APPENDIX K

Access Management Concepts

Access Spacing

Access spacing is key to roadway function. The spacing provisions for the South Meridian Access Management Study are based on established standards found in the *Access Management Manual*, NCHRP Report 348 *Access Management Guidelines for Activity Centers*, and research conducted by transportation professionals and published in the ITE Journal. Additionally, they are tailored to the functional classification of the roadway as described earlier and are not consistent with existing ACHD access guidelines.

The number of accidents at commercial driveways on arterials is disproportionately higher than at public road intersections. It has been shown in the *Benefits of Access Management: Access Spacing* prepared by the Federal Highway Administration (FHWA) that the greater the number of driveways on a given roadway, the greater the rate of traffic accidents. Roadway speeds are reduced by an average of 2.45 mph for every 10 access points per mile. Often driveways are spaced too close together on high speed/high volume roads. This close spacing leads to inadequate sight distance. The following sections describe methods to determine adequate distance between intersections and driveways along roadways to avoid these issues.

Sight Distance

Adequate sight distance must be provided at all access intersections on roadways so drivers can judge approaching vehicle speeds and enter the roadway safely. Also, approaching vehicles must be able to see access locations ahead and vehicles using them. There are three types of sight distance that must be reviewed in designing the spacing of driveways.

Stopping sight distance is the distance required for a driver to perceive and react to a hazard and then brake to a stop before reaching the hazard. This value is based on the AASHTO stopping sight distance assuming the pavement is wet. This would be the minimum stopping distance between driveways. Distances applicable to the South Meridian Access Management Plan are defined in AASHTO and include the following:

- Speed = 30 mph, Stopping sight distance= 200-feet
- Speed = 40 mph, Stopping sight distance= 305-feet
- Speed = 50 mph, Stopping sight distance= 425-feet
- Speed = 60 mph, Stopping sight distance= 570-feet

Intersection sight distance is the distance required for a driver to safely make a left or right turn from an access connection or to cross a roadway. Distances applicable to the South Meridian Access Management Plan are defined in AASHTO and include the following:

- Speed = 30 mph, Intersection sight distance= 335-feet left turn, 290-feet right turn
- Speed = 40 mph, Intersection sight distance= 445-feet left turn, 385-feet right turn

- Speed = 50 mph, Intersection sight distance= 555-feet left turn, 480-feet right turn
- Speed = 60 mph, Intersection sight distance= 665-feet left turn, 575-feet right turn

Sight triangles are a graphical way of determining if access points along a specific roadway meet the sight distance requirements described above. The intersection sight distances listed can be plotted from an access point along a particular roadway based on the speed of that roadway to determine if adequate sight distance is available. Section 7200 of the ACHD *Policy Manual* and Figure 72-F7 contain requirements and examples for sight triangles at intersections and driveways.

Right Turn Overlap

Right turn overlap is another method to determine adequate access spacing along a roadway and is defined as the minimum distance required to avoid conflict overlap between adjacent access points. This distance separates conflicts so the driver can focus on one driveway at a time. The *Access Management Manual* Table 9-7 gives right turn overlap distances for speeds up to 45 mph. This is because higher speeds create a greater speed differential between the free flow vehicle speed and the speed of the right turning vehicle. The right turn overlap distances are short and create a potential collision problem on high speed, high volume roadways. The right turn overlap distances are similar to stopping sight distances. Right turn overlap distances defined in AASHTO applicable to the South Meridian Access Management Plan include the following:

- Speed = 45 mph, Right turn overlap distance = 350-feet
- Speed = 40 mph, Right turn overlap distance = 300-feet
- Speed = 35 mph, Right turn overlap distance = 245-feet

Functional Intersection Area

The "functional intersection area" of an intersection is defined in AASHTO's *A Policy on the Geometric Design of Highways and Streets* as an area that extends upstream and downstream from intersections and includes the longitudinal limits of auxiliary lanes. This includes the tapers needed to develop the auxiliary lanes. Ideally, driveways should not be situated within the functional area of an intersection or the influence area of an adjacent driveway.

