IH 35 PEL Study
Alternative Concepts Development and Evaluation Technical Report

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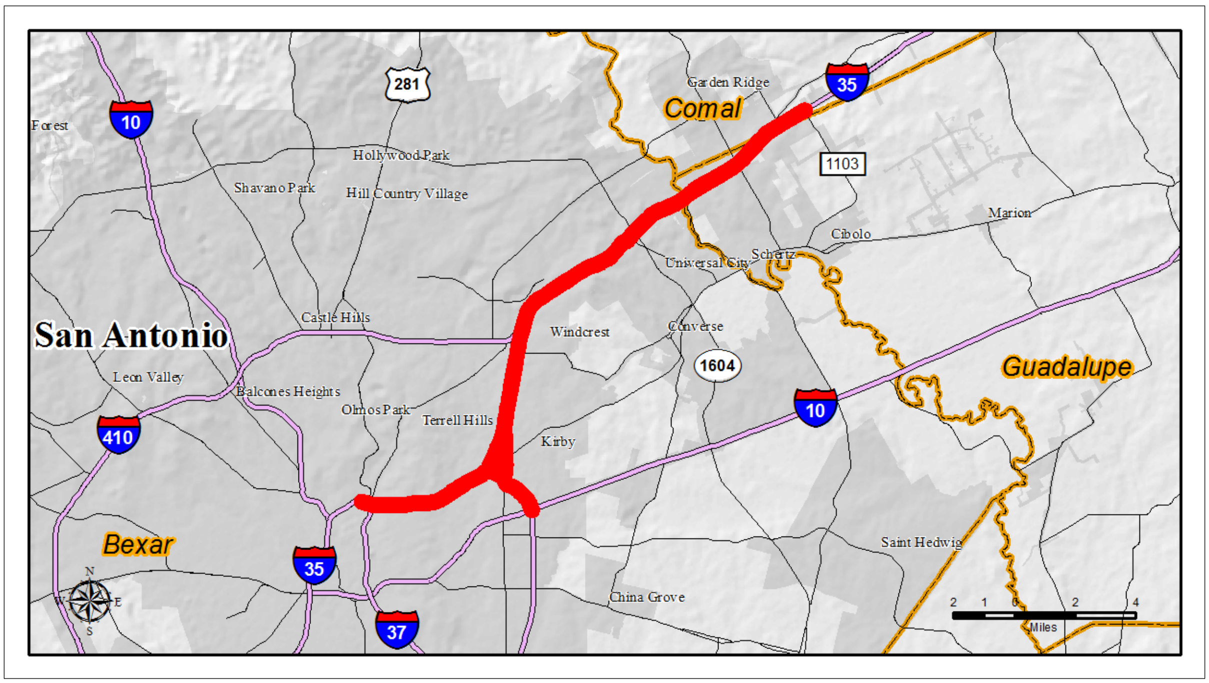
Appendix A – IH 35 PEL Study Traffic Modeling Technical Report

1.0 Introduction

In September 2011, the Alamo Regional Mobility Authority (Alamo RMA) and Texas Department of Transportation (TxDOT) began an IH 35 Planning and Environmental Linkages (PEL) Study to identify transportation needs and potential improvements for IH 35 from Hubertus Road/FM 1103 in Schertz to the intersection with IH 37/US 281 in downtown San Antonio, and for IH 410 from IH 35 on the north side of San Antonio east to IH 10. This 22.3-mile section of IH 35 is primarily located in Bexar County with portions also spanning Comal and Guadalupe Counties. The 3.1-mile section of IH 410 is located in Bexar County. A map depicting the approximate Study Area limits is provided in **Figure 1**.

Figure 1 - IH 35 PEL Study Area Map



Previous planning studies, including the *1996 Northeast (IH 35) Corridor Major Investment Study (MIS)*[1] and the *I-35 Corridor Advisory Committee Plan, August, 2011* (My 35 Plan)[2], identified a need for transportation improvements along this section of IH 35. However, none of these efforts resulted in projects that were advanced to the environmental study process. The IH 35 PEL Study links the previous planning efforts with current technical analysis and input from the public and agencies, to develop and recommend alternative concepts[3] for improvements to IH 35 for more detailed environmental studies.

[1] San Antonio-Bexar County Metropolitan Planning Organization. *Northeast (IH 35) Corridor Major Investment Study-Final Report*. October 1996.

[2] I-35 Corridor Advisory Committee. *I-35 Corridor Advisory Committee Plan*. August 2011.

[3] It should be noted that the level of alternative development undertaken in the IH 35 PEL Study was planning-level as opposed to a detailed, project-level analysis. Any mention of the term "alternatives" in this document refers to "alternative concepts" and not project-level alternatives.

As documented in the *IH 35 PEL Study Need and Purpose Technical Report*[4], the IH 35 PEL Study seeks to identify improvements to existing IH 35 within the Study Area to address the following needs:

- Increasing traffic demand and congestion
- Inadequate roadway capacity
- Roadway safety and operational concerns
- Roadway maintenance deficiencies
- Limited integration of IH 35 with other existing and planned transportation modes

These issues lead to increased vehicle delay and have negative economic and environmental consequences to area residents, commuters, businesses, and freight movements. Therefore, the purpose of the IH 35 PEL Study is:

To develop transportation alternatives that improve mobility and safety in the IH 35 corridor in a manner that will manage vehicle congestion for the projected 25-year planning horizon, promote efficient use of existing transportation facilities, minimize impacts to the natural and built environment, and complement other modes of transportation and economic development initiatives in the region.

The San Antonio-Bexar County Metropolitan Planning Organization's (MPO) Metropolitan Transportation Plan (MTP)[5] identifies the need for capacity improvements on IH 35 from US 281/IH 37 to Schertz Parkway in the fiscally constrained portion of the MTP. The PEL study limits include the area described in the MTP, however, the northern limit of the PEL study area extends past Schertz Parkway to FM 1103 to ensure that the recent growth in this area, which influences traffic on IH 35, is considered. Additionally, the segment of I-410 between IH 35 and IH 10 was included in this study to capture the traffic movements between IH 35 and IH 10 that could also influence the traffic on IH 35.

Three other segments of IH 35 are identified in the unfunded portion of the MTP as needing capacity improvements based on current and forecasted needs. The section of IH 35 from the Atascosa County Line to IH 410 and the section from IH 410 to US 90 have been identified as long term needs within the MTP. The section from US 90 to US 281/IH 37 has been identified for preliminary study beginning in the Fall of 2012. These three segments of IH 35 are outside the limits of this PEL study. The purpose of the *IH 35 PEL Study Alternative Concepts Development and Evaluation Technical Report* is to describe the process and key technical findings used to recommend alternative concepts for improvements to IH 35 in the Study Area to study further in NEPA.

2.0 Development of Conceptual Alternatives

This section describes the alternative concept development process for the IH 35 PEL Study, including definitions of each of the eleven (11) preliminary alternative concepts under consideration. A discussion of the alternative concepts screening and evaluation methodology is provided in **Section 3 – Phase I**

[4] TxDOT and Alamo RMA. *IH 35 PEL Study Technical Report*. 2012.
[5] San Antonio-Bexar County MPO. *Mobility 2035: Metropolitan Transportation Plan*. December 2009.

Alternative Concept Screening Methodology and **Section 5 – Phase II Alternative Concept Evaluation Methodology**. Note that any mention of the term "alternatives" in this section refers to "alternative concepts" and not project-level alternatives.

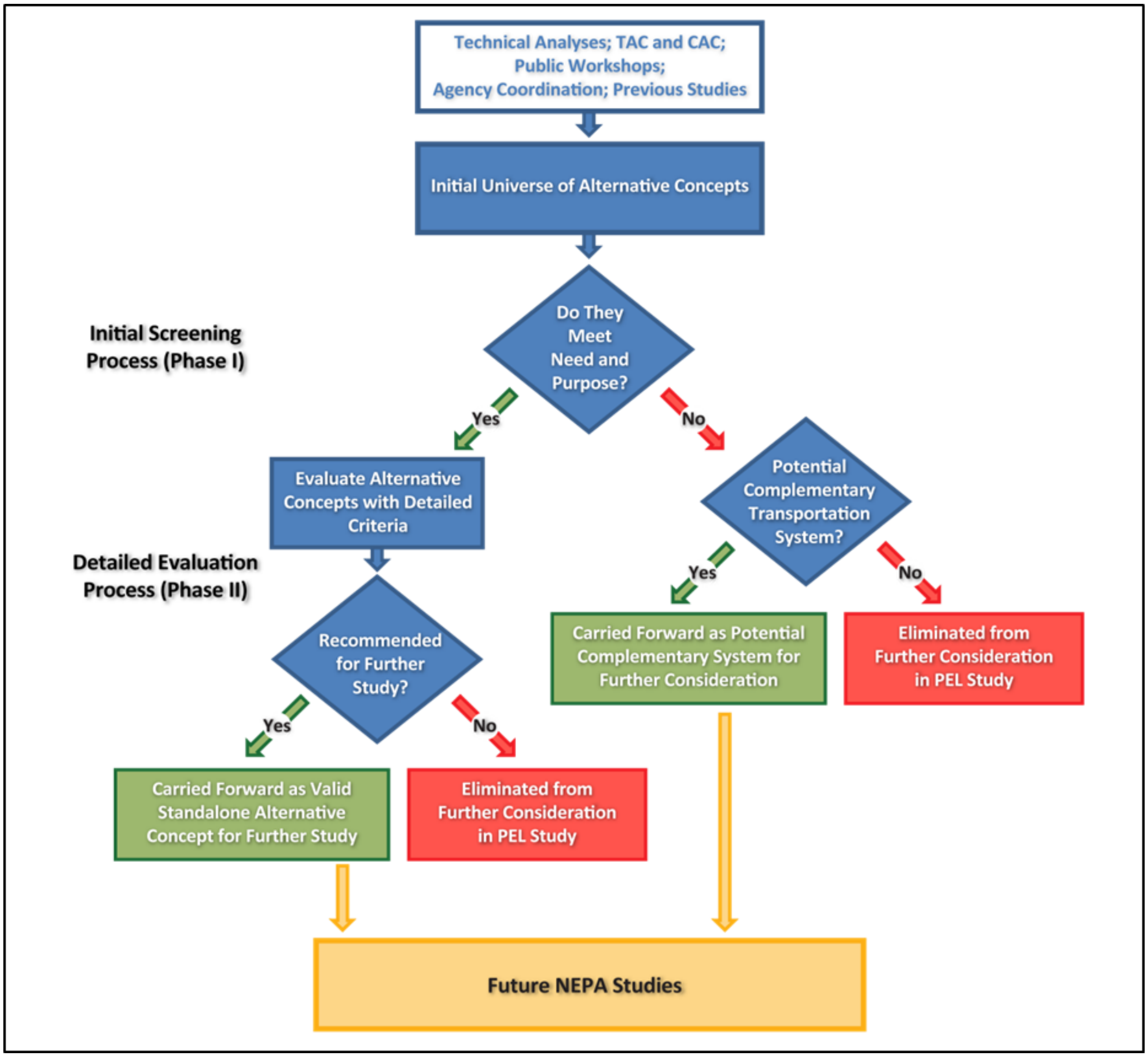
2.1 Alternative Concepts Development Process

The IH 35 PEL Study utilized information from previous planning studies, current technical analyses, and input from the project technical and community advisory committees (advisory committees), general public and individual agency coordination to develop a range of alternative concepts to be evaluated. The concepts developed in the 1996 *Northeast (IH 35) Corridor MIS* were used as a starting point from which to develop possible alternative concepts for the PEL Study. Information from other transportation planning efforts relevant to the Study Area was also used in the alternative concept development process. For example, the San Antonio-Bexar County MPO has identified the need for four to six lanes of additional IH-35 mainlane capacity between US 281/IH 37 and Schertz Parkway. Also, the *My 35 Plan* recommends interchange improvements at IH 35/Loop 1604 and IH 35/IH 410 on the north side of the San Antonio metro area, as well as expanding IH 35 mainlane capacity to a minimum of eight lanes and constructing managed lanes in the IH 35 PEL Study Area. The identified needs and recommendations from these planning efforts were considered in development of the universe of conceptual alternatives.

Development of alternative concepts for the IH 35 PEL Study involves a two-phased screening and evaluation process. Phase I of the screening process provides a high-level, analysis of the universe of alternative concepts to determine their abilities to meet the Need and Purpose of the IH 35 PEL Study. Phase I primarily involves qualitative analyses intended to identify fatal flaws early in the alternative development process so those alternative concepts can be eliminated. The alternative concepts passing the Phase I screening move into the Phase II evaluation, where they are measured against more quantitative criteria developed in coordination with the IH 35 PEL Technical Advisory Committee. The Phase II evaluation is intended to identify the alternative concept(s) that achieve the most mobility benefit for IH 35 while minimizing impacts in the Study Area. The alternative concept or concepts that emerge from the alternative development and evaluation process in the PEL Study will be recommended for more detailed analysis in subsequent environmental studies.

A process overview of alternative development and screening for the IH 35 PEL Study is provided in **Figure 2**.

Figure 2 - Alternative Development and Screening Process Overview



2.2 Description of Alternative Concepts

This section provides a brief description of the eleven (11) preliminary alternative concepts representing the *universe of alternatives* under consideration in the IH 35 PEL Study. An initial viability determination for each of these alternatives is provided in **Section 4 – Phase I Screening Results**.

The alternatives developed assume that all reasonably foreseeable transportation improvements are likely to occur regardless of the outcome of the IH 35 PEL Study (i.e., all improvements contained in the No Build Alternative); however, any major general purpose capacity improvements to the existing IH 35 and IH 410 facilities (including those listed in the 2035 MTP) over the 25-year planning horizon of the PEL Study are not included.

2.2.1 No Build Alternative

The No Build Alternative provides a baseline to gauge how effective various Build Alternatives will be at accomplishing the Need and Purpose of the project. This alternative is required to be considered in PEL and NEPA analyses.

The No Build Alternative includes the preservation of the existing transportation network and any programmed transportation improvements that are reasonably expected to occur regardless of the outcome of the IH 35 PEL Study. As such, the No Build Alternative includes all of the short-term operational improvements currently underway and planned for IH 35 in the San Antonio area[6], in addition to all other programmed transportation projects in the region that are contained in the most recently adopted San Antonio-Bexar County MPO Long-Range Plan (2035 MTP).[7] However, the No Build Alternative assumes that no major capacity improvements are implemented on existing IH 35 and IH 410 (including those listed in the 2035 MTP) over the 25-year planning horizon of the PEL Study.

2.2.2 TDM/TSM/ITS-Only Alternative Concept

Transportation System Management (TSM) focuses on minor improvements, generally within existing right-of-way, such as signal improvements, signing, ramp modifications, auxiliary lane additions, or minor construction that enables the existing system to operate more efficiently and safely.

Traffic Demand Management (TDM) focuses on driver behavior with actions or programs which encourage people to travel at alternative times or with fewer vehicles (carpooling) in order to reduce congestion. TDM is often aimed at employers in an effort to prompt them to adopt measures to reduce employee commuting trips. Examples of employer-based TDM programs include commute information programs, in-house ride-matching programs, transit pass subsidies, home-based telecommuting, compressed workweeks, and alternative work hours.

Intelligent Transportation Systems (ITS) focuses on advanced technologies such as surveillance cameras, message signs, and web-based alerts to enable drivers to operate vehicles with greater knowledge about existing traffic conditions such as congestion, construction, accidents, and emergencies. *TransGuide*[8] is San Antonio's existing ITS system and is currently operational within the PEL Study Area.

The TDM/TSM/ITS-Only Alternative Concept involves the implementation of new and/or enhancement of existing TDM/TSM/ITS services in the IH 35 PEL Study Area. This alternative would include the promotion of various combinations of operational and demand-management strategies, policies, incentives, and the enhanced use of technology to address the mobility issues identified in the IH 35 PEL Study Area.

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[6] Operational improvements on IH-35 are currently planned between Judson Road and FM 3009 and from IH 37 to IH 410N, including the construction of a direct connector from IH 35 SB to IH 410 SB.

[7] San Antonio-Bexar County MPO. *Mobility 2035: Metropolitan Transportation Plan*. December 2009. *Roadway projects list* last updated March 5, 2012.

[8] TxDOT-San Antonio District. *TransGuide Intelligent Transportation System*. http://www.transguide.dot.state.tx.us/

2.2.3 Rail-Only Alternative Concept

The Rail-Only Alternative Concept involves the implementation of rail transit service, either within a new dedicated right-of-way or within existing Union Pacific Railroad (UP) freight line right-of-way near the IH 35 PEL Study Area. The latter option would include construction of separate rail lines within the existing freight rail right-of-way, relocation of existing UP rail operations to a new dedicated corridor, or shared use of the existing freight railroad with separate schedules for freight and passenger transit services. The Rail-Only Alternative would also potentially include grade-separations at select roadway crossings to address any existing safety concerns related to the interaction of rail and vehicular traffic movements.

2.2.4 Transit-Only Alternative Concept

The Transit-Only Alternative Concept involves the implementation of new and/or enhanced bus transit service in the IH 35 PEL Study Area. This Alternative would potentially include some or all of the following elements: the construction of additional park-and-ride facilities, expansion of existing bus routes and/or service, implementation of express bus and/or bus rapid transit (BRT) service, in addition to the promotion of any policies or programs that encourage or incentivize enhanced transit ridership in the IH 35 PEL Study Area.

2.2.5 Truck-Only Alternative Concept

The Truck-Only Alternative Concept involves the construction of a dedicated lane(s) on the existing IH 35 and/or IH 410 facility that is restricted solely for use by large trucks (e.g., eighteen-wheelers). The Truck-Only Alternative would effectively separate freight-carrying truck traffic from passenger vehicle traffic on IH 35 by requiring all trucks on IH 35 to utilize the Truck-Only Lane while the rest of the passenger vehicles on IH 35 utilize the existing general purpose lanes. The Truck-Only Lane Alternative would allow for efficient travel of thru-truck trips that do not originate or terminate in the San Antonio Region and provide limited access points for trucks to enter/exit the Truck-Only Lane and integrate with the general purpose lanes for trips that originate, or are bound for destinations, in and around San Antonio.

2.2.6 At-Grade Expansion Alternative Concepts

Three different concepts for an At-Grade Expansion Alternative were developed and are described below:

- At-Grade Expansion Option 1 involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing an additional three northbound (NB) and three southbound (SB) mainlanes (six lanes total) on each respective facility. The additional lanes associated with this alternative would be constructed at-grade with the existing facilities, and would require additional right-of-way at various locations, especially towards the north end of the IH 35 PEL Study Area where developmental constraints encroach on the existing corridor.

- At-Grade Expansion Option 2 involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing additional at-grade capacity while optimizing lane balancing, transitions, and merging/weaving. For the existing IH 35 facility, the total number of additional northbound and southbound mainlanes constructed varies from zero to five lanes depending on the configuration of the existing facility and existing right-of-way. For the existing IH 410 facility, the alternative includes the construction of an additional three northbound and three southbound mainlanes for a total of six additional lanes. The additional lanes associated with this alternative would be constructed at-grade with the existing facilities and within the existing right-of-way.

- At-Grade Expansion Alternative Option 3 involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing additional at-grade capacity while optimizing lane balancing, transitions, and merging/weaving. This alternative is similar to the At-Grade Expansion Alternative (Concept 2) with the primary difference being that Concept 3 allows for the slight deviation from the existing right-of-way in certain locations where the existing right-of-way is relatively narrow or constrained as compared to other sections in the Study Area. For the existing IH 35 facility, the total number of additional northbound and southbound mainlanes constructed varies from zero to five lanes depending on the configuration of the existing facility. For the existing IH 410 facility, the alternative includes the construction of an additional three northbound and three southbound mainlanes for a total of six additional lanes. The additional lanes associated with this alternative would all be constructed at-grade with the existing facilities and the IH 35 expansion would involve the acquisition of additional right-of-way, whereas the IH 410 expansion could be accommodated within the existing right-of-way.

2.2.7 Elevated Expansion Alternative Concept

The Elevated Expansion Alternative Concept involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing an additional three northbound and three southbound mainlanes (six lanes total) on each respective facility. The additional lanes associated with this alternative would be elevated throughout the entire Study Area and would be constructed within the existing right-of-way. This alternative is very similar to the At-Grade Expansion Alternative Concept 1, with the only difference being that the Elevated Expansion Alternative proposes to add elevated capacity while Concept 1 proposes to add the capacity to the existing facilities at-grade.

2.2.8 Elevated/At-Grade Mix Expansion Alternative Concept

The Elevated/At-Grade Mix Expansion Alternative Concept involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing an additional three northbound and three southbound mainlanes (six lanes total) on each respective facility. The additional lanes associated with this alternative would be a combination of at-grade and elevated capacity based on the constraints of the existing right-of-way. Locations that contain adequate existing right-of-way for expansion at-grade would be constructed as such, and locations where existing right-of-way widths are narrow and could not accommodate at-grade expansion would be elevated. All expansions associated with this alternative would be within the existing right-of-way. Essentially, this alternative is a combination of the At-Grade Expansion Alternative Concept 1 and the Elevated Expansion Alternative, which has been maximized to utilize at-grade expansions, where feasible, and elevate where necessary to stay within the existing right-of-way.

2.2.9 Depressed Expansion Alternative Concept

The Depressed Expansion Alternative Concept involves the expansion of the existing IH 35 and IH 410 facilities in the Study Area by constructing an additional three NB and three SB mainlanes (six lanes total) on each respective facility. The additional lanes associated with this alternative would be depressed throughout the entire Study Area and would be constructed within the existing right-of-way. This alternative is very similar to the At-Grade Expansion Alternative (Option 1) Alternative and the Elevated Expansion Alternative, with the only difference being that the Depressed Expansion Alternative proposes to add depressed capacity, while the Elevated Expansion Alternative proposes to add elevated capacity and the At-Grade Expansion Alternative (Option 1) proposes to add the capacity to the existing facilities at-grade.

2.2.10 New Location Highway Alternative Concept

The New Location Highway Alternative Concept involves the construction of a greenfield controlled-access highway that would attempt to capture the same travel market that is currently utilizing the existing IH 35 facility in the Study Area to alleviate congestion issues on existing IH 35. The New Location Highway Alternative would be constructed in proximity to the existing IH 35 facility so as to be able to serve the same travel market under consideration in the IH 35 PEL Study, i.e., from Schertz to Downtown San Antonio. In order to accomplish this, the New Location Highway Alternative would require the acquisition of new right-of-way to accommodate a six-lane highway facility with frontage roads.

2.2.11 Expansion of Parallel Facility Alternative Concept

The Expansion of Parallel Facility Alternative Concept involves the expansion and upgrade of an existing roadway, or combination of multiple roadways, that parallel the existing IH 35 corridor in the IH 35 PEL Study Area. Similar to the New Location Highway Alternative Concept, this alternative concept would attempt to serve the same travel market currently utilizing the existing IH 35 facility and alleviate congestion on IH 35 by providing an alternative route for travelers. As such, the parallel facility defined in this alternative concept would need to follow existing facilities within densely populated portions of the city of San Antonio.

There are two major existing roadways that run parallel and in relative proximity to IH 35 in the Study Area. These are FM 2252/Nacogdoches Road located approximately two miles north/west of IH 35 and FM 1976/FM 78 located approximately three miles east/south of IH 35. FM 2252/Nacogdoches Road and FM 78 are four-lane roadways and FM 1976 is a two-lane roadway. It is likely that the major upgrade and expansion of one or more of these facilities, or other facilities that exhibit similar characteristics, would be included as part of this alternative concept.

3.0 Phase I Alternative Concept Screening Method and Results

This section describes the Phase I screening method that was used to evaluate alternatives. The purpose of the Phase I screening process was to identify those alternative concepts which had potential to meet the need and purpose of the project. It should be noted that the level of screening analysis performed during Phase I was a high-level, pass/fail type analysis intended to eliminate alternatives that would obviously not meet the need and purpose of the Study. The Phase II Alternative Concept Evaluation includes more quantitative screening measures to be evaluated in much greater detail than what is examined in Phase I. **Figure 2** provides an overview of the alternative development and screening process for the IH 35 PEL Study (**Section 2.1 – Alternative Concept Development Process**).

3.1 Phase I Screening Approach

Each of the alternative concepts in the universe of alternative was taken through the Phase I screening analysis and examined with regard to several broad factors (screening criteria) that were tied to the need and purpose of the project. Information regarding the screening criteria used at this stage of analysis is discussed further in **Section 3.2 – Screening Criteria**. Qualitative data was primarily used to screen the concepts at this stage. After this screening, the alternative concepts were then grouped into two distinct categories:

- <u>Alternative Concepts Eliminated from Further Study as Standalone Solutions</u> – Defined as those alternative concepts considered in the IH 35 PEL Study which, as standalone solutions, failed to adequately address the need and purpose for improvements over the planning-horizon of the Study. These alternative concepts, as standalone solutions, are not recommended to be carried forward for further analysis in the PEL study.

- <u>Reduced Set of Alternative Concepts to be Carried Forward for Further Study</u> – Defined as those alternative concepts considered in the IH 35 PEL Study which, as standalone solutions, had the potential to adequately address the need and purpose for improvements over the planning-horizon of the Study. These alternative concepts are recommended to be carried forward for further evaluation in Phase II of the alternative concept development and screening process.

The alternative concepts identified as "*Alternatives Eliminated from Further Study as Standalone Solutions"* were then examined to see if they could be a complementary transportation system solution (CTSS)[9] in one or more of the other standalone alternatives.

The output of the Phase I screening analysis was used as a basis for further quantitative evaluation in Phase II of the alternative concept development and screening process.

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[9] A Complementary Transportation System Solution (CTSS) is an alternative concept that has been eliminated as a standalone alternative, but that has the potential to complement and enhance other alternative concepts still under consideration as standalone alternatives concepts. These are recommended for additional discussion and analysis in future studies to improve the overall transportation system function.

3.2 Phase I Screening Criteria

The screening criteria utilized in the Phase I analysis focused on broad evaluation factors directly related to the need and purpose of the project. These broad factors sought only to provide a rough characterization and differentiation between: (1) those alternative concepts with a high probability of meeting the need and purpose, and (2) those alternative concepts which will obviously not meet the need and purpose and thus should be eliminated from further study at this point.

The transportation issues identified in the Study Area, as discussed in the IH 35 PEL Need and Purpose Technical Report, include:

- Increasing traffic demand and congestion
- Inadequate roadway capacity
- Roadway safety and operational concerns
- Roadway maintenance deficiencies
- Limited integration of IH 35 with other existing and planned transportation modes

These issues were used to develop the following broad screening criteria that were used in the Phase I screening. The criteria sought to answer the following questions for each alternative concept:

- Does the alternative concept have the potential to address the projected transportation needs over the 25-year planning horizon of the study?
- Does the alternative concept have the potential to improve mobility and safety in a manner that will manage vehicle congestion?
- Does the alternative concept have the potential to encourage integration with other transportation modes?
- Does the alternative concept have the potential to be compatible with economic development initiatives in the region?

