

DEVELOPMENT PROCESS MANUAL

Chapter 4: Transportation



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4. TRANSPORTATION

4.1 Introduction

4.1.A Purpose

The purpose of this chapter is to provide standards for roadway design elements where it is necessary for consistency and to ensure, as far as it is practical, that the City of Rio Rancho's minimum requirements are met for roadway and transportation safety, welfare, aesthetics, environmental sensitivity, and economical maintenance.

The standards outlined in this chapter cannot realistically apply to all situations. They are intended to assist the professional engineer's competent work but not to substitute for it. Professional engineers are expected to bring the best of their skills and abilities to each project so that it is designed accurately.

Further, these standards are not intended to unreasonably limit any innovative or creative effort that might result in higher quality or increased cost savings for the public. Any proposed departure from these standards will be judged on the basis of whether such a variance will yield a compensating or comparable result that is fully adequate for road users and City residents.

At the beginning of each project, the following shall be established:

1. Impacted existing roadways and new roadways to be constructed.
2. Any associated roadway functional classification.
3. Future traffic volumes for impacted roadways.

These basic criteria shall determine the design standards to be used. Any deviations from these published standards must be approved by the City of Rio Rancho (CORR) Department of Public Works or an authorized representative before the project design will be considered for approval. The standards are based upon the most current version of the guidelines promulgated by the American Association of State Highway and Transportation Officials (AASHTO).

The guidelines in this Development Process Manual will be periodically updated as needs become apparent to reflect changes to City practice. It is the responsibility of the user to determine that they are utilizing the most current version of these standards.

4.2 Applicability

These standards shall govern all construction and reconstruction of transportation facilities within the City as a whole. They shall also apply to all transportation facilities proposed to be built in right-of-way that is intended to be dedicated to the City, or is already within City right-of-way, and is accepted into the City Road System for maintenance.

Before the City accepts a road for maintenance, it shall meet the standards outlined in this chapter. Permitted work shall also conform to the requirements of the current City Resolutions governing permitted work. If field conditions change after plan approval, improvements shall be made as necessary in order to bring the transportation facilities up to these standards. These standards shall be used by private parties, consulting engineers, public utilities, agencies, and City staff.

All roads owned and managed by the CORR shall follow the standards in this chapter. All roads owned and managed by NMDOT within the municipal limits of the City shall comply with applicable standards of the [NMDOT](#).

4.3 Definitions

Average Daily Traffic (ADT) - The total traffic volume during a given period, ranging from 2 to 365 consecutive days, divided by the number of days in that time period and expressed in vehicles per day.

Bikeway - A bikeway is any road, path, or way that is specifically designated for bicycle travel.

Bicycle Facilities - Bicycle facilities are the infrastructure that accommodates or encourages bicycling including bikeways, shared roadways not specifically designated for bicycle use, bicycle parking and storage facilities, and bicycle signal actuation hardware.

Bicycle Lane – A portion of a roadway that has been designated for preferential or exclusive use by bicyclists. A typical bicycle lane is delineated from the adjacent general-purpose lane(s) by longitudinal pavement markings and bicycle lane symbol or word markings and, if used, signs.

Bike Route - Bike routes are designated roadways with appropriate directional and informational signing, with or without a specific bicycle route number, in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

City - Refers to City of Rio Rancho staff reviewing and/or approving any requests or submittals.

Design Year - The Design Year for future traffic volumes is the year when construction/buildout is complete.

Design Hour Volume - The Design Hour Volume is the traffic volume used to determine the number of traffic lanes on the roadway. It is derived by multiplying the Annual Average Daily Traffic (AADT) by a “K-factor,” which represents the percentage of traffic that occurs during the peak hour considered for design purposes – typically the busiest hour of the day.

Developer - Refers to the applicant requesting the proposed improvements or development. This includes any consultants or contractors that may be hired by the developer to complete the project.

Functional Classification - Functional classification is the process by which roads are grouped into classes or systems according to the kind of service they will provide. Functional classification categorizes streets according to their ability to 1) move traffic, and 2) provide access to adjacent properties. Street types under functional classification include arterials, collectors, and locals. Using national classification terminology, these systems are sub-classified based on the trips served, the areas served, and the operational characteristics of the streets or highways.

Horizon Year - The Horizon year is the farthest future time that the impacts of a development shall be studied in a traffic impact analysis. Unless otherwise directed by City staff, the horizon year is five years after completion of construction.

Level of Service (LOS) - LOS is a term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay, and safety. The level of service of a facility is designated with a letter, A to F, with A representing the best operating conditions and F the worst.

- LOS A: free flow, with low volumes and high speeds.

- LOS B: reasonably free flow, speeds beginning to be restricted by traffic conditions.
- LOS C: stable flow zone, most drivers restricted in freedom to select their own speed.
- LOS D: approaching unstable flow, drivers have little freedom to maneuver.
- LOS E: unstable flow, may be short stoppages.
- LOS F: forced or breakdown flow.

MRCOG - Mid-Region Council of Governments.

Paved Shoulder Bikeways - Paved shoulder bikeways are located on uncurbed arterials and collectors and consist of a smooth paved surface that covers all or part of the roadway shoulder.

Peak Hour - Represents the highest, or busiest, hour of traffic measurement.

Shared Roadway - A shared roadway is any roadway that may be legally used by both motor vehicles and bicycles and is not specifically designated as a bikeway.

Shared Use Path/Trail - A shared use path is a bikeway physically separated from motorized vehicle traffic by an open space or barrier and constructed within the street right-of-way or within an independent right-of-way including shared-use rights-of-way or utility or drainage easements.

Traffic Impact Analysis (TIA) - A TIA analyzes the effects of new development on the city's transportation infrastructure, and helps the city determine what changes, if any, are necessary to minimize those effects. It is also used to determine how much capacity a new road within a development is required to appropriately serve its needs. Also known as a Traffic Impact Study (TIS).

Trip Generation - Trip generation is performed by relating the number or frequency of vehicular trips to the characteristics of the individuals, of the zone, and of the transportation network. The zone that contains the home end of home-based trips or the origin end of non-home-based trips is considered to have produced the trip, while the destination zone where an out-of-home activity will be undertaken is considered to have attracted the trip.

Trip Generation Report - A trip generation report outlines anticipated vehicular trips based on associated land uses within proposed development.

Wide Curb Lanes - Wide curb lanes are located on shared roadways with outside lane widths of 14 to 16 feet.

4.4 Transportation Planning

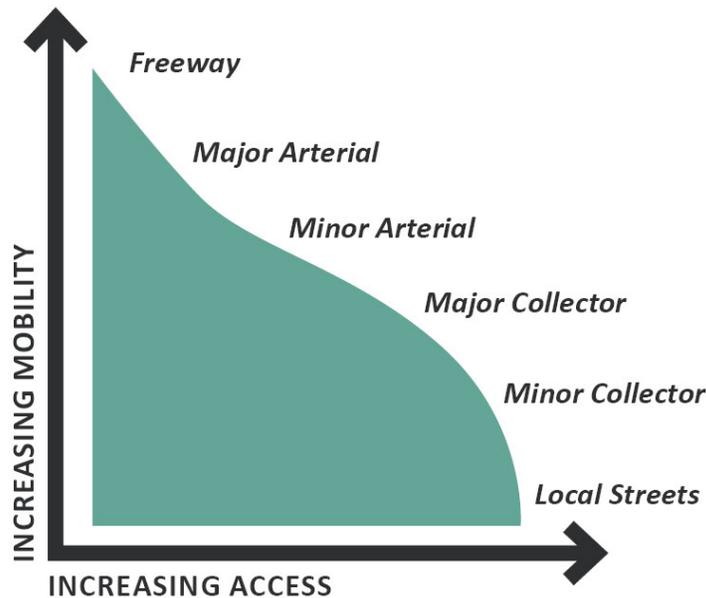
4.4.A Functional Classification and Level of Service (LOS)

The City of Rio Rancho utilizes roadway functional classification and level of service analysis to determine required roadway infrastructure to support the community's transportation needs and account for impacts from continued development. Details specific to the functional classification of roads in the City of Rio Rancho are provided in the following section (4.4.A.I Transportation System). Typical cross sections are available in the City of Rio Rancho Standard Details available on the City's website.

As a rule, traffic analysis shall be used in conjunction with previously identified roadway expectations to support the determination of functional classification in the City. The base desired Level of Service (LOS)

for all roads constructed in the City is LOS D. Through the Development Review process and the completion of a trip generation report (detailed in the Procedures Chapter), consultation with City staff may require roadway improvements (for example, increased number of lanes, restricted turning movements, etc.) to an increased LOS classification and associated functional classification.

Figure 1 Functional Classification Hierarchy



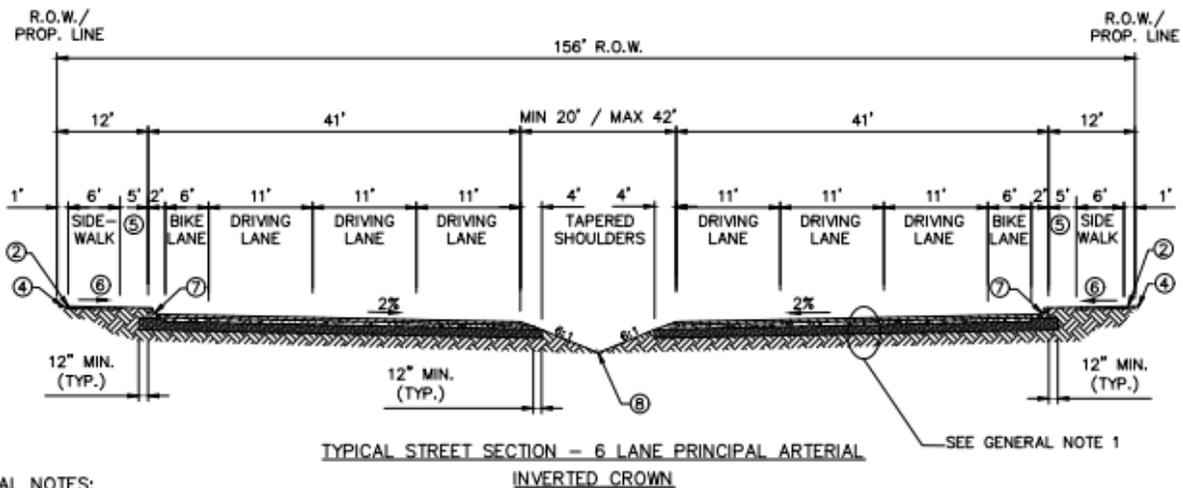
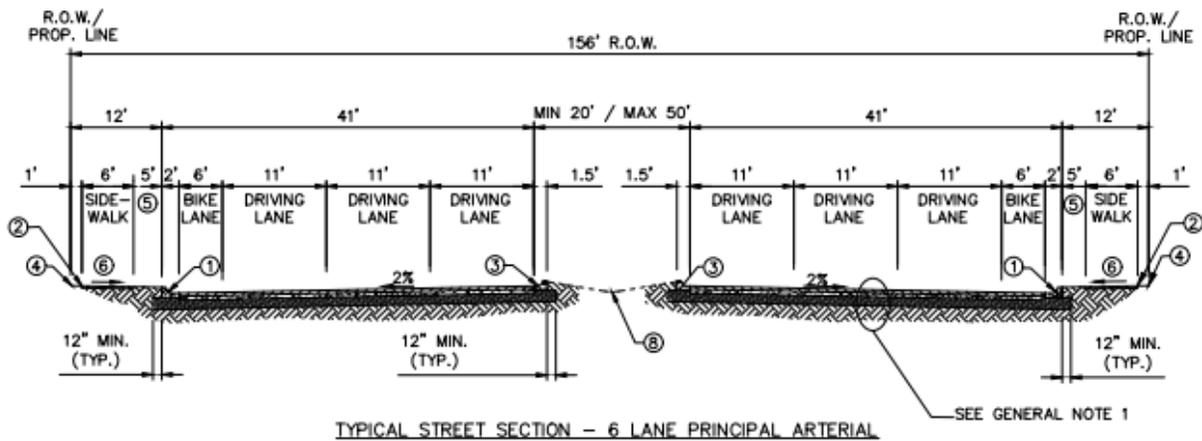
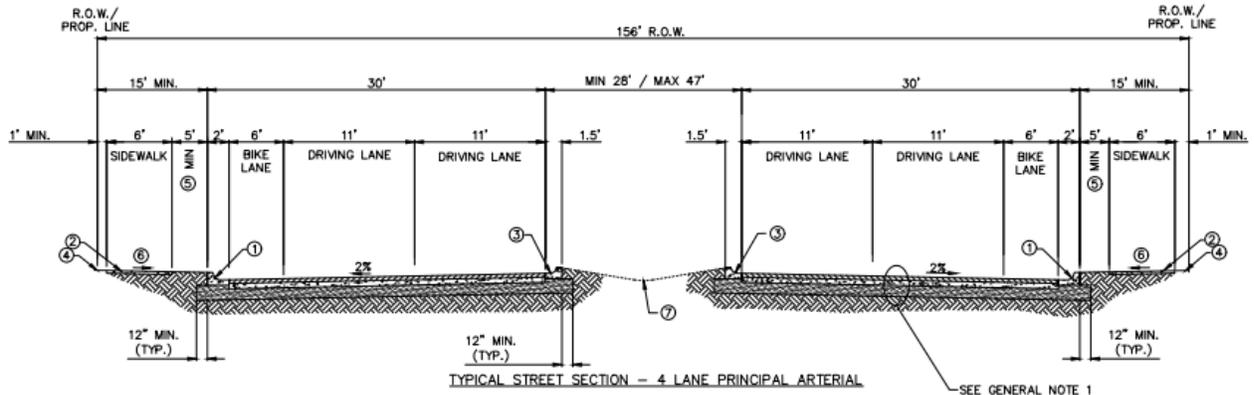
4.4.A.I. TRANSPORTATION SYSTEM

4.4.A.I.a. Principal Arterial

Principal Arterials are roads with the following characteristics:

1. Traffic movements consisting of through movements and major circulation movements, with limited access for adjacent parcels of land.
2. Posted speeds between 45 mph and 65 mph.
3. Four-lane or six-lane roads with exclusive turn lanes where applicable.
4. Planning volumes as shown in Table 4.1.