The functional intersection area upstream from the intersection equals the distance traveled during perception-reaction time, deceleration distance while the driver maneuvers to stop, and queue storage needed at the intersection or driveway. Table 8-4 in the *Access Management Manual* gives upstream functional distances for specific locations and roadway speeds. Examples applicable to the South Meridian Access Management Plan include the following:

- Suburban, speed = 30 mph, Upstream functional distance = 645-feet
- Suburban, speed = 40 mph, Upstream functional distance = 670-feet

- Suburban, speed = 50 mph, Upstream functional distance = 735-feet
- Urban, speed = 30 mph, Upstream functional distance = 725-feet

Stopping sight distance is the most common method for determining the functional intersection area downstream from the intersection. Examples applicable to the South Meridian Access Management Plan include the following:

- Speed = 30 mph, Downstream functional distance = 200-feet
- Speed = 40 mph, Downstream functional distance = 305-feet
- Speed = 50 mph, Downstream functional distance = 425-feet
- Speed = 60 mph, Downstream functional distance = 570-feet

Driveway Influence Distance

The driveway influence area includes the impact distance, the perception-reaction distance, and the car length. The impact distance is defined as the point upstream from the access drive where brake lights of a following through vehicle are activated. “Spillback” occurs at an access point when a through vehicle must brake in response to another vehicle making a right turn at an access point. Thus, impact distance is determined by the spillback rate. The acceptable spillback rate on a roadway is dependant on the functional classification of that roadway. The *Access Management Manual* gives acceptable spillback rates for arterials as 2%. For collectors, acceptable spillback rates range from 5% to 15%. Driveway influence distances applicable to the South Meridian Access Management Plan include the following:

- Arterial, Spillback = 2%, Speed = 50, Driveway Influence Distance = 620-feet
- Arterial, Spillback = 2%, Speed = 40, Driveway Influence Distance = 460-feet
- Collector, Spillback = 5%, Speed = 40, Driveway Influence Distance = 400-feet
- Collector, Spillback = 15%, Speed = 40, Driveway Influence Distance = 305-feet

Two-Way Left Turn Lanes versus Medians

TWLTLs are very common on arterial roadways. They are included in most widening projects to provide access to development along a roadway. However, they generally only work well on low speed roadways with low left turn concentrations. When driveway densities are high, the left turning vehicles often interfere with each other and limit sight distance of other vehicles. Also, most conflicts at driveways are associated with left turning vehicles entering and exiting the main roadway.

An *ITE Journal* article entitled “Should Direct Left Turns from Driveways be Avoided?” studied the differences between driveway operations on roadways with TWLTL’s versus those with medians. The average number of conflicts measured on the study roadways with direct left turn movements were 30.21 per thousand vehicles. The average conflicts on the study roadways with right turns followed by U-turns were 18.71 per thousand vehicles. Those locations where direct left turns were removed and a right-in/right-out were installed showed that average number of conflicts per thousand changed from 25.18 before to 12.60 after, a 49.9% reduction. The severity of injury/fatality crashes was reduced 22% and the average crash rate was reduced 27% when direct left turns were removed and changed to right turns followed by U-turns.

This study concluded that if driveway density is high, raised medians were safer than TWLTL. Right turns followed by U-turns are becoming popular because they do not require a large financial investment in roadway improvements or right-of-way acquisition and greatly reduce accident rates and accident severity.

Figure I-1 depicts the conflict points associated with a full access intersection/driveway versus **Figure I-2**, which depicts the conflict points associated with a right-in/right-out intersection/driveway. These figures were developed as part of the *Chinden Blvd. Corridor Stud*y. The right-in/right-out driveway removes 30 of the potential 34 conflicts at a full access intersection.