Each alternative concept was examined with regard to the Phase I screening criteria listed above, and a determination was made to assign either a “Yes” or “No” for each of the assessment criteria. Alternative concepts that received all “Yes” answers, were deemed to have a high probability of meeting the need and purpose of the project as standalone concepts. Any alternative concepts that received a “No” answer for any criteria were deemed less likely to accomplish the need and purpose and were either recommended to be eliminated as standalone concepts or identified as a CTSS.

3.3 Phase I Screening Results

This section presents the results from the initial alternative concept screening process and provides rationale as to why alternative concepts were either eliminated or carried forward for further study into the Phase II evaluation in the alternatives development and screening process. Descriptions of the alternative concepts discussed in this section are provided in **Section 2.2 – Description of Alternatives**.

3.3.1 Alternative Concepts Eliminated from Further Study as Standalone Solutions

Alternative concepts that did not meet the need and purpose of the project were eliminated from further study as standalone alternatives. Four (4) alternative concepts are recommended for elimination from further study as standalone alternative concepts. Many of these alternative concepts addressed one or more elements of the need and purpose, however, as standalone alternative concepts they would not adequately address all of the elements of the need and purpose. Although these concepts are not recommended for further study as standalone alternatives, it is recognized that various components and elements of these alternative concepts may have potential to be incorporated into other standalone alternatives as the project development processes evolves. The remainder of this section provides the rationale as to why these alternatives were eliminated from further consideration and also discusses which element(s), if any, of the eliminated alternative concepts could be considered a CTSS.

3.3.1.1 Rail-Only Alternative Concept

The Rail-Only Alternative Concept is not recommended for further consideration as a standalone alternative concept in the IH 35 PEL Study. **Table 1** presents the screening results for the Rail-Only Alternative Concept.

Table 1 - Rail-Only Alternative Concept Screening Summary

Assessment Criteria for Need and Purpose	Meets Criteria?	Reasoning
Addresses the projected transportation needs over the 25-year planning horizon of the study	N	This alternative would not attract a large enough volume of existing or projected IH 35 traffic to adequately address the mobility challenges in the corridor over the planning horizon of the study.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would potentially assist with the management of vehicle congestion in the study area, as compared to the No Build Alternative.
Encourages integration with other transportation modes	Y	This alternative proposes to implement a new mode of transportation in the study area.
Compatible with economic development initiatives in the region	Y	The development of a passenger rail facility could spur additional economic development in the region, especially near station locations.

According to the 1996 MIS, the local rail transit alternative (utilizing the existing UP rail paralleling the PEL Study Area) was determined to be an ineffective solution to address mobility issues on IH 35 in the Study Area. It was determined this system would be underutilized, with projected ridership approximately one-third of a typical new start-up system. Under the MIS rail transit alternative, which also included major IH 35 interchange operational and safety improvements, traffic congestion did not show significant improvement on IH 35. The MIS acknowledged that rail transit could become effective beyond the MIS 20-year planning horizon (2016) with additional population density and economic development, and recommended a comprehensive light rail system study for San Antonio as a short range (1-5 year) goal. However, while VIA[10] Metropolitan Transit's *Long-Range Plan*[11] states that commuter rail is a potential transit mode for the IH 35 Northeast Corridor, it does not currently include any plans for prospective rail service in the Study Area.[12]

The Lone Star Austin-San Antonio Commuter Rail Project[13] corridor also utilizes the existing UP rail line. Although the Lone Star Rail Project corridor parallels IH 35 for a portion of the PEL Study Area, it is a separate corridor located as much as five miles from IH 35 in some locations. As a result of this distance, and the origin-destination pairs served by the proposed project (i.e., Austin and San Antonio), it is likely that the travel shed served by the Lone Star Rail Project corridor is different from that served by the IH 35 Northeast Corridor. As such, development of the Lone Star Project corridor would not meet the need and purpose of the PEL project. Furthermore, planned Lone Star Rail project service (32 trains per day[14]) would carry a negligible proportion of total IH 35 PEL Study Area passenger vehicle volume; projected 2020 daily weekday Austin-San Antonio rail ridership in 2020 would be approximately 11,000[15], or 1.7 percent of the total projected 644,080 Austin-San Antonio interurban weekday person trips in 2020.[16] It is unlikely this would have an appreciable effect on congestion and mobility in the Study Area. Finally, existing developmental densities adjacent to the Study Area would preclude the feasible construction of a greenfield rail corridor in close enough proximity to the existing IH 35 facility so as to be able to serve the same travel shed that is under examination as part of the IH 35 PEL Study. Construction of a new rail corridor would potentially impart substantial adverse impacts to existing commercial and residential developments in addition to requiring large swaths of new right-of-way and involving prohibitively high project costs.

In contrast to the feasibility of rail improvements in the IH 35 PEL Study Area, the *Austin-San Antonio Commuter Rail Project Study-Final Report* concluded that operation of an Austin-San Antonio commuter rail system is feasible from both a technical and financial perspective. According to the *Austin-San Antonio Commuter Rail Project 2004 Feasibility Report Update*[17], cultural, land use, and economic factors of the Austin-San Antonio region exhibit the same characteristics that mark other areas of the U.S. that have implemented regional passenger rail. The 2007 *Financial and Economic Benefit Study*[18] estimates a

[10] VIA Metropolitan Transit – San Antonio's transit service provider

[11] VIA Metropolitan Transit. *2035 Long Range Comprehensive Transportation Plan-Final Report*. July 2011.

[12] The Lone Star Rail Project, under development by other entities, is depicted in the VIA 2035 Plan. A portion of this proposed project is located near the IH 35 PEL Study Area.

[13] Under development by the Lone Star Rail District. http://www.lonestarrail.com/

[14] Lone Star Rail District. http://lonestarrail.com/index.php/lstar/about-project-overview/

[15] Austin-San Antonio Commuter Rail District. *Austin-San Antonio Commuter Rail Study-Final Report*. 1999. ftp://ftp.dot.state.tx.us/pub/txdot-info/tpp/asr/finalrpt.pdf

[16] The 2004 Feasibility Study Update presents a lower estimate of 3,800-4,600 riders per day in 2030 (from Austin-San Antonio Commuter Rail District. *Austin-San Antonio Commuter Rail Project 2004 Feasibility Report Update. 2004)*

[17] Austin-San Antonio Commuter Rail District. *Austin-San Antonio Commuter Rail Project 2004 Feasibility Report Update – Appendix B: The Economic Implications of Regional Passenger Rail.* 2004. http://lonestarrail.com/images/uploads/ASA_Econ_Impli_of_Reg_Rail_200412.pdf

[18] Austin-San Antonio Commuter Rail District. *Financial and Economic Benefits Study*. March 2007. http://lonestarrail.com/images/uploads/ASA_Rail_Economic_Study_Report-200703.pdf

$1.8+ billion economic benefit to the Austin-San Antonio region from commuter rail implementation. As currently envisioned, the Lone Star Rail Austin-San Antonio commuter line would utilize the existing UP freight rail line right-of-way located near the IH 35 PEL Study Area and thus relocation of the existing rail traffic on UP's freight lines would be required. In summary, there is a distinction between the IH 35 Northeast Corridor, examined in the current IH 35 PEL Study, and the overall Austin-San Antonio corridor rail systems in terms of their respective feasibility. The Lone Star Rail project, while viable within an Austin-San Antonio commuter context, is not viable as a means of meeting the need and purpose of the project.

Although the Rail-Only Alternative Concept is not being recommended for further study as a standalone solution, it is recognized that the implementation of the Lone Star Rail Project, or similar rail service, would serve as a complementary regional transportation improvement, and would likely proceed, or not proceed, towards implementation regardless of the outcome of the IH 35 PEL Study. To the extent possible, efforts should be made in during project development to ensure alternatives are developed that complement the potential implementation of the Lone Star Rail, or similar rail service, in or around the Study Area. It is also recommended that coordination efforts continue with the Lone Star Rail District to ensure any improvements proposed in the PEL Study, or subsequent environmental studies, are complementary with any planned passenger rail improvements in the region to the extent practicable.

3.3.1.2 Truck-Only Alternative Concept

The Truck-Only Alternative Concept is not recommended for further consideration as a standalone alternative in the IH 35 PEL Study. **Table 2** presents the screening results for the Truck-Only Alternative Concept.

Table 2 - Truck-Only Alternative Concept Screening Summary

Assessment Criteria for Need and Purpose	Meets Criteria?	Reasoning
Addresses the projected transportation needs over the 25-year planning horizon of the study	N	This alternative would not attract a large enough volume of existing or projected IH 35 traffic to adequately address the mobility challenges in the corridor over the planning horizon of the study. Truck volumes only comprise between 8-10% of total vehicle volumes in the study area.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would potentially assist with the management of vehicle congestion in the study area, as compared to the No Build Alternative.
Encourages integration with other transportation modes	N	This alternative does not include any improvements that would encourage integration with other modes.

Table 2 - Truck-Only Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Compatible with economic development initiatives in the region	Y	This alternative could promote more efficient freight movements through the region.

There are very few dedicated *truck-only* lanes in existence in the United States. Most states, including Texas, restrict trucks to certain lanes with signage, but also allow all vehicles to use the same lanes in order to achieve maximum utilization of the existing roadway capacity. It is therefore unlikely that a Truck-Only Alternative would be the most efficient way to address congestion issues in the Study Area. While a Truck-Only Alternative would present certain safety and mobility advantages compared to the No Build Alternative, it would not include any new roadway capacity for general passenger vehicles traveling through the Study Area over the 25-year planning horizon of the Study. While from an absolute perspective it appears there are many trucks travelling through the PEL Study Area, the majority of the vehicular traffic mix is still dominated by general passenger vehicles, which comprise between 90-92% of the total vehicle volume at locations throughout the Study Area.[19] Studies have shown that truck-only facilities are only viable when certain criteria are met such as high absolute truck traffic volumes *and* high relative truck percentage of the overall vehicle mix in the Study Area. Specifically, the California Department of Transportation (Caltrans) estimates that truck volumes need to comprise in excess of 30% of the overall vehicle mix before truck-only lanes are viable.[20] Given the high level of existing roadway congestion, in addition to the future growth expected in the Study Area, it is unlikely that a Truck-Only Alternative Concept would be able to adequately address the mobility needs in the Study Area over the planning horizon of the Study.

Additionally, other feasibility and policy-related concerns exist regarding the implementation of a Truck-Only Alternative that attempts to restrict or inhibit the complete and free access of certain vehicle types on an interstate highway facility. The use of barrier separation between truck lanes and general purpose lanes would not promote an open and integrated transportation system. Feasibility concerns also exist with regard to the complex weaving and merging movements that would be associated with entering and exiting a Truck-Only Lane Alternative facility and mingling with general purpose traffic. For these reasons, the Truck-Only Lane Alternative Concept was not recommended for inclusion in the reduced set of alternatives to be carried forward for further study.

3.3.1.3 TDM/TSM/ITS-Only Alternative Concept

The TDM/TSM/ITS-Only Alternative Concept is not recommended for further consideration as a standalone alternative in the IH 35 PEL Study. **Table 3** presents the screening results for the TDM/TSM/ITS-Only Alternative Concept.

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[19] TxDOT and Alamo RMA. *IH 35 PEL Study Need and Purpose Technical Report.* 2012.

[20] California Department of Transportation (Caltrans). *Truck-Only Lanes*. Fact Sheet on the Southern California Truck-Only Lane Feasibility Study. Traffic Operations Program, Office of Truck Services. 2004.

Table 3 - TDM/TSM/ITS-Only Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	N	The improvements associated with this alternative do not go far enough to adequately address the projected transportation needs over the planning horizon of the study.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	The operational and demand-management strategies, policies, incentives, and enhanced use of technology associated with this alternative could help manage congestion in the study area.
Encourages integration with other transportation modes	Y	This alternative could promote enhanced efficiency and integration of various modes in the regional transportation system.
Compatible with economic development initiatives in the region	N	The forecasted future congestion associated with this alternative would not be conducive to supporting goods movement and economic development objectives.

The TDM/TSM/ITS-Only Alternative Concept is comprised of operational and demand-management strategies, policies, incentives, and the enhanced use of technology to improve mobility in the Study Area. While it is recognized that the types of strategies associated with this alternative concept may indeed have a beneficial effect on mobility in the Study Area, the improvements do not go far enough to adequately address all the issues identified in the need and purpose over the 25-year planning horizon of the Study.

Although the TDM/TSM/ITS-Only Alternative Concept is not being recommended for further study as a standalone alternative concept, it is recognized there are elements associated with this alternative concept that would potentially be complementary additions to other viable alternative concepts. Specifically, improvements associated with this alternative concept could directly support the goal of improved integration of the Study Area with other existing and planned transportation modes, in addition to positively impacting mobility and safety in the corridor to some degree. Therefore, it is recommended that the components and elements associated with the TDM/TSM/ITS-Only Alternative be carried forward for further consideration as a possible CTSS.

3.3.1.4 Transit-Only Alternative Concept

The Transit-Only Alternative Concept is not recommended for further consideration as a standalone alternative in the IH 35 PEL Study. **Table 4** presents the screening results for the Transit-Only Alternative Concept.

Table 4 - Transit-Only Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	N	This alternative would not attract a large enough volume of existing or projected IH 35 traffic to adequately address the mobility challenges in the corridor over the planning horizon of the study.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would potentially assist with the management of vehicle congestion in the study area, as compared to the No Build Alternative.
Encourages integration with other transportation modes	Y	This alternative proposes to enhance existing and/or provide new modes of transportation in the study area.
Compatible with economic development initiatives in the region	Y	The implementation of a more functional transit system could support economic development initiatives.

Similar to the reasoning behind the elimination of the Rail-Only Alternative Concept and TDM/TSM/ITS-Only Alternative Concept, the Transit-Only Alternative Concept in and of its own accord is unlikely to adequately address the transportation issues in the Study Area identified in the need and purpose of the project. The implementation of new and/or enhanced transit service (e.g., express bus, bus rapid transit, etc.) in and around the IH 35 PEL Study Area would likely be a positive transportation improvement for the mobility on IH 35, likely diverting some portion of the existing traffic; however, since the alternative concept does not include any major capacity improvements to IH 35, it would not go far enough to address the mobility issues in the Study Area over the 25-year planning horizon of the Study.

Plans for future transit improvements in and around the Study Area are described in *SmartWaySA*, VIA's Long Range Comprehensive Transportation Plan (LRCTP) for Bexar County up to the year 2035. *SmartWaySA* identifies and prioritizes high capacity transit corridors and recommends a range of transit alternatives and suggested supporting facilities for those corridors. Many high capacity transit alternatives have been considered for the region including bus rapid transit (BRT), electric streetcar, light rail, commuter rail, HOV lanes and others.

The *SmartWaySA* plan identified several BRT Corridors, one of which parallels I-35 just to the west within the PEL Study area from Thousand Oaks Drive to South Military Drive. The major routes along this recommended corridor include Austin Highway, Broadway Street, and Roosevelt Avenue. Assuming full build-out of the recommended plan by 2035, ridership along this corridor is forecasted to be 6,200 to 9,300 a day by 2035. Daily lane capacity for an interstate facility is typically 18,000 to 25,000 vehicles per day. Assuming all or a portion of the ridership are I-35 users, the equivalent reduction in demand for I-35 would equal one half of one lane of capacity. The MPO plan has identified a need of 6 to 8 additional lanes to address mobility needs by 2035. Therefore, the current 2035 *SmartWaySA* transit plan would not fully address the mobility needs identified for I-35 within the PEL study area.

The implementation of transit improvements in the PEL Study Area and/or region would serve as a complementary improvement to the alternatives examined in the PEL Study, and will likely proceed, or not proceed, towards implementation regardless of the outcome of the IH 35 PEL Study. Specifically, transit improvements could directly support the goal of improved integration of the Study Area with other existing and planned transportation modes. To the extent possible, efforts should be made in the IH 35 PEL Study alternatives development process and subsequent environmental studies to find ways to ensure alternatives are developed that are compatible with and complementary to the potential implementation of enhanced transit service in or around the Study Area[21]. Improvements proposed in the PEL Study, or subsequent environmental analyses, should be complementary with any planned transit improvements, to the extent practicable. Therefore, the Transit-Only Alternative Concept is identified as a CTSS.

3.3.2 Reduced Set of Alternative Concepts to be Carried Forward for Further Study

Alternative concepts with the highest potential to meet the need and purpose of the project were recommended to be carried forward for further analysis. Seven (7) alternatives are recommended to be carried forward into the reduced set of alternative concepts for further study in Phase II of the IH 35 PEL Study alternatives development and screening process and are discussed below.

3.3.2.1 No Build Alternative

The No Build Alternative is recommended to be carried forward for further study. **Table 5** presents the screening results for the No Build Alternative. Although it is recognized that the No Build Alternative will not meet the need and purpose of the project, it is a requirement of the NEPA process to include the No Build Alternative as it provides the future environmental baseline against which other alternatives are compared.

Table 5 - No Build Alternative Screening Summary

Assessment Criteria for Need and Purpose	Meets Criteria?	Reasoning
Addresses the projected transportation needs over the 25-year planning horizon of the study	N	The San Antonio-Bexar County MPO's Metropolitan Transportation Plan has identified capacity improvements for I-35 needed to address forecasted transportation needs. The No Build Alternative does not include those capacity improvements.
Improves mobility and safety in a manner that will manage vehicle congestion	N	Under the No Build Alternative, congestion would continue to worsen as traffic increases over time.
Encourages integration with other transportation modes	N	The No Build Alternative does not include any improvements that would encourage integration with other modes.

[21] Coordination with VIA Metropolitan Transit has occurred during this PEL study to discuss the potential for alternative concepts developed in this study to be complementary to and consider any proposed transit plans. This coordination is documented in the IH 35 PEL Study Agency and Committees Coordination Technical Report.

Table 5 - No Build Alternative Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Compatible with economic development initiatives in the region	N	This alternative allows for the continued increase in traffic congestion and associated delay well into the future. This alternative would have negative impacts to economic development objectives.

3.3.2.2 At-Grade Expansion Alternative Concepts

The three concepts of the At-Grade Expansion Alternative are recommended to be carried forward as viable alternative concepts for further study. **Table 6** presents the screening results for the three At-Grade Expansion Alternative Concepts.

Table 6 - At-Grade Expansion Alternative Concepts Screening Summary (Options 1, 2, and 3)		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would implement major capacity improvements in the study area capable of addressing the projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. The three options of the At-Grade Expansion Alternative exhibit a high potential to adequately address the transportation issues in the Study Area as a standalone solution over the planning-horizon of the Study, in a manner that both supports the need and purpose of the project and addresses the needs identified by the MPO in the Long-Range Plan. The options proposed in this alternative concept should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering which what other viable elements from

CTSS could potentially be incorporated into the alternative concept to better meet the need and purpose of the project.

3.3.2.3 Elevated Expansion Alternative Concept

The Elevated Expansion Alternative Concept is recommended to be carried forward as a viable alternative concept into the reduced set of alternatives for further study. This alternative includes the construction of three additional mainlanes in each direction (six lanes total) for both IH 35 and IH 410. Additional capacity is elevated with regard to the existing facilities and within the existing right-of-way. **Table 7** presents the screening results for the Elevated Expansion Alternative Concept.

Table 7 - Elevated Expansion Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would implement major capacity improvements in the study area capable of addressing the projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. The Elevated Expansion Alternative Concept exhibits a high potential to adequately address the transportation issues in the Study Area as a standalone solution over the planning-horizon of the Study, in a manner that both supports the need and purpose of the project and addresses the needs identified by the MPO in the Long-Range Plan. The concept proposed by this alternative should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative concept should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering what other viable elements from CTSS could potentially be incorporated into the alternative concept as complementary improvements to better meet the need and purpose of the project.

3.3.2.5 Elevated/At-Grade Mix Expansion Alternative Concept

The Partially-Elevated Expansion Alternative Concept is recommended to be carried forward as a viable alternative concept into the reduced set of alternatives for further study. This alternative includes the construction of three additional mainlanes in each direction (six lanes total) on both IH 35 and IH 410. Additional capacity is a combination of at-grade and elevated lanes and within the existing right-of-way. **Table 8** presents the screening results for the Partially-Elevated Expansion Alternative Concept.

Table 8 - Partially-Elevated Expansion Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would implement major capacity improvements in the study area capable of addressing the projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. The Partially-Elevated Expansion Alternative Concept exhibits a high potential to adequately address the transportation issues in the Study Area as a standalone solution over the planning-horizon of the Study, in a manner that both supports the need and purpose of the project and addresses the needs identified by the MPO in the Long-Range Plan. The concept proposed by this alternative should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative concept should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering what other viable elements from CTSS could potentially be incorporated into the alternative concept to better meet the need and purpose of the project.

3.3.2.6 Depressed Expansion Alternative Concept

The Depressed Expansion Alternative Concept is recommended for further consideration as a standalone alternative in the IH 35 PEL Study. This alternative includes the construction of three additional mainlanes in each direction (six lanes total) on both IH 35 and IH 410. Additional capacity is depressed with regard to the existing facilities and within the existing right-of-way. **Table 9** presents the screening results for the Depressed Expansion Alternative Concept.

Table 9 - Depressed Expansion Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would implement major capacity improvements in the study area capable of addressing the projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. The Depressed Expansion Alternative Concept exhibits a high potential to adequately address the transportation issues in the Study Area as a standalone solution over the planning-horizon of the Study, in a manner that both supports the need and purpose of the project and addresses the needs identified by the MPO in the Long-Range Plan. The concept proposed by this alternative should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative concept should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering what other viable elements from CTSS could potentially be incorporated into the alternative concept as complementary improvements to better meet the need and purpose of the project.

3.3.2.7 New Location Highway Alternative Concept

The New Location Alternative Concept is recommended for further consideration as a standalone alternative in the IH 35 PEL Study. This alternative includes the construction of an entirely new controlled-access highway project adjacent to the existing IH 35 corridor in the study area, in attempt to capture the same travel market that is currently utilizing the IH 35 facility. **Table 10** presents the screening results for the New Location Highway Alternative Concept.

Table 10 - New Location Highway Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would implement major capacity improvements in close enough proximity to the study area to be able to address projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. Although the New Location Highway Alternative Concept does not add capacity to IH 35, it could potentially alleviate congestion on existing IH 35 by providing an alternate route for travelling through the Study Area, in a manner similar to adding capacity to the existing facility. The concept proposed by this alternative should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative concept should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering what other viable elements from CTSS could potentially be incorporated into the alternative concept to better meet the need and purpose of the project.

3.3.2.8 Expansion of a Parallel Facility Alternative Concept

The Expansion of a Parallel Facility Alternative Concept is recommended for further consideration as a standalone alternative in the IH 35 PEL Study. This alternative includes the expansion or upgrade of an existing roadway, or combination of multiple roadways, that parallel the existing IH 35 corridor in the study area, in attempt to serve the same travel market currently utilizing the existing IH 35 facility. **Table 11** presents the screening results for the Expansion of a Parallel Facility Alternative Concept.

Table 11 - Expansion of a Parallel Facility Alternative Concept Screening Summary		
Assessment Criteria for Need and Purpose	**Meets Criteria?**	**Reasoning**
Addresses the projected transportation needs over the 25-year planning horizon of the study	Y	This alternative would expand/upgrade existing roadways to great enough magnitude to be able to address projected future transportation needs.
Improves mobility and safety in a manner that will manage vehicle congestion	Y	This alternative would increase capacity, which would help to manage vehicle congestion.
Encourages integration with other transportation modes	Y	This alternative could potentially encourage integration with other transportation modes (e.g., managed lanes integrated with transit system, etc.).
Compatible with economic development initiatives in the region	Y	This alternative would promote more efficient goods movement in the region by adding transportation capacity and could potentially support or induce additional economic development.

The San Antonio-Bexar County MPO's 2035 Long-Range Plan recommends major capacity improvements for IH 35 from Schertz Parkway to US 281/IH 37. Although the Expansion of a Parallel Facility Alternative Concept does not add capacity to IH 35, it could potentially alleviate congestion on existing IH 35 by providing an alternate route for travelling through the Study Area, in a manner similar to adding capacity to the existing facility. The concept proposed by this alternative should continue to be optimized and refined, as appropriate, as project development progresses into more detailed analyses. Specifically, this alternative concept should undergo additional quantitative analyses to estimate traffic levels, potential impacts, and costs associated with the concept in addition to considering what other viable elements from CTSS could potentially be incorporated into the alternative concept to better meet the need and purpose of the project.

In summary, four alternative concepts were eliminated as Standalone Alternatives and seven alternative concepts, plus the No Build, were identified for Phase II evaluation. **Table 12** below provides an overview of the Phase I screening results.

Table 12 - Phase I Alternative Concept Screening Overview					
Alternative Concepts	**Assessment Criteria based on Need and Purpose**				**Recommendation**
	Addresses projected transportation needs over the Study's 25-year planning horizon	**Improves mobility and safety in a manner that will manage vehicle congestion**	**Encourages integration with other transportation modes**	**Compatible with economic development initiatives in the region**	
No Build Alternative	N	N	N	N	Study in Phase II (required)
TDM/TSM/ITS-Only Alternative	N	Y	Y	N	Consider as a CTSS*
Rail-Only Alternative	N	Y	Y	Y	Consider as a CTSS*
Transit-Only Alternative	N	Y	Y	Y	Consider as a CTSS*
Truck-Only Lane Alternative	N	Y	N	Y	Do not study further
Expansion Alternative - At-Grade Option 1	Y	Y	Y	Y	Study in Phase II
Expansion Alternative - At-Grade Option 2	Y	Y	Y	Y	Study in Phase II
Expansion Alternative - At-Grade Option 3	Y	Y	Y	Y	Study in Phase II
Elevated Expansion Alternative	Y	Y	Y	Y	Study in Phase II
Elevated/At-Grade Mix Expansion Alternative	Y	Y	Y	Y	Study in Phase II
Depressed Expansion Alternative	Y	Y	Y	Y	Study in Phase II
New Location Highway Alternative	Y	Y	Y	Y	Study in Phase II
Parallel Facility Alternative	Y	Y	Y	Y	Study in Phase II

*Complementary Transportation System Solution (CTSS)

4.0 Phase II Alternative Concept Evaluation Method and Results

Phase II of the alternative concept development and screening process involved the evaluation of the reduced set of alternatives resulting from the Phase I screening. The following sections will describe the method used for further refining, analyzing, and differentiating between the alternative concepts that were determined in Phase I screening to meet the need and purpose of the project.

4.1 Evaluation Approach

Upon completion of the Phase I screening process, it became apparent that the standalone alternative concepts which passed the initial screen could be generalized and grouped into two distinct alternative concepts:

1. **Add Roadway Capacity to the Existing IH 35 Facility**
   - Expansion Alternative – At-Grade (Option 1, Option 2, Option 3)
   - Expansion Alternative – Elevated Option
   - Expansion Alternative – Elevated/At-Grade Mix Option
   - Expansion Alternative – Depressed Option
2. **Add Roadway Capacity Away from the Existing IH 35 Facility**
   - New Location Highway Alternative
   - Parallel Facility Alternative

At a planning level, these two generalized alternative concepts represented the best conceptual approaches for meeting the need and purpose of the project. Therefore, the Phase II alternative concept evaluation examined and compared these two general concepts to determine which approach would be the most successful at meeting the need and purpose of the project. The intent of this analysis was to identify the best conceptual approach for improvements in the PEL Study Phase, while deferring project-specific decisions to NEPA (e.g., number of lanes, construction approaches, project financing), when more detailed information is available. However, discussions of these issues are included in this report, based on the information that was available at the PEL Study level of analysis, to inform the NEPA process to the maximum extent possible.