Figure 2 Arterial Cross Section (4-lane and 6-lane)



GENERAL NOTES:

4.4.A.I.b.Minor Arterial

Minor Arterials are roads with the following characteristics:

1. Traffic movements consisting of major circulation movements, with some access included for adjacent parcels of land.

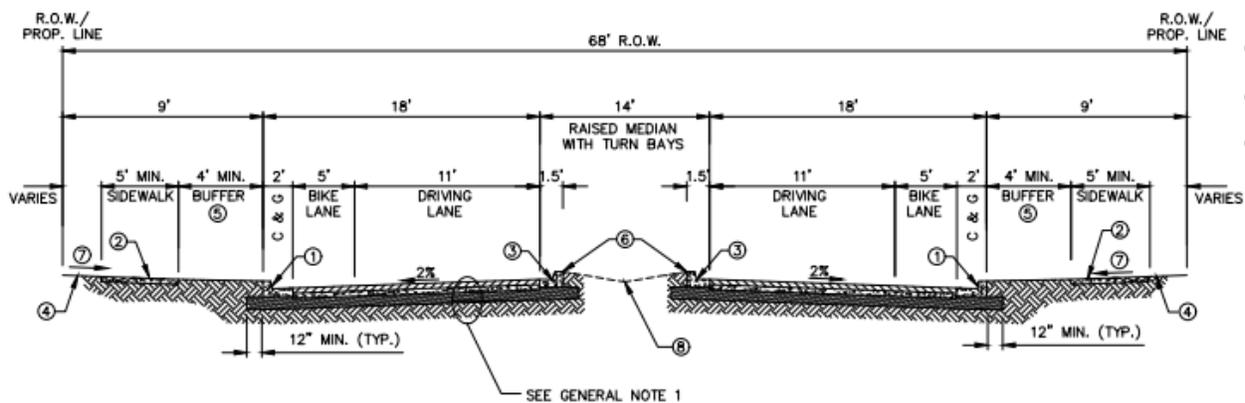
2. Traffic movements do not directly penetrate residential neighborhoods.
3. Traffic movements with partially controlled access facilities.
4. Minimum speed limit of 40 mph.
5. Undivided or divided (divided preferred) two or four-lane with intersections at grade and exclusive turn lanes where applicable.
6. Planning volumes as shown in Table 4.1.

4.4.A.I.c. Major Collector

Collector Roads are roads with the following characteristics:

1. Traffic movements consisting of both adjacent land access and traffic circulation, typically connecting arterials with local roads or other collectors.
2. Traffic movements may access residential and local areas.
3. Commercial development may front directly on the road.
4. Traffic capacity is limited not by the typical capacity of the road section but instead by the desirability of maintaining acceptable traffic levels using raised medians with left turn bays.
5. Planning volume as shown in Table 4.1.
6. Residences do not front collectors.
7. Minimum speed limit of 35mph.

Figure 3 Collector Cross Section



TYPICAL STREET SECTION – COLLECTOR STREET

4.4.A.I.d.Minor Collector

Minor Collector roads are roads with the following characteristics:

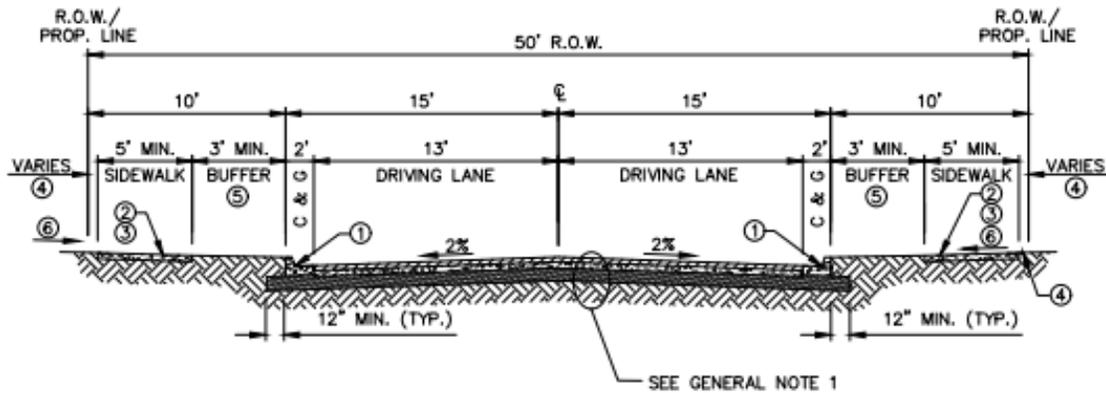
1. Traffic movements consisting of both adjacent land access and traffic circulation, typically connecting arterials with local roads or other collectors.
2. Traffic movements may access residential and local areas.
3. Commercial development may front directly on road.
4. Planning volume as shown in Table 4.1. Any roadway that is anticipated to exceed 1,000 vehicles per day should be designed as a collector.
5. Residences do not front collectors.
6. Minimum speed limit of 30 mph.
7. Minor collectors are differentiated from Major collectors in two ways: anticipated traffic volumes as shown in Table 4.1, and the necessary characteristics of the road given implementation.

4.4.A.I.e.Local Road System

Local Roads are those with the following characteristics:

1. Two-lane undivided roads with intersections at grade with frequent driveway access.
2. Planning volumes as shown in Table 4.1.
3. Speed limit of 25 mph.
4. Traffic movements between adjacent lands and collectors or other roads of higher classification.

Figure 4 Local Road Section



TYPICAL STREET SECTION – RESIDENTIAL STREET

Table 4.1 Roadway Planning Level Traffic Provides general ranges of traffic volumes that can be expected for various roadway types. ADT refers to Average Daily Traffic (24-hour weekday, two-way volume).					
Road Classification	ADT / Lane	No. Thru Lanes	2-Way ADT Range	Peak Hr./ ADT% (K)	Max. Roadway Length*
Local	350	2	50 – 1,000	15	1,000 ft.
Minor Collector	2000	2	500-6,500	12	2 mi.
Major Collector	3,500	2	800 – 8,500	12	2 mi.
Minor Arterial	5,500	4	5,000 – 35,000	8	---
Principal Arterial	7,500	6**	30,000 – 60,000	8	---

* Length may be variable as a function of degree of home frontage on the road.
 ** Guidance is for planning level only. Requirement may vary after consultation with CoRR staff.

4.4.B Street Location and Naming

4.4.B.I. STREET LOCATION

Streets must conform in character, location, and arrangement to adopted plans. Governing plans may be the approved neighborhood site plan, site development, sector plans, or adopted future street lines. The Department of Development Services should be consulted for information regarding applicable plans for areas under design consideration.

Proposed street arrangements must provide for the continuation of existing streets or appropriate projections thereof if not otherwise governed by an adopted plan. No half street improvements are allowed within the City of Rio Rancho. All proposed roadway improvements must be continuous for a total length, intersection to intersection, and approved by the City.

4.4.B.II. STREET NAMING

The naming of streets shall be coordinated with the City of Rio Rancho Development Services Department. Street naming shall be in accordance with the ordinances and guidelines set by Development Services.

4.4.C Traffic Impact Analysis Procedures

Developers are required to discuss proposed projects with City staff prior to beginning any traffic impact analysis. Please refer Table 2.3 Traffic Impact Analysis Level of Effort, Chp.2 for more information. This is to enable discussion and determination of parameters to be used and to open communications between City staff and the Developer. Such communication will help in identifying land uses with traffic characteristics that are in the entire community's best interests. Coordination with City Staff is outlined in the procedures chapter and begins with the Development Review meeting. Developers shall initially provide a trip generation report and a site plan for staff to review to determine if further traffic impact analysis is required. For roads with a projected ADT above 18,000 vehicles, the City may require two lanes in each direction so long as intersections maintain operation at LOS D or better.

4.4.C.I. TRAFFIC IMPACT ANALYSIS (TIA) REQUIREMENTS

The primary concerns to be addressed in the TIA are site access, impact on the existing roadway system, and what construction is necessary to mitigate both the on-site and off-site impacts. Site design should

be tailored to the traffic requirements, and the City reserves the right to require changes to the access points to better serve the transportation system. For specific requirements related to TIAs, including methodology and procedures, please reference Chapter 2 Procedures, section 2.8.A.III.c.

4.4.D Design Hour Volumes

4.4.D.I. ADJUSTMENT TO DESIGN YEAR ADT VOLUMES

For some roadway design projects, adjustments will be required to the volumes projected by MRCOG. Adjustments will be required in anticipation of major land developments or significant changes in nearby street and/or highway networks that will affect future traffic volumes expected on the roadway under design. Adjustments in traffic volumes for major land developments will follow the CORR Traffic Impact Analysis Procedures as referenced in the Procedures chapter 2.8.A of the Development Process Manual. Adjustments for other impacts shall be approved by the City before being undertaken by the Developer.

4.4.D.II. DESIGN HOUR VOLUME

The number of lanes required for each direction of traffic for an interim roadway is determined by the TIA. However, the interim roadway shall be designed for conversion to the ultimate section determined by the functional classification.

For special activity centers such as recreational areas, factories, sports arenas, etc., other values of the trip generation factors used in the development of the TIA should be used. It is also recognized that special traffic conditions may or will exist that require modification of these factors. In these two sets of cases, the different factors must be documented and approved for use by City staff.

4.4.D.III. TURNING MOVEMENT PERCENTAGES

At major intersections and at driveways leading to major activity centers, the design hour turning volumes are important in determining the intersection capacity, resulting number of lanes, and the storage length for exclusive turning lanes required for each approach. For intersections being reconstructed and that are in fully developed areas, existing turning movement percentages will be collected in the field and are assumed to be the same for the future design year. For new intersections or for those significantly impacted by new land developments or major changes in nearby street/highway networks, existing and projected traffic data along with engineering judgment will be used to reassign vehicle trips on nearby street networks to derive the turning movements at project intersections.

Turning movements must be analyzed for both AM and PM peak hours at project intersections so that the maximum turning or through volumes can be determined for each approach. It is important for the Developer to obtain sufficient existing traffic counts by hourly variation to accurately identify and quantify project intersection turning movement volumes for the design year.

4.4.D.IV. OTHER TRAFFIC VOLUME REDUCTION FACTORS

Vehicle trip (traffic volume) reductions for future transit ridership or other transportation modes are generally not permitted. Reductions for "passer-by" or "diverted" trips are allowed as per the Institute of Transportation Engineers (ITE) Trip Generation Manual (latest revision) but must first be approved by City staff. Trip reductions for special land uses utilizing travel demand management (TDM) strategies will be considered on a case-by-case basis.

4.4.D.V. CAPACITY ANALYSIS

Current HCM procedures will be used to determine the capacity and resulting number of lanes for roadway design project street sections and intersections. The number of lanes on collector and arterial roadways must also be consistent with any City-adopted overall thoroughfare plan, regional or project-specific master plans, and traffic impact analysis for other projects in the area. For street sections with existing or planned traffic signals more than a mile apart, the appropriate section of the HCM will be used. For areas where traffic signals are at or less than a mile apart, it will be assumed that the signalized intersection capacity will control the design of the roadway segments.

The number of through lanes on street sections must be consistent with the number of through lanes at adjacent intersections. For capacity and lane determination, major intersections are assumed to be signalized for the design year. The signalized intersection section of the HCM will be used for the analysis. The default values of the peak hour factor (PHF), percentage of trucks, and saturation flow rate shall be used. Other input criteria will be those equal to existing or future traffic conditions and approved by the City.

4.4.D.VI. FUTURE TRAFFIC VOLUMES

Future traffic volumes shall be used to ensure that the road has enough traffic carrying capacity. The general unit of measure for traffic on a road is the ADT, the total volume of traffic in each time period divided by the number of days in that time period. If available, the future ADT shall be derived from the MRCOG travel demand model and the City's judgment of growth patterns in the area.

The traffic volume during a period shorter than a day shall be used for design purposes, reflecting peak hour periods. For roads with unusual or highly seasonal fluctuation in traffic volumes, the 30th highest hour of the design year should be used.

The directional design hour volume is the traffic volume for the peak hour period in the peak direction of flow. Use directional distribution factors based on existing traffic counts. Reference Table 4.1 for design volume threshold per hour per lane. A more detailed analysis of intersection and road capacity should be completed in accordance with the current version of the HCM.

4.5 Design Procedure

4.5.A Basic Criteria – Scoping meeting

4.5.A.I. ROAD FUNCTIONAL CLASSIFICATION AND TYPICAL SECTION

During development review and following the requirements outlined in the procedures chapter 2.8.A of the Development Process Manual, the roadway functional classification shall be identified in the materials outlining the proposed project including adopted plans such as master plans, area plans, neighborhood plans, etc. If the classification is not identified, the Developer must submit a classification for approval to the City.