Median openings should be provided at signalized and unsignalized intersections with arterial and collector streets as described in the South Meridian Access Management Plan. However, median openings should be subject to closure when traffic volumes increase to the point that signal warrants are met and signal spacing criteria cannot be met. Access points for left turn egress along a roadway should be located in conformance with coordinated signal spacing requirements where possible, and thus follow median breaks. If future volumes at these left turn access points warrant a traffic signal and signalized spacing requirements cannot be met, left turn access should be closed in one or both directions.

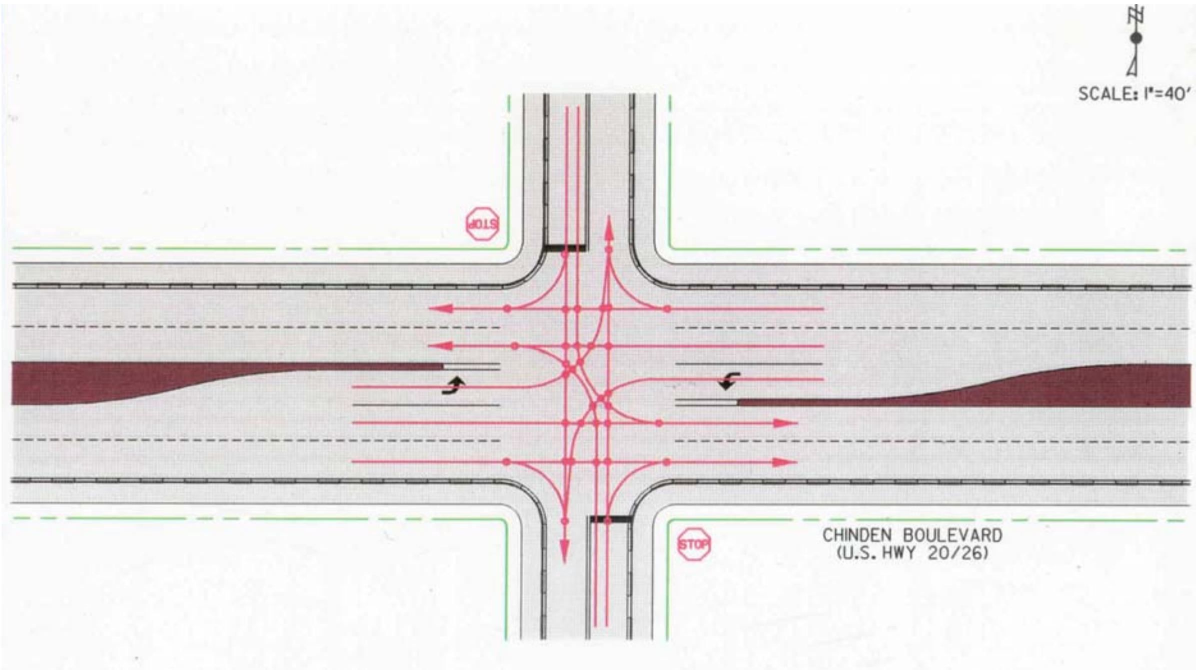

Figure I-1. 34 Conflict Points at Full Access Intersection/Driveway

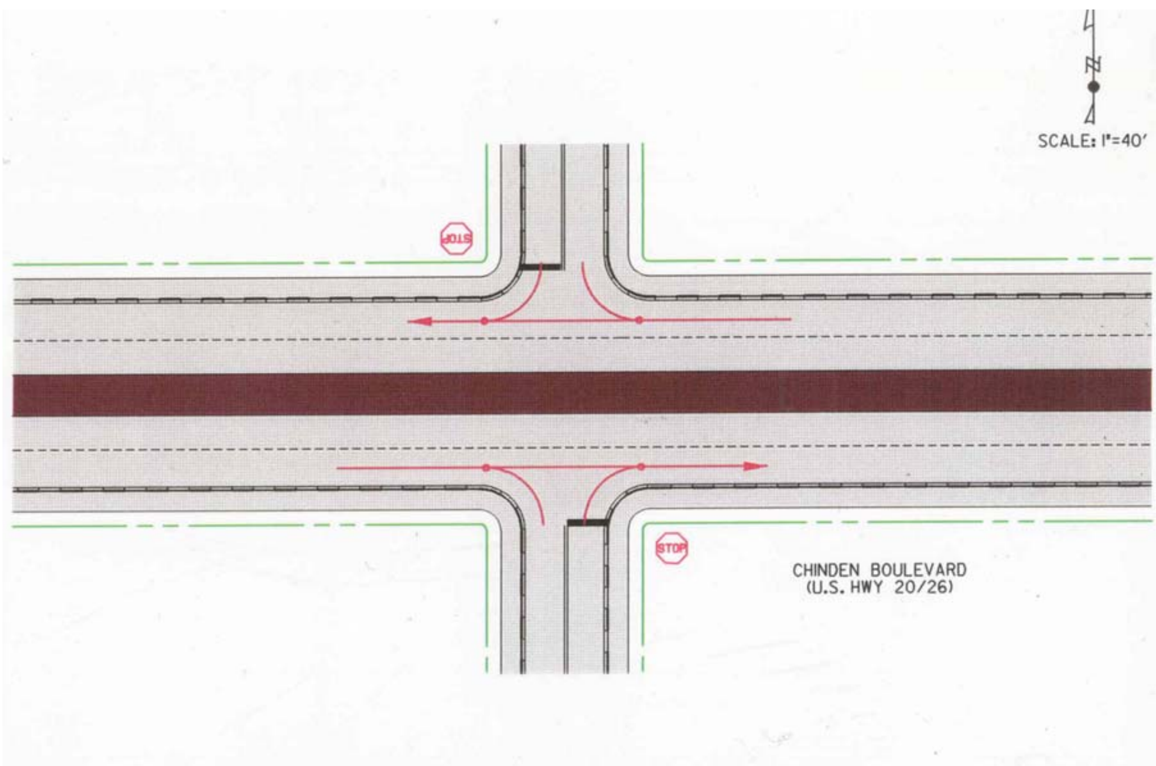

Figure I-2. 4 Conflict Points at Right-In/Right-Out Intersection/Driveway

Signalized Intersection Guidelines

The number of traffic signals per mile on an arterial has a greater influence on travel speeds than traffic volume per lane or the volume to capacity ratio. The *Access Management Manual* developed Table 9-2 that shows the relationship between speeds, cycle length, and signal spacing. Longer cycles reduce progression speed while increased spacing increases progression speed. Examples applicable to the South Meridian Access Management Plan include the following:

- 100 second cycle, ¼ mile spacing, 18 mph progression speed
- 100 second cycle, 1/3 mile spacing, 24 mph progression speed