4.2 Evaluation Criteria and Measures

Evaluation criteria for the Phase II analysis were developed based on input from the IH 35 PEL advisory committees and the general public. At their January 2012 meetings, the advisory committees developed objectives they considered important in developing and evaluating solutions for the Study Area. The objectives were presented to the general public at the February 2012 meetings to solicit input. The objectives were modified based upon comments from the public, then criteria were identified that could be quantitatively measured and would likely provide a distinction among alternative concepts for comparison. The criteria and measures used to compare the alternative concepts include the following:

- **Mobility**
  - Average Speed
  - Travel Time
  - Total Vehicle Volume
- **Potential Impacts**
  - Potential Impacts to Residents
  - Potential Impacts to Businesses
  - Potential Impacts to the Environment

Additional potential evaluation criteria were discussed throughout the PEL process, and those which could not be used at this early planning stage will be passed forward to future, project-specific studies. For example, project cost estimates were not used to differentiate amongst alternatives at the PEL Study level of analysis, since the alternative concepts examined were generalized and would require more project-specific details to provide meaningful information to the process. Project costs and potential funding sources are reserved for analysis in subsequent NEPA studies.

4.2.1 Mobility Measures

Mobility measures were developed to determine which alternative concept would best meet the goal of improving mobility and managing congestion on IH 35 for the 2035 planning horizon. These measures evaluated how each alternative concept affects average travel speed, travel times, and total volume on IH 35 in the Study Area. Definitions of these three measures are as follows:

- **Average speed** is defined as the total distance travelled divided by the total time elapsed. For transportation projects, average speed is typically measured in miles-per-hour (mph).
- **Travel time** is defined as the amount of time it takes for a vehicle trip to reach its destination and is a direct index of traffic flow and congestion.
- **Average peak volume** is defined as the average number of vehicles passing through a given roadway segment during the peak period (or rush hour), and is also known as vehicle throughput.

The two alternative concepts, and the No Build, were examined with regard to these mobility measures to assess their relative abilities of addressing the existing and forecasted mobility issues in the Study Area.

4.2.2 Potential Impact Measures

Avoidance or minimization of impacts to the human and natural environment was identified by the advisory committees as an objective in evaluating alternative concepts. As detailed in the **IH 35 PEL Study Affected Environment Technical Report**, resources or existing conditions located with the IH 35 PEL Study Area include potential Environmental Justice populations, land use (planning, development patterns), local transportation systems/planning (rail, transit), surface waters, floodplains, groundwater, air quality, hazardous materials sites, wildlife including threatened and endangered species, park and recreation areas, and historic and cultural resources. Some impacts to resources or conditions are difficult to estimate or quantify at this early stage in the planning process. Therefore, the analysis at the PEL stage focused on environmental measures that could be quantified and would likely provide a differentiation among alternative concepts.

The PEL impact analysis focused primarily on three measures:

- **Potential impacts to residents** is defined as the potential for a transportation alternative concept to impact residential property.
- **Potential impacts to businesses** is defined as the potential for a transportation alternative concept to impact commercial/industrial property or operations.

- **Potential impact to the environment** is defined as the potential for a transportation alternative concept to impact environmental features (e.g., floodplains, wetlands) or community resources (e.g., parks, schools, place of worship).

The two alternative concepts, and the No Build, were examined with regard to the criteria listed above to assess their relative potential impacts to the built and natural environment.

4.3 Evaluation Results

For the comparison of the two alternative concepts, general assumptions related to the facility configuration were used for traffic modeling and potential impact estimation. Specifically, the alternative concepts compared in the Phase II evaluation were defined as follows to allow for a comparative analysis:

- **Add Roadway Capacity to the Existing IH 35 Facility**
  - 6 lanes of roadway capacity added to IH 35 facility
  - Additional lanes modeled as general purpose lanes
- **Construct Capacity Away from the Existing IH 35 Facility**
  - 6 lanes of roadway capacity added to a new or existing parallel roadway (in relative proximity to IH 35 corridor)
  - Additional lanes modeled as general purpose lanes

Table 13 presents the raw mobility results for the No Build and the two alternative concepts under study, including several different configuration options for each alternative concept. For the mobility metrics of Average Speed, Travel Time, and Average Peak Volume, both alternative concepts would provide significant mobility improvements on IH 35 as compared to the No Build; however, the *Add Capacity to the Existing IH 35 Facility* Alternative Concept would provide relatively more mobility benefits than the *Construct Capacity Away from IH 35* Alternative Concept. More detailed information regarding traffic modeling results can be found in **Appendix A - IH 35 PEL Study Traffic Modeling Technical Report**.

Table 13 - Summary of Mobility Results			
Alternative Concept	**Average Speed on IH 35**	**Travel Time on IH 35**	**AM Peak Period* Volume on IH 35**
No Build	21 mph	60 minutes	18,500
Add Capacity to Existing IH 35			
At-Grade Expansion	45 mph	28 minutes	27,600
Elevated Expansion	43 mph	29 minutes	26,500
Elevated/At-Grade Expansion	42 mph	26 minutes	30,900
Depressed Expansion	45 mph	28 minutes	27,600
Construct Capacity Away from IH 35			
New Location Highway	33 mph	38 minutes	16,800**
Expand Existing Facility (north)	34 mph	36 minutes	16,400**
Expand Existing Facility (south)	33 mph	38 minutes	16,600**

Source: IH 35 PEL Study Traffic Modeling Technical Report.

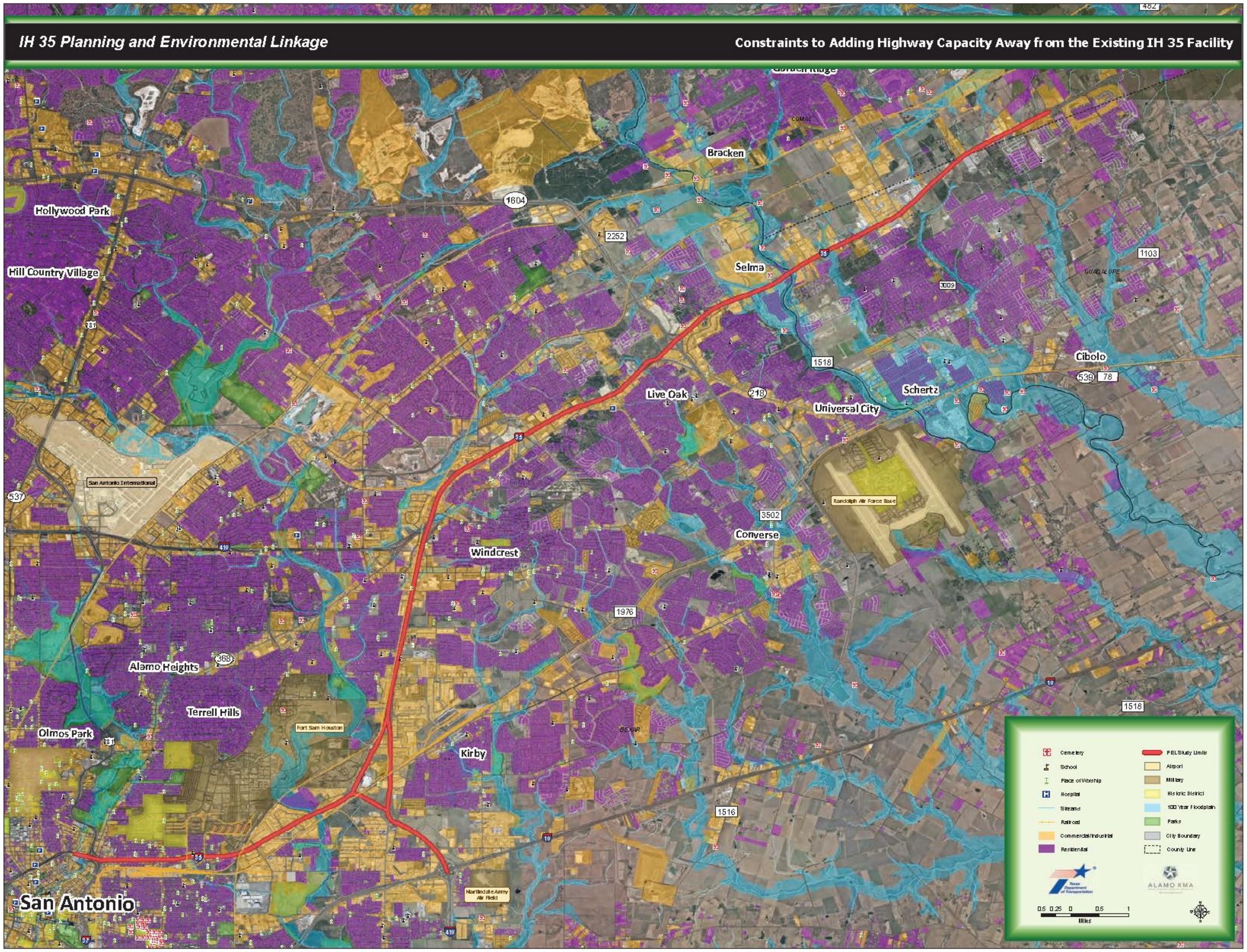
Note: Volumes, speed, and travel times reports are southbound AM peak on IH 35 in 2035.

*AM Peak Period is three hours, 6 AM to 9 AM.

**Excludes traffic diverted to new location or parallel facilities. It is assumed that when the additional volumes diverted to these facilities are accounted for, overall throughput in the study area would be greater than the No Build Alternative.

Regarding potential impacts, **Figure 3** shows commercial/industrial and residential land use and select environmental constraints in and around the Study Area. Generally, the map indicates that existing residential and commercial/industrial development and environment constraints are present throughout most of the land area paralleling the existing IH 35 facility, limiting the ability of siting a new location, interstate-level, transportation corridor that would still serve the same origin-destination pair served by the existing IH 35 facility in the Study Area without imparting significant impacts to residents, businesses, and the environment. In contrast, the existing IH 35 facility has already been developed as an interstate highway corridor indicating compatibility with future similar transportation improvements, and exhibits relatively less constraints than a new location facility, in addition to possessing areas where existing right of way exists and could be utilized for any proposed transportation improvements.

Figure 3 - Constraints to Adding Highway Capacity Away from the Existing IH 35 Facility



Based on the results presented above, **Table 14** presents a summary evaluation of the evaluation results for the two alternative approaches, and the No Build, with regard to mobility benefits and potential impacts. In **Table 14,** an "✘" signifies relatively poor performance, whereas a "✓" signifies a relatively positive performance for any given metric.

Table 14 - Phase II Alternative Concept Evaluation Results						
Alternative Concept	**Mobility Benefits**			**Minimize Potential Impacts**		
	Avg. Speed	**Travel Time**	**Total Volume**	**Residential**	**Business**	**Environment**
No Build	✘	✘	✘	✓	✓	✓
Add Roadway Capacity to the Existing IH 35 Facility	✓	✓	✓	✓	✓	✓
Add Roadway Capacity Away from the Existing IH 35 Facility	✓	✓	✓	✘	✘	✘

As shown in **Table 14**, both alternative concepts would provide significant mobility benefits as compared to the No Build Alternative. However, the alternative concept that proposes to *Add Roadway Capacity Away from the Existing IH 35 Facility* (i.e., new location or existing parallel upgrade) would have many more potential impacts to the built and natural environment as compared to the expansion of the existing IH 35 facility. Furthermore, it should be noted that in order to achieve the mobility benefits shown in **Table 13**, the *Add Roadway Capacity Away from the Existing IH 35 Facility* concept would have to be built in relative proximity to the existing IH 35 facility in order to serve the same origin-destination pair under consideration in the PEL study, and the available existing transportation facilities and/or undeveloped land for a new location highway that would need to be utilized for this concept would impart substantial impacts to the built and natural environment, above and beyond any potential impacts to roadway expansion within the existing IH 35 corridor (see **Figure 3**). The potential for impacts to the built and natural environment are substantially less for the on-facility IH 35 expansion concept because the existing IH 35 corridor has already been developed as an interstate highway corridor and there is potential to minimize the need for additional ROW acquisition under this alternative concept due to availability of existing ROW.

5.0 Recommendations

5.1 Alternative Concept Recommended for Further Study

Based on the results of the evaluation analysis, it is recommended to carry forward one alternative concept into the NEPA process that involves the construction of additional roadway capacity on the existing IH 35 facility. It was determined that this approach to enhanced mobility would provide the best method of meeting the need and purpose of the project. Other approaches, such as expanding existing roadway capacity away from the IH 35 facility, constructing a new transportation facility, or constructing/enhancing other modes of transportation, were deemed relatively less successful at the meeting the need and purpose of the project and thus are eliminated from further consideration. Project-specific determinations regarding the proposed number of lanes to add to existing IH 35, construction approaches (i.e., elevated, at-grade, depressed, or some combination thereof), and project funding or tolling would be made during the NEPA process.

5.2 Issues for Further Consideration Regarding Recommended Alternative

The alternative concept recommended for further study is a capacity expansion of the existing IH 35 facility. As mentioned previously, the majority of project-specific decisions regarding the various configuration options of the recommended alternative concept (e.g., number of lanes, construction approaches, project financing), are being deferred to NEPA, when they are riper for decision-making purposes. However, discussions of these issues are included in this section, based on the information that was available at the PEL Study level of analysis to inform the NEPA process to the maximum extent possible.

5.2.1 Number of Lanes

The number of additional lanes to be constructed under the Build Alternative could be any number of lanes that will meet the mobility needs of the planning horizon year (2035). As shown in **Table 15**, based on results of the traffic modeling analysis, the alternative concepts which included 0-5 additional lanes on IH 35 will not meet the mobility needs of the 2035 planning horizon year.

Table 15 - Mobility Improvement of 0-5 Lane IH 35 Expansion as Compared to No Build

Alterative Concept	Avg. Speed	Avg. Travel Time	Additional Traffic
0-5 Lanes Added to IH 35	12%	14%	8%

Source: IH 35 PEL Study Traffic Modeling Technical Report

Improvements contained in the 0-5 lane alternative concept, which include constructing auxiliary lanes, lane balancing, extending auxiliary lanes, are localized to specific portions of the corridor. These types of improvements and the associated benefits reflect those of operational improvements and as a result, this alternative has very little impacts to the natural and built environment but does not address long term corridor transportation needs.

In contrast, the IH 35 expansion concepts which included 6 or more lanes of additional capacity would meet mobility needs of the 2035 planning horizon. As shown in **Table 16**, based on the results of the traffic modeling analysis, the addition of lanes under this alternative provided a significant increase in mobility benefits to the corridor as compared to the No-Build Alternative.

Table 16 - Mobility Improvement of 6-Lane IH 35 Expansion as Compared to No Build			
Alternative Concept	**Avg. Speed**	**Avg. Travel Time**	**Additional Traffic**
6 Lanes Added to IH 35	48%	49%	33%

Source: IH 35 PEL Study Traffic Modeling Technical Report

An expansion of 6 (or more) lanes provides mobility benefits that are corridor-wide and addresses the forecasted growth over the 2035 planning horizon. These results are consistent with the transportation needs forecasted in the San Antonio-Bexar County MPO's 2035 MTP, which identifies the fiscally-constrained need for at least 6 additional lanes of capacity on IH 35 in the northern part of the study area and 4 additional lanes of capacity in the southern part of the study area.

5.2.2 Construction Approaches

Any 6-lane (or more) expansion configuration on IH 35 could meet the long-term mobility needs in the study area, however, engineering and design consideration should be given to each configuration where appropriate in order to maximize mobility benefits and minimize construction costs and impacts. Below are a few considerations with regard to construction approaches (e.g., at-grade, elevated, depressed) that should be studied further in subsequent NEPA studies:

- An **At-Grade expansion** would likely have a lower construction cost than a depressed or elevated section, however, the at-grade expansion and depressed sections would likely have higher impacts to the built environment than an elevated section.
- An **Elevated expansion** would likely have a higher construction cost than an At-Grade expansion section, however, the elevated expansion would likely have less impacts to the built environment.
- A **Depressed expansion** would likely have a higher construction cost than an At-Grade expansion section and have similar impacts to the built environment as an At-Grade expansion. This approach would likely only be employed to accommodate expansion in areas of the corridor that are already depressed.

These construction approaches would need to be evaluated in the context of a project-specific study and applied as necessary where they are determined to be the most prudent method of providing additional capacity. It is expected that some combination of these approaches would be necessary in the corridor in order to minimize impacts to the built and natural environment and achieve the maximal mobility benefits.

5.2.3 Project Financing and Tolling

As mentioned previously, capacity improvements for IH 35 are identified in the San Antonio-Bexar County MPO's long range transportation plan (*Mobility 2035*). It should be noted that MPO long range plans are required to be fiscally constrained. Therefore, every identified transportation improvement within a MPO's long range transportation plan must have a funding source identified. Currently, express lanes (i.e., managed lanes, toll lanes, HOT) have been identified as the funding source for the capacity improvement for IH 35 from Schertz Parkway to IH 37/US 281 within the San Antonio Bexar County MPOs Long Range Transportation Plan. For this reason, tolling should be considered as a potential project funding source in subsequent NEPA studies.

However, general purpose lanes are not precluded from future consideration as part of the IH 35 expansion alternative studied in NEPA. Any future increases to the San Antonio-Bexar County MPO transportation funding sources could off-set the need for tolling as a funding source. Other options may include a blend of general purpose and express lanes. For example, express lanes could be constructed on a portion of the corridor that may provide enough revenue to construct general purpose lanes on another portion of the corridor, or some mixture of general purpose and express lanes throughout the entire length of the corridor. Future studies will need to be conducted to identify the most efficient and cost effective means to deliver needed capacity in a timely manner.

6.0 Conclusion

In conclusion, it is recommended that a single Build Alternative consisting of the construction of additional roadway capacity on the existing IH 35 facility be carried forward into NEPA for further study. The No Build Alternative will also be carried forward, as required. Project-specific analyses will need to be performed in NEPA in order to determine the specific configuration of the Build Alternative, including number of lanes, recommended construction approaches, and project financing and tolling.

APPENDIX A – IH 35 PEL STUDY
TRAFFIC MODELING TECHNICAL REPORT

IH 35 San Antonio PEL Study

TxDOT

Draft Technical Memorandum

October, 2012

CDM Smith

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Executive Summary

CDM Smith was retained by the Texas Department of Transportation (TxDOT) through a sub consultant agreement with HNTB Corporation, to conduct traffic modeling of the proposed improvements to the IH 35 corridor in San Antonio, Texas. This analysis is part of TxDOT's ongoing efforts to study the various possible alternatives to improve the traffic flow and mobility along the IH 35 corridor under the Planning and Environmental Linkage (PEL) study framework and provides TxDOT with planning level traffic estimates to analyze and evaluate several alternative improvement scenarios. The proposed 20.6-mile IH 35 corridor being studied as part of this project extends from the intersection with IH 37 in the south, to FM 1103 in the north, as shown in **Figure ES-1**. This technical memorandum describes the technical approach and data sources used by CDM Smith to develop the travel demand model and forecast traffic for year 2035 for the various proposed alternatives for the IH 35 corridor.

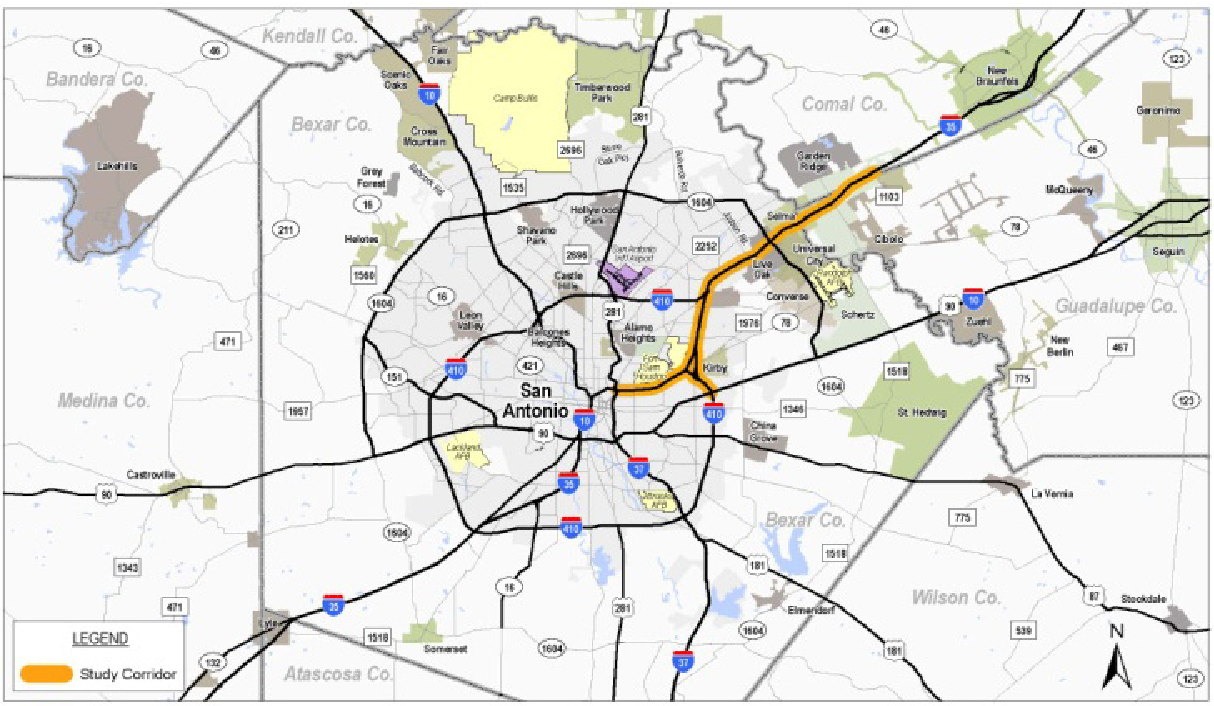


Figure ES-1: IH 35 San Antonio PEL Study Project Corridor

ES.1 Traffic Modeling and Analysis of Alternatives

The proposed alternatives are meant to mitigate the severe congestion that is currently experienced within the corridor during the peak periods which generally occurs during the morning in the southbound direction and during the evening in the northbound direction. This memorandum describes the data collected within the corridor and along the adjacent competing and feeding facilities, the methodology used to modify and develop the forecasting models to reflect anticipated future traffic demand within the corridor, and the results for the year 2035. The study is not intended for use in deciding a preferred alternative or for the financing of the project; and instead the study provides an indication of the likely traffic potential of the proposed IH 35 corridor improvements under various alternatives.

The modeling of the corridor demand was performed for the year 2035 using the latest updated network and trip tables that were based on the San Antonio-Bexar County (SA-BC) MPO Model. The demand profiles that were used within the travel demand model to develop traffic forecasts for this study were based on the socioeconomic data that was used for the Loop 1604 and US 281 Traffic and Toll Revenue Study.

ES.2 Project Scenarios Description

There were nine unique project alternatives and a no-build alternative that were developed for the PEL study to encompass the various possible improvements that are being considered for the IH 35 corridor. The project alternatives evaluated as part of the study are described below.

ES.2.1 At-Grade Expansion Alternative (Option 1)

This alternative includes the construction of three additional at-grade main lanes in each direction (six lanes total) along IH 35 within the study area. This alternative will require acquisition of major right-of-way (ROW) along the IH 35 corridor to maximize capacity.

ES.2.2 At-Grade Expansion Alternative (Option 2)

This alternative includes the construction of additional at-grade capacity along IH 35 based on applying high-level engineering judgment to optimize lane balancing, transitions, and merging/weaving operations. The total number of additional main lanes varies from zero to five lanes along various segments of IH 35. All improvements are within the existing right-of-way.

ES.2.3 At-Grade Expansion Alternative (Option 3)

This alternative includes the construction of additional at-grade capacity along IH 35 based on applying high-level engineering judgment to optimize lane balancing, transitions, and merging/weaving operations. The total number of additional main lanes varies from zero to five lanes along various segments of IH 35. Minor right-of-way required at various locations along IH 35 to optimize capacity. This alternative is similar to Alternative 2, with the main difference being that there are more segments of higher roadway capacity than under Alternative 2, based on not being restricted to the existing right-of-way.

ES.2.4 Elevated Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is elevated above the existing facilities and is located within the existing right-of-way with limited access to the elevated lanes.

ES.2.5 Elevated/At-Grade Mix Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is a combination of at-grade and elevated lanes and within the existing right-of-way with limited access to the elevated sections.

ES.2.6 Depressed Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is depressed with regard to the existing facilities and within the existing right-of-way. For the purposes of traffic analysis this alternative is the same as Alternative 1 and the future traffic forecasts for the these two alternatives were assumed to be identical.

ES.2.7 New Location Highway Alternative

This alternative includes the construction of an entirely new controlled-access highway project adjacent to the existing IH 35 corridor in the study area, in attempt to capture the same travel market that currently utilizes the IH 35 facility.

ES.2.8 Expansion of Parallel Facility Alternative (FM 2252)

This alternative includes the expansion and upgrade of FM 2252/Loop 368 to a limited-access expressway in an attempt to serve the same travel market currently utilizing the existing IH 35 facility.

ES.2.9 Expansion of Parallel Facility Alternative (FM 1976)

This alternative includes the expansion and upgrade of FM 1103/FM 1976 to a limited-access expressway in an attempt to serve the same travel market currently utilizing the existing IH 35 facility.

ES.2.10 No-Build Alternative

This alternative does not include any additional capacity expansion that are being studied along IH 35, other than the proposed improvements identified in the SA-BC MPO Plan, and are expected to be in place between the current year of 2012 and the future year 2035.

ES.3 Existing and Future Conditions

The current IH 35 corridor has a very diverse development profile with mixed residential, shopping, and commercial land-use along much of the corridor. The continued and stable growth in demand along the corridor is partly due to the growth occurring in the suburbs and the interactions that these regions have with the downtown San Antonio region. The IH 35 corridor also services the north-south suburb-to-suburb movement of commuter and recreational travelers.

The healthy growth within the City of San Antonio and the substantial growth that has occurred in its surrounding suburbs both in the north and the east have resulted in significant growth in traffic along the IH 35 corridor.

ES.4 Traffic Analysis Summary

The annual traffic forecasts for year 2035 for the nine proposed alternative improvements to the IH 35 corridor along with the No-Build alternative were developed based on the following basic assumptions:

- All of the proposed alternatives are non tolled;
- All other future transportation infrastructure improvements will be as detailed in the San Antonio-Bexar County (SA-BC) MPO's Metropolitan Transportation Plan (MTP): Mobility

2035: no other major competing routes or capacity improvements will be constructed within the forecast period and no additional general purpose lane capacity, outside the proposed alternatives, will be provided along the IH 35 corridor. The impact of any future changes or amendments to the San Antonio MTP would need to be evaluated;

- Single Occupancy Vehicles (SOVs), High Occupancy Vehicles (HOVs) and Trucks/Commercial vehicles will continue to have access to IH 35 corridor and the proposed improved sections under all alternatives;
- The values-of-time that were used to estimate the demand for the proposed toll roads in the region were estimated based on an analysis of the data from the stated-preference (SP) survey efforts conducted by Resource Systems Group Inc. (RSG) for the Loop 1604 and US 281 study. The values-of-time were escalated at an estimated average rate of 3.0 percent per year over the duration of the forecast horizon.; and
- The vehicle operating costs were assumed to be 17.7 cents per mile for passenger cars (in 2011 dollars), based on AAA data.