4.5.A.II. DESIGN VEHICLE

The design vehicle is the largest vehicle likely to use the road with considerable frequency or a vehicle with special characteristics that must be considered in designing the road. The design vehicle will affect the radii at intersections and the radii of turning roadways. It will also affect the climbing lane requirements on two lane roads and roundabout design. Unless otherwise specified, all arterial and

collector roadways and intersections will be designed to accommodate a WB-50 design vehicle. All residential roadways shall be designed to accommodate a Single Unit (SU) design vehicle. Design vehicles shall be those as defined in the AASHTO publication, A Policy on Geometric Design of Highways (current edition). The Developer shall confirm with City staff which design vehicle to use for the purpose of roadway design.

4.5.A.III. DESIGN FOR FUTURE TRAFFIC VOLUMES

The primary design consideration for roadways is the handling of vehicular traffic. When streets are built or reconstructed, they will be designed with sufficient traffic handling capacity to accommodate a future level of traffic volumes. Section 2.8.A.iii Traffic Impact Analysis Procedures describe in greater detail the acceptable process that shall be followed in determining the capacity of roadways and intersections used in the design process.

While the functional classification approved for a roadway will govern the basic cross-sectional elements, additional through or left turn lanes, auxiliary right turn lanes, acceleration lanes, and similar design features may be required based on further coordination and direction from City staff. The New Mexico Department of Transportation establishes access management requirements which will protect the functional integrity of the state highway system. The state access management manual provides procedures and standards to preserve and protect the public health, safety, and welfare, and to maintain smooth traffic flow. The Developer may be required to complete a detailed capacity analysis to determine the need for additional or auxiliary lanes.

An additional design consideration is traffic calming. On residential streets, to control speeds and improve safety, various forms of traffic calming measures include Bulb outs, Semi-diverters, Chicanes, and Curvilinear Roads. The developer may be required to implement one or more of these traffic calming measures on straight roads that will likely encourage speeding.

4.5.A.IV. TOPOGRAPHY

The topography of the area shall be determined by a site visit and available topographic maps. The terrain shall be classified as level, rolling, or mountainous.

1. *Level terrain* is when roadway sight distances are or could be made adequate without major construction requirements. This generally includes short grades of no more than 1 or 2 percent.
2. *Rolling terrain* is when natural slopes consistently rise and fall with grades of up to 6 percent for lengths of 700 feet.
3. *Mountainous terrain* is when changes in the ground's elevation with respect to a road are abrupt. Mountainous terrain has greater than 15 percent slopes on the U.S.G.S. 7.5-Minute Series Maps.

4.5.A.V. DEVELOPMENT OF PLANS AND SPECIFICATIONS

Project design and construction, unless otherwise indicated, shall be in accordance with the latest edition and current revision of the following publications:

- Design Criteria, Standard Details, and Standard Construction Specifications as provided/required by the City of Rio Rancho.
- APWA Uniform Standard Specifications and Details for Public Works Construction as distributed by American Public Works Association New Mexico Chapter.

- Manual on Uniform Traffic Control Devices for Streets and Highways as distributed by the U.S. Department of Transportation, Federal Highway Administration.
- A Policy on Geometric Design of Highways and Streets as distributed by the American Association of State Highway and Transportation Officials (AASHTO).
- Roadside Design Guide as distributed by the American Association of State Highway and Transportation Officials (AASHTO).
- Highway Capacity Manual and the current Highway Capacity Software, as distributed by the Transportation Research Board.
- State Access Management Manual (SAMM), as distributed by the New Mexico Department of Transportation.
- Standard Specifications for Highway and Bridge Construction as distributed by the New Mexico Department of Transportation (NMDOT).
- Information Guide for Roadway Lighting as distributed by the American Association of State Highway and Transportation Officials (AASHTO).
- Guide for Development of Bicycle Facilities as distributed by AASHTO.
- Urban Bikeway Design Guide as distributed by NACTO.

4.5.A.VI. ALTERNATIVE MULTI-MODAL CROSSINGS

The City will incorporate identified trail crossings of the MRCOG Long Range Bikeways Systems Map in the design and construction of roadways. The City will consider all trails, shared-use paths, and other multi-modal facilities proposed by developers or other agencies in the design and construction of roadways. The type of crossing will be determined on a case-by-case basis. Grade separated intersections at major road crossings should be considered whenever feasible. Guidelines for crossings will comply with the latest edition of the AASHTO Guide to the Development of Bicycle Facilities and/or the NACTO Urban Bikeway Design Guide, MRCOG Long Range Bikeways Systems Map, City of Rio Rancho Mid-block Crossing Policy, or other agreed upon national or local design guidelines or standards.

4.5.A.VII. TIME LIMITATION OF APPROVAL

The City approval of residential developments, commercial developments, and road construction plans shall be valid for a period of one (1) year. Plans not under construction within this time period are to be resubmitted and approved by the City prior to construction.

4.5.B Special Provisions and Engineer's Estimate

4.5.B.I. SPECIAL PROVISIONS

4.5.B.I.a. Residential/Commercial Development

The Developer shall prepare Special Provisions for construction items not contained in or adequately covered by the APWA New Mexico Standard Specifications and Details for Public Works Construction, or the City of Rio Rancho Specifications and Details as needed. Special provisions shall insure that each construction item is clearly defined, and all material and construction requirements are identified. Special Provisions shall be written and arranged in the same format as the APWA New Mexico Standard

Specifications and Details for Public Works Construction. The Developer shall prepare and submit sealed Special Provisions. Special provisions shall be included with proposed construction documents submitted for review.

4.5.B.II. ENGINEER'S ESTIMATES

4.5.B.II.a. Residential/Commercial Developments

The Developer shall provide City staff with an Engineer's Estimate of Probable Cost at final submittal of the construction documents. The estimate shall contain a comprehensive itemized listing of individual project components with quantities, estimated unit costs and extended total costs identified for each item. Unit costs shall accurately reflect current market costs. Supporting documentation shall be provided to the City upon request.

An example of the preferred formats for the Estimate of Probable Cost for Onsite, Offsite, and Deferred Improvements can be found on the City of Rio Rancho website.

4.5.C Survey and Data Acquisition

The development of a survey for the purposes of roadway design shall be completed in accordance with Chapter 7 Survey and Permanent Monumentation of the Development Process Manual.

4.5.D Right of Way

The Preliminary Plat and/or Concept Report submitted to City staff, by the Developer, will identify the anticipated basic right-of-way for individual projects. It is understood that the design process will refine the concept by identifying additional requirements and any construction, drainage, or slope easements required. Permanent right-of-way, including the size of triangles at intersections, shall be recommended at the time of initial submittal. The location and configuration of construction, drainage, slope, and temporary easements, including any required for detours, shall be shown. The plans shall show and clearly identify both existing and new right-of-way and easement configurations.

The Developer shall furnish a base map to City staff showing existing and new right-of-way required for the proposed improvements.

4.5.E Utilities

Relocation of existing utilities shall be avoided, except where necessary due to construction or drainage requirements. Design of culverts and/or storm drain systems should avoid or minimize any disruption of utility service. The location of existing and new underground utilities and culverts shall be appropriately shown in paving profiles, culvert profiles, and storm drain profiles. All above ground utilities and signal poles shall be offset behind future sidewalk in urban areas. In rural areas, above ground utilities shall be located as close to the right-of-way line as is practical.

4.5.E.I. COORDINATION WITH UTILITIES OWNERS

4.5.E.I.a. Residential/Commercial Developments

Close coordination with utility owners is very important to new developments and roadway projects to ensure timely relocations or installation of new facilities. The Developer shall research utility information, determine the location and ownership of all utilities within the project limits and resolve each design issue associated with utilities. When two or more utility owners with the same type of facility exist within the project limits, the plans shall indicate the owner

associated with each installation. The construction documents shall clearly identify any conflicts or relocations that will need to take place within the project limits. Dry utilities shall be in the Public Utility Easement (PUE) and wet utilities shall be located in the roadway per City of Rio Rancho standards.

The Developer shall furnish plan sets to each utility owner impacted by the project. Direct contact with utility company for design coordination and land conflict resolution will be led by the Developer but coordinated with City staff. The Developer shall record minutes of all meetings and provide the City with copies of all minutes and correspondence directly received by the Developer from the utility owners.

4.5.F Signing and Striping

4.5.F.I. SIGNING & STRIPING DESIGN

The developer shall design signing and striping in accordance with the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

4.5.F.II. COORDINATION WITH THE CITY

4.5.F.II.a. Meeting with the City of Rio Rancho Development Services Department

The Developer may meet with City staff prior to beginning the pavement marking and signing design to discuss the project in detail. This discussion should address all applicable pavement marking and signing related items, as noted below.

1. Identify current design standards that will control the design.
2. Verify which pavement marking materials are to be used.
3. Verify that traffic signs will use the following criteria:
 - a. All sign posts shall be square tube perforated sign posts.
 - b. Use street light poles to mount signs when possible.
 - c. Signs to be installed per City of Rio Rancho Standard if available.
4. Verify the project's design speed and posted speed limit.
 - a. Projects design speed should be based on functional classification.
5. Clarify the limits of the project and determine how the new design will match into the existing roadway.
6. Confirm the primary City of Rio Rancho Development Services Department contacts for the project.
7. Overall project schedule.

Developer will identify any specialty signing in the area of the project or any unusual roadway pavement marking needs (e.g., hospitals, park and ride facilities, freeway trailblazing, libraries, bike lanes, etc.).

4.5.F.II.b. Post Meeting Communication

The Developer may send to City staff any follow-up material that may be needed, particularly information that modifies or changes the concepts that were discussed during the original pre-design meeting. For example, the Developer will:

1. Prepare and distribute meeting minutes to all concerned parties.
2. Send project scope changes and design criteria changes to City staff.
3. Update the project schedule and proposed submittal dates.
4. If necessary, schedule a meeting with City staff to discuss and review comments.

4.5.F.III. EARLY TRAFFIC ENGINEERING INPUT INTO GEOMETRIC DESIGN

4.5.F.III.a. Traffic Engineering Input

The Developer shall coordinate with City staff early, and often throughout the roadway design process. This process shall reference the current version of the AASHTO in the development of all roadway designs for the process. Additional transportation design requirements can be found in Section 4.6.A Roadway Design Criteria.

4.5.F.IV. LIGHTING AND SIGNING

4.5.F.IV.a. Streetlight Design

4.5.F.IV.a.i. Streetlights – Required

Streetlights shall be required for all public roadways being developed or constructed unless as noted in Section (4.5.F.IV.a.i). In addition, streetlights may be required for lots and parcels which are being improved or altered, depending on the nature and extent of the work. Illustrations of streetlights generally required are shown on City of Rio Rancho Standard Drawings.

4.5.F.IV.a.ii. Streetlights – Not Required

For planned developments, residential, commercial, and industrial developments where the internal streets are not offered for dedication (private roads), a streetlighting system will not be required for the internal non-dedicated streets but shall be provided by the developer on the external public street frontage.

4.5.F.IV.a.iii. Developer Responsibility

Existing streetlights which must be relocated or repositioned because of the construction of new streets or driveways into a development shall be the responsibility of the developer.

Where a development abuts a roadway and/or the development's Traffic Impact Analysis identifies improvements to the roadway or intersection, streetlights shall be installed on both sides of the roadway according to City of Rio Rancho Standard Drawings.

Any new service, including any transformer, required for new service or modification, replacement, or relocation of an existing utility service pedestal, shall be the responsibility of the developer. The developer shall also be responsible to ensure that power shall remain to existing streetlights during the period of any such modification, replacement or relocation of an existing utility service pedestal unless otherwise approved by the City.

Except where lighting is approved by the City's Traffic Section Manager as an addition to an existing metered service, Developers or their contractors shall be fully responsible for service applications in their own name and shall retain responsibility for the streetlights including all costs for PNM to provide power service until the City has granted final acceptance. The City will assume responsibility for the streetlight power service upon final acceptance and will be responsible for the costs associated with the power service thereafter.

The Developer or their contractor shall submit permits to the City of Rio Rancho Building Division and Project Manager and complete all inspections as required by the City Building Division and New Mexico Administrative Code (NMAC). Submittal documents shall be approved by the Project Manager and Rio Rancho Building Division prior to construction and shall include proposed equipment and a site map showing locations of pedestals, poles, luminaires conduit conductors etc. Submittals shall also include

one-line diagrams with all pertinent information, including, but not limited to, grounding details, voltage drop calculations, overcurrent protection, etc.

4.5.F.IV.a.iv. Streetlight Design Standards

Streetlighting shall be designed in conformance with the current edition of the City of Rio Rancho Standard Street Light Standard Drawings for the intended roadway classification typical section. Where roadway conditions and typical sections do not conform to those established in the City's standard drawing, streetlighting shall be designed in accordance with the current ANSI/IES standards for roadway lighting.

4.5.F.IV.a.v. Streetlight General Plan Details

The plans shall show and identify all streetlights to be installed, all existing streetlights in the immediate vicinity of the project, all conduit and conductor runs, service points, trees, and all applicable provisions and details specified in these standards.

On subdivision plans, the streetlights shall be shown on their own streetlight plan sheets. The following shall be required on the streetlight portion of subdivision plans, even though duplications may be involved:

- A vicinity map or equivalent.
- Utility infrastructure (including water, sewer, gas, communications, poles, transformers, junction boxes, etc.) and public utility easements.
- Names of adjacent subdivisions.
- Intersecting property lines of adjacent properties.
- A north arrow and appropriate scale (1"=10' to 1"=100').
- All existing streetlights on both sides of any streets and in the median.
- All trees within the vicinity of the conduit runs or proposed streetlights.

