

Frontage Road Primer

US 1 Corridor Study

June 6, 2006

Purpose

A critical component of freeway design is providing appropriate access to local streets and properties. This is the case for the US 1 Corridor Study, especially the section from I-540 to NC 98 (Durham Road). This section of the US 1 study corridor currently has suburban characteristics, US 1 between I-540 and NC 98 however is rapidly developing into an urban corridor with many properties and businesses fronting US 1 that currently have direct access to the highway. Limited control of access exists in some sections of the corridor. Access management techniques are starting to be deployed by the North Carolina Department of Transportation (NCDOT) to help control and manage access to the highway. How and where traffic enters or leaves a freeway has a significant impact on safety and traffic flow. The purpose of this primer is to provide information to the Oversight Team and the public so that the function of frontage road systems and their operational characteristics can be better understood.

Background

The US 1 Corridor Study has determined additional highway and transit capacity is needed to provide an acceptable level of service and enhanced safety along this corridor in the future. Two viable multimodal alternatives have been developed between I-540 and Durham Road. Both of these alternatives have similar cross-sections and the total number of traffic lanes is identical. Both alternatives consist of a full control of access freeway cross-section and frontage roads. Additional freeway auxiliary lanes may be needed and pedestrian/bicycle lanes will also be recommended to provide multimodal capability to the community and transit facilities.

Most freeways in North Carolina have full control of access to and from the facility. In other words, access to and from the freeway is only permitted at grade-separated interchanges with overpasses or underpasses. In many other states, freeway interchanges can also link travelers to one-way frontage roads with slip ramps thus linking the freeway and frontage roads together (see Figure 1).

Frontage roads are access roads that parallel the access-controlled freeway. AASHTO's Green Book characterizes frontage roads as "the ultimate in access control" (1995, page 528). A policy of building frontage roads avoids the purchase of access rights when upgrading existing highways to freeway standards, and generally supplements local street networks. Frontage road

systems may also impact corridor operations, land values, and development patterns.

Frontage roads separate local traffic, (i.e., traffic that needs to slow down and turn into local destinations), from the faster through-traffic on an access-controlled freeway. The challenge in designing frontage roads, which can serve either one-way or two-way, is that they must separate slowing and turning local traffic from the through-traffic on the freeway. If there is not enough storage room for traffic exiting and entering the freeway, then backups and crashes on both the freeway and the frontage road become more likely.

Two-Way Frontage Roads

North Carolina has many examples of frontage roads that provide access to properties via a two-way facility connecting to the cross-street (see Figure 2). Since there are numerous two-way frontage roads within the State, drivers are familiar with their operations and therefore, driver expectancy is high. The travel distance and time between destinations along two-way frontage roads is usually less than that for one-way frontage roads. Two-way frontage roads require much more space than one-way frontage roads in order to prevent backups at intersections and interchange ramps. Current guidelines that help ensure the safe operation of two-way frontage roads in North Carolina include:

- A minimum of 1,000 feet between the interchange ramps and the frontage road / cross-street intersections. This separation distance is required to ensure efficient traffic operations and requires additional right-of way acquisitions at interchanges as compared to one-way frontage roads.
- No direct (slip) ramps from the highway to and from the two-way frontage road.

One-Way Frontage Roads

One-way frontage roads are generally safer because they have fewer conflict points at driveways along the frontage road (only right-ins and right-outs turns are allowed) and at intersections with cross-streets (see Figure 2). Motorists that have experience using one-way frontage roads tend to appreciate the convenient and safer access to properties that front the freeway. Slip ramps that connect directly to the frontage roads provide a convenient system that links travelers to these fronting properties. A disadvantage of one-way frontage roads is that the motorist has farther to travel when they miss a turn. Agencies designing one-way frontage roads have developed the following guidelines to improve safety and traffic operations:

- Detailed standards that define the control of the access line (where driveways/intersections cannot be permitted) which provides adequate

distance between ramp termini with the frontage road and the nearest driveway and/or cross-street intersection. These standards prohibit the placement of frontage road property driveways from aligning either directly across or too close to the slip ramps which would cause safety issues.

- A feature that helps move traffic along one-way frontage roads and provides quick access to the opposite side frontage road is the “Texas U-turn” (see turnaround in Figure 2). Essentially a Texas U-turn carries frontage road traffic heading in one direction to the frontage going in the opposite direction. In this way, traffic along this turnaround maneuver is continuous and does not have to pass through traffic signals or stop signs.

