traffic signal needs studies

10. EXHIBITS

The following information shall be provided on clear and legible figures:

a. Site location

b. Site plan

c. Existing transportation system(s) (Number of lanes, traffic control, etc.)

d. Existing and future area development

e. Existing daily traffic volumes
f. Existing peak hour turning volumes
g. Future transportation system
h. Estimated site traffic (daily and peak periods)
i. Directional distribution of site traffic (daily and peak periods)
j. Total future traffic (peak periods)
k. Queuing distance at study intersections, per lane (total traffic in peak periods)
l. Protected levels of service including existing, horizon year non-site and total horizon year (with site development) conditions
m. Recommended improvements

DESIGN STANDARD REFERENCE

A. Design in accordance with the current Maricopa County Roadway Design Manual and other current MAG and MCDOT policies, procedures and standards
B. Capacity analyses in accordance with the latest edition of the Highway Capacity Manual
C. Traffic Signal needs studies in accordance with the latest edition with ADOT PGP-4C-2-X, “Traffic Signal Needs Study”
D. Data collection in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies
E. Trip generation in accordance with the latest edition of the ITE publication Trip Generation