Plans shall be submitted to the City of Rio Rancho Development Services Department in accordance with the requirements outlined in the Development Process Manual for construction of infrastructure in the public right-of-way. Material cut sheets, manufacturer drawings, or product data sheets for all poles, luminaires, photocells / lighting controllers, service / disconnect / meter pedestals, and pull boxes shall be submitted for review and approval prior to ordering of any materials. The City reserves the right to require removal and replacement of any unapproved materials at the Developer's sole expense.

Where roadway conditions and typical sections do not conform to those established in the City's standard drawings, a photometric analysis shall be included with the lighting design that includes the lighting design criteria, street class, pedestrian activity classification, light plot, average luminance, Average Uniformity Ratio, Maximum Uniformity Ratio, and Maximum Veiling Luminance Ratio.

4.5.F.IV.a.vi. Streetlight Design Details

Design details for streetlights are as follows:

- Roadway Streetlighting – Streetlighting shall be placed along the roadway as shown on City of Rio Rancho Standard Drawings for their intended functional classification and roadway typical section. Median streetlighting may only be utilized on corridors where existing median streetlighting has been implemented or where preapproved by the City of Rio Rancho traffic Section Manager.

- Intersections -- Intersections shall have at least one streetlight over each of the stop-controlled approaches. Single lane all-way stops may have only two streetlights over opposing approaches. The number and locations required shall conform to City of Rio Rancho Standard Drawings. Excluding residential roadways, intersection streetlighting shall not be included as a part of streetlight spacing along a roadway. Roundabouts and signalized intersections shall be designed to conform to the latest edition of ANSI/IES RP-8 requirements for approval by the City Traffic Section Manager.
- Cul-de-Sacs -- All cul-de-sacs exceeding 130-feet in length, measured from the streetlight location at the intersection to the right-of-way line at the end of the cul-de-sac shall have a streetlight within the bulb. The location of the streetlight within the cul-de-sac bulb shall conform to City of Rio Rancho Standard Drawings.
- Curves – Except as noted below in spacing for arterials, streetlights shall be located on the inside of curves with a radius of less than 200 feet and internal angle of less than 120 degrees.
- Mid-block Pedestrian Crossings -- Streetlights shall be placed at both ends of marked mid-block pedestrian crossings. The design of streetlighting at mid-block pedestrian crossings shall conform to the latest edition of ANSI/IES RP-8 requirements.
- Spacing -- Maximum streetlight spacing, measured along the street centerline, shall conform to City of Rio Rancho Standard Drawings, except on arterial streets with a 1,000-foot or smaller radius horizontal curve, in which case the maximum spacing shall be determined by photometric analysis. The ultimate planned street type and right-of-way width shall be the controlling factor for determination of streetlight spacing rather than the existing street classifications (arterial, collector, etc.).
- Streetlight Poles and Luminaires -- All streetlight poles shall be as shown on City of Rio Rancho Standard Drawings. Where roadway conditions and typical sections do not conform to those established in the City’s standard drawing Street Lighting shall be designed in accordance with the the current ANSI/IES standards for roadway lighting and submitted to the City for approve by the Traffic Section Manager.

4.5.F.IV.a.vii. Light Emitting Diode Luminaires

All new streetlight installations shall utilize Light Emitting Diode (LED) luminaires. All luminaires shall conform to the specific manufacturer, model, and wattages shown on City of Rio Rancho Standard Drawings, unless otherwise supported by a photometric analysis approved by the City’s Traffic Section Manager.

4.5.F.IV.a.viii. Service

All streetlight systems shall have underground service provided. Service voltage shall be shown on the plans. Service voltage shall be either 120 volts or 240 volts for unmetered and 240 volts for metered service. Service points shall be provided within a Public Utility Easement immediately adjacent to the right-of-way, or within the existing right-of-way, and at a point which is as reasonably near as possible to the serving utility power source as shown on City of Rio Rancho Standard Drawings.

4.5.F.IV.a.ix. Pull Boxes

All pull boxes, including the size, shall be shown, and identified on the plans. Pull boxes shall be installed at all locations where more than two conduit runs intersect, where conduit runs are more than 300 feet long and where shown on City of Rio Rancho Standard Drawings. Pull boxes shall conform to City of Rio Rancho Standard Drawings.

4.5.F.IV.a.x. Conductors

All conductors, including quantity and size, shall be identified on the plans. Unless otherwise specified, conductors shall only be single conductor, solid or stranded aluminum, sized in accordance with these standards and the National Electrical Code (NEC) and shall conform to City of Rio Rancho Standard Drawings.

4.5.F.IV.a.xi. Photo Cell and Receptacle

All luminaires shall have an intelligent lighting management controller as shown on City of Rio Rancho Standard Drawings.

4.5.F.IV.a.xii. Conduit

All conduit runs, including the size, shall be shown, and identified on the plans and shall conform to City of Rio Rancho Standard Drawings.

4.5.F.IV.a.xiii. Electrical Equipment and Work

Control and switching equipment and fusing of all circuits shall meet the requirements of the New Mexico Administrative Code (NMAC), National Electrical Code (NEC), New Mexico Electrical Code, the rules of the National Board of Fire Underwriters, and the City of Rio Rancho Standard Drawings and Standard Construction Specifications.

4.5.F.IV.a.xiv. Substantial Completion

Prior to requesting substantial completion, the developer shall have all streetlights, disconnects, field wiring, conduit, pull boxes, and luminaires etc. fully installed. For the substantial completion walk through the developer shall provide the City's Project Manager and Traffic Section Manager with the location and extent of the development including any off-sight improvements, a copy of the latest plan set, including light locations, service locations, spacing, pull boxes, street light submittals, etc. During the substantial completion, the Developer or their Contractor shall remove pull box lids and hand holes as necessary to verify connections and grounding as requested.

4.5.F.IV.a.xv. Final Completion

Prior to requesting final completion, the developer shall have resolved any deficiencies found during substantial completion, the services shall be green tagged, streetlights energized, and smart nodes all pre-programmed and configured to the City's panel. For the final completion walk through the developer shall provide the City's Project Manager and Traffic Section Manager with the location and extent of the development including any off-sight improvements and As-Builts of luminaire locations, service pedestals, conduit, and conductor, pull boxes, and services pedestals, etc. Upon final completion the City's traffic section will verify street light function via smart node and lock service disconnects once verified.

4.5.F.IV.b. Signing

The developer is responsible for all signing.

The roadway classification and/or design speed shall typically govern the posted speed limit. A speed limit sign shall be required at all subdivision entrances and at all areas where the speed limit changes.

All other signing within the proposed development shall be shown on the construction plans for review and approval by City staff.

4.5.F.V. INTERSECTION CONTROL AND MARKINGS

Intersection control and markings are important elements to be considered in the design of all street systems. The application of these elements to the design of streets are described in several of the references in this chapter. The latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) shall be used to define the design of these elements.

4.5.F.V.a. Traffic Signals and Roundabouts

The determination of where and when traffic signals and roundabouts are to be installed shall be made by the City with a recommendation to be included in the appropriate Master Plan or TIA. This decision is based upon the evaluation of traffic conditions at an intersection in accordance with the warrants contained within the MUTCD. Excepting intersections on principal arterials, roundabouts shall be considered for every location that does meet or is anticipated to meet MUTCD criteria for a traffic signal. The City will decide what the appropriate treatment is based on criteria that includes, but is not limited to, safety, efficiency, construction and operating costs, and available right-of-way.

4.5.F.V.b. Markings

Street markings in accordance with the MUTCD shall be included in new construction, the marking layout must be shown in the plans and included in the work to be performed by the contractor. The Developer shall layout the proposed signing and striping plan in the field for verification by City staff. See 4.19 Appendix A for guidance on intersection stop bars, yield marks, crosswalks, and lane designation symbols.

4.5.F.VI. TRAFFIC CONTROL, CONSTRUCTION PHASING AND CONSTRUCTION PERMITS

All anticipated construction activities shall include a plan to identify the phasing of construction activities and the necessary traffic control devices in accordance with the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Construction activities within the right-of-way require a Right-of-Way Use Permit. Prior to the issuance of the permit, plans must be submitted with appropriate approvals which define the construction activities, appropriate traffic control measures, and evidence of notification through the One Call System (505-260-1990) or 811 and submitted to the City for review and approval.

Information regarding Right-of-Way Use Permits can be obtained on the City of Rio Rancho website.

4.5.G Subdivision Infrastructure Requirements

The following information has been provided to assist the development community in determining the extent of public infrastructure that will be required in conjunction with a planned residential development. The information is to be used as a guide, and additional coordination and discussions with the City's Department of Public Works and Development Services will be required.

Note: The Developer will be required to meet the applicable design procedures, design guidelines, drafting and submittal requirements as outlined in the City's DPM for the development of their project.

4.5.G.I. ROADWAY IMPROVEMENTS

The Developer will be required to construct full roadway improvements adjacent to and surrounding the project's boundaries.

The roadway typical sections for the road system adjacent to the project's boundaries will need to be established by the developments Traffic Impact Analysis (TIA), as necessary – see Section 4.4.C of this chapter. Once completed, the results of the analysis shall be submitted for review and approval by City staff. Once the analysis is approved, the developer will be required to construct improvements along the project's frontage, as determined by the TIA, and provide the necessary pavement tapers in accordance with AASHTO to transition the proposed roadway section to match the existing roadway section.

In the event that the proposed residential development is located away from any existing paved roads, the developer will be required to pave full width roadway improvements necessary to gain unrestricted access to the development from the nearest arterial or collector roadway. The extent of those improvements outside the project boundaries will also be based on the information provided in the TIA.

4.5.G.II. WATER AND SEWER IMPROVEMENTS

The Developer will be required to provide the necessary water and sewer facilities needed to successfully service all the proposed residential homes / commercial developments that will be located within the planned community. The extent of the water and sewer improvements will be based on the location of the residential subdivision / commercial development in relation to existing City water and sewer facilities and their available capacities. The Developer will be required to prepare a Master Water and Sewer Report to determine the demand and the corresponding line sizes that will be needed to service the development.

If the development is located outside the limits of the City's existing water and sewer system, the Developer will be required to extend the necessary lines (water and sewer) to service the development. If the demand would overload the City's water and sewer system, the City is not obligated to approve the proposed subdivision.

If the demand of the residential development does not overload the existing City water and sewer system, the Developer will be allowed to extend the existing water and sewer system as needed to service the development.

It is the sole responsibility of the Developer to provide the water and sewer lines required to service the development no matter the cost associated with the improvements.

4.5.G.III. STORM DRAIN IMPROVEMENTS

The Developer is required to construct and install all the necessary storm drain improvements to capture and convey the runoff generated from the development so that it does not have a negative impact on surrounding developments/residents or the environment.

It is the sole responsibility of the Developer to evaluate and analyze the impacts that the runoff generated from the development may have to the surrounding area. The Developer will be required to address and mitigate potential drainage issues that could arise. Discussion with the City Roadway and Drainage Sections should take place to determine the best course of action in the event that additional drainage improvements may be required. (See Chapter 3 –Drainage, Flood Control and Erosion Control).

4.5.H Post Construction Requirements

See Chapter 2.8 Submittal Requirements.

4.5.H.I. FINAL PROJECT SUBMITTAL

Upon receipt of the acceptance letter the “Final Project Submittal Package” shall be submitted. See Chapter 2.8 Submittal Requirements.

4.6 Roadway Design Standards

4.6.A Design Criteria

The criteria presented within this section are major controlling factors in the design of streets. It is expected that designers will carefully apply, with attention to detail, these criteria to individual design circumstances. Suitable transitional elements must be provided between changes in geometric configuration, pavement and curb character, and drainage carrying aspects of the ultimate street design.

In the following, the major criteria governing design speed, horizontal and vertical geometrics, sight distance, curvature and superelevation, gradients, and comfort controls are presented.

The guidelines contained herein are intended to provide direction in the design of transportation facilities. While most of the design parameters that should be used are provided in the following pages, unusual conditions may occur in some projects. When additional guidance and explanation is needed, the designer should refer to the list of publications already included in Section 4.5.A.V. of this chapter or the most current edition thereof.

Variations in design standards may be sought to cover unusual circumstances or alternative design concepts. Variations for these would be granted by the review body or person(s) that would have primary responsibility for those standards.

4.6.B Roadway Cross Sections

4.6.B.I. LANE WIDTHS

Consult the standard cross sections found on the City of Rio Rancho design criteria, standard detail, and standard construction specifications webpage for standard lane widths and other relevant cross section geometry. For analyzing non-typical situations, The Developer must consult with and obtain prior approval from City staff before using alternative values. The Developer shall prepare a design memo detailing the cross section and lane widths when changes to the standard City cross sections are needed. All dimensions are in feet and measured to center of lane lines from the edge of pavement (no curb) or to the edge of curb. Current City standard details for roads, drainage, and traffic can be found on the City’s website.

4.6.B.II. CROSS SLOPE

The desirable cross slope on normal sections of all pavement types should be 0.02 foot per foot (2%), with 0.01 foot per foot (1%) minimum and 0.03 foot per foot (3%) maximum for collector and residential roads. For arterials, follow ASHTO. The minimum cross slope at intersections may be reduced to 0.005 foot per foot (0.50%). The 1% absolute minimum cross slope shall not be used in combination with a minimum longitudinal slope.

The slope is downward on each side of a centerline high point for two-way roads. For one-way roads, the slope should be constructed to angle uniformly throughout the full surface width. When pavements are resurfaced the desirable transverse slope should be 0.02 foot per foot (2%) with a maximum slope of 0.03 foot per foot (3%).