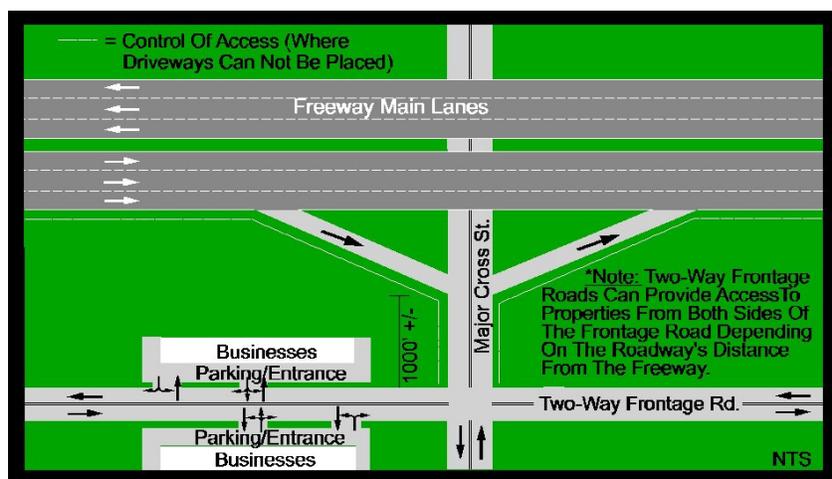
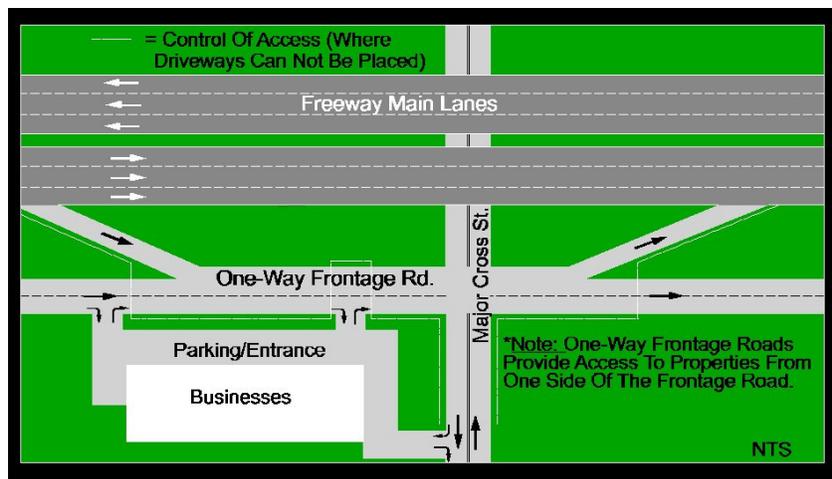
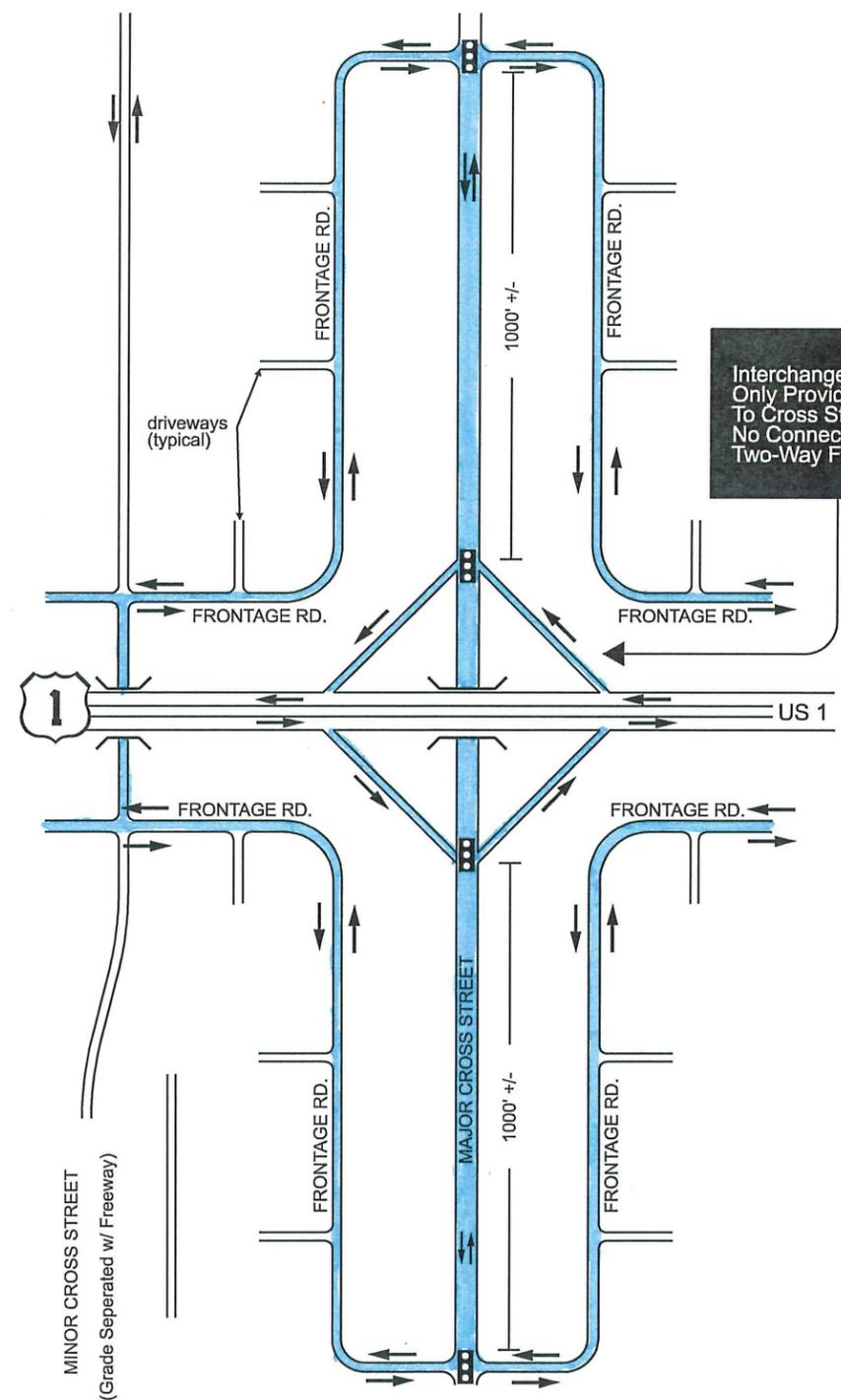
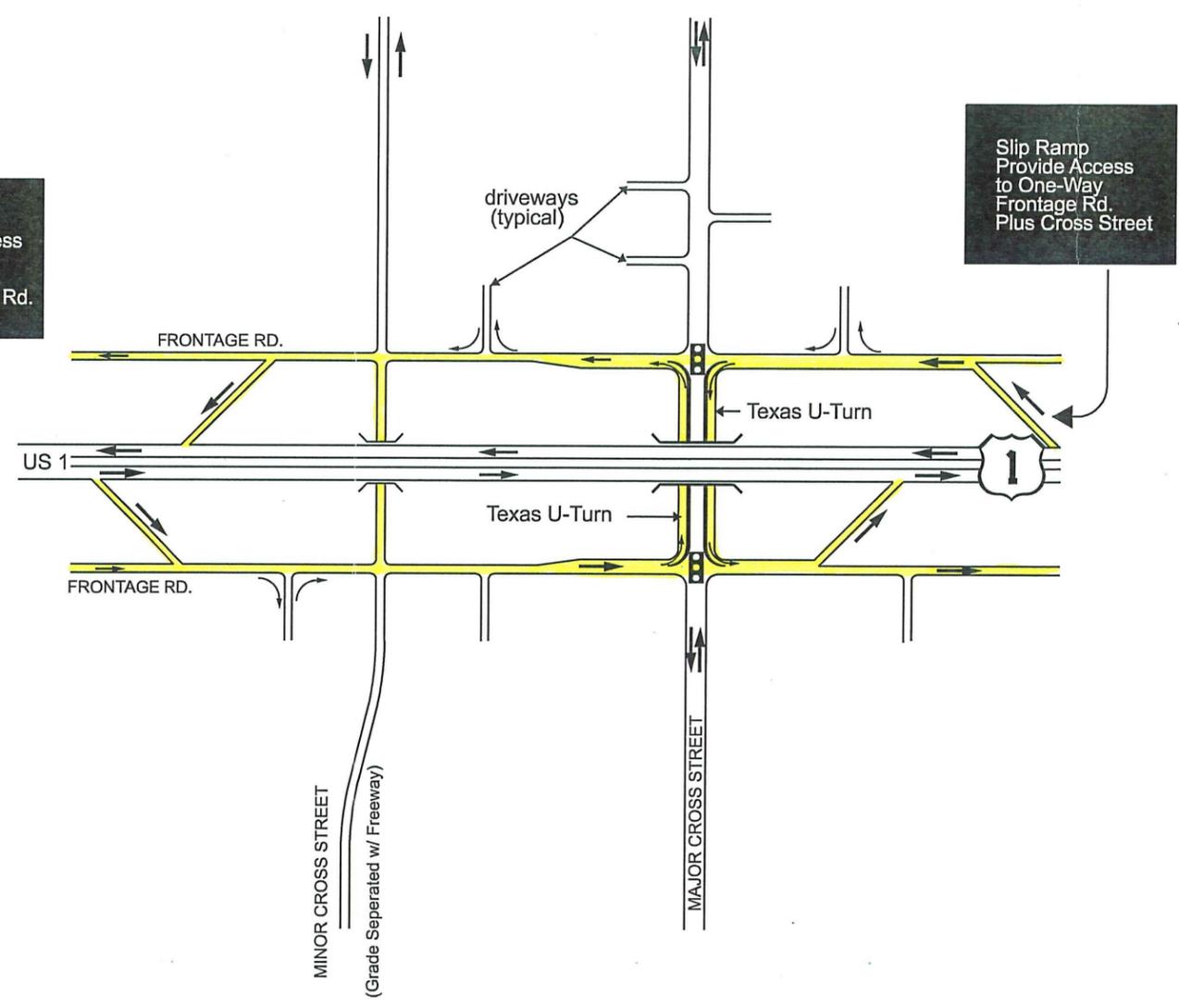


Figure 1



Alternative III A
Highway + Transit Alternative
with Two-Way Frontage Roads



Alternative III B
Highway + Transit Alternative
with One-Way Frontage Roads and Slip Ramps

Legend

- Two-Way Frontage Road Interchange Ramp Systems
- One-Way Frontage Road and Slip Ramp System

NTS



**Two-Way Vs. One-Way
Frontage Road Operations**