The average annual daily traffic volumes, representing the average along the IH 35 mainlane locations (general purpose and express lanes wherever applicable) for each alternative, excluding frontage roads were calculated for the year 2035. These 2035 volumes for the proposed IH 35 corridor improvements project are summarized in **Table ES-1** for the nine alternatives listed above and the no-build alternative.

As shown in **Table ES-1**, under the no-build alternative, the traffic along IH 35 is projected to grow to approximately 175,000 vehicles daily. The no-build alternative as compared to IH 35 expansion alternatives carried the lowest volumes, reflecting the capacity constrained demand for the corridor under the no-build condition. The new location and parallel alternatives show a lower daily volume on IH 35, as demand diverts to those proposed facilities.

Table ES-1: Summary of 2035 Traffic Forecasts for the Alternatives Analyzed

Alternatives	Distance (miles)	Lane-miles (miles)	Average Daily Volume on IH 35
At-Grade Expansion Alternative (Option 1)	20.6	266.9	212,500
At-Grade Expansion Alternative (Option 2)	20.6	173.8	187,000
At-Grade Expansion Alternative (Option 3)	20.6	189.9	196,100
Elevated Expansion Alternative	20.6	261.8	204,900
Elevated/At-Grade Mix Expansion Alternative	20.6	261.1	212,000
Depressed Expansion Alternative	20.6	266.9	212,500
New Location Highway Alternative	20.6	143.6	166,000
Expansion of Parallel Facility Alternative (FM 2252)	20.6	143.6	150,000
Expansion of Parallel Facility Alternative (FM 1976)	20.6	143.6	159,600
No-Build Alternative	20.6	143.0	175,300

Section 1 Introduction

CDM Smith was retained by the Texas Department of Transportation (TxDOT) through a sub consultant agreement with HNTB Corporation, to conduct traffic modeling of the proposed improvements to the IH 35 corridor in San Antonio, Texas. This analysis is part of TxDOT's ongoing efforts to study the various possible alternatives to improve the traffic flow and mobility along the IH 35 corridor under the Planning and Environmental Linkage (PEL) study framework and provides TxDOT with planning level traffic estimates to analyze and evaluate several alternative improvement scenarios. The proposed 20.6-mile IH 35 corridor being studied as part of this project extends from the intersection with IH 37 in the south, to FM 1103 in the north, as shown in **Figure 1-1**.

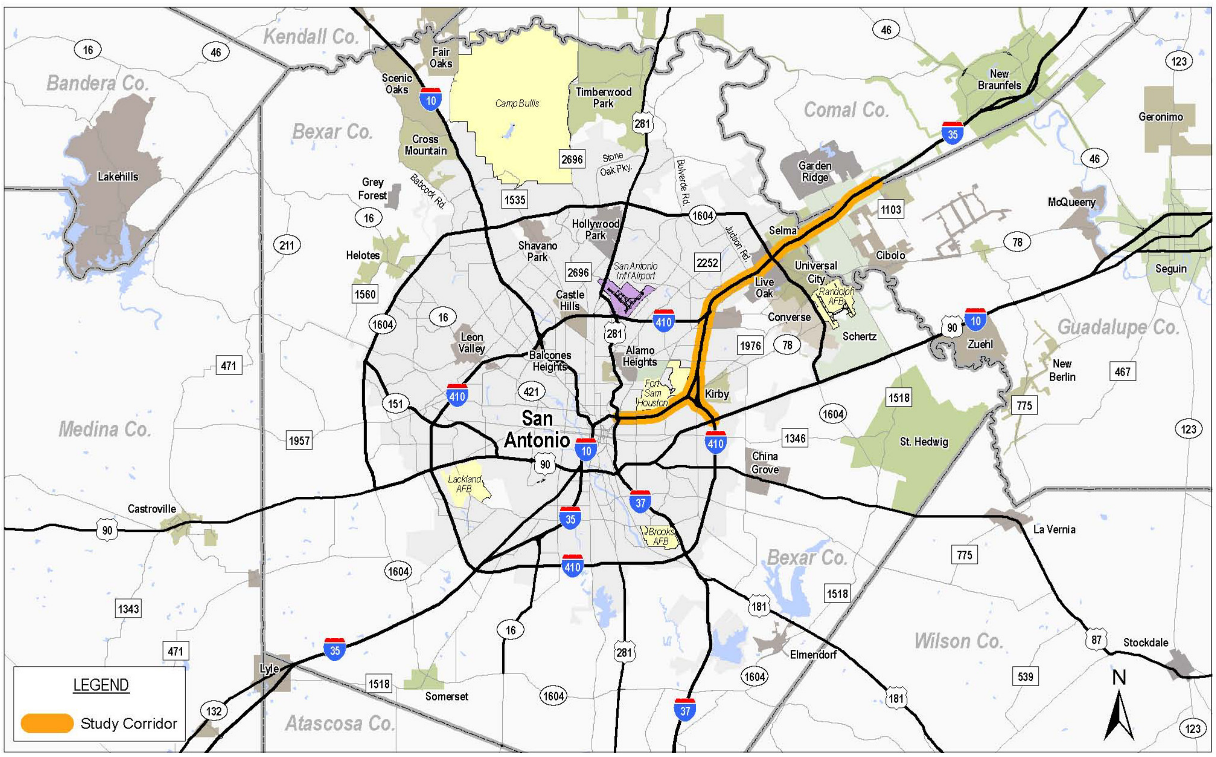


Figure 1-1: IH 35 PEL Study Corridor

1.1 Objective and Scope of Study

This technical memorandum details the data collection, modeling methodology, and the resulting traffic forecasts for each of the nine proposed alternative improvements along the IH 35 corridor under several project configurations. A limited traffic data collection effort was undertaken as part of this study and the data was used to calibrate and enhance the travel demand model that was used to forecast future traffic demand under each of the proposed alternatives. The data that was collected for this study included:

- Speed and delay data in concert with traffic counts along IH 35. This data was collected along IH 35 and parallel competing routes in spring of 2012 to establish a current baseline of traffic patterns in the study area for purposes of calibrating the base travel demand model; and

- Traffic Counts – Limited data collection along IH 35 and arterial routes in the vicinity of the project corridor.

In addition to the above data, extensive traffic data was collected and a regional socioeconomic analysis was performed for the San Antonio region as part of the Loop 1604 and US 281 Traffic and Toll Revenue Study. This data was also used as a reference for developing traffic forecasts for the PEL study.

The PEL study technical memorandum provides a general description of the existing trends and characteristics of traffic within the corridor. The overall scope of work for this traffic analysis for the PEL study included a review of background material, limited data collection, analysis of the regional economic growth, model calibration and development of traffic estimates for the IH 35 corridor under each of proposed alternatives. The modeling of the corridor demand was performed by calibrating the regional model using the corridor-specific data described in this technical memorandum. The key inputs used for this analysis included updated network and trip tables developed using the San Antonio-Bexar County Metropolitan Planning Organization's (SA-BC MPO) Metropolitan Transportation Plan (MTP): Mobility 2035 travel demand model databases and an Independent Economic Review undertaken as part of the Loop 1604 and US 281 study.

1.2 IH 35 PEL Project Description

Given the current traffic demand, the forecasted demand, and the limited availability of right-of-way along the IH 35 corridor, nine alternatives have been developed to address the growing regional demand within the corridor. Several of the proposed IH 35 alternatives are also contained within the SA-BC MPO's Metropolitan Transportation Plan.

The existing configuration of the IH 35 corridor, including the general purpose lanes, the frontage roads, and the ramps, is shown in Appendix A, **Figure A-7.** The current configuration of general purpose lanes and the frontage roads along IH 35 are assumed to be modified, based on the alternatives studied for the year 2035.

1.3 Description of Project Alternatives

Traffic demand for the proposed IH 35 corridor improvements was evaluated under eight alternatives, and a no-build alternative.

The nine alternatives evaluated as part of the study are described below and the project line diagrams used for the traffic analysis are shown in the Appendix A, **Figures A-1** through **A-6**.

1.3.1 At-Grade Expansion Alternative (Option 1)

This alternative includes the construction of three additional at-grade main lanes in each direction (six lanes total) along IH 35 within the study area. This alternative will require acquisition of major right-of-way (ROW) along the IH 35 corridor to maximize capacity.

1.3.2 At-Grade Expansion Alternative (Option 2)

This alternative includes the construction of additional at-grade capacity along IH 35 based on applying high-level engineering judgment to optimize lane balancing, transitions, and merging/weaving operations. The total number of additional main lanes varies from zero to five lanes along various segments of IH 35. All improvements are within the existing right-of-way.

1.3.3 At-Grade Expansion Alternative (Option 3)

This alternative includes the construction of additional at-grade capacity along IH 35 based on applying high-level engineering judgment to optimize lane balancing, transitions, and merging/weaving operations. The total number of additional main lanes varies from zero to five lanes along various segments of IH 35. Minor right-of-way required at various locations along IH 35 to optimize capacity. This alternative is similar to Alternative 2, with the main difference being that there are more segments of higher roadway capacity than under Alternative 2, based on not being restricted to the existing right-of-way.

1.3.4 Elevated Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is elevated above the existing facilities and is located within the existing right-of-way with limited access to the elevated lanes.

1.3.5 Elevated/At-Grade Mix Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is a combination of at-grade and elevated lanes and within the existing right-of-way with limited access to the elevated sections.

1.3.6 Depressed Expansion Alternative

This alternative includes the construction of three additional main lanes in each direction (six lanes total) along IH 35. Additional capacity is depressed with regard to the existing facilities and within the existing right-of-way. For the purposes of traffic analysis this alternative is the same as Alternative 1 and the future traffic forecasts for the these two alternatives were assumed to be identical.

1.3.7 New Location Highway Alternative

This alternative includes the construction of an entirely new controlled-access highway project adjacent to the existing IH 35 corridor in the study area, in attempt to capture the same travel market that currently utilizes the IH 35 facility.

1.3.8 Expansion of Parallel Facility Alternative (FM 2252)

This alternative includes the expansion and upgrade of FM 2252/Loop 368 to a limited-access expressway in an attempt to serve the same travel market currently utilizing the existing IH 35 facility.

1.3.9 Expansion of Parallel Facility Alternative (FM 1976)

This alternative includes the expansion and upgrade of FM 1103/FM 1976 to a limited-access expressway in an attempt to serve the same travel market currently utilizing the existing IH 35 facility.

1.3.10 No-Build Alternative

This alternative does not include any additional capacity expansion that are being studied along IH 35, other than the proposed improvements identified in the SA-BC MPO Plan, and are expected to be in place between the current year of 2012 and the future year 2035.

The detailed results of the alternatives evaluated as part of this study are shown in Section 4 of this technical memorandum. **Figure 1-2** shows the location of the proposed improvements for the IH 35 expansion alternatives, the parallel facilities alternatives, and the new location highway alternative.

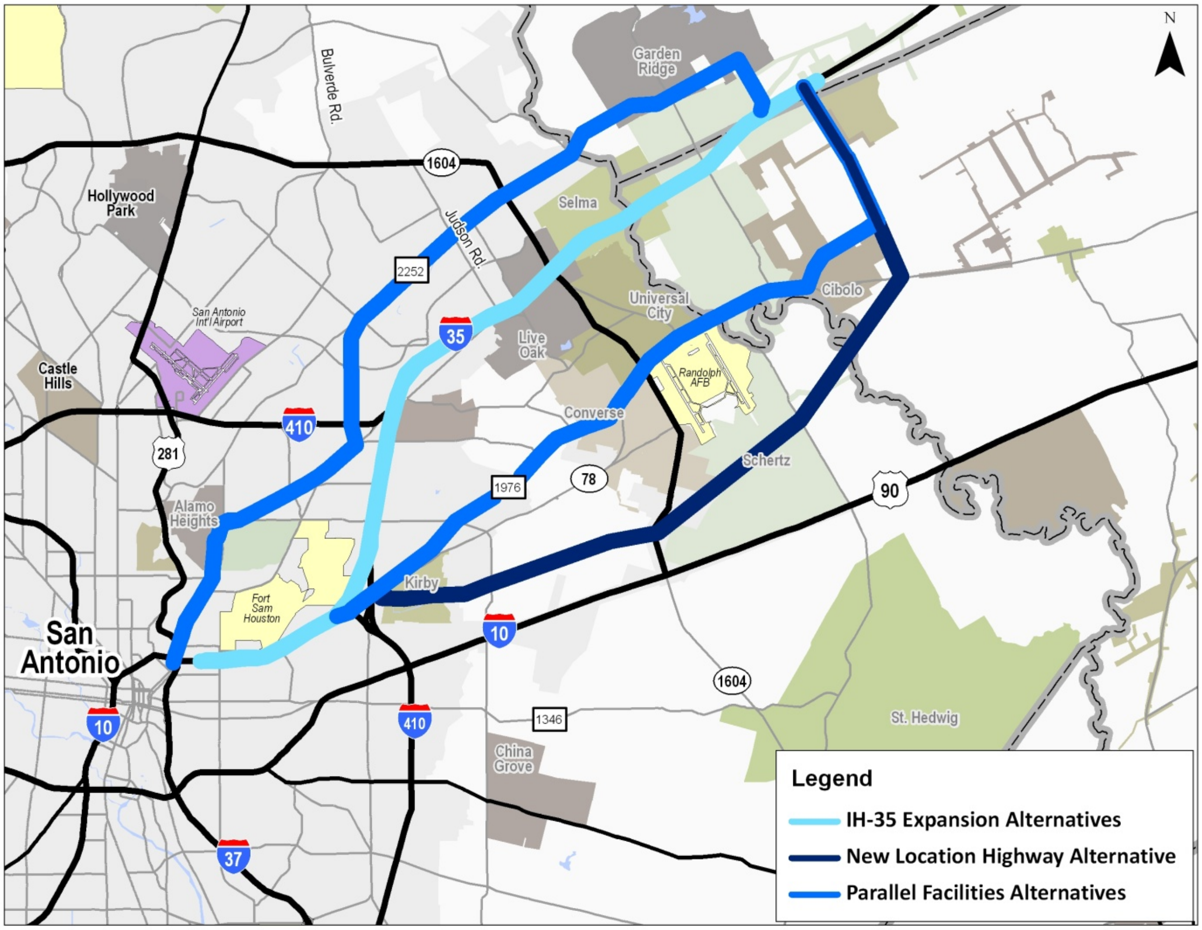


Figure 1-2: Location of Proposed IH 35 Improvement Alternative

Section 2 Existing Traffic Trends and Characteristics

This section provides a summary of the historical traffic trends and the existing highway infrastructure characteristics within the IH 35 PEL project corridor in San Antonio, Texas. Databases from TxDOT and other government agencies were consulted and reviewed to investigate the typical travel characteristics experienced within the project corridor.

To complement these databases, a limited traffic count program was undertaken within the project study area along with speed-delay data collection in the spring of 2012. As described earlier, this data was supplemented with the traffic data that was collected in the vicinity of the IH 35 corridor as part of the Loop 1604 and US 281 Traffic and Toll Revenue Study. The traffic and operational data collected and summarized in this section were used as key inputs to calibrate the model for the purposes of forecasting the traffic for the proposed IH 35 corridor alternatives.

2.1 Historical Traffic Growth Trends

The following section summarizes the key observed trends utilizing available traffic count information. The assessment includes a description of the historical traffic counts along IH 35 corridor to highlight the traffic growth that has occurred since 1990.

The historical traffic growth between 1990 and 2010 along IH 35 and key competing and feeder facilities within the study corridor were obtained from the Transportation Planning and Programming (TP&P) Division of TxDOT, which is responsible for collecting and maintaining a statewide traffic counts database that is updated on an annual basis. The historical traffic growth along IH 35 and other routes in the vicinity is summarized in Appendix A,**Table A-1**. The following provides a brief description of the corridor trends:

IH 35, between 2000 and 2007 experienced an annual growth of approximately five percent south of Loop 1604. Near the Guadalupe County line and southwest of Judson Road, the annual growth rate for the same period was approximately four percent. Closer to downtown, growth was more modest or flat during that period. After 2007 the section north of Loop 1604 continued to grow annually at over four percent. Between 2007 and 2010, northern sections showed a positive growth while the southern sections showed negative growth rates. In 2010, the highest daily volume on IH 35 within the project limits was observed north of SL 368, this location reached 200,000 vehicles per day.

IH 410 generally saw declines in volume from 2000 to 2007 while the locations north of IH 35, IH 10 area and north of FM 78 showed positive growth. From 2007 to 2010, strong growth appeared in the sections from IH 10 to US 281 where traffic in 2010 exceeded 200,000 vehicles per day likely due the completion of the expansion project. Other than the location north of FM 78, all other locations in the project study area showed a reduction in volumes from 2007 to 2010.

IH 10 showed a decline in traffic volumes since 2007. Traffic volumes in 2010 varied in between 71,000 to 126,000 within the region closest to the IH 35 study area.

IH 37 carried a traffic volume of 129,000 in 2010 at a location just south of IH 35, which did not change from the year 2007. At a location south of IH 10, it showed a decreasing volume trend of 119,000 vehicles in 2007 to 104,000 vehicles in 2010.

US 281 showed a strong annual growth between 2000 to 2007 and a decreasing trend from 2007 to 2010.

Loop 1604 saw a strong growth from 2000 to 2007 north and south of IH 35 demonstrating annual growth rate of three to five percent at these locations. From 2007 to 2010, there was a declining growth at these locations with the exception of the location south of Kitty Hawk Road. In 2010, the highest traffic volumes were observed at the location north of IH 35 with average daily traffic of 81,000 vehicles per day.

FM 1103 continued to show strong growth, although being an arterial at the outskirts of San Antonio the volumes at this location were lower as compared to other routes, and did not exceed 10,000 vehicles per day.

In summary, traffic growth was stronger on these facilities from 2000 to 2007 than 2007 to 2010.

Historic growth rates for IH-35 traffic along the project corridor from 1990 to 2010, are as shown in **Figure 2-1**.

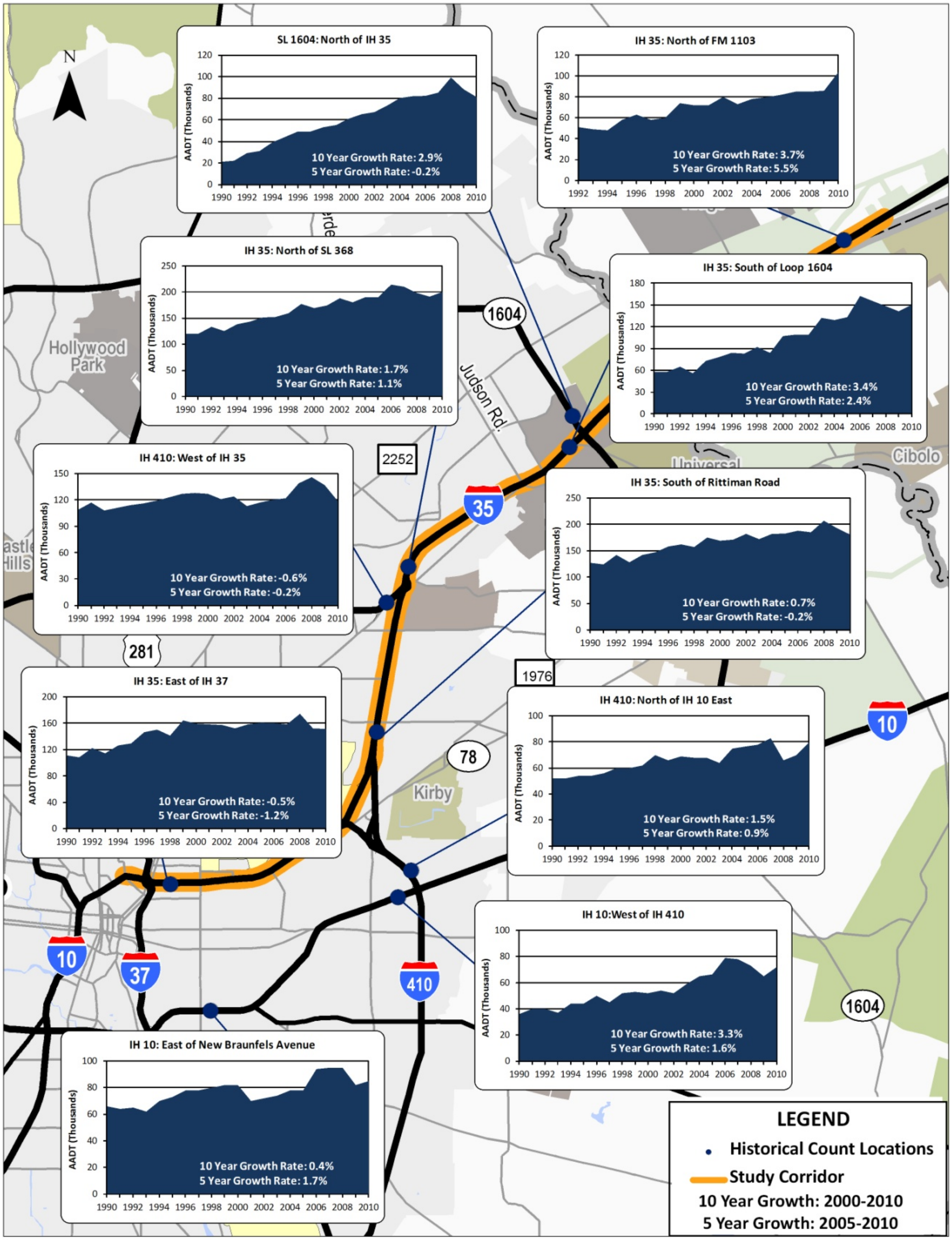


Figure 2-1: Historical Count Locations along the Study Corridor

2.2 Traffic Data Collection

A traffic count program was conducted in the spring of 2012 with coverage of IH 35 in the study area as well as some of the connecting and competing roadways. C J Hensch & Associates, Inc., a data collection firm, was retained to implement the data collection program along the study corridor. All counts were 48 hours in duration and were conducted on weekdays.

In addition, vehicle classification counts were performed at selected locations along the study corridors to obtain the current cross-section of the existing demand within the corridor.

The automatic counts were summarized in 15-minute intervals to review the disaggregated temporal distribution of the current corridor traffic demand and to generate temporal segmentations for the traffic model as described in the later part of this section. The data obtained from this traffic count program was used to calibrate the base year model to reflect the existing patterns and trends along the IH 35 corridor.

Figure 2-2 illustrates the count locations where data was collected in the spring of 2012. Each location in the figures has a unique identifier. Additional details on count locations are available in **Table 2-2** which includes location type, physical location description, duration, indication of classification data, and count start date by count location identifier.

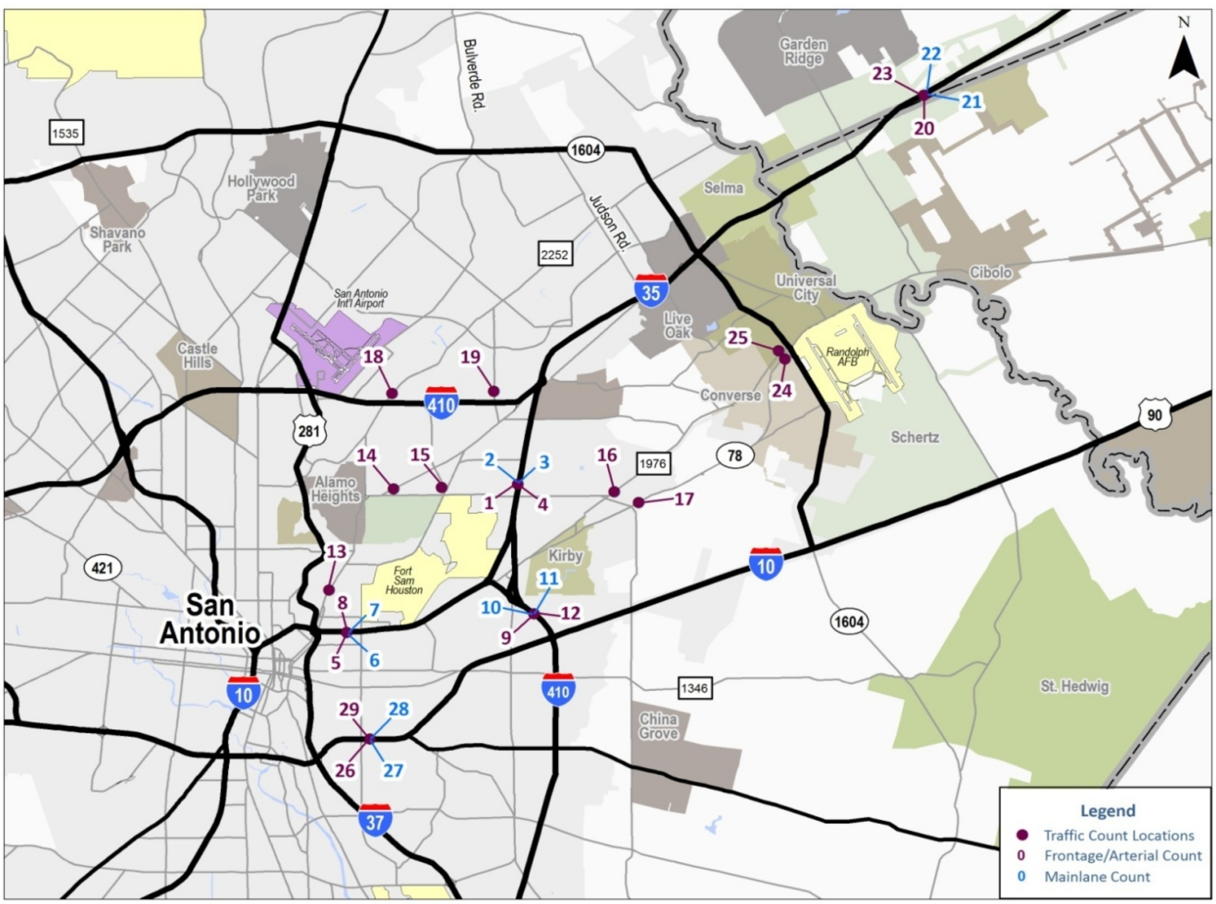


Figure 2-2: Traffic Count Locations

Table 2-1: Traffic Count Descriptions

Location ID	Location Type	Location Description	Duration (Hours)	Count Type	Date Collected
1	Frontage Road	IH 35 Frontage SB: North of Rittiman Road	48	Traffic Count	28-Feb-12
2	Main Lane	IH 35 SB: North of Rittiman Road	48	Traffic Count	28-Feb-12
3	Main Lane	IH 35 NB: North of Rittiman Road	48	Traffic Count	28-Feb-12
4	Frontage Road	IH 35 Frontage Road NB: North of Rittiman Road	48	Traffic Count	28-Feb-12
5	Frontage Road	IH 35 Frontage EB: East of Muncey Street	48	Traffic Count	28-Feb-12
6	Main Lane	IH 35 EB: East of Muncey Street	48	Vehicle Classification	28-Feb-12
7	Main Lane	IH 35 WB: East of Muncey Street	48	Vehicle Classification	28-Feb-12
8	Frontage Road	IH 35 Frontage Road WB: East of Muncey Street	48	Traffic Count	28-Feb-12
9	Frontage Road	IH 410 Frontage Road SB: North of Rock Island Drive	48	Traffic Count	28-Feb-12
10	Main Lane	IH 410 SB: North of Rock Island Drive	48	Vehicle Classification	28-Feb-12
11	Main Lane	IH 410 NB: North of Rock Island Drive	48	Vehicle Classification	28-Feb-12
12	Frontage Road	IH 410 Frontage Road NB: North of Rock Island Drive	48	Traffic Count	28-Feb-12
13	Arterial (Two Way)	Broadway Street: South of Mulberry Avenue	48	Traffic Count	29-Feb-12
14	Arterial (Two Way)	Austin Highway: North of Rittiman Road	48	Traffic Count	29-Feb-12
15	Arterial (Two Way)	Harry Wurzbach: North of Rittiman Road	48	Traffic Count	28-Feb-12
16	Arterial (Two Way)	FM 1976: North of Rittiman Road	48	Traffic Count	29-Feb-12
17	Arterial (Two Way)	FM 78: East of Foster Road	48	Traffic Count	28-Feb-12
18	Arterial (Two Way)	Nacogdoches Road: North of IH 410	48	Traffic Count	28-Feb-12
19	Arterial (Two Way)	Perrin Beitel Road: North of IH 410	48	Traffic Count	28-Feb-12
20	Frontage Road	IH 35 Frontage Road NB: South of FM 1103	48	Traffic Count	28-Feb-12
21	Main Lane	IH 35 NB: South of FM 1103	48	Vehicle Classification	28-Feb-12
22	Main Lane	IH 35 SB: South of FM 1103	48	Vehicle Classification	28-Feb-12
23	Frontage Road	IH 35 Frontage Road SB: South of FM 1103	48	Traffic Count	28-Feb-12
24	Arterial (Two Way)	FM 3502: South of Loop 1604	48	Traffic Count	28-Feb-12
25	Arterial (Two Way)	FM 78: South of Loop 1604	48	Traffic Count	28-Feb-12
26	Frontage Road	IH 10 Frontage Road EB: East of New Braunfels Avenue	48	Traffic Count	28-Feb-12
27	Main Lane	IH 10 EB: East of New Braunfels Avenue	48	Traffic Count	28-Feb-12
28	Main Lane	IH 10 WB: East of New Braunfels Avenue	48	Traffic Count	28-Feb-12
29	Frontage Road	IH 10 Frontage Road WB: East of New Braunfels Avenue	48	Traffic Count	28-Feb-12

2.3 Automatic Traffic Counts

The traffic counts collected along the IH 35 study corridor provided information regarding the current average weekday total traffic volumes, and the current distribution of this total traffic during the morning, afternoon, and off-peak periods. The traffic count data collected during this effort were reviewed and compared for consistency and reasonableness against published historical traffic data. Upon final review, the observed traffic volumes were then used to calibrate the base travel demand models and served as the basis to evaluate the future demand potential along the IH 35 corridor, under the different alternatives.