The minimum desirable longitudinal curb grade shall be 0.005 foot per foot (0.50%). The absolute minimum shall be 0.0035 foot per foot (0.35%). The maximum desirable shall be 0.06 foot per foot (6%) with 0.10 foot per foot (10%) as absolute maximum. The Developer is required to discuss using the absolute minimum and maximum values for longitudinal slope with City staff for approval.

4.6.B.III. GRADED SHOULDERS

Graded shoulders should slope 0.05 foot per foot (20:1) downward from the adjacent pavement edge. In superelevated sections, the graded shoulder slope shall continue to slope away from of the pavement. The graded slope on the high side may have a reduced slope. The graded slope on the low side shall remain at 0.05 foot per foot (20:1) downward, except when the superelevation rate exceeds 0.05 foot per foot (5%), in which case the low side graded shoulder slope shall equal the rate of superelevation. However, when portions of the shoulders on two-lane highways are paved as an integral part of the travel lanes (and the paved portion is 5 feet or less in width) the paved shoulder slope shall be the same as the cross slope of the traveled lanes. The remaining unpaved portion of the shoulder should be sloped 0.05 feet per foot (20:1) except when modification is needed for superelevated sections. Local roads shall have the graded portion of the shoulder sloped at 10:1.

Street Type	Street ROW Cross Section								Design/Posted Speed	Max Gradient	Min. Gradient	Min Radius		Min. Sight Distance	Min. Tangent Length	Max. Length
	Min. Width	Curb & Gutter	Driving Lane	Parking Lane	Median Width	Bicycle Lane	Sidewalk Width	Buffer Separation				@ Centerline	Min. Radius			
Principal Arterial	156 ft	STD DWG CG-01	11 ft	-	Varies by # of Lanes	6 ft	6 ft	5 ft min	45 mph-65 mph	10%	0.50%	SEE AASHTO	SEE AASHTO	SEE AASHTO		
Minor Arterial	Varies Min 86 ft Max 106 ft	STD DWG CG-01	11 ft	-	22 ft	6 ft	6 ft	5 ft	40 mph min	10%	0.50%	SEE AASHTO	SEE AASHTO	SEE AASHTO		
Intersections (750 ft. distance)	Additional 30 ft (15 either side)	-	-	-	-	-	-	-	-	4% max 50 ft from intersection	0.5 min - 3% max through the intersection	-	-	-		
Minor Collector	Varies Min 80 ft Max 102 ft	STD DWG CG-01	15 ft	9 ft (parallel) 14-30 ft (angle)	-	-	Varies Min 14 ft Max 20 ft	N/A	30 mph min	10%	0.50%	SEE AASHTO	SEE AASHTO	SEE AASHTO		
Major Collector	68 ft	STD DWG CG-01	11 ft	-	11 ft	5 ft	5 ft min	3 ft min	35 mph min	10%	0.50%	SEE AASHTO	SEE AASHTO	SEE AASHTO		
Local	50 ft	STD DWG CG-01	13 ft	-	-	-	5 ft min	3 ft min	25 mph	10%	0.50%	SEE AASHTO	SEE AASHTO	SEE AASHTO	600 ft	
Alley	20 ft	-	20 ft	-	-	-	-	-	-	-	-	-	-	-		
Driveway	STD DWG DW-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cul-de-Sac	100 ft diameter	-	-	-	-	-	-	-	-	-	-	-	-	-	500 ft	

The design control at the crossover line between the pavement and the graded portion of the shoulder is the algebraic difference in the cross-slope rates. The maximum algebraic difference at this point is 0.08 foot per foot (8%). For superelevated pavements greater than 0.03 foot per foot (3%) but less than 0.06 foot per foot (6%) the graded portion of shoulder on the high side can vary from 5% to 2% to affect a maximum algebraic grade difference of 0.08 foot per foot (8%). For superelevated pavements greater than 0.06 foot per foot (6%) the graded portion of shoulder shall be paved to match the cross slope of the roadway. Where they both slope in the same direction, it is the difference of their cross-slope rates. Shoulder slopes that drain away from the paved surface on the outside of well-superelevated sections should be designed to avoid greater than an 8.0% grade break.

When the designer is matching pavement, the cross slope or breakover should not exceed 0.01 foot per foot (1%) except at crown lines.

4.6.C Design Speeds and Posted Speeds

The design of geometric features such as horizontal and vertical curves will depend upon the design speed selected for the street. The choice of the design speed is primarily determined by the street classification. The design speed is the maximum recommended speed at which reasonable safe operation of a vehicle can be maintained over a specific section of a road when conditions are so favorable that the design features of the road govern. Design speeds for the various classifications of roads may be found in Table 4.2 above.

4.6.D Horizontal Curves

For specific direction on the consideration of horizontal curves in designing roadways, AASHTO's *A Policy on Geometric Design of Highways and Streets*, latest edition should be reviewed for guidance. Specifically, the following should be noted:

- General controls.
- Superelevation rates.
- Superelevation transition.
- Sight distance.
- Appropriate consideration of “knuckles” on residential streets with right angle cures as needed to accommodate school bus design vehicles. This is important on roads with parking permitted on both sides of the street.

4.6.E Vertical Alignment

All design elements related to the vertical alignment shall refer to the current AASHTO A Policy on Geometric Design of Highways and Streets for guidance.

4.6.F Roadway Alignment

All design elements related to roadway alignment shall refer to the current AASHTO A Policy on Geometric Design of Highways and Streets, for guidance.

4.6.G Clear Zones, Guardrails, and Curbs

All design elements related to clear zones, guardrails and curbs shall refer to the AASHTO *Roadside Design Guide* for guidance. For design considerations related to curb returns, see City of Rio Rancho Standard Detail specifications.

4.6.H Sidewalks

Sidewalks shall be designed in accordance with the current City of Rio Rancho Standard Details. All newly constructed sidewalks and corresponding ramps shall be in compliance with the Americans with Disabilities Act (ADA) requirements and take into account Public Rights-of-Way Accessibility Guidelines.

4.6.I Grading in Parkway and on Private Property

If a cut or fill slope must extend onto private property, the top of the bank and the toe of slope shall be shown on plan view regardless of the depth of the cut or fill. The Developer must obtain sufficient topographic information and spot elevations to accurately determine the limits of the cut or fill. This may require survey beyond what is normally expected on private property if the road is located on a hillside slope.

A typical cross-section drawing showing the existing ground slope and the proposed cut or fill shall be shown on the same plan sheet. Any easements that are required to construct the proposed cuts or fills on private property shall also be shown on the plan views. The City shall be notified in writing of all easement requirements for cuts and fills. The drawing of proposed easement lines on the construction plan is not suitable notification.

If the difference in elevation between the back of a graded pedestrian walkway (or the back of a sidewalk) and the existing ground at that location is greater than one foot, the top of the bank and the toe of the slope shall be provided on the same plan sheet.

The maximum slope of the grading behind a graded pedestrian walk or sidewalk may be increased if the abutting property is undeveloped and if available right of way is not sufficient for a 4:1 slope without encroaching onto private property. This should be discussed with the City.

If existing fences, trees, or other structures lie in the area where cuts and fills are planned, their relocation, if necessary, shall be part of the design requirement. Trees must be relocated if the cut(s) or fill(s) will encroach upon them.

Retaining walls may be considered as an alternative to cuts and fills if development on private property would be adversely affected by a cut or fill, or if an easement is unobtainable. The goal is to achieve practical and economical solutions to problems generated by grade differentials.

4.7 Intersections

4.7.A General Controls

4.7.A.I. INTERSECTION ANGLE

Roads shall intersect each other at not more than 10 degrees from perpendicular.

4.7.A.II. INTERSECTION SPACING

For local roads, intersection spacing should maintain sight-distance requirements at a minimum. For all other roadways within the City of Rio Rancho, refer to NMDOT State Access Management Manual for guidance.

4.7.A.III. INTERSECTION LOCATION

Arterials and collectors shall have straight approaches of at least 330 feet between the intersection and horizontal curves.

4.7.A.IV. LIMITS OF IMPROVEMENTS

Intersecting major streets shall be improved to the limits designated. Tapers to match existing pavement shall be as designated in the geometrics. Care shall be taken to ensure smooth grades in both directions at the intersection of arterial streets, collector streets, and any other potentially signalized intersections.

Work at intersecting streets shall generally end at the terminus of the curb return. If an intersecting street is unpaved and ROW is available, the pavement (with curb and gutter) shall generally be extended 100 feet beyond the returns to prevent gravel accumulation and erosion at the intersection.

4.7.A.V. SIDEWALK RAMPS

All improvements shall be designed in accordance with current ADA guidelines and City of Rio Rancho Standard Details.

4.7.A.VI. CURB RETURNS AT STREET

Refer to City of Rio Rancho Standard Details.

4.7.A.VII. INTERSECTION SIGHT DISTANCE

Intersection sight distance shall be proved at all intersections. The procedure for calculating intersection sight distance may be found in the AASHTO Policy on Geometric Design of Highways and Streets.

4.7.A.VIII. LEFT TURN LANE STORAGE

The left turn storage length shall be determined by a TIA for both signalized and unsignalized intersections. The minimum storage length shall not be less than 75 feet for unsignalized intersections or 160 feet for signalized intersections, unless agreed upon with the City. If a TIA indicates that these minimums are not adequate, then the storage length shall meet the 95th percentile queue.

4.7.A.IX. RIGHT TURN LANE STORAGE

The right turn storage length shall be determined by a TIA for both signalized and unsignalized intersections. The minimum storage length shall not be less than 75 feet for unsignalized intersections or 160 feet for signalized intersections, unless agreed upon with the City. If analysis indicates that these minimums are not adequate, then the storage length shall meet the 95th percentile queue.

4.7.A.X. AUXILIARY LANE TRANSITION TAPERS AND DECELERATION REQUIREMENTS FOR AUXILIARY LANES

Refer to NMDOT State Access Management Manual for guidance.

4.7.A.XI. LANE REQUIREMENTS

The determination of functional classification is required to determine the number of lanes and the lane configuration for intersections. The outputs of a TIA should also be referenced in support of this determination. See section 2.8.A.III of Procedures chapter for analysis requirements.

4.7.A.XII. INTERSECTION TURN LANE DESIGN

At intersections where no specific left turn lane or a single left turn lane is to be provided, a truck turning template must be used to ensure the width of the receiving lane on the exit portion of the intersection is sufficient for the design vehicle. A left turning vehicle's sight distance shall not be obstructed by an opposing left-turning vehicle.

At intersections where double left turn lanes are to be provided, a truck turning template must be used to ensure the width of the receiving lanes on the exit portion of the intersection are sufficient for the design vehicle.

4.7.A.XIII. INTERSECTION CROSS SLOPE/GRADING

Intersections must be graded to provide characteristics consistent with the design speed of the through street. Intersection staking sheets through the intersection will be required for design review of major intersections involving arterial and collector streets. Alignment of arterial streets through intersections must be continuous without breaks in grade. Grades within the intersection need to be flat enough to minimize problems with turning vehicles and to keep stopping distances reasonable. Grades should also be steep enough to ensure that proper drainage occurs. Grades should be between 0.5% minimum and 3% maximum. Grades established for channelized turning roadways need to be compatible with superelevation for design.

Minor leg approach tangent gradients to intersections generally must not exceed 4% for a distance of at least 50' back from the projected curb flowline of the through street. Deviations from this standard will require concurrence from City staff.

Street crown should be reduced through signalized intersections of collector and major local streets of approximately equal classification to promote driver comfort. Crown reduction should not generally exceed one half of standard crown unless special circumstances govern, and concurrence of City staff is obtained. Grade breaks through major-major, major-collector, and any other signalized or potentially signalized intersections shall not exceed 2.0% desirable or 3.0% absolute maximum. Intersection grading must provide for appropriate drainage.

Grades intended to serve as drainage water blocks may only be designed on minor approach legs of intersections. Maximum height of such water blocks allowed will be 12" as measured vertically from the projected gutter flowline elevation of the major or through street to the gutter flowline elevation at the high point of the minor leg gutter. Vertical curves of a minimum length of 50' must be provided for water block configuration. The vertical curve needs to begin at the intersection flowline to preserve reasonable intersection visibility. Adequate stopping sight distance must be provided in the design.

Detailed drainage design must follow the requirements of Chapter 3.6; however, the designer should specifically investigate intersection design to assure that design flows will not overtop curbs resulting in damage outside the right-of-way.

Intersections should be located to avoid roadway segments that are highly superelevated. Intersection grading for superelevated roadways needs to consider the issues of grade compatibility, cross-over crown etc. to ensure that the intersection will operate properly.

4.7.B Roundabouts

4.7.B.1. GENERAL

Roundabouts shall be the preferred option for intersection control on all single lane minor arterials and collectors. They should also be considered as alternatives to signals on two lane minor arterials. The criteria to be used for selecting a roundabout over other forms of intersection control such as signals or stop signs include, but are not limited to:

1. Safety Improvements – This use would typically be used on locations where there were abnormally high crash rates associated with conflicts that would be reduced or eliminated with roundabouts.
2. Operational Improvements – This use would typically be used in locations where a roundabout would provide better performance than other traffic control modes such as stop signs or traffic signals.
3. Community Enhancement – This use is typically a gateway treatment to convey a change in environment or land use.
4. Special Situations – This use would be limited to areas where unique alignment and/or geometric constraints make it impractical to use traditional traffic control modes.