- 120 second cycle, ½ mile spacing, 30 mph progression speed

During off peak conditions a major suburban arterial should operate at speeds between 45 and 55 mph. During peak hours, the same arterial with ½ mile spacing will operate at speeds between 30 and 35 mph. This is an acceptable condition and represents an LOS of C to D. The ½ mile signal spacing has also been found to reduce vehicle-hours of delay by 60% and vehicle-hours of travel time by 50% over ¼ mile spacing. A 4-lane divided arterial with ½ mile signal spacing can carry the same traffic volume the same LOS and progression speed as a 6-lane divided roadway with ¼ mile signal spacing.

However, FHWA has published data that shows that having 2 signals per mile (e.g. 1-mile signal spacing) does not increase the average travel time on an arterial. Increasing the number of signals per mile increases travel time. Adding a signal at the mid-mile (e.g. ½ mile signal spacing) increases travel time by 9%, while adding signals at 1/3 mile increments leads to a 16% increase in travel time.

The ½ mile spacing of signals along arterials is consistent with land use and development patterns in the City of Meridian and the City of Kuna. In discussions with both cities, it has been agreed that ½ mile spacing is more realistic than 1-mile spacing. The ACHD *Collector Study* recommended collectors located at the mid-mile of most arterials in the South Meridian Area. These collectors will provide the main access from the arterials to the adjacent land uses.