Figure 2-3 provides the count locations and traffic count results from the traffic count program conducted as part of the IH 35 PEL study. As shown in the figure, the daily traffic volume along IH 35 at the southern terminus of the study corridor and closer to the IH 37/US 281 junction is approximately 155,000 vehicles, increasing to 168,000 vehicles in the middle section and reducing to 111,000 vehicles, at the northern terminus.

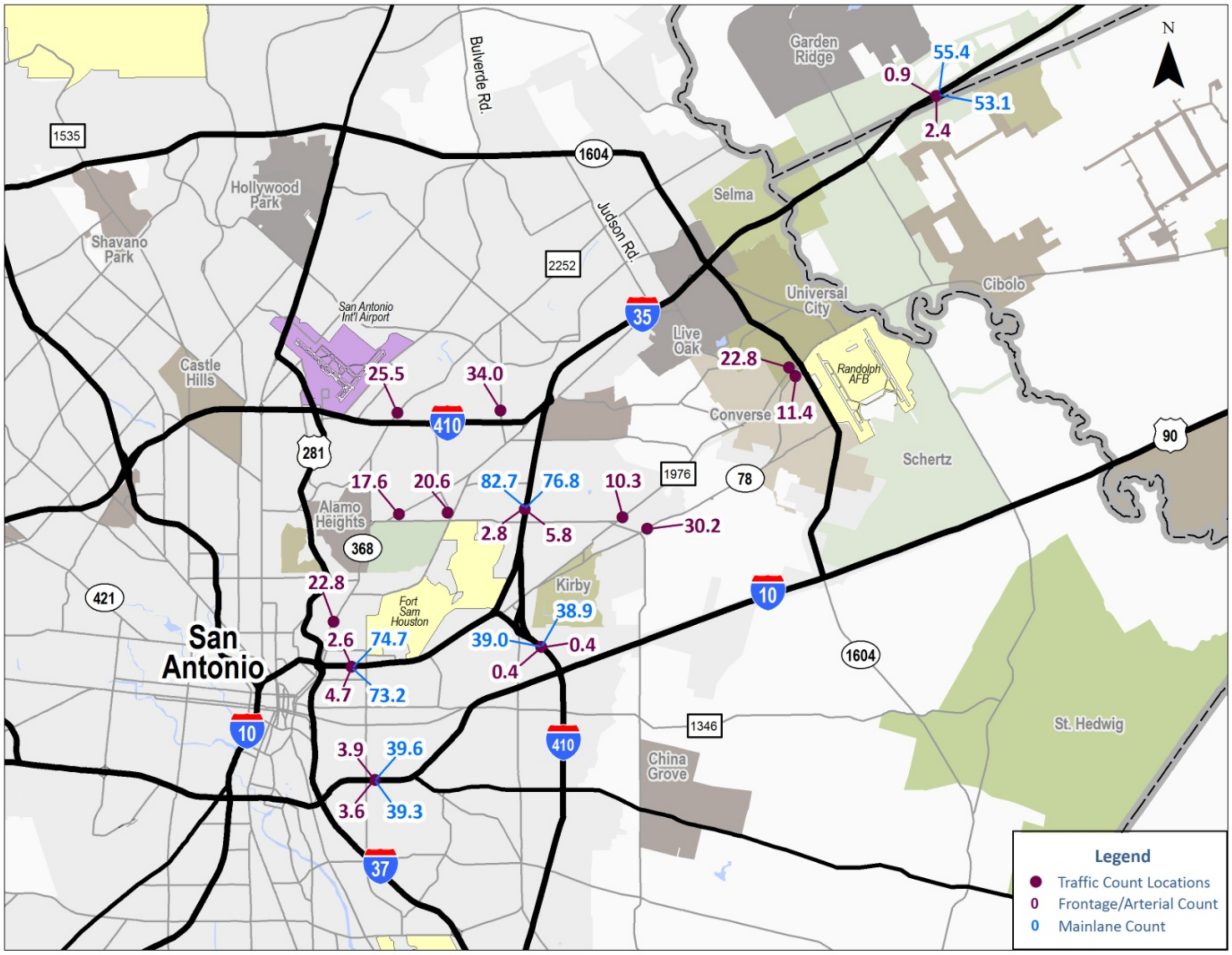


Figure 2-3: 2012 Average Daily Traffic Counts (thousands ADT)

2.4 Time-of-Day Traffic Distribution

- In addition to evaluating the magnitude of the average daily volumes, the hourly distributions of traffic at five locations along the IH 35 study area were developed based on the traffic count program conducted for the IH 35 PEL. Three locations were along IH 35 at east of Pine Street, north of Rittiman Road, and south of FM 1103. The fourth location was at IH 10 east of New Braunfels Avenue and the fifth location at IH 410 East.

This information has been summarized in **Figure 2- 4.**

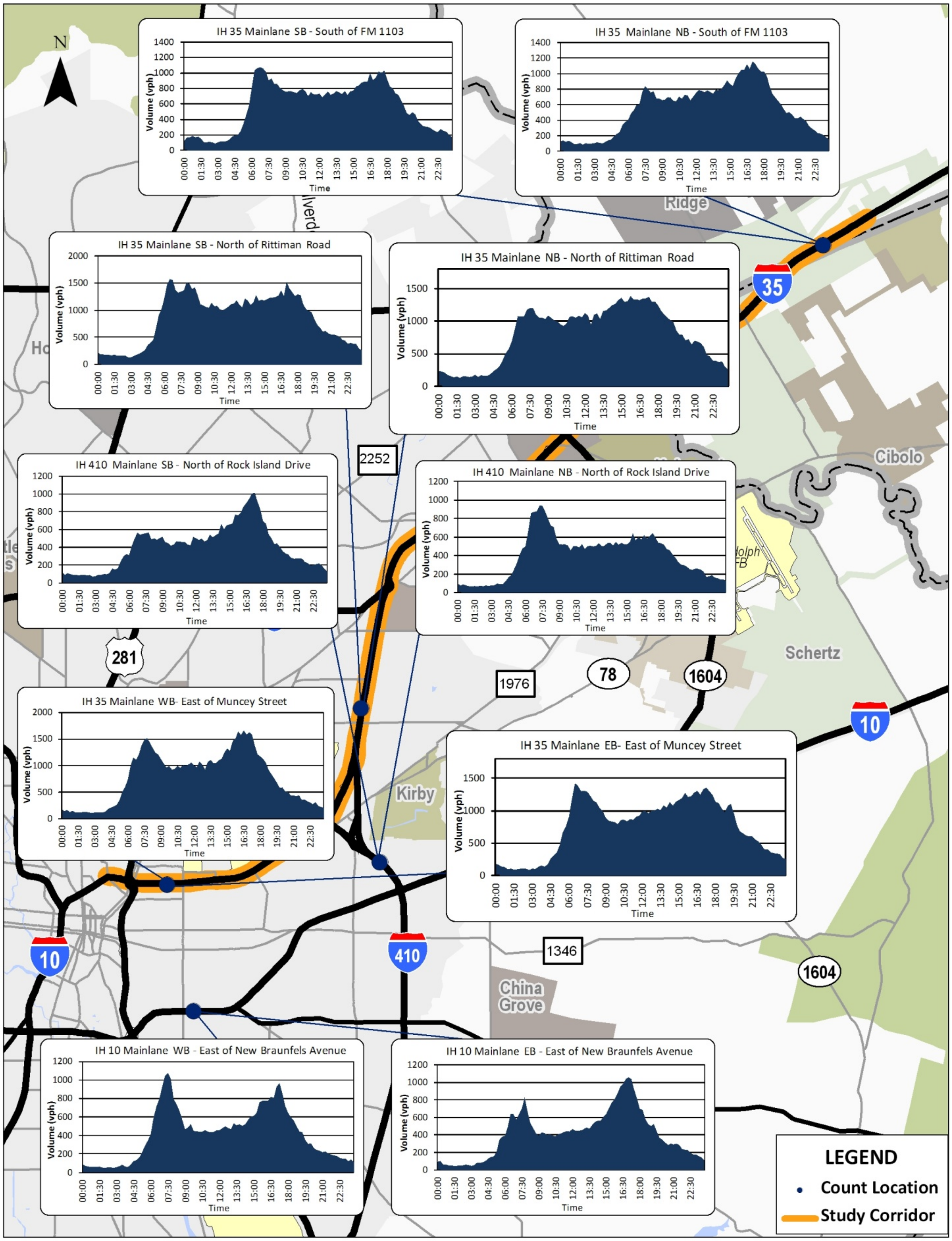


Figure 2-4: Traffic Temporal Distribution (15 minute volumes)

The hourly distribution of traffic was aggregated into four time periods as shown below:

- Morning Peak Period – 6:00 AM to 9:00 AM (3 hours)
- Midday Period – 9:00 AM to 3:00 PM (6 hours)
- Afternoon Peak Period – 3:00 PM to 7:00 PM (4 hours)
- Night Period – 7:00 PM to 6:00 AM (11 hours)

Figures 2-5 through **2-11** summarize the average weekday traffic peaking characteristics by direction of travel for each of the four time periods at various locations along the study corridor. For IH 35, a commuter oriented traffic characteristic is displayed. At all locations, southbound morning and northbound afternoon peaks are observed, although the difference in the peaks varied at each location. Midday traffic is nearly equal in both directions at most locations.

The proportion of daily traffic for each time period by direction is shown in **Figures 2-12** through **2-18**. For IH 35, morning traffic shares are approximately 15% to 23% in the peak direction and 14% to 23% in the off-peak direction. Midday peak direction traffic is between 31% and 35% at all locations. Off-peak direction share is approximately the same at approximately 31% to 34% for all locations. In the afternoon, peak direction traffic ranges from 23% to 31%. In the off-peak direction in the afternoon, shares are 23% to 27%. Night traffic is a significant share of the corridor traffic at approximately 17% to 23%.

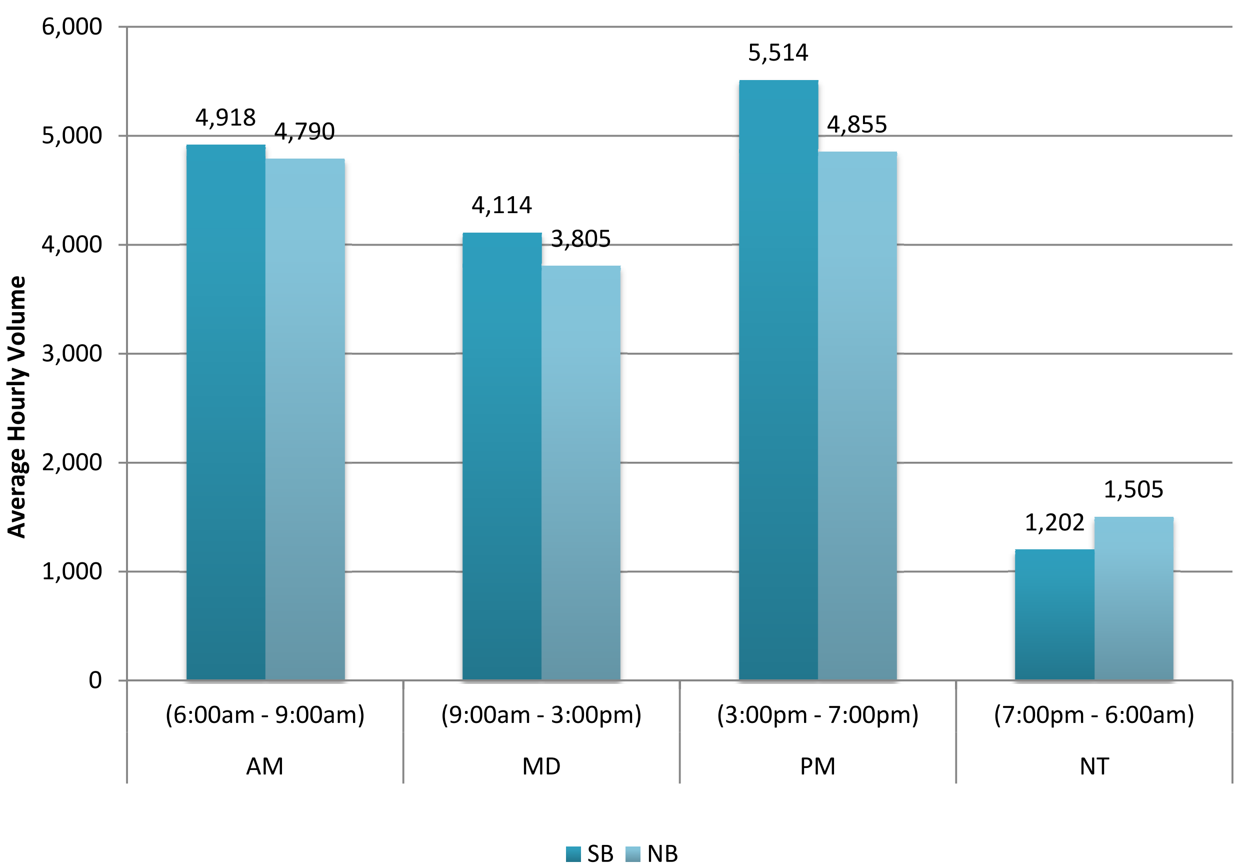
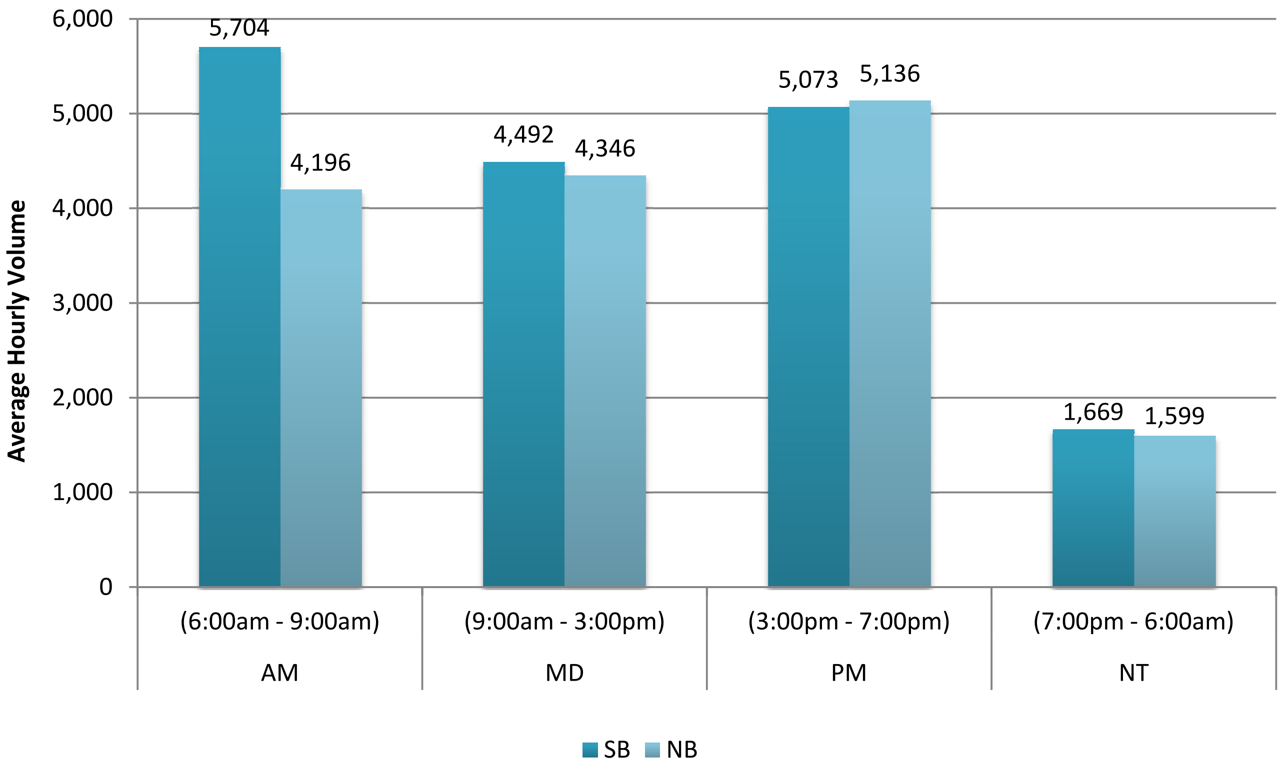


Figure 2-5: Weekday Traffic Profile (IH 35: East of Pine Street)



(NB: 5 lanes and SB: 4 lanes)

Figure 2-6: Weekday Traffic Profile (IH 35: North of Rittiman Road)
(NB: 3 lanes and SB: 4 lanes)

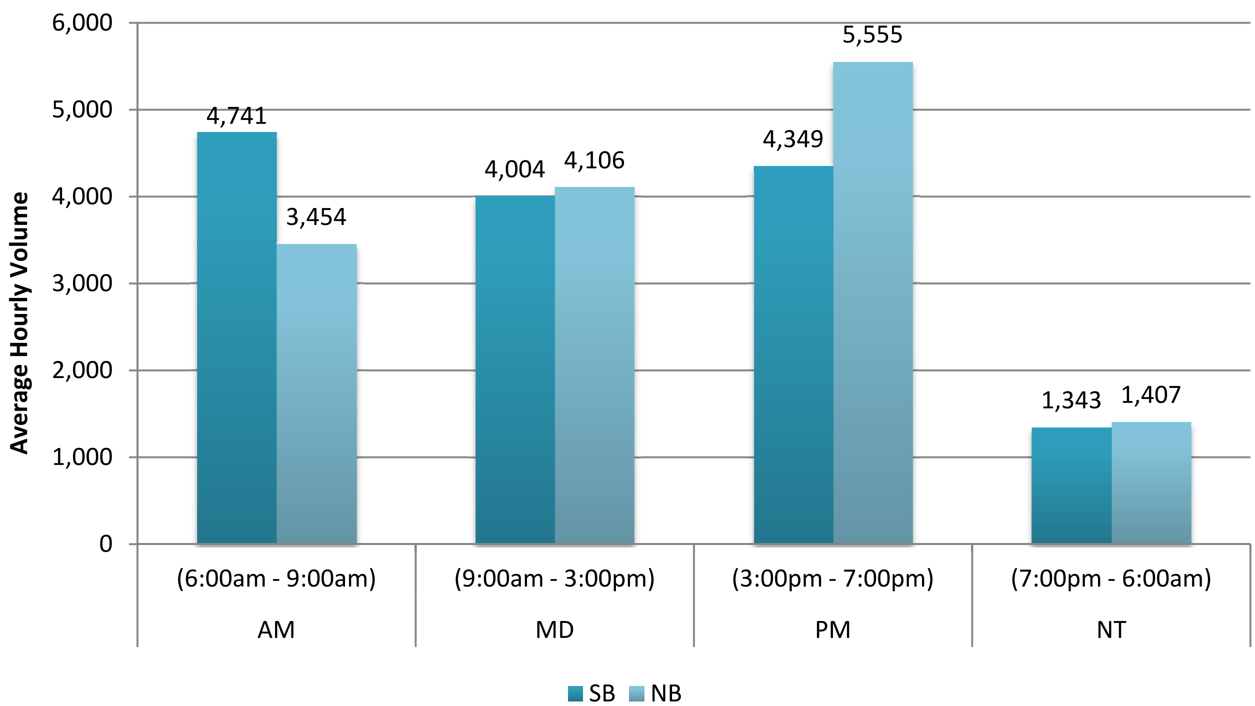


Figure 2-7: Weekday Traffic Profile (IH 35: South of Pat Booker Road)
(NB: 4 lanes and SB: 3 lanes)

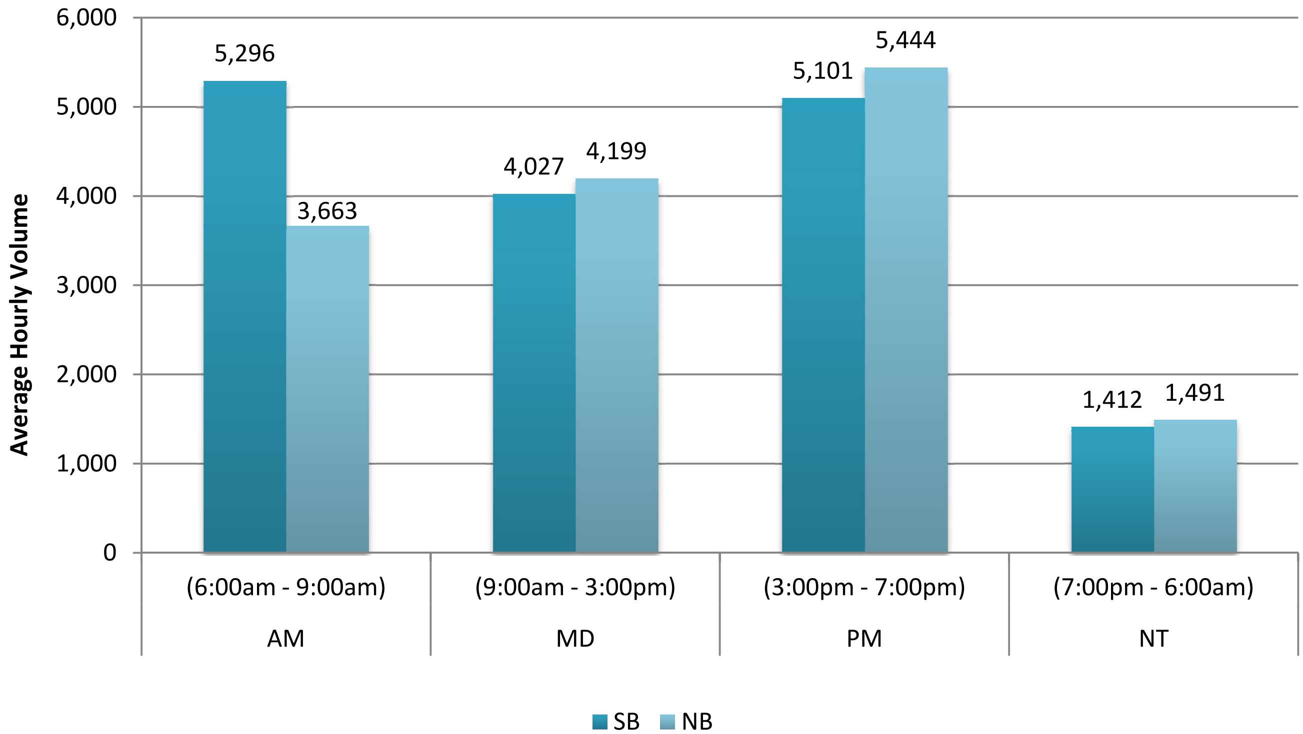


Figure 2-8: Weekday Traffic Profile (IH 35: North of Loop 1604)
(NB: 4 lanes and SB: 4 lanes)