In addition, all Traffic Impact Analysis (TIA) should include a comparison of the theoretical intersection delay for a roundabout versus a signal at all warranted signal locations, where applicable and/or required. For more information regarding roundabouts, please visit the City's Roundabout Information webpage.

4.8 Access Control

With respect to driveways, road users have certain rights of access to abutting property as well as the right to travel on the road with relative safety and freedom from interference. Since these various rights sometimes conflict, the City is given the responsibility for reconciling and satisfying, to the extent feasible, the needs and rights of all road users with respect to driveway location, design, and operation. When conflicts cannot be fully resolved, preference will be given to the safe and efficient use of the road, particularly when traffic growth requires additional storage capacity of left-turning vehicles at signalized intersections. In such cases, the City reserves the right to change a nearby access point from full access to partial to ensure safe, efficient operations of the adjacent signal.

Existing accesses, even if not in use, must not be relocated, altered, or reconstructed without approval from the City of Rio Rancho. When an access to a roadway with a curb and gutter is abandoned, it must be replaced by a full height curb across the abandoned access and the depression behind must be filled. When an access to a roadway with a shoulder and ditch is abandoned, it must be replaced by a matching existing shoulder and ditch.

4.9 Access to State Highways

Access to State highways is regulated by the New Mexico Department of Transportation (NMDOT). The City of Rio Rancho will not review changes to an existing access or any new access which is in State right-of-way. Encroachment permits for access to State highways must be obtained directly from the NMDOT. The City shall review requests for new access where any portion of the access is in City right-of-way.

4.10 Access to City Roadways

All construction to connect or change driveways entering City right-of-way must first be authorized by a valid City of Rio Rancho Curb Cut Permit and a Right of Way Use Permit. These permits can be obtained through the Department of Public Works website.

The City currently follows the standards in the NMDOT State Access Management Manual (SAMM). No access points shall be approved without an acceptable project site plan indicating the location and number of access points. A Traffic Impact Analysis may be required to substantiate the need for access or any variances to the SAMM guidelines.

4.11 Driveways

4.11.A Driveway Characteristics

4.11.A.I. SINGLE FAMILY RESIDENTIAL DEVELOPMENT

Driveways serving single family residential units should be designed in accordance with Standard Detail DW-01, "Sidewalk and Driveway Transitions (Residential)" and DW-02, "Sidewalk and Driveway Transitions (Collector)." located on the City's Standard Details for Roads, Drainage, and Traffic webpage. If the driveway is to serve one single family unit, the maximum width should be 24 feet. For single family residential accesses, the width must equal the width of the garage opening if the garage is within 25 feet of the right-of-way line, up to a maximum of 30 feet. If one driveway is to serve two single family units, the maximum width should be 30 feet.

4.12 Driveway Design

4.12.A Restriction of Turning Movements

Where necessary for the safe and efficient movement of traffic, the City may require access points to be geometrically designed so as to provide for only limited turning movements. The restriction of turning movements should not affect the number and location of access points as specified elsewhere.

4.12.B Medians For Limited Movement Accesses

The ends of the medians should typically be provided with 2-foot back of curb radii.

Acceleration and deceleration lanes in accordance with SAMM will be required to be incorporated into the design. Medians must be provided with vertical curbs. Additional right-of-way or easement may be required to accommodate these designs.

4.12.C Design

Generally, all new private property access will be designed as driveway cuts. The design of accesses must also take into consideration the needs of truck traffic and must be checked using the appropriate turning template. Drainage patterns must also be taken into consideration in the design of accesses.

4.12.D Driveway Sight Distance

Adequate sight distance must be provided for vehicles exiting and entering a driveway. Driveway locations should be evaluated to determine whether a sight obstruction exists, such as buildings, signs, vegetation, parked vehicles, horizontal or vertical highway alignments, etc.

If the sight distance is not adequate, consideration should be given to the following options:

1. Removing the sight obstruction.
2. Relocating the driveway to a more favorable location along the frontage.
3. Prohibiting critical movements at the driveway.
4. Relocating access to another street, a frontage road, or a joint access location.

In all cases, stopping sight distance must be provided. AASHTO guidance and a design speed of posted speed plus at least 5 miles per hour should be used when determining site distance.

4.12.E Driveway Profiles

Adequate design of driveway grades should reflect consideration for basic functions of the adjacent street and the site that the access driveway serves. Generally, to enable safe ingress or egress maneuvers, driveway profiles should provide for sufficient clearance between the vehicle and the driveway surface.

4.12.F Driveway Angles

Two-way driveway should be as close to 90° to the roadway as possible (no less than 75°).

One-way driveway may be as flat as 75°. However, a minimum of an 85° angle is recommended for driveways in areas of high pedestrian or bicycle activity.

4.13 Large Developments

For large developments, the City may require the Developer to consolidate access points which may be signalized. Driveway signals must be located to provide satisfactory signal progression for through traffic on the public road.

4.14 Driveway Locations

4.14.A Driveway Spacing

Refer to the NMDOT State Access Management Manual for guidance.

4.14.B Joint Access

Joint access will be required for two adjacent developments where a proposed new access will not meet the spacing requirements set forth in this section. Joint access must be approved by the City. Temporary joint access may be allowed.

4.14.C Driveway Corner Clearance

Corner clearance for driveways on collectors and arterials are governed by the NMDOT State Access Management Manual. Corner clearance for residential street driveways shall be coordinated with City staff.

4.14.D Driveway Location Restrictions

Driveway location on collectors and arterials are governed by the NMDOT State Access Management Manual.

4.14.E Driveway Location Coordination

It is necessary to coordinate the location of access for properties on opposite sides of the street so that they do not interfere with each other.

1. Driveways should be located directly opposite each other to ensure that they share a single access location.
2. Where lots are not large enough to allow accesses on opposite sides of the street to be aligned, the center of driveways not in alignment will normally be offset a minimum of 150 feet on all collector roads, and 330 feet on all industrial, major collector, and arterial roads. Greater distances may be required due to left turn storage lane requirements.

4.15 Driveway Storage

The design of a driveway should take into consideration the space necessary to store vehicles using the driveway. This applies to both vehicles making a left turn from the roadway and to vehicles stopped on the driveway waiting to enter the roadway. Adequate storage area is necessary to provide safe and efficient movement of vehicles and pedestrians on the public right-of-way.

The recommended vehicle storage area needed for the entire site may be spread over several accesses if more than one access serves the site. The recommended distance may be further adjusted by the City for accesses with two approach lanes and will be subject to traffic volumes and site layout.

When a development is located adjacent to a public road, the parking facility must have full internal vehicular circulation and storage. Vehicular circulation must be located completely within the property and vehicles within one portion of the development must have access to all other portions without using the adjacent road system.

4.16 Acceleration and Deceleration Lanes

Refer to NMDOT State Access Management Manual for guidance.

4.17 Bicycle Facilities Guidelines

4.17.A Basic Criteria

4.17.A.I. GENERAL

The City of Rio Rancho follows the nationally accepted guidelines, AASHTO Guide for the Development of Bicycle Facilities. In addition to the AASHTO guide, the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide may be referenced as appropriate.

The guidelines presented in this section primarily address the development of on-street bicycle facilities. All new roadways which are legal for bicycle use should be designed and constructed under the assumption that they will be used by bicyclists. Bicycle lanes will be included as part of the standard cross section on all arterial and collector streets when they are designed, constructed, reconstructed, or widened.

Specifications included in the City's Bicycle and Pedestrian Transportation Master Plan shall be utilized when incorporating bicycle and pedestrian infrastructure in a planned roadway.

4.17.A.II. DEVELOPMENT OF PLANS AND SPECIFICATIONS

Except where these standards provide otherwise, testing, report preparation, design, design details, workmanship, and materials shall be in accordance with the current editions of the following publications:

- Guide for the Development of Bicycle Facilities, The American Association of State Highway and Transportation Officials, ("AASHTO").
- Manual On Uniform Traffic Control Devices (MUTCD), U.S. Department of Transportation.
- Urban Bikeway Design Guide, National Association of City Transportation Officials (NACTO).
- ADA Standards for Accessible Design Guidelines, U.S. Department of Justice.

4.17.A.III. VARIANCES

Variations from these standards and procedures may be granted by the City upon evidence that such variations are in the public interest, that they are based upon sound engineering judgment, and that safety, function, appearance, and maintainability requirements are fully met. Variations must be requested and approved in writing.

4.17.A.IV. THE BIKEWAY SYSTEM

The bikeway system is intended to safely connect residential areas, employment, retail services, businesses, education centers, and recreational facilities. The bikeway System is also intended to include recreational bikeways. Consideration of connections and additions to the City's bikeway systems should be coordinated with the City's Bicycle and Pedestrian Transportation Master Plan.

4.18 Landscaping

4.18.A Landscape Design Standards

4.18.A.I. PURPOSE

These Landscape Design Standards have been written to serve as a guide to landscape architects and engineers for the purpose of designing and reviewing roadway landscape plans.

4.18.A.II. DESIGN CRITERIA

The surroundings in which the roadway is being designed will have a strong influence on the landscape design. The design shall be respectful of existing natural features such as landforms and vegetation. When the roadway traverses urban developed areas, the landscape design shall reinforce the adjacent landscape theme or character. The principles of low maintenance and low water use shall be incorporated into all landscape designs.

Under any circumstances the design shall not compromise on safety of all roadway users, including motorists, pedestrians, bicyclists, and construction and maintenance workers. Special consideration should be given to the placement of objects in medians and at corners to ensure safety is preserved for all roadway users.

4.18.A.III. PROCESS

Many elements need to be considered during development of the landscape design. The landscape design process shall begin with a thorough inventory and analysis of existing conditions including the natural landscape elements, topographic and physical characteristics, ecological factors, recreational potentials, residential qualities, historical features, and visual values. The results of the inventory/analysis shall be incorporated into a schematic or concept design submittal (typically included in the 30% submittal).

Subsequent steps in the design process will be determined by the size and complexity of the project. Relatively simple projects may require only schematic levels of design prior to preparation of construction documents. Typically, an intermediate design development stage - the preliminary design - is required between the conceptual design development and construction document preparation. On larger projects, additional design, and/or planning activities (i.e., visual studies, native plant surveys, land use evaluations, etc.) may be necessary.

Early in the project development stage, the landscape architect shall consult with the City of Rio Rancho Design Guidelines when published for guidance on the landscape design submittal requirements, including sheet size, order of drawings, standard notes and details, special provisions, etc.

4.18.B Design Considerations

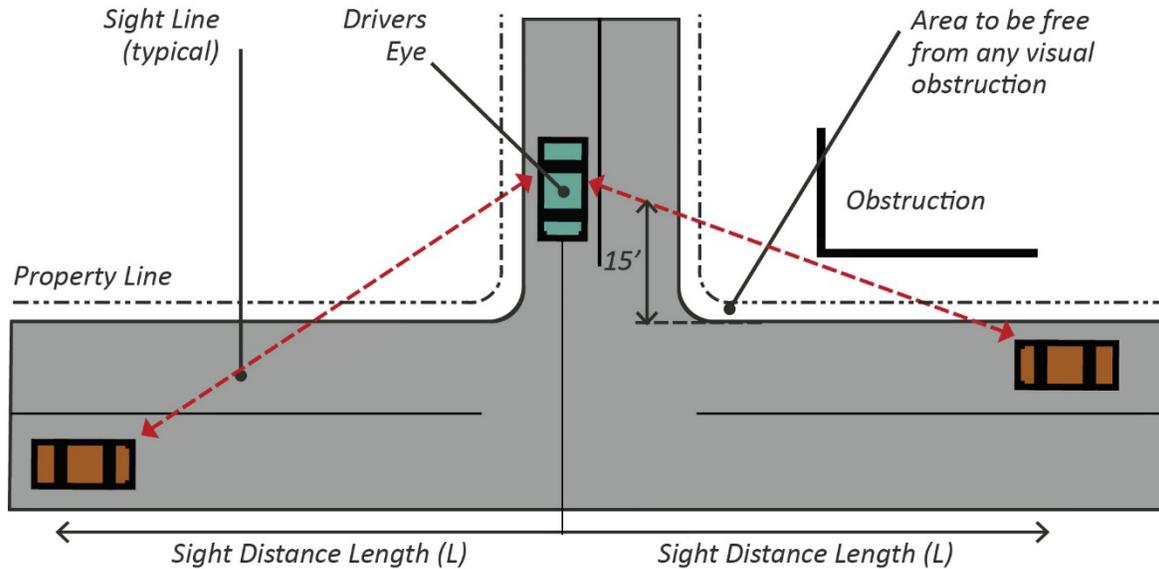
4.18.B.I. ALIGNMENT AND PROFILE—SIGHT DISTANCES AND SIGHT LINES/TRIANGLES

4.18.B.I.a. Sight Triangles

When designing landscaping around intersections, driveways, or other approaches onto a street, plant material placement and height restrictions must be observed. The purpose of these restrictions is to maintain visibility for the driver to turn safely at intersections.

Sightlines shall be maintained for all intersections. The roadway classification for the road being designed will be designated by City staff. The sight distance lines shall be shown, dimensioned, and labeled on the landscape plans.

Figure 5 Sight Triangle



An open view must be maintained up to 7-feet above grade for proper visibility within the sightline triangle. Plants cannot be planted within the sight triangle if they have a potential to reach a mature height greater than 2-feet above the roadway pavement. Trees must have a canopy that can be maintained 7-feet above the roadway pavement without extensive pruning and must be spaced at least 5 feet from an intersection. For specific guidance on maintaining sightlines within landscaping treatments, please see AASHTO. Plants may be considered by the City for use on a project-by-project basis. Vegetation shall not block sight lines to signs.