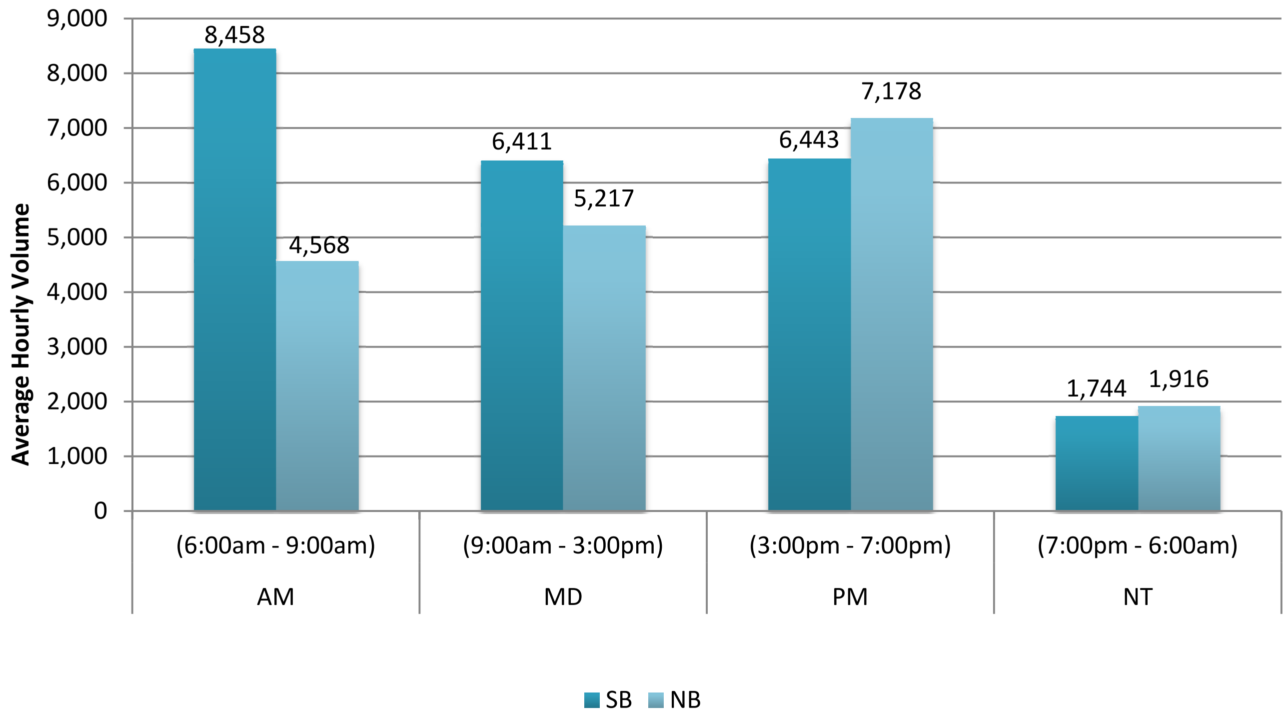


Figure 2-9: Weekday Traffic Profile (IH 35: North of Thousand Oaks Drive)
(NB: 5 lanes and SB: 5 lanes)

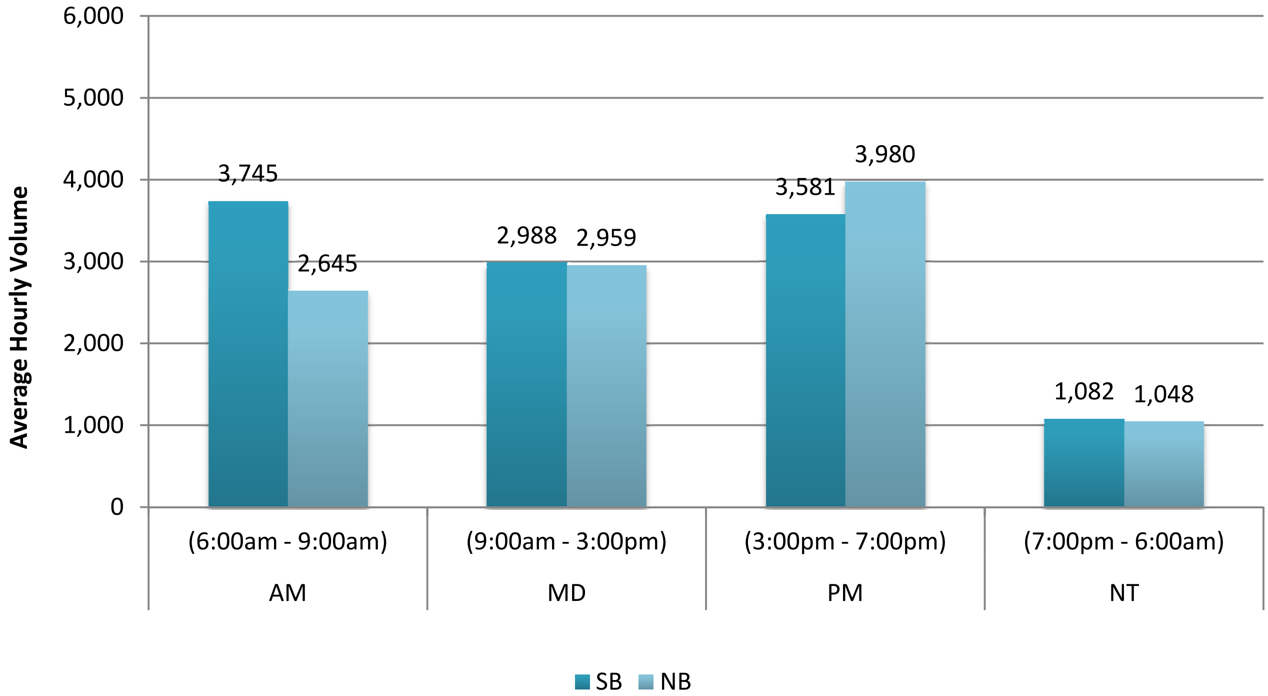


Figure 2-10: Weekday Traffic Profile (IH 35: South of FM 1103)
(NB: 3 lanes and SB: 3 lanes)

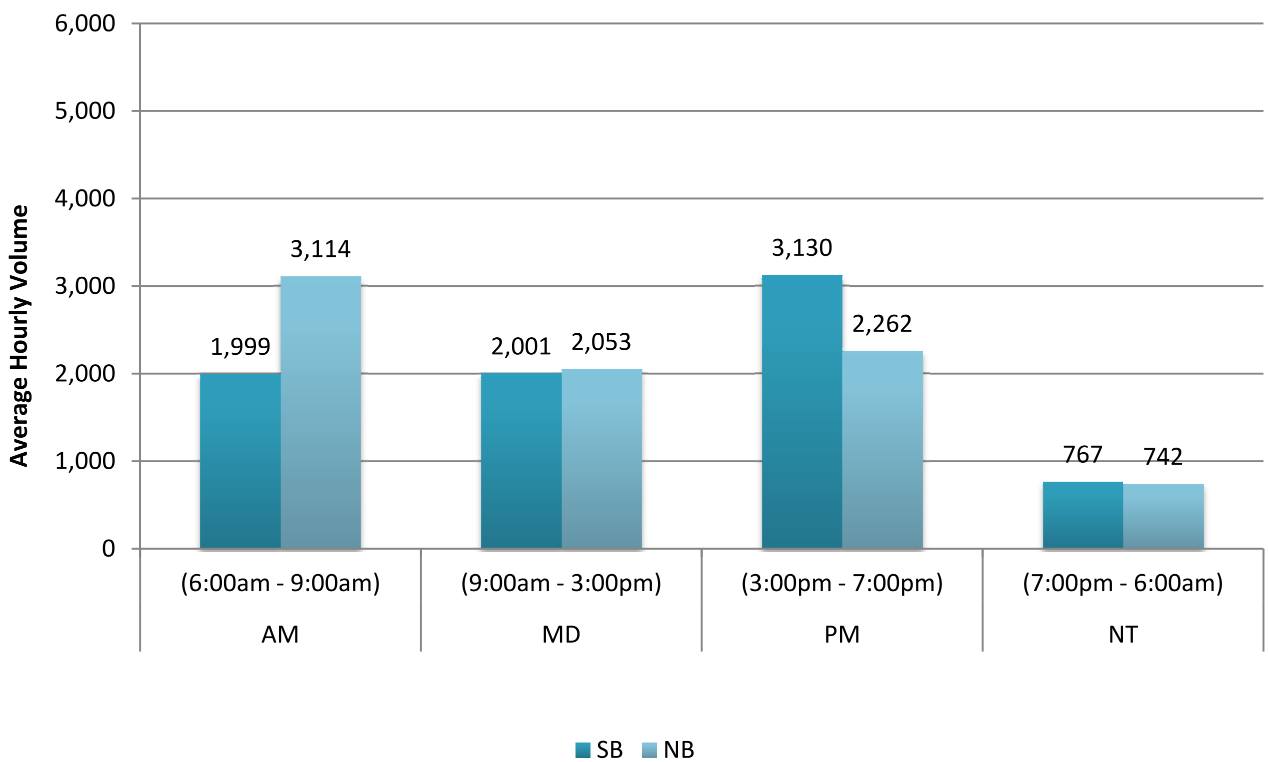


Figure 2-11: Weekday Traffic Profile (IH 410 East: North of Rock Island Drive)
(NB: 2 lanes and SB: 2 lanes)

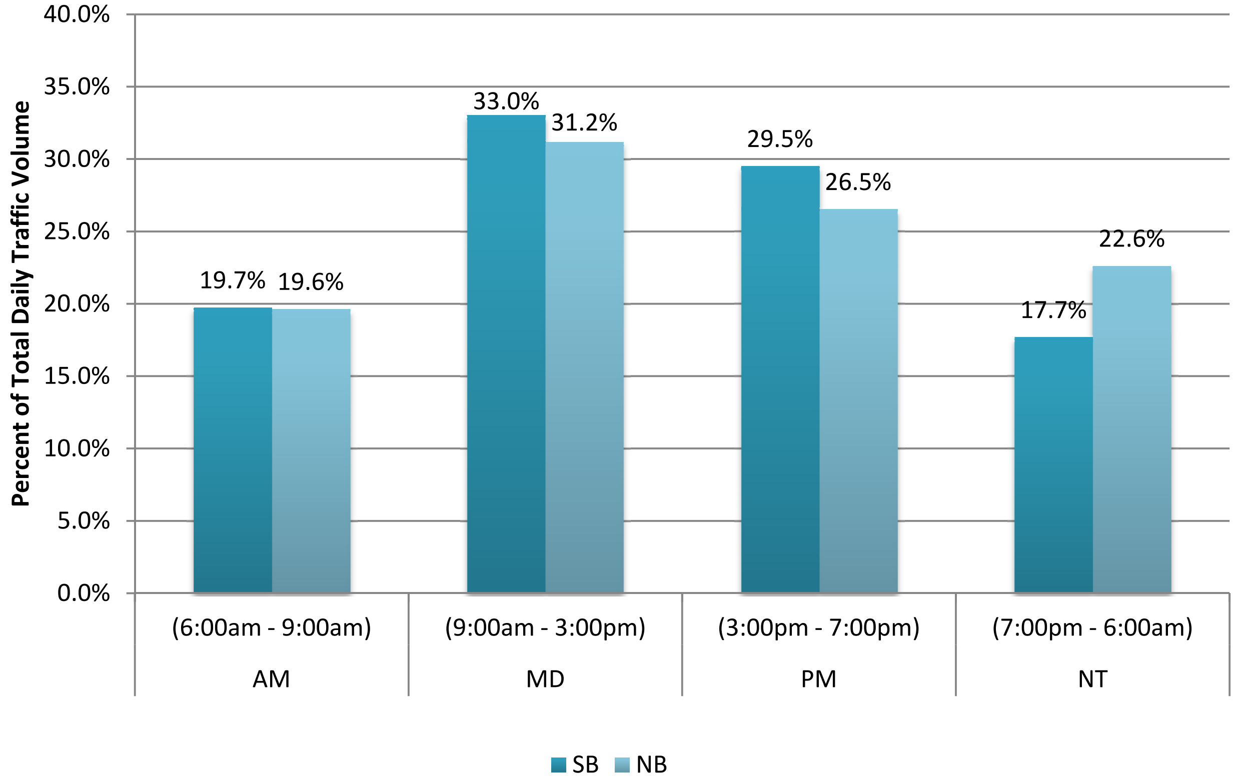


Figure 2-12: Weekday Traffic Proportion Profile (IH 35: East of Pine Street)

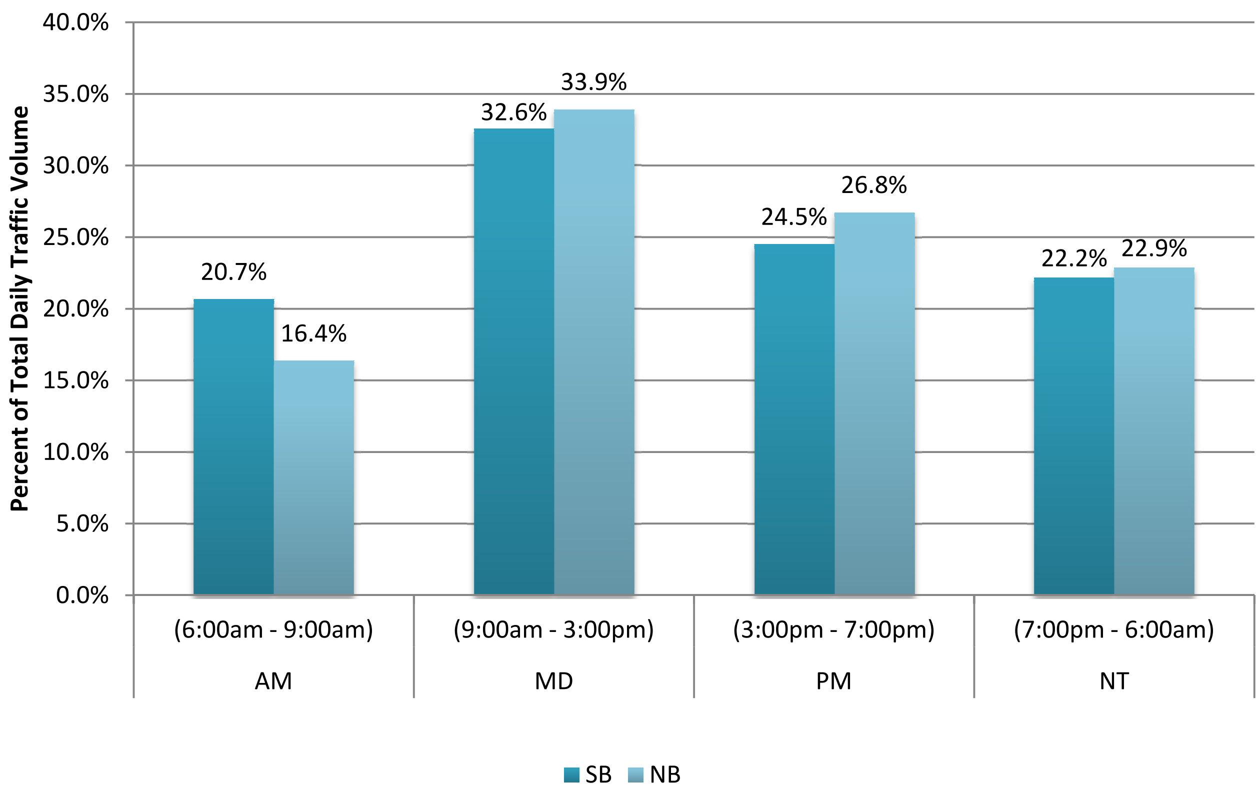


Figure 2-13: Weekday Traffic Proportion Profile (IH 35: North of Rittiman Road)

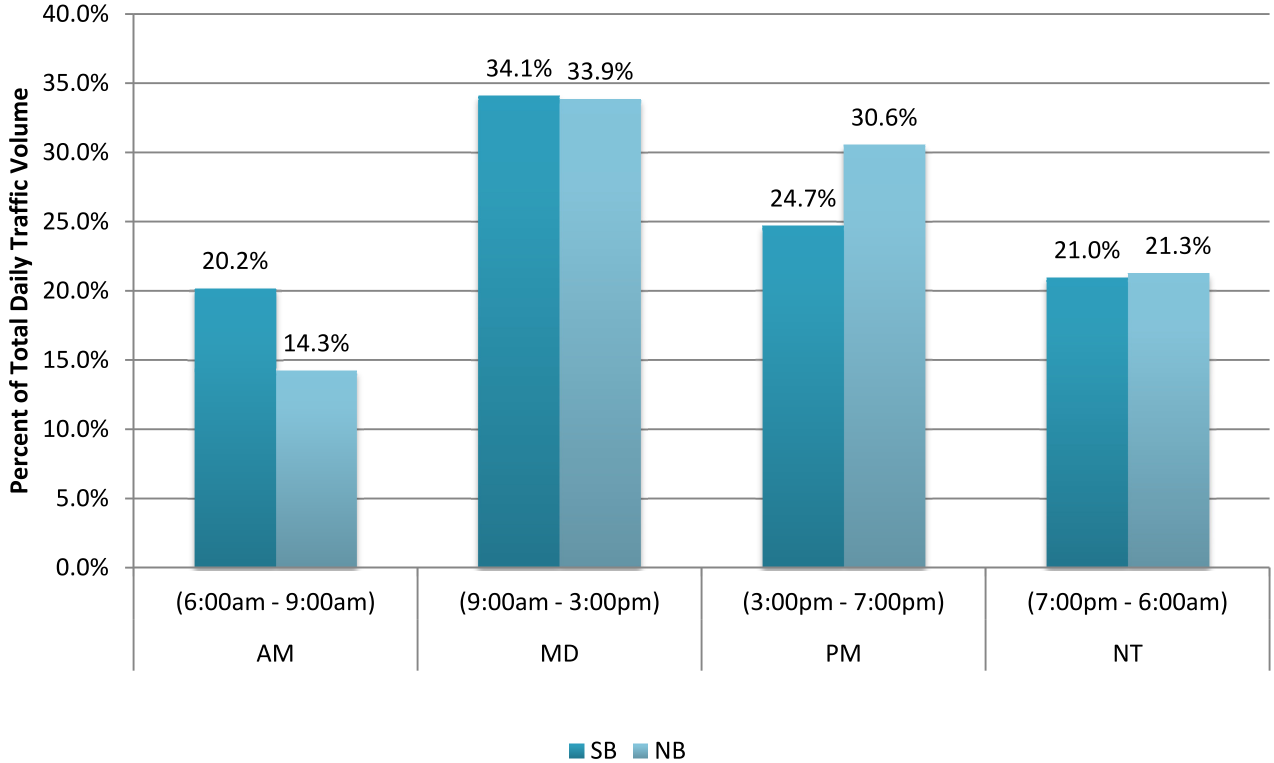


Figure 2-14: Weekday Traffic Proportion Profile (IH 35: South of Pat Booker Road)

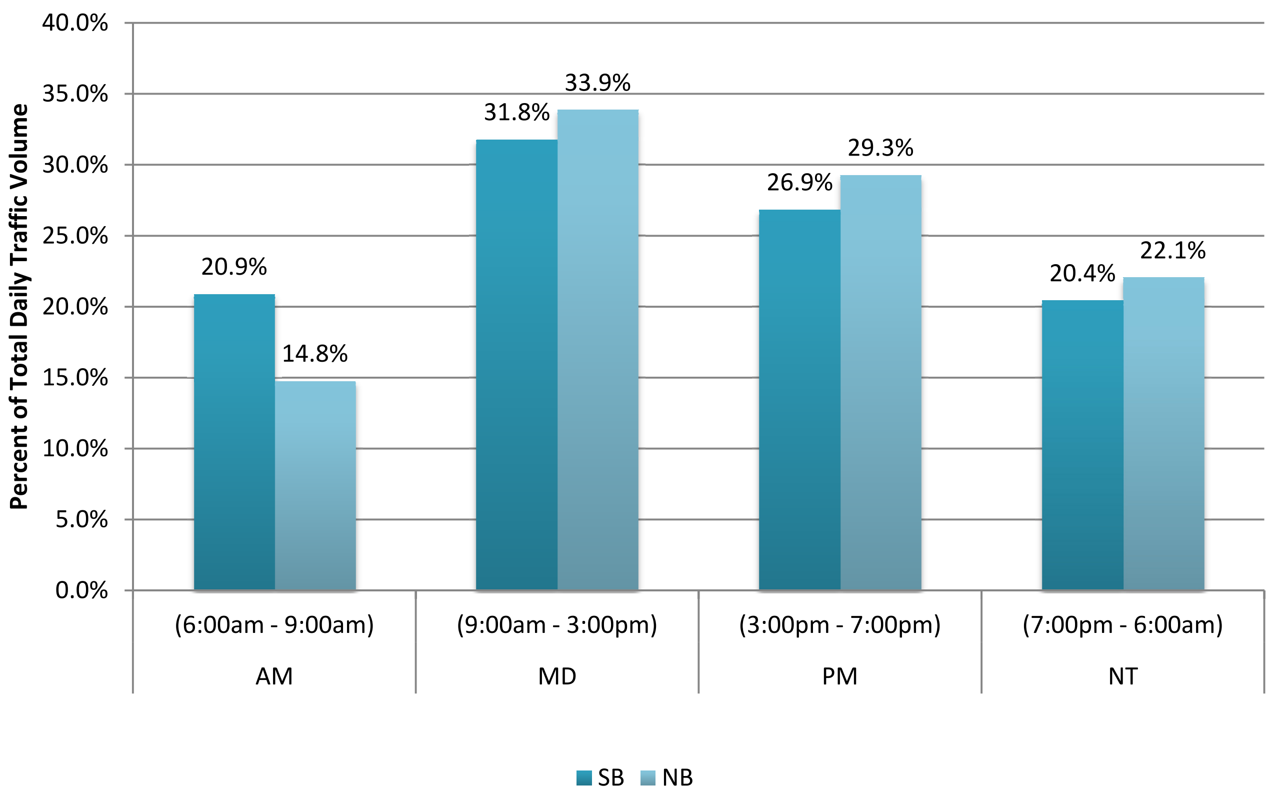


Figure 2-15: Weekday Traffic Profile (IH 35: North of Loop 1604)

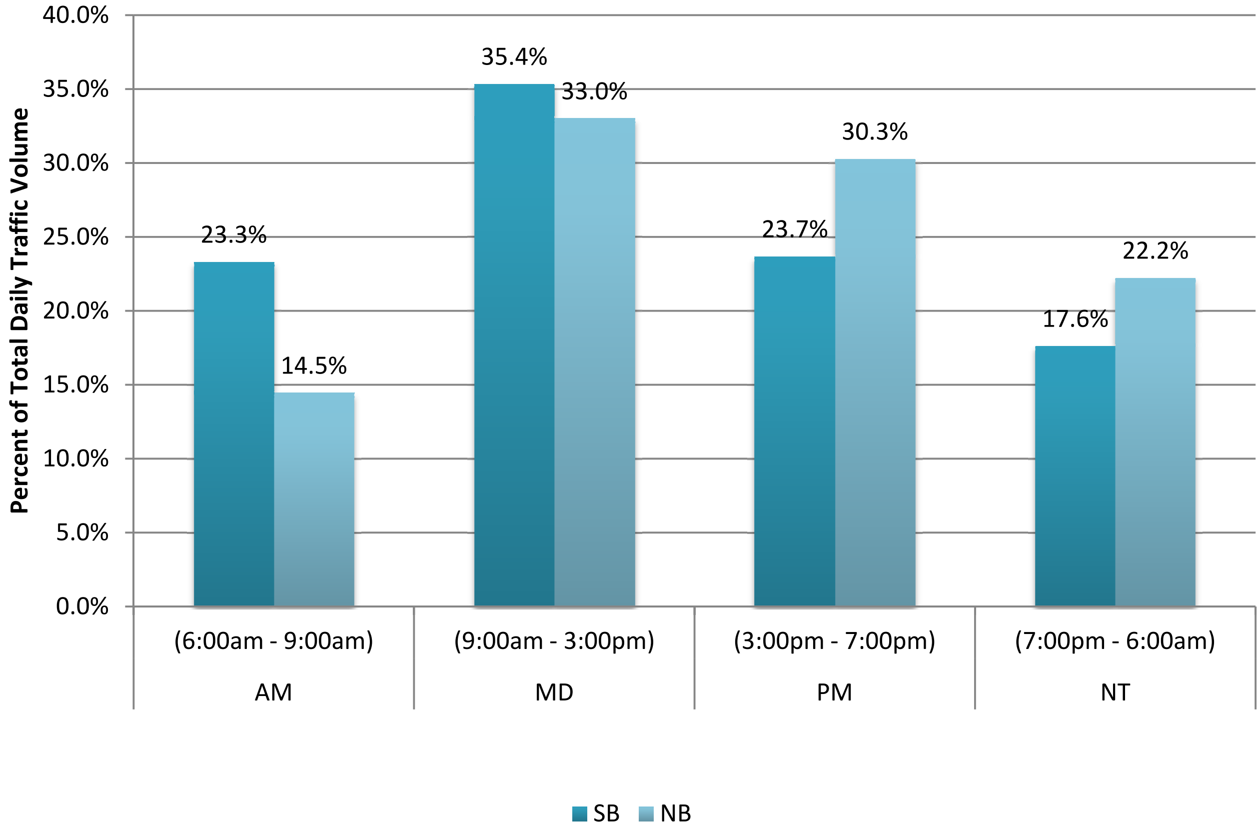


Figure 2-16: Weekday Traffic Proportion Profile (IH 35: North of Thousand Oaks Drive)

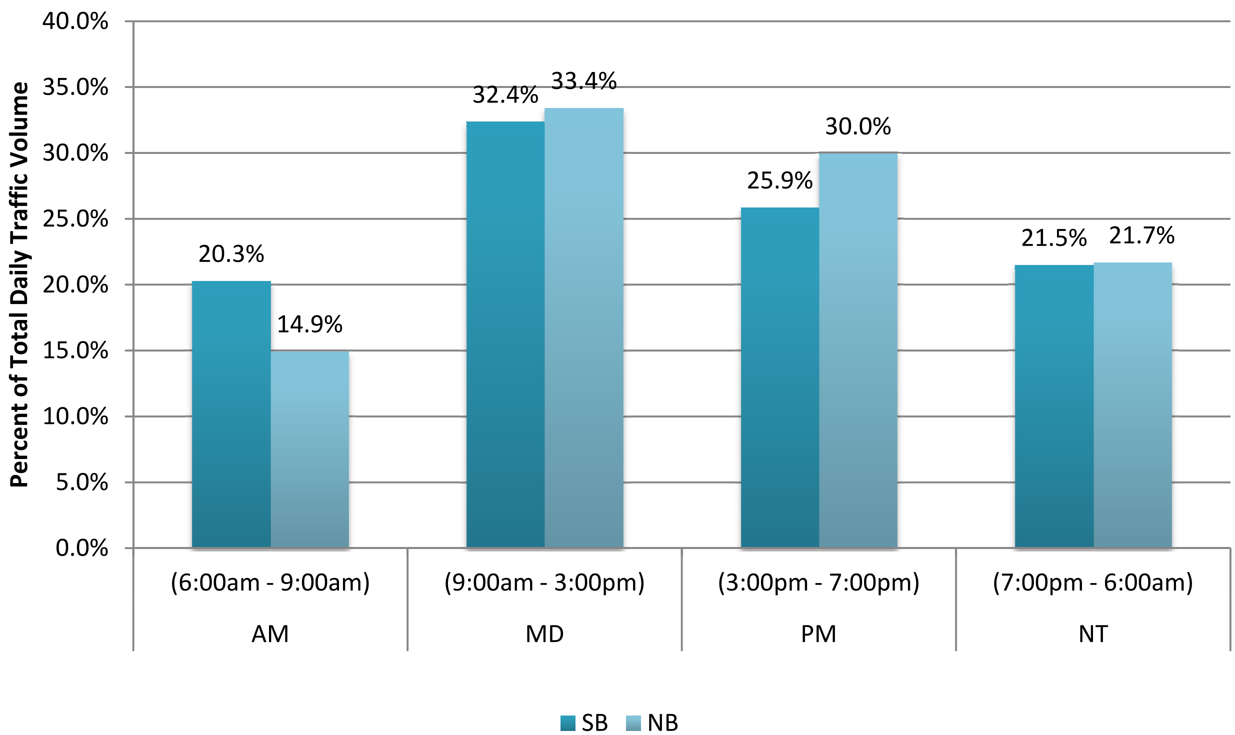


Figure 2-17: Weekday Traffic Proportion Profile (IH 35: South of FM 1103)

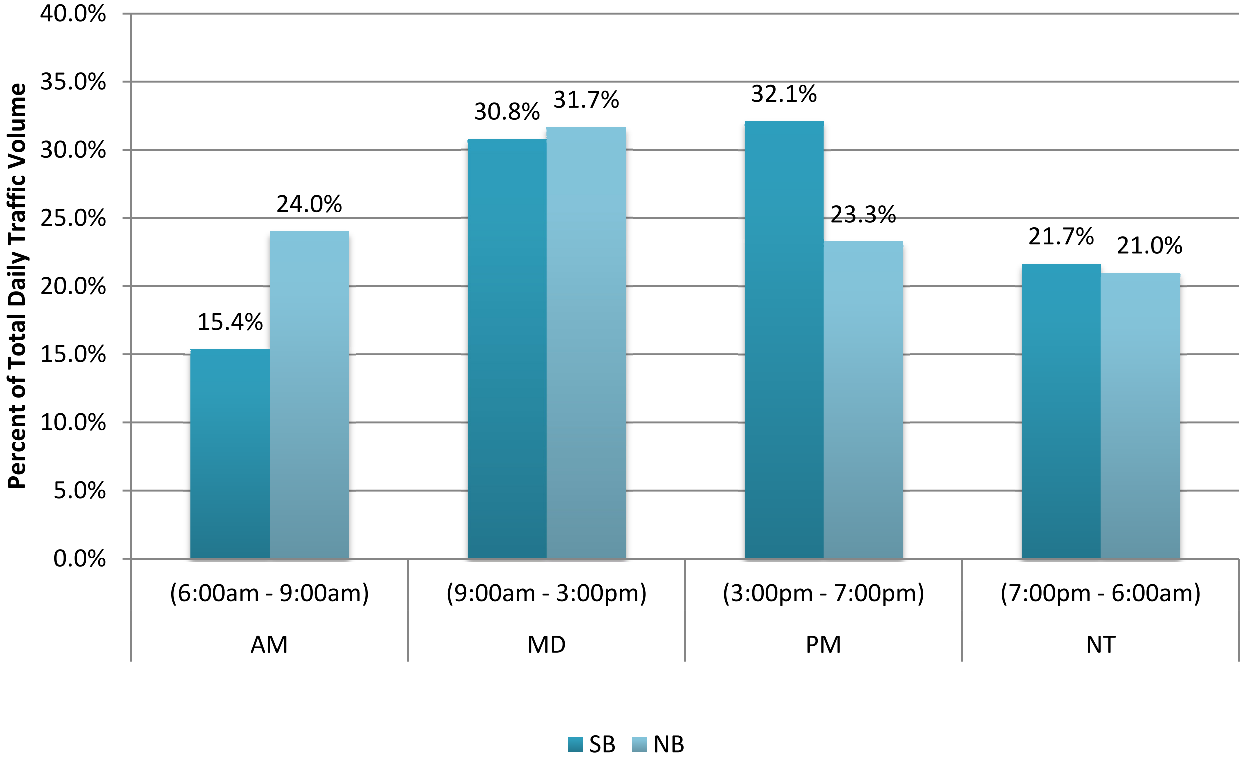


Figure 2-18: Weekday Traffic Proportion Profile (IH 410 East: North of Rock Island Drive)

2.5 Corridor Traffic Profiles

The data collected along the IH 35 study corridor were analyzed with the results shown in **Figures 2-19** through **2-21**. (Note, where applicable, the volumes shown include the main lane and frontage road volumes.)