4.18.B.II. ROADSIDE DEVELOPMENT

4.18.B.II.a. Offset Distances For Trees

Trees, large shrubs, and cacti whose trunk diameter at maturity will exceed 4 inches shall not be planted within the clear zone. The diameter measurement shall be taken at 12 inches above grade. Refer to the *AASHTO Roadside Design Guide – Current Edition*, for information on clear zone width. The clear zone width is not to be considered a fixed single control dimension. Variations in cross section design and traffic speed may increase or decrease this distance. Shrubs and ground covers may be planted or retained within the clear zone for safety and aesthetic purposes as approved by the City of Rio Rancho. Existing trees may be retained under the following circumstances:

1. If they are on the high or cut side of the roadway beyond the clear zone distance.
2. If they are on the low or fill side, if protected by a guardrail or beyond the clear zone distance.

For 50 MPH or greater design speed, minimum clearances for newly planted trees, shrubs, and cacti with an ultimate trunk diameter of more than 4 inches shall be 30 feet unless one of the following reasons will allow for a lesser distance:

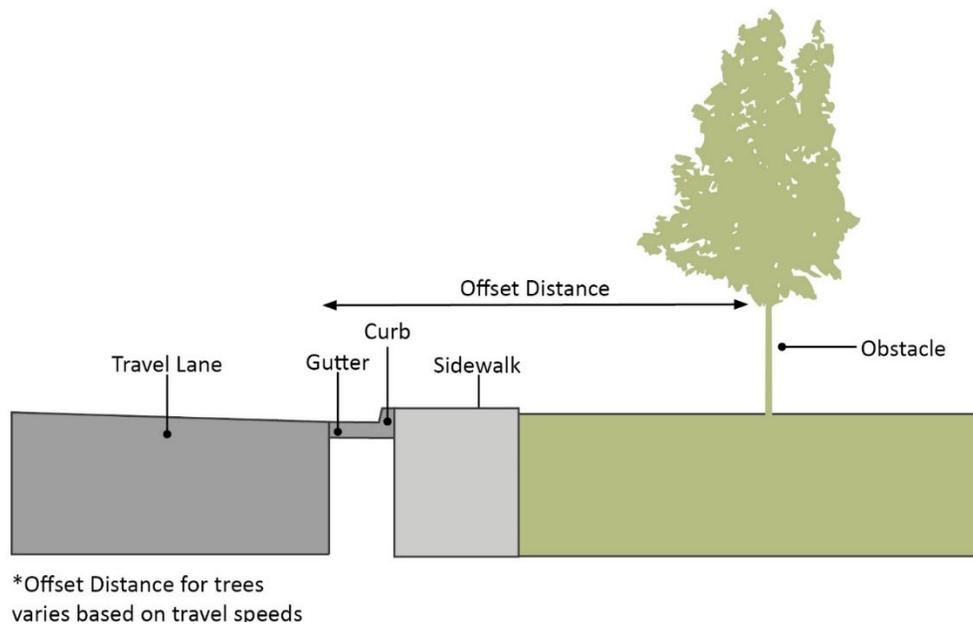
1. Where cut slopes are 3:1 or steeper; 10 feet behind the point of vertical intersection (PVI) at the toe of the slope.
2. Where concrete barriers, walls, abutments, or other rigid obstructions are used, 4 feet behind the obstruction.
3. Where there are barrier curbs near a traveled lane, 10 feet behind the face of the curb. (Except medians).
4. Where limited right-of-way or the necessity for planting would result in less clearance; all factors in the problem area shall be weighed to decide if a special exception is warranted.
5. The offset where there is bicycle traffic shall be a minimum of 7 feet from the edge of the bicycle facility and have a minimum 10 feet of clearance to the canopy. The travel lane illustrated below refers to the vehicle travel lane and does not assume a bicycle lane is present.

For design speed less than 50 MPH, minimum clearances for newly planted trees, shrubs, and cacti with an ultimate trunk diameter of more than 4 inches shall meet the clear zone requirements unless one of the reasons listed above will allow for a lesser distance.

On curves, adequate sight distance for the design speed of the roadway must be maintained.

Modification of the minimum clearance may be required by special considerations. For example, occasionally, special conditions may warrant planting closer to the pavement to fulfill a specified function or requirement. Plantings in the reduced clear zone shall consist of low-growing shrubs and groundcovers under 2 feet in height. Also, the characteristics of the plant material proposed for use will affect the amount of offset required.

Figure 6 Offset Distance Measurement



4.18.B.III. UTILITIES AND EQUIPMENT

No landscaping shall be installed within 10 feet of fire department equipment (i.e., fire hydrants, Fire Department Connections (FDC), and gate valves (PIV)).

No landscaping shall be planted within 10 feet of water and sewer main lines.

4.18.B.IV. LANDSCAPE MEDIANS

Apart from improving roadway aesthetic, median landscaping also provides means to mitigate headlight glare and reduces potential for driver monotony. A landscaped median can also serve to reduce the perceived scale of the roadway.

The minimum clearance for trees in the median is six feet behind the face of a curb, provided that the location meets the sight line criteria. Trees, shrubs, or cacti that will exceed 4 inches in diameter at maturity shall not be planted in a median without curb.

Mature tree growth shall be maintained 2-feet behind the face of the curb line and at minimum five feet from an intersection.

4.18.B.V. GRADING, DRAINAGE, AND IRRIGATION

4.18.B.V.a. Grading

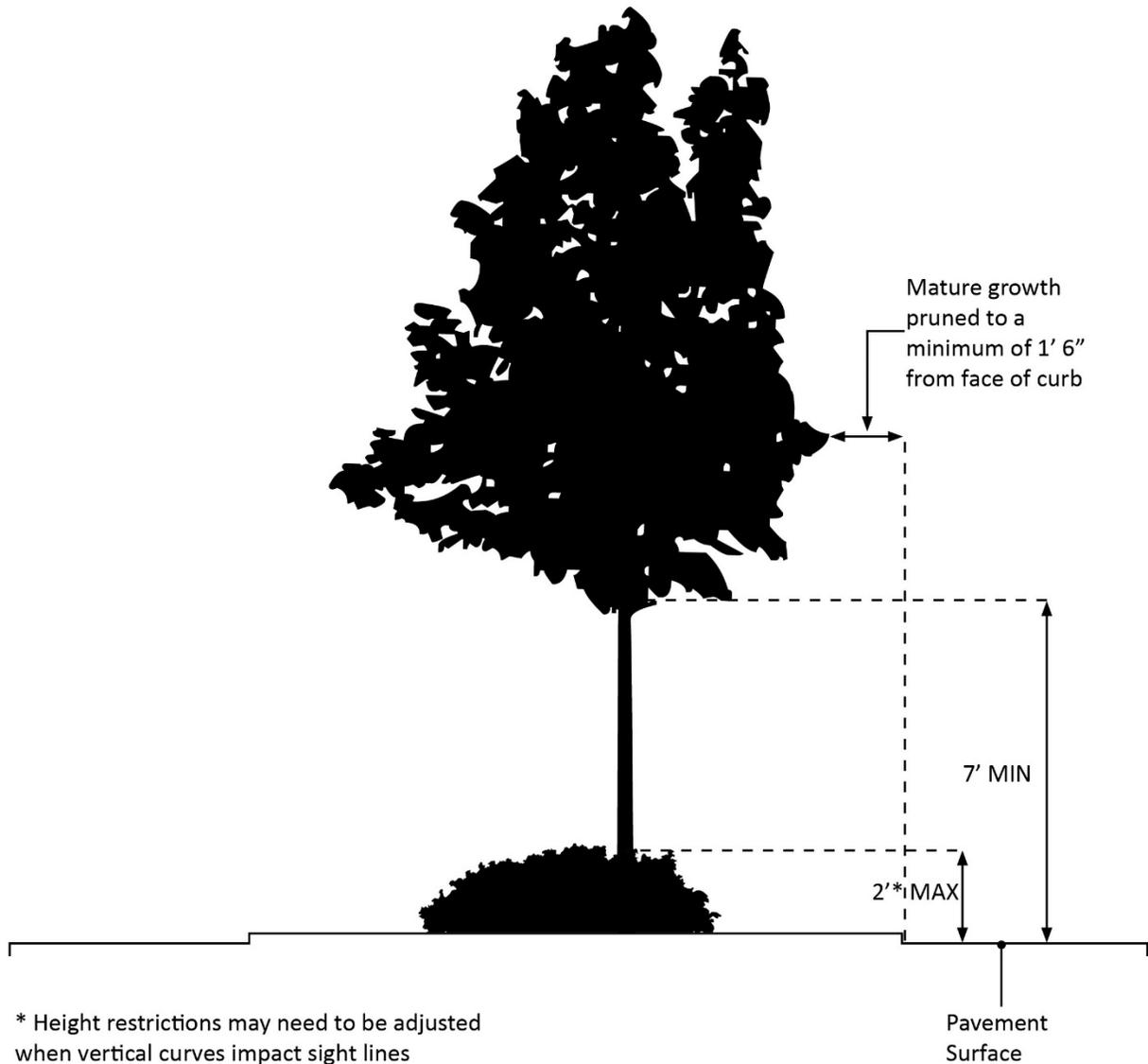
The proper shaping of slopes can benefit drainage, erosion control, aesthetic, and future maintenance. Grading plans shall be used wherever feasible. The grading shall always be smooth enough to meet safety requirements, permit easy maintenance, and adequately serve the needs of surface drainage. Grading shall integrate the hydrology, aesthetic and earthwork needs for the site and maximize use of storm water runoff to support the landscape development.

4.18.B.V.b. Erosion Control

In planting design, the following parameters shall be considered to control erosion:

1. Slopes with ratios of 3(h):1(v) and flatter favor the establishment of natural vegetation as protection against erosion. Slopes with ratios of 4(h):1(v) and flatter add to vehicular safety.
2. Plant along the contour of the slope. Avoid planting arrangements that would encourage erosion.
3. Stabilize soils at dip sections in both the right-of-way and the median where applicable. The use of decomposed granite in dip sections is prohibited.

Figure 7 Height Restrictions and Pruning Requirements Within The Sightline Triangle



4.18.B.V.c. Underground Irrigation

Irrigation systems are designed to promote water conservation, including prevention of water run-off and overspray. The City promotes the use of efficient irrigation methods and practices to reduce the demand on the City of Rio Rancho potable water system. The use of plants which, once established, can survive on minimal supplemental watering or natural rainfall is recommended for areas to be maintained by the City.

In areas where underground irrigation will be used to establish and maintain new plantings, the underground systems will improve the health of the plants and improve the overall appearance of the roadway. All required vegetated areas shall be irrigated by an automatic underground irrigation system, or drip irrigation.

It is important that the area to be landscaped is large enough to accommodate the plants and any associated irrigation components, if an irrigation system is planned for the area. Irrigation components such as valves and controllers shall be placed as close to the right-of-way limits as possible, and within a vault when possible. All underground landscape equipment within 5 feet of back of curb, or back of sidewalk, or within 15 feet of edge of pavement must have 36-inch minimum depth of cover.

4.18.B.VI. WATER HARVESTING

The City is interested in incorporating Passive and Active Water Harvesting Techniques when establishing underground irrigation systems.

Passive water harvesting techniques include:

- Surface collection such as swales, parking lot islands, bar ditches, detention ponds and constructed wetlands. These techniques shall be used for slopes.
- In ground storage: soil amendments, constructed rain gardens, French drains, permeable paving and collection structures with infiltration fields or galleries.

Active water harvesting techniques include:

- Storage and distribution systems including ground rain barrels, storage tanks and below grade cisterns that use gravity or pumps to distribute water to an irrigation system.
- Gray water irrigation can be appropriate for some landscape installations. Gray water is regulated by the New Mexico Environment Department (NMED) and may require a permit. Use of reclaimed water (treated sewage) may be used if by the City of Rio Rancho and signed to indicate non-potable water.

4.18.B.VII. XERISCAPING

Xeriscape landscaping is a transitional planting zone concept which may include several zones going from lush (or oasis) areas to drought tolerant planting areas. Oasis areas are not recommended for landscaping in conjunction with roadway improvements, due to high-water requirements within the City's right-of-way.

4.18.B.VIII. IRRIGATION PIPELINES

If provisions are being made for future irrigation, install sleeves under streets, drives and impervious surfaces with appropriate sized schedule 40 PVC. The sleeves shall extend beyond the impervious surface to a length equal to the depth at which the sleeves are placed.

Pipelines carrying water under constant pressure will be buried to a minimum depth of twenty-four (24) inches. Those that are under intermittent pressure will be buried to a minimum depth of eighteen (18) inches. Polyethylene lines will be buried to a minimum depth of eight (8) inches, PVC lines will be buried to a minimum depth of twelve (12) inches unless they are under constant or intermittent pressure.

Shrub and bubbler heads located within twenty-four (24) inches of any paved surface will be installed with a system that allows the riser assembly to absorb impacts and return to normal position.

Temporary spray irrigation systems may be used to establish seeded areas for native grass and groundcover (see standard drawing BF-01).

Trees and shrubs will be irrigated with low-flow bubblers or emitters.

The irrigation system will be controlled by a digital controller and the appropriate backflow prevention assembly will be correctly installed per CORR standards.

4.18.C Use of Plant Materials

4.18.C.I. PRESERVATION OF EXISTING VEGETATION

In some cases, it may be necessary to maintain existing right-of-way plants in their present location and incorporate them into the final design. The plants to be protected in place will be determined by the City after the inventory and analysis has been completed. Plants to remain shall meet the clear zone requirements of this Section.