As shown in **Figure 2-19**, the highest total daily traffic along the IH 35 corridor was observed between north of Thousand Oaks Drive and north of Rittiman Road. Average Daily Traffic (ADT) ranged between 203,000 and 159,000 at these locations. Further north, approximately 108,000 vehicles per day were observed south of FM 1103. Similarly to the south, around 148,000 vehicles daily were observed east of Pine Street.

Directional volumes were nearly matched throughout the corridor, which is to be expected for daily traffic volumes.

A more detailed assessment of the temporal distribution of the average weekday hourly traffic counts was also conducted for the morning and afternoon time periods to better understand the demand occurring along the IH 35 corridor, as summarized in **Figure 2-20**. As expected, in the three hour morning peak period (6:00 to 9:00 AM), the total traffic is highest in the same area as the daily traffic at Thousand Oaks Drive and Rittiman Road. The highest volumes were around 39,000 vehicles for the three hour morning period. Traffic was lowest south of FM 1103 at approximately 19,000 vehicles for the morning period.

In the four hour afternoon peak period (3:00 to 7:00 PM) shown in **Figure 2-21**, traffic is again the highest at Thousand Oaks Drive. The location north of Loop 1604 showed the next highest traffic volumes. Similar to daily and morning peak periods, the lowest volumes were just south of FM 1103.

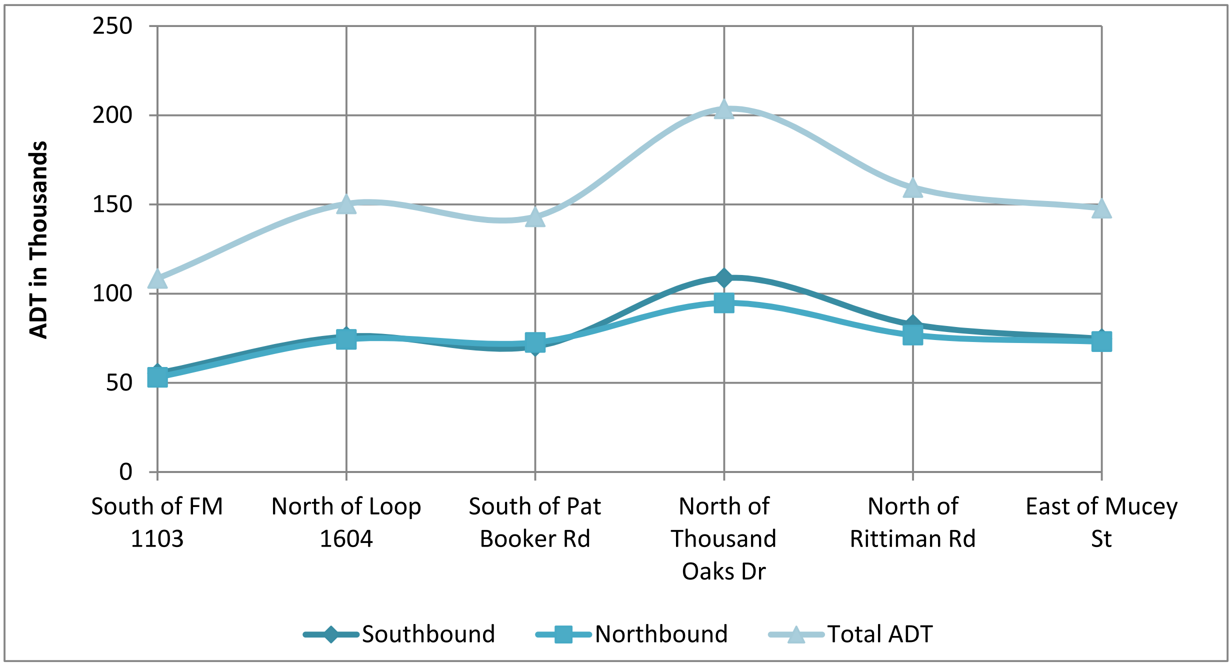


Figure 2-19: IH 35 Daily Traffic Profile

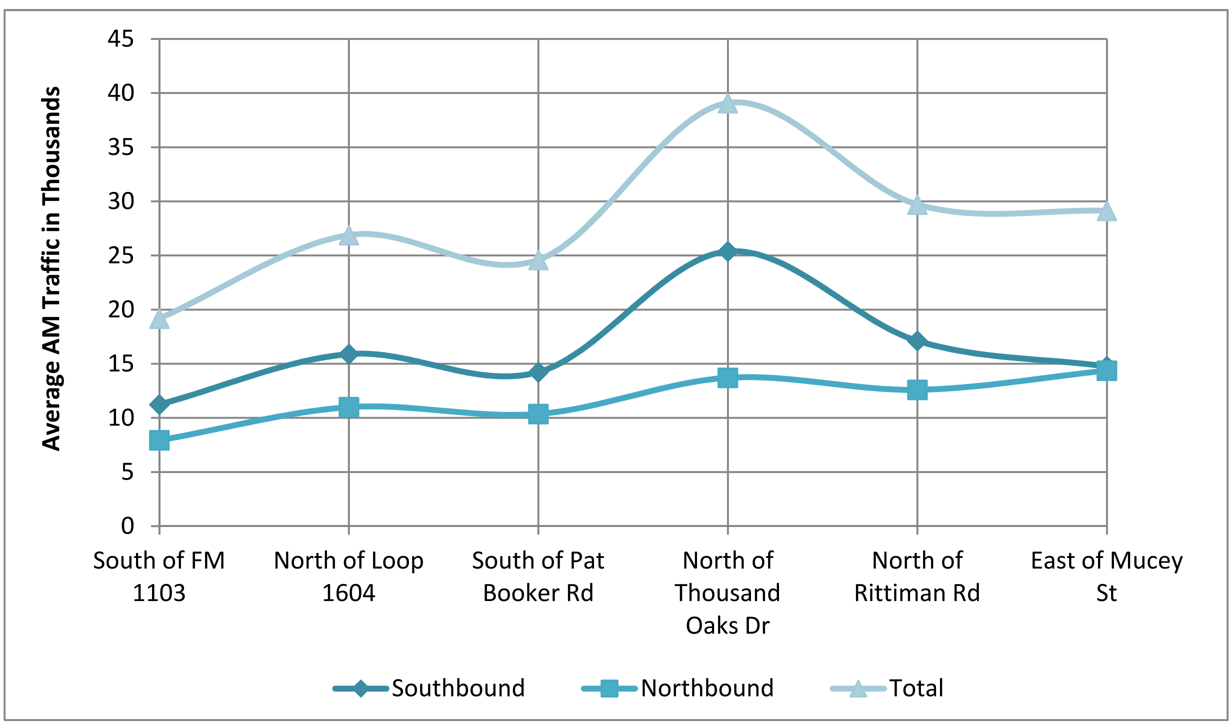


Figure 2-20: Average AM Traffic in Thousands on IH 35

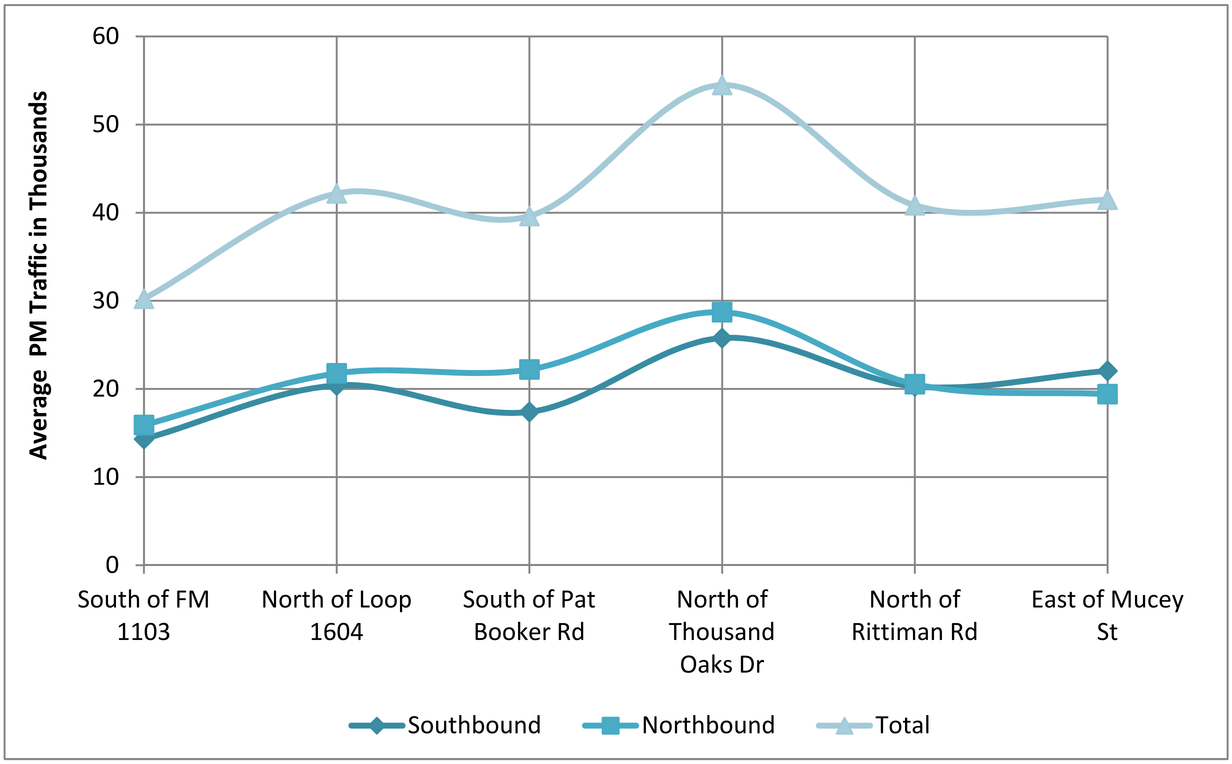


Figure 2-21: Average PM Traffic in Thousands on IH 35

2.6 Seasonal Variation Trends

The Texas Department of Transportation (TxDOT) has several permanent traffic counters along interstate and state highways throughout Texas. These permanent traffic counters continuously record traffic volumes throughout an entire year. There was one permanent traffic counter within the study area at IH 37 just south of IH 35. Using the data from this permanent traffic counter location, an analysis of seasonal variation was conducted. The traffic count program for this project was implemented in February. Observed traffic data for the month of February was approximately two percent higher than the average annual index. Given this relatively small factor, no seasonal variations were taken into consideration as part of the model calibration process. Model calibration is the process of comparing the observed average daily traffic (ADT) volumes against those produced by the travel demand model.

2.7 Vehicle Classification Counts

Vehicle classification counts were also conducted as part of the traffic count program conducted in 2012 at the following locations along IH 35 and IH 410:

- IH 35 East of Pine Street
- IH 35 South of FM 1103
- IH 410 North of Rock Island Drive

Results from the vehicle classification counts provide information on vehicle type, typically passenger cars and commercial vehicles (trucks). Summaries of the classification count data are shown in **Figures 2-22** through **2-24.** Of the locations studied on IH 35, the highest truck share was approximately 16% on IH 35 south of FM 1103. The lowest share was on IH 35 East of Pine Street at approximately 8%. For all locations, truck shares were approximately the same in both directions. Truck share at the IH 410 location north of Rock Island Drive was approximately 16% and did not show a significant difference by direction.

Also shown in **Figures 2-22** to **2-24** is the information on the truck axle distribution. Axle distribution is a further breakdown of the commercial vehicles into medium and heavy trucks. Data at each location includes a breakdown of medium (generally two axle six tire, three axle, and four axle single unit trucks and small buses and excluding two-axle six-tire pick-up trucks) and heavy trucks (trucks with trailers and multi trailers with four or more axles, large school and city/transit buses). Heavy truck shares appear to be highest along IH 35 south of FM 1103 with nearly 80% heavy trucks. The lowest heavy truck share was shown to be at the location, east of Pine Street at approximately 65%. IH 410, north of Rock Island Drive showed heavy trucks in excess of 70%.

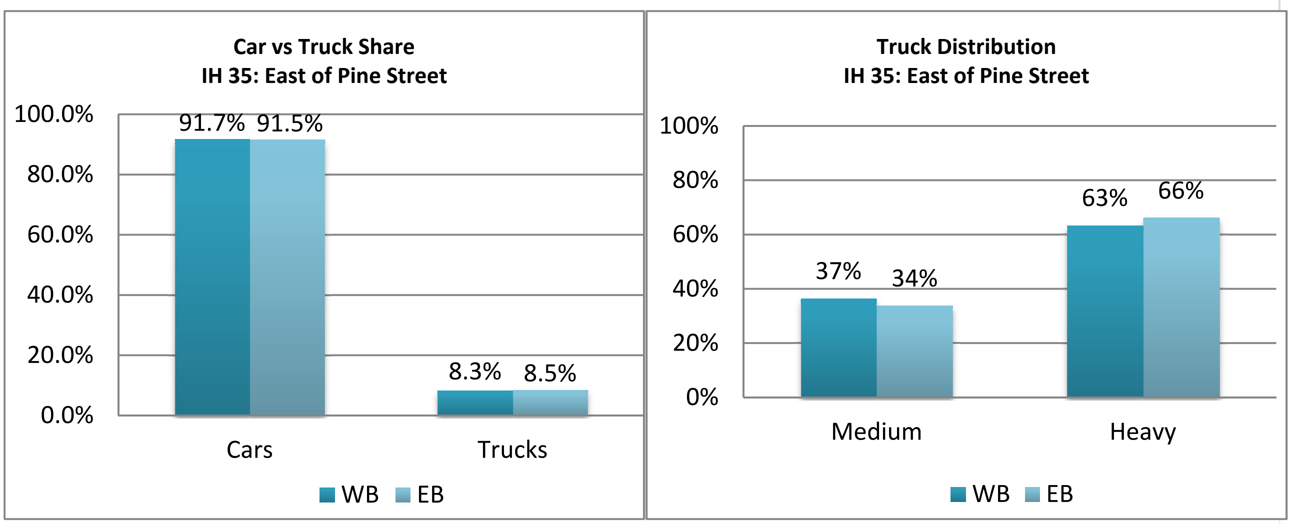


Figure 2-22: Vehicle Classification on IH 35 East of Pine Street

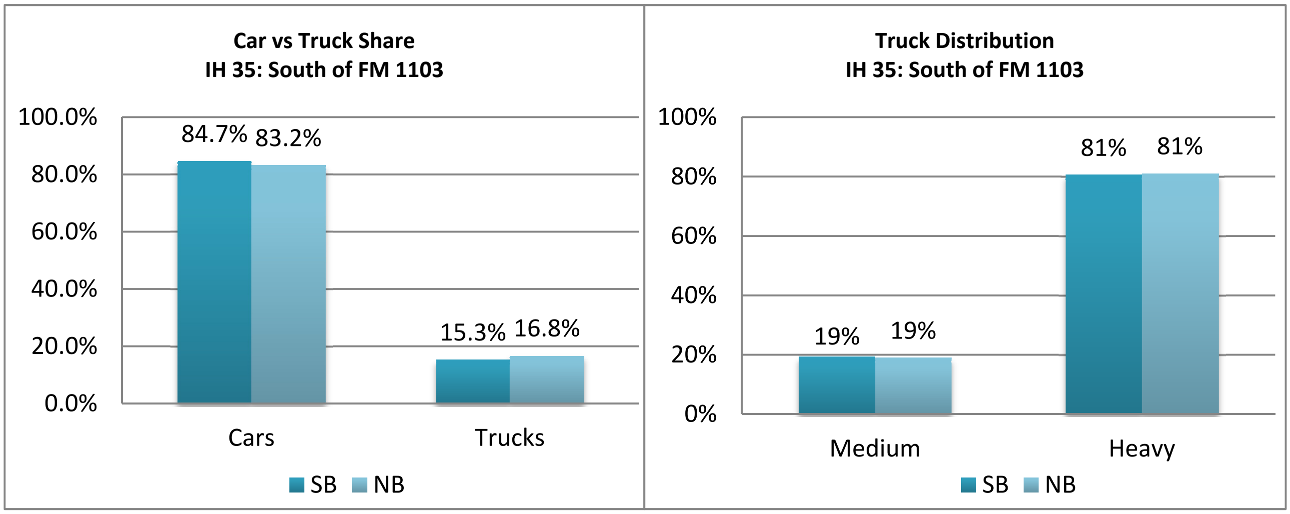


Figure 2-23: Vehicle Classification on IH 35 South of FM 1103

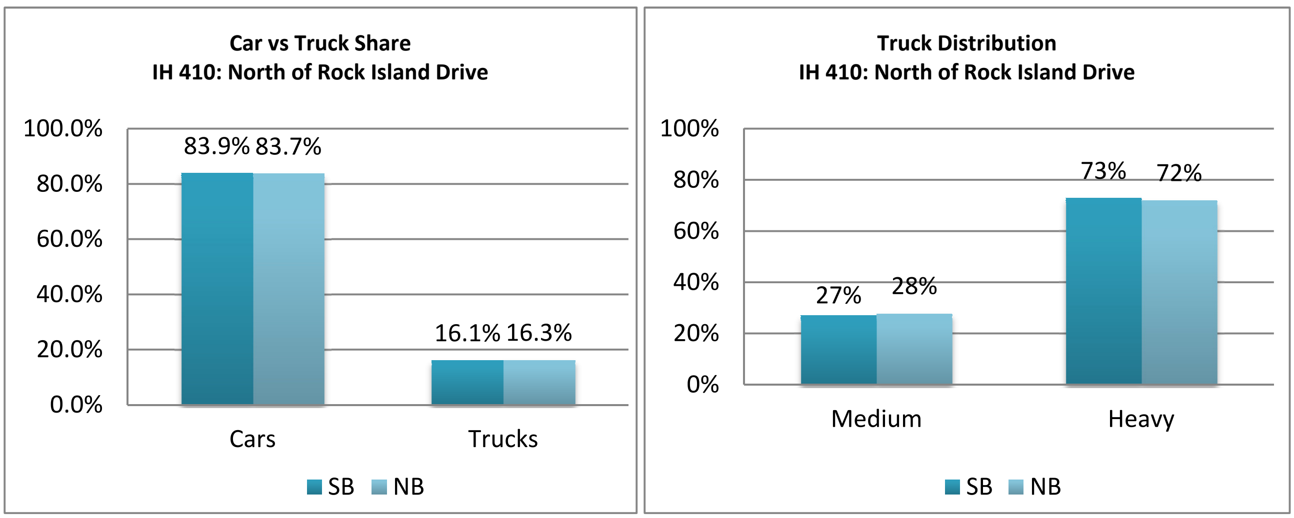


Figure 2-24: Vehicle Classification on IH 410 North of Rock Island Drive

2.8 Corridor Average Travel Speeds

In addition to the traffic count program conducted for the IH 35 PEL, speed and delay data was collected on the routes shown in **Figure 2-25**. Speed and delay data are used to assist in the model calibration process by comparing observed travel times to modeled travel times and making the appropriate model or network adjustments. **Figures 2-26** through **2-28** show average travel speeds observed during the AM, midday, and PM time periods for both directions on IH 35 as well as some of the other competing facilities. For each direction, the profiles represent seven morning period runs (6:00 AM to 8:30 AM start times), six midday period runs (11:30 AM to 1:00 PM start times), and 11 afternoon period runs (3:15 PM to 6:45 PM start times). Data was collected Tuesday through Thursday, February 28-March 1, 2012.

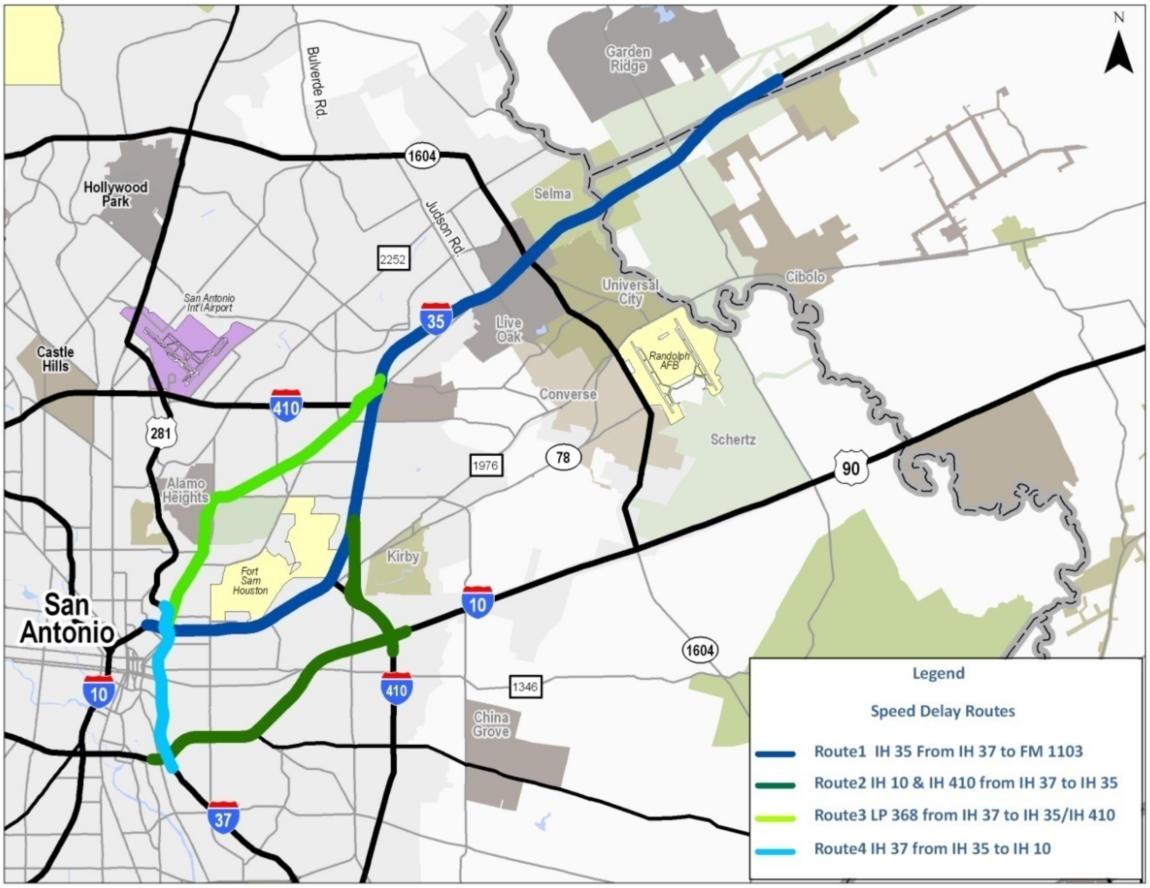


Figure 2-25: Speed and Delay Data Collection Routes

In the southbound direction, significant congestion is observed during the AM peak hour for large portions of IH 35 within the study corridor. The area in the vicinity of IH 410 and to some extent near FM 3009 showed average speeds below 20 mph. Speeds below 40 mph are also observed on significant sections of the corridor. Speeds pick up above 50 mph approaching downtown mainly due to the metering effect due to upstream congestion. In the northbound direction during the AM peak hour, there is no congestion, and traffic speeds were in excess of 60 mph for the entire section of the project study corridor between IH 37 and FM 1103. Speed reductions were also observed on Loop 368 in both directions which were partly due to construction and lane closures in the Alamo Heights area.