4.18.C.II. PLANT SALVAGE

On occasion, selected materials (including State-protected plants) will be analyzed for potential salvage and reuse on the project. The analysis will be accomplished using the results of a Plant Inventory as directed by the City during the course of the project. The species to be considered will depend on the project setting. For example, within urban areas, existing street trees important to the adjacent neighborhood could be candidates for salvage and reuse.

Several factors must be evaluated when plant salvaging is considered. First, the existing plants must be evaluated for age, health, overall condition, and their capability to survive the transplanting operation. Second, the cost of transplanting shall be assessed against the replacement with nursery grown plants of a comparable size; this shall be reviewed in terms of the project budget. Third, other factors such as schedule impacts from salvaging activities, the availability or lack of on-site temporary storage locations, temporary irrigation needs and the importance of the resource to affected local interests shall be evaluated. Based on the above factors, the decision for salvaging will be made by the City of Rio Rancho.

The bid documents shall state that prior to destroying State-protected plants, the contractor shall file a formal Notice of Intent to Clear Land with the New Mexico Department of Agriculture, if this Notice has not been completed during the design phase. The contractor shall obtain State permits prior to moving protected plants.

4.18.C.III. PLANTING RECOMMENDATIONS AND CONSIDERATIONS

Water use must be minimized by using water conserving plant materials. Native desert and xeriscape trees and shrubs must be used wherever possible.

Existing plant materials in the project area must be taken into consideration to provide design continuity. Impact on adjacent development must be mitigated. The existing landscape character must be evaluated, and landscape expectations obtained from citizens groups and the community. Community identities shall also be enhanced and regional character reinforced through the landscape design. Plant material must be appropriately selected and spaced to maximize visual continuity. The use of distinctive plant materials shall help clue drivers of upcoming intersections and decision points.

Some conditions may be unfavorable to plant growth in an urban area. Drainage conditions may be inadequate; there may be excess drainage or not enough. Air pollution is often a concern. Many plants cannot survive the polluted and dust-laden atmosphere of severe urban conditions. Reflected heat from pavements and adjacent buildings further limits the use of many desirable plants. Only those plants that

have proven themselves adaptable to the difficult growing conditions found in some urban situations shall be used in such locations.

Plants shall be used to buffer pedestrians from traffic. The climate for pedestrian comfort can be moderated with shade trees. Trees and shrubs shall be used predominantly, because of their longer life span as compared to groundcovers and herbaceous perennials.

There are specific plant types in and adjacent to the public right-of-way that are not allowed or whose use is not recommended. Trees and shrubs with thorns are to be carefully placed to avoid injury to pedestrians and others using the public right-of-way. Thorny plants must maintain a minimum setback of 2 feet from roadways, sidewalks, and the edge of a bicycle facility. Such plants will be allowed in a median island with vertical curb, provided a minimum of 2 feet is maintained from back of curb as a clear zone (measured from nearest part of plant). Whenever possible, thornless varieties shall be used. Refer to the Vision 20/20 Plan for an approved list of approved plants that can be planted within the right of way.

Plantings shall be kept a minimum of 6 feet back from the edge of roadway when no vertical curb is present. Plantings shall be kept away from walls and fences to allow for maintenance of those structures.

Trees and shrubs shall be planted so that at maturity they do not interfere with service lines and the property rights of adjacent property owners. The designer shall contact the appropriate utility company to obtain a list of trees acceptable for use over or under their utility lines.

Due to the risks of their falling over and dropping large limbs, trees having shallow root systems or a weak branch structure shall not be used within 20 feet of the right-of-way limit or traveled way.

The use of plants producing large volumes of wind-blown pollen shall be kept to a minimum.

4.18.C.IV. PLANTING TO SCREEN

4.18.C.IV.a. Headlight Glare

The value of screening for glare depends on road alignment, ground forms, existing vegetation, and the width of the median. Where needed, plantings shall be at least 4 feet high and form a continuous screen, to avoid intermittent glare.

4.18.C.IV.b. Undesirable Views and Objects

An effective method of obscuring undesirable views from and toward the highway is the use of fencing or other structural materials, or by planting. In some cases, effective screening with plants will take a period of years to achieve, but this shall not prevent the use of plants to achieve this objective. The sight lines from and toward the object to be screened shall be studied early in the design process to provide an appropriate solution and to preserve any existing plant material or structure that will contribute to the screening. Deciduous plant material shall be avoided if a year-round screening effect is desirable.

Vegetation shall not completely encircle lights, signs, or other roadside structures; access must be provided for maintenance purposes.

4.18.C.IV.c. Wind Control

In some instances where high winds are characteristic of a particular site, deep-rooting trees with a dense growth habit are beneficial in reducing wind velocity as well as in catching blowing dust and debris. Trees that are weak wooded shall be avoided in these areas.

4.18.C.IV.d. Shade

Shade effectiveness shall be carefully analyzed. The following criteria should be followed to create the desired effect.

1. Local streets: 1 canopy tree and 3 shrubs and groundcover, every 33 ft. located within 10 ft. behind the sidewalk.
2. Collector streets: 1 canopy tree every 33 ft. located behind the sidewalk and 3 shrubs and groundcover located in the 3 ft. wide buffer.
3. Arterial streets: 1 canopy tree and 3 shrubs and groundcover every 33 ft. located in the 5 ft. wide buffer between the curb and sidewalk.
4. Medians: 1 canopy tree or 2 accent trees, and 3 shrubs and groundcover every 33 ft. located in the 18 ft. wide median.

4.18.C.V. PLANTING FOR TRAFFIC INDICATION

Functional planting can help make it evident to the driver that a change in alignment of the road is imminent or that the driver is approaching an intersection. Such planting shall be designed with consideration for traffic safety and low maintenance.

4.18.C.VI. PLANT DENSITY

4.18.C.VI.a. New Vegetation

All bare ground on the site and/or landscape area shall be covered with live plant material, decorative aggregate, organic mulch, or other suitable material approved by the Development Services Department.

- 75% of the landscaped area at maturity shall be covered by live plant material.
- 50% of plant cover shall be low water use vegetation.

4.18.C.VI.b. Inert Materials

The use of inert materials for landscaping is recommended to minimize the dust associated with its use. Smaller gradation material tends to be absorbed into the surrounding material and does not provide adequate dust protection.

Boulders, river cobble or rock products can be utilized to provide textural contrast to decomposed granite, provided the material does not exceed 4 inches in any dimension within the clear zone.

A pre-emergent herbicide shall be applied to the ground prior to placement of inert materials and again following placement.

Decorative paving (stamped concrete, exposed aggregate concrete, pavers, etc.) shall be considered in place of plants for narrow median areas, such as at median noses.

4.18.C.VII. LANDSCAPE ACCENTS/STREETScape

Strong landscape accents/streetscape should be provided to highlight major entries to commercial, multi-family and subdivision developments reviewed and approved by the City.

Street furniture is to be provided as part of the street frontage landscaping within collector and arterial street rights-of-way which may include such features as bus stop shelters, benches, pedestrian lighting, trash receptacles.

4.18.C.VIII. LANDSCAPE PLANS

Planting plans shall be clear and concise and the processes of achieving aesthetic objectives clearly understood. Specifications for nursery stock, planting, seeding, and other types of landscape construction shall be clear, concise, and embody the practice and quality of work best suited for the area. The landscape contractor shall be responsible for the condition of all plants during a specified establishment period. The bid documents shall be set up so that final acceptance and termination of the contract will not occur until expiration of the establishment period.

Refer to the City of Rio Rancho drafting standards for guidelines in preparing the Landscape plans.

4.18.C.IX. MAINTENANCE AND COSTS

4.18.C.IX.a. Considerations for Maintenance:

1. Species.
2. Size.
3. Location of the plant.
4. Accessibility of the plant.
5. Susceptibility to insects and disease.
6. Fertilization needs.
7. Removal and trimming needs (streetlight, traffic sign, signal, or vision obstruction).

Select trees with a naturally high canopy for use within sight distance triangles to avoid the need for continuous pruning. Some trees create a high quantity of leaf litter, flowers, beans, and/or seeds and shall therefore be avoided. Deciduous trees in the median shall also be avoided.

Masses shall be placed in “drifts,” arranged to allow access for maintenance and to provide a continuous screen or barrier where desired.

Maximum use shall be made of fast-growing shrubs that recover quickly from injury. Slow growers shall be reserved for use as accents.

Landscape plantings shall not encroach onto the roadway or driveway entrances. Landscapes that overhang off-site sidewalks must be maintained so that 7-foot-high clearance is provided at all times

4.19 Transportation Appendices

4.19.A Intersection Stop Bars/Yield Marks, Crosswalks, and Lane Designation Symbols

Intersection Stop Bars/Yield Marks, Crosswalks, and Lane Designation Symbols				
Functional Classification		When to Mark		
Major Roadway	Minor Roadway	Stop Bars / Yield Marks *	Crosswalks Markings*	Lane Designation Symbols (Arrows and ONLY)**
Principal Arterial	Principal Arterial to Major Collector	Stop Bars always at all stop controlled approaches	At signalized intersections where pedestrian signals are present;	Approaches should receive lane designations at multilane approaches and where through lanes become through-left or through right lanes; Dedicated turn bays on major and minor approaches should be marked with Arrow, Only, Arrow appropriately spaced and repeated as necessary through turn bay; Through left lanes should be marked with at least two designations; Through right markings should only be used as deemed necessary. Single lane approaches do not require lane designation symbols. The use of through arrows is discouraged unless required due to intersection alignment or lane shifts.
		Yield Marks at all roundabout approaches.	At roundabouts where pedestrian crossings exist; and	
			Stop controlled approaches where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist.	
Principal Arterial	Minor Collector to Residential/Local	Crosswalks locations, multi-lane approaches, and all approaches to all-way stop controlled intersections.	At signalized intersections where pedestrian signals are present;	
		Yield Marks at all roundabout approaches.	At roundabouts where pedestrian crossings exist; Only at stop controlled approaches within school zones where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist.	
Minor Arterial	Minor Arterial to Major Collector	Stop Bars always at all stop controlled approaches	At signalized intersections where pedestrian signals are present;	
		Yield Marks at all roundabout approaches.	At roundabouts where pedestrian crossings exist; and	
			Only at stop controlled approaches within school zones where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist.	
Minor Arterial	Minor Collector to Residential/Local	Crosswalks locations, multi-lane approaches, and all approaches to all-way stop controlled intersections.	At signalized intersections where pedestrian signals are present;	Turn bays on major and minor approaches at signalized intersections should be marked with Arrow, Only, Arrow appropriately spaced and repeated as necessary through turn bay; Approaches should receive lane designations at multilane approaches and where through lanes become through-left or through right lanes; Dedicated turn bays on major and minor approaches should be marked with a single designation/arrow at entrance of turn bay/approach lane adjacent to holding bar. Through-right markings should only be used as deemed necessary. Single lane approaches do not require lane designation symbols.
		Yield Marks at all roundabout approaches.	At roundabouts where pedestrian crossings exist; Only at stop controlled approaches within school zones where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist	
Major Collector	Major Collector	Stop Bars always at all stop controlled approaches	At signalized intersections where pedestrian signals are present;	
		Yield Marks at all roundabout approaches.	At roundabouts where pedestrian crossings exist; and	

Intersection Stop Bars/Yield Marks, Crosswalks, and Lane Designation Symbols				
Functional Classification		When to Mark		
			Only at stop controlled approaches within school zones where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist	The use of through arrows is discouraged unless required due to intersection alignment or lane shifts.
Major Collector	Minor Collector to Residential/Local	Crosswalks locations, multi-lane approaches, and all approaches to all-way stop controlled intersections.	At signalized intersections here pedestrian signals are present; At roundabouts where pedestrian crossings exist;	Turn bays on major and minor approaches at signalized intersections should be marked with Arrow, Only, Arrow appropriately spaced and repeated as necessary through turn bay; Approaches should only receive lane designation where there are multiple through lanes or where through lanes become left or right turn lanes. Dedicated turn bays on major and minor approaches should be marked with a single designation/arrow at entrance of turn bay/approach lane adjacent to holding bar. Minor approaches should only receive lane designations as needed at multilane approaches to the major street. Single lane approaches do not require lane designation symbols. The use of through arrows is discouraged unless required due to intersection alignment or lane shifts.
		Yield Marks at all roundabout approaches.	Only at stop controlled approaches within school zones where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist.	
Minor Collector	Minor Collector	Crosswalks locations, multi-lane approaches, and all approaches to all-way stop controlled intersections.	At signalized intersections where pedestrian signals are present; At roundabouts where pedestrian crossings exist; and	Approaches should only receive lane designations as needed at multilane approaches to the major street. Single lane approaches do not require lane designation symbols. The use of through arrows is discouraged unless required due to intersection alignment or lane shifts.
		Yield Marks at all roundabout approaches.	Only at stop controlled approaches within school zones only where pedestrian facilities (sidewalks or multiuse trails) and pedestrian ramps exist	
Minor Collector to Residential/Local	Residential/Local	Crosswalks locations and multi-lane approaches.	Only at stop controlled minor approaches within school zones where pedestrian facilities (sidewalks or multi-use trails) and pedestrian ramps exist	Approaches should only receive lane designations as needed at multilane approaches.
*See also City of Rio Rancho Mid-block Crossing Policy				
** Excludes TWLTL, See MUTCD for use of bike lane and other symbols				