During midday hour, no congestion was observed along IH 35 in both directions. However, Loop 368 continued to show a reduction in speed along different sections again partly due to lane closures and construction.

In the northbound direction some sections along IH 35 showed reduction in speeds during the PM peak hour, but the congestion patterns did not appear to be as severe as those observed during the AM peak hour. The PM peak hour traffic flowed at free flow conditions in the southbound direction. Loop 368 continued to demonstrate congestion characteristics along different sections. The traffic data and analyses presented in this section, were used to benchmark the baseline model characteristics and in the development of the model as detailed in the next section.

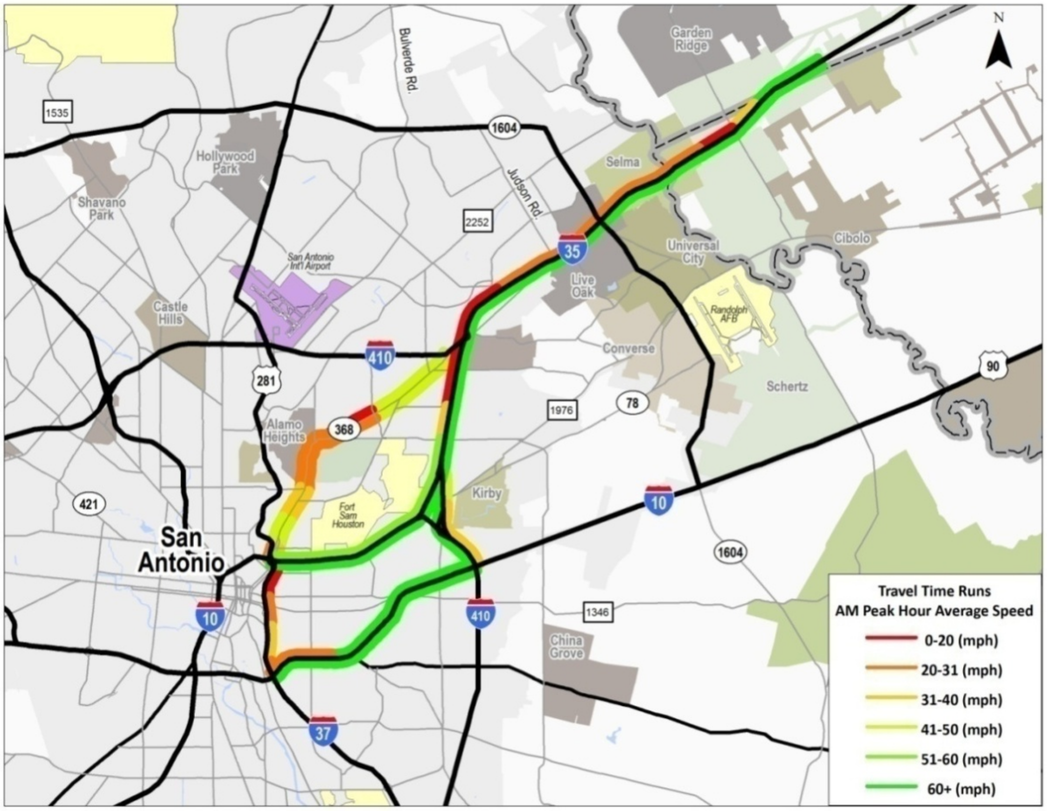


Figure 2-26: Observed Average Travel Speeds – AM Peak Hour

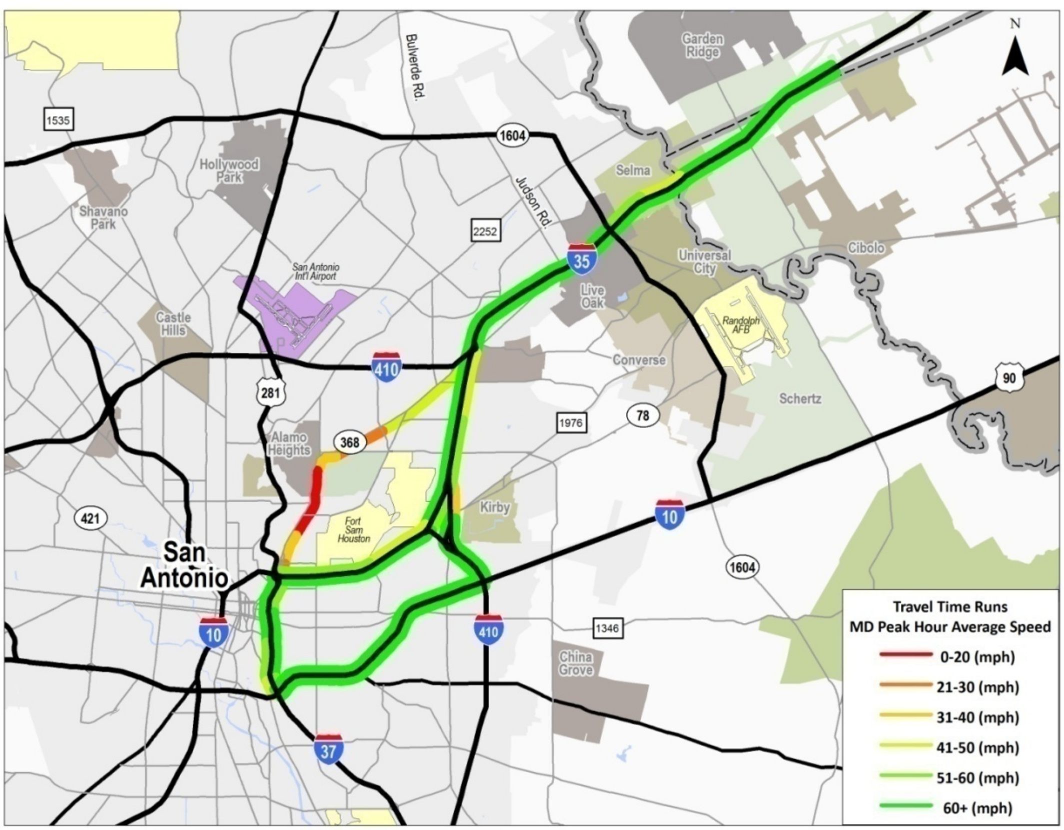


Figure 2-27: Observed Average Travel Speeds – Midday

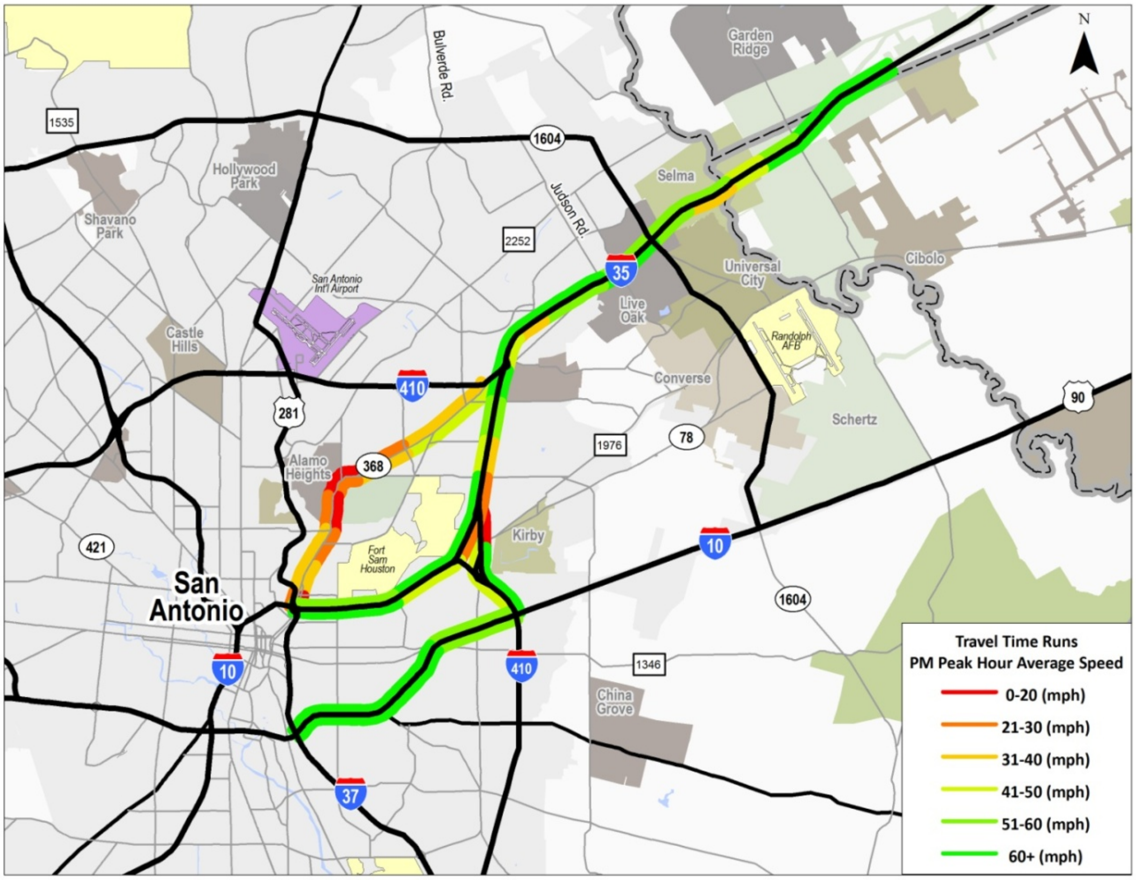


Figure 2-28: Observed Average Travel Speeds – PM Peak Hour

Section 3 Travel Demand Model Development

The purpose of the travel demand model was to forecast the traffic demand and network performance under each of the alternatives being evaluated for the IH 35 corridor. Most travel demand modeling analyses attempt to answer the following fundamental questions:

- How much demand currently exists in the corridor?
- What is the expected future demand for the corridor?

Detailed profiles of the existing traffic demand and characteristics (based on the traffic count program) is presented in earlier sections. These travel characteristics became the foundation upon which the travel demand models were developed and calibrated. The model development for the traffic estimation process involved two levels of analysis:

- Global Demand Estimates - The global demand is an estimate of the amount of total traffic that will likely use the IH 35 corridor under the existing and future conditions. An assessment of the regional socioeconomics was performed as part of another study to provide a gauge of what the total global demand will be in the future within the corridor. The regional highway networks obtained from San Antonio-Bexar County MPO were reviewed to ensure that the future planned improvements within the IH 35 study area were coded correctly. The networks were then updated to incorporate the latest alternatives for the proposed IH 35 configuration. Updated regional socioeconomic data developed by an independent economist for the Loop 1604 and US 281 Traffic and Toll Revenue Study was incorporated within the San Antonio Bexar County MPO model to develop existing and future year trip tables and the model estimated travel patterns were analyzed and compared with the information collected from the field studies; and
- Market Share Model - The market share model is used to estimate the traffic that will elect to use proposed tolled lanes along major facilities in the region. The share of the corridor traffic that diverts to the tolled lanes is based on several factors that include: the location of access points and the general purpose lane configurations between scenarios; the time savings offered by the tolled lanes; and the magnitude of tolls charged. For this study, the market share model procedures were incorporated into the traffic assignment routine for the tolled projects along Loop 1604 and US 281 to forecast traffic for the entire San Antonio Bexar County MPO region, including the IH 35 corridor.

3.1 Model Development and Refinements

The travel demand model used for the San Antonio-Bexar County MPO's 2035 Metropolitan Transportation Plan –was used as the basis for the development of traffic forecasts for this study. The San Antonio model included 1,287 Traffic Analysis Zones (TAZs) encompassing the five counties (Bexar, Guadalupe, Comal, Wilson and Kendall) within the San Antonio region. The trip tables generated by the MPO's model were daily trip tables and were segmented into four modes; drive-alone (single occupancy vehicles – SOV), two-occupant high-occupancy vehicles (HOV2), high-occupancy vehicles with three or more occupants (HOV3+), and trucks. The trip tables were developed for 2011/2012 (base year) as well as 2035 forecast year. The highway networks obtained from the MPO model included specific link parameters regarding lengths, functional classes, area-types, number of lanes, speeds, and capacities.

To accommodate the detailed assessment of the IH 35 corridor the SA-BC MPO daily trip tables were disaggregated into four time periods. The four time periods were based on the temporal distribution of traffic that was developed using the data collected along the IH 35 corridor as well as the traffic counts obtained from other projects within the project corridor, and other available historical count data. The assessment of the data showed that morning peak period exhibits sharp peaking characteristic while the evening peak period traffic profiles along the IH 35 corridor showed very stable and consistent volumes throughout. The off-peak period was split into Midday and Night time periods. The definitions of the four time periods that were used during the model calibration are provided below:

- AM Peak Period – 6:00 AM to 9:00 AM (3 hours)
- Midday Period – 9:00 AM to 3:00 PM (6 hours)
- PM Peak Period – 3:00 PM to 7:00 PM (4 hours)
- Night Period – 7:00 PM to 6:00 AM (11 hours)

3.2 Global Demand Estimates

The global traffic demand, defined as the total potential traffic traveling within the IH 35 corridor (including the frontage roads and mainlanes was estimated using the models developed for the IH 35 corridor. The enhancements incorporated into the SA-BC MPO regional model used to support this study included the development of trip table for the year 2035 for each of the four time periods as defined earlier. The trip tables were segmented into SOV, HOV2, HOV3+, and Trucks to facilitate a more detailed analysis of each market segment, if needed.

The adjustments to several assignment parameters such as the link speeds and capacities, and the speed/flow relationships were implemented to reflect the current travel characteristics in the corridor where applicable. This process utilized the extensive traffic data collected in 2011 and 2012 to ensure that the model reasonably replicated the current traffic volumes and speeds along the IH 35 corridor and along the major competing routes within the study area.

The model development efforts undertaken to generate the future global demand estimates required several updates and modifications to the highway network, the socioeconomic databases, and the trip tables, all of which are described in more detail below.

3.2.1 Highway Network

The San Antonio-Bexar County Metropolitan Planning Organization's (SA-BC MPO's) regional highway network based on the 2035 Mobility Transportation Plan (MTP) was the original base network used as a starting point for this study. The roadways within the IH 35 project study area were then reviewed and updated to ensure the future projects and highway improvements were correctly coded in all of the future year networks. The IH 35 corridor was edited to incorporate the proposed configuration for each of the nine alternatives that were analyzed for the PEL study.

Other elements in the networks that were also reviewed included centroid connections, free flow speeds, link lengths, number of lanes, and lane capacities. The final version of the networks for the base and each future year were tested by conducting a "shortest path" assignment based on time and distance between select pairs of TAZs. This process is used to determine the reasonableness of modeled route choice.

3.2.2 Socioeconomic Assumptions

An important element used to review the SA-BC MPO socioeconomic database was the regional and county-level total population and employment forecasts from several independent sources. The independent population forecast sources included the Texas State Data Center, the Texas Water Development Board, and Woods & Poole and these were all reviewed and compared with original SA-BC MPO demographic forecasts. An independent economic review conducted by Alliance Transportation Group, Inc. (ATG) for the Loop 1604 and US 281 Traffic and Toll Revenue Study, was used as part of this study to derive the expected future travel demand characteristics. The final summary of the 2035 model runs for the IH 35 corridor that are presented in Section 4 are based on the revised demographics datasets that were developed by the independent economist (ATG).

3.2.3 Trip Tables

The trip tables used for the development of traffic forecasts for this study were developed using the SA-BC MPO model and the revised demographic datasets developed for the Loop 1604 and US 281 Traffic and Toll Revenue Study as described above. The traffic count profiles were used to segment traffic demand within the respective time periods. The trip tables were also compared to the classification count data to ensure that the distributions of the various auto and truck modes were adequately modeled. The daily trip tables generated using the SA-BC MPO model platform were disaggregated into the four time periods as mentioned earlier by applying the temporal trip factors obtained from the San Antonio area household survey. These temporal trip factors were provided by SA-BC MPO.

The regional model future year (2035) traffic assignments were used to quantify the future corridor traffic demand along the IH 35 corridor and were influenced by several factors such as:

- Population and employment growth in the region;
- Additional new roadway capacity competing with the alternatives being studied herein;
- Highway improvements to other freeways in the region providing accessibility to the corridor; and
- Changes to the project corridor ramp configurations as part of the study alternatives.

3.3 Model Calibration

The traffic count data collected in 2011 for the Loop 1604 and US 281 Traffic and Toll Revenue study and in 2012 for the IH 35 PEL study, along with the count data obtained from TxDOT was extracted and summarized for each respective count location. This traffic data was then used to validate the model outputs for the overall region as well as along the IH 35 corridor. The total corridor traffic trends were analyzed and the base year model outputs were then compared with the current traffic characteristics within the IH 35 corridor.

3.3.1 Assignment Calibration

Table 3-1 lists the ratios of the model-estimated and observed vehicle-miles-traveled (VMT) along links categorized by area-type (AT) and facility-type (FT) for the daily traffic. **Table 3-2** shows the number of (one-way) model links where traffic counts observations were made for each area-type and facility-type category. The table shows that on a 24-hour basis for each of the overall area-type (column totals) and facility-type (row totals) categories, the model-estimated VMT was within ten percent of the observed VMT except for other freeways , minor arterials and frontage roads categories which had a ratio of 1.13, 0.89 and 0.68 respectively. The overall estimated VMT for the model was within one percent of the observed VMT.

Table 3-1: Observed and Model Estimated VMT Ratios

AT\FT	Interstate Highways	Other Freeways	Expressways	Principal Arterials	Minor Arterials	Collectors	Frontage Roads	Ramps	ALL
CBD	1.05			0.69	1.16	1.42	0.85		1.08
CBD Fringe	1.04	1.06		0.93	0.81	0.95	0.66	1.37	0.95
Urban	1.07	1.18	0.90	1.02	0.94	0.94	0.77	0.91	1.03
Suburban	1.07	1.09	0.93	0.97	0.96	0.72	0.67	0.95	1.00
Rural	1.23		2.14	1.22	0.74	1.18	0.20		1.08
ALL	1.09	1.13	0.98	0.97	0.89	0.92	0.68	0.94	1.01

Table 3-2: Number of One-way Links with Observed Counts

AT\FT	Interstate Highways	Other Freeways	Expressways	Principal Arterials	Minor Arterials	Collectors	Frontage Roads	Ramps	ALL
CBD	6			2	6	12	1		27
CBD Fringe	28	8		54	119	58	20	1	288
Urban	48	26	6	38	167	135	34	72	526
Suburban	34	18	12	36	92	110	16	33	351
Rural	24		2	6	32	110	11		185
ALL	140	52	20	136	416	425	82	106	1377

Table 3-3 shows the observed and assigned daily traffic volumes at six locations along the IH 35 corridor. As shown in the table, in most cases the model assigned volumes matched reasonably well with the observed IH 35 traffic. Based on the model assignment results presented in **Table 3-1** and **3-3**, the model calibration for the region as well as the project corridor was deemed to be reasonable for this level of planning study.

Table 3-3: Observed and Model Assigned Volumes along IH 35

Direction	Location	Observed Count	Assigned Volume	Percent Difference
NB	West of New Braunfels Ave	73,200	83,100	13.5
SB	West of New Braunfels Ave	74,700	85,400	14.3
NB	North of Rittiman Rd	76,800	80,100	4.3
SB	North of Rittiman Rd	82,700	77,500	-6.3
NB	At Thousand Oaks Dr	94,800	83,300	-12.1
SB	At Thousand Oaks Dr	108,800	94,800	-12.9
NB	South of Loop 1604	72,700	78,400	7.8
SB	South of Loop 1604	70,400	65,500	-7.0
NB	North of Loop 1604	74,400	74,200	-0.3
SB	North of Loop 1604	76,000	76,200	0.3
NB	South of FM 1103	53,100	54,700	3.0
SB	South of FM 1103	55,400	55,600	0.4

3.3.2 Calibration of Network Speeds

In addition to the calibration of the model link volumes, the model results were also reviewed to confirm that the congested travel speeds predicted by the model along the IH 35 corridor were reasonable. **Table 3-4** through **3-6** show a comparison of the model estimated and observed speeds for four segments along the IH 35 corridor for AM peak period, Midday and the PM peak period respectively. The tables provide a range of observed speeds (minimum and maximum) and the estimated average travel speeds by the model along the IH 35 corridor.

Table 3-4 Observed and Model Estimated Average Speeds for the AM Peak Period

IH 35 Segment	Northbound			Southbound		
	Observed		Estimated	Observed		Estimated
	Minimum	Maximum		Minimum	Maximum	
US 281 to Rittiman Road	58.3	65.7	54.3	42.9	60.6	51.6
Rittman Road to IH 410	55.1	67.2	42.5	9.2	50.4	44.4
IH 410 to Loop 1604	59.7	67.3	61.9	11.9	52.4	40.0
Loop 1604 to FM 1103	62.1	67.8	57.6	18.2	45.4	37.2

Table 3-5 Observed and Model Estimated Average Speeds for Midday Period

IH 35 Segment	Northbound			Southbound		
	Observed		Estimated	Observed		Estimated
	Minimum	Maximum		Minimum	Maximum	
US 281 to Rittiman Road	41.4	68.8	58.3	44.9	62.4	56.7
Rittiman Road to IH 410	19.7	67.4	51.5	29.1	67.2	56.5
IH 410 to Loop 1604	61.1	68.2	60.0	61.6	67.3	59.7
Loop 1604 to FM 1103	49.4	69.9	61.6	48.6	68.8	60.9

Table 3-6 Observed and Model Estimated Average Speeds for the PM Peak Period

IH 35 Segment	Northbound			Southbound		
	Observed		Estimated	Observed		Estimated
	Minimum	Maximum		Minimum	Maximum	
US 281 to Rittiman Road	28.3	61.8	50.7	55.3	66.4	51.8
Rittiman Road to IH 410	39.8	66.6	30.9	42.7	66.8	51.9
IH 410 to Loop 1604	48.4	67.2	41.1	58.2	65.6	58.3
Loop 1604 to FM 1103	47.7	66.0	41.0	43.8	71.1	57.4

In many cases, the model-estimated average speeds fell within the range of observed maximum and minimum values. The model estimated speeds for some of the segments were shown to differ significantly from the observed values, most notably in the northbound direction during the PM peak period. To some extent, these differences are attributed to the exact definitions of individual segments between the observed data and the corresponding model network.

Overall the level of calibration of travel speeds was deemed reasonable for a planning model which does not have the capability of modeling queue spillbacks and delays associated with weaving movements.

3.4 Market Share Model

Portions of the San Antonio MPO's long range plan contain toll facilities. Therefore, the market share model developed for the Loop 1604 and US 281 Traffic and Toll Revenue Study was used to properly model the wider traffic impacts of the proposed toll roads in the region along Loop 1604 and US 281.

It should be noted that all of the alternatives studied as part of this PEL study included non-tolled improvements along IH 35, and the above noted market share model is not applicable to the IH 35 corridor itself.

3.5 Additional Key Parameters

Value of Time (VOT) - The VOTs used in this study were based on an analysis of the responses provided in stated preference surveys conducted in the fall of 2011 as part of the Loop 1604 and US 281 Traffic and Toll Revenue Study.

No Tolls - The alternatives evaluated as part of this study did not include tolled lanes as part of any of the alternatives.

Vehicle Categories - The micro-model trip tables were separated into three components: SOV, HOV2+, and Trucks.

Vehicle Operating Costs - An average vehicle operating cost of 17.7 cents per mile for passenger vehicles in 2011 was used, based on information obtained from the American Automobile Association (AAA) and other sources regarding the typical vehicle operating costs per mile and inflated at a compounded annual growth rate of three percent. Average vehicle operating costs for trucks was assumed to be two and half times the cost of passenger vehicles (44.3 cents per mile in 2011) based on typical industry standards. Past studies have shown that these additional costs can play a role in travelers' route choice decisions.

Section 4 Results

The corridor-level model that resulted from the calibration process and is described in Section 3 was used to analyze the nine alternatives and the no-build scenario for the IH 35 PEL study. This analysis was conducted for the milestone analysis year of 2035.

It is not the intent of this analysis or this document to rank performance or make recommendations with regards to the alternatives. The results of the travel demand modeling are but one input to the IH 35 PEL decision making process. The results from the 2035 model runs for the AM peak period, Midday period and the PM peak period are summarized in **Table 4-1** through **Table 4-3** respectively.

Table 4-1: IH 35 PEL Traffic Summary - AM Peak Period for Year 2035

Alternative 1 & 6 Adding At-Grade / Depressed 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	134.3	45	27,600	566,773	12,656	28	106,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	132.7	64	13,000	269,765	4,209	19	106,300

Alternative 2 Maximize Lanes within Existing ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	84.6	25	20,200	415,489	16,848	50	92,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	89.2	61	12,600	261,271	4,303	20	94,800

Alternative 3 Maximize Lanes with Minimal Additional ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	96.4	30	22,900	470,641	15,682	41	98,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	93.5	62	12,800	265,580	4,305	20	97,800

Alternative 4 Adding Elevated 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.7	37	15,500	317,975	8,490	33	74,000
(FM 1103 to Pine Street)	Express Lanes	19.6	58.8	51	11,000	215,568	4,245	23	28,800
Northbound	Express Lanes	19.9	59.6	65	3,800	75,309	1,150	18	31,400
(Pine Street to FM 1103)	Main lanes	20.7	70.6	60	9,100	188,461	3,135	21	72,700

Alternative 5 Adding At-Grade & Partially Elevated 3 Lanes in each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	88.5	40	18,400	377,980	9,438	31	74,700
(FM 1103 to Pine Street)	Express Lanes	14.3	42.9	46	12,500	179,253	3,893	19	44,400
Northbound	Express Lanes	12.4	37.2	67	6,100	75,144	1,123	11	49,300
(Pine Street to FM 1103)	Main lanes	20.7	92.5	63	9,600	197,787	3,155	20	76,200

Alternative 7 Adding 3 Lanes Capacity in Each Direction on New Alignment	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	33	16,800	348,488	10,632	38	83,600
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	58	11,100	229,412	3,944	21	82,400

Alternative 8a Adding 3 Lanes Capacity in Each Direction on FM 2252	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	34	16,400	338,912	9,843	36	75,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	60	10,300	213,781	3,547	21	74,500

Alternative 8b Adding 3 Lanes Capacity in Each Direction on FM 1976	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	33	16,600	343,687	10,471	38	79,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	59	10,800	224,282	3,811	21	80,000

No-Build Alternative No Capacity Improvement	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.1	21	18,500	380,808	18,377	60	87,700
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	70.8	56	11,900	245,405	4,397	22	87,600

Table 4-2: IH 35 PEL Traffic Summary - Midday Period for Year 2035

Alternative 1 & 6 – Adding At-Grade / Depressed 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	134.3	63	36,600	753,209	11,928	20	106,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	132.7	64	33,200	686,222	10,778	19	106,300

Alternative 2 – Maximize Lanes within Existing ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	84.6	52	32,300	664,382	12,767	24	92,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	89.2	56	30,900	639,095	11,357	22	94,800

Alternative 3 – Maximize Lanes with Minimal Additional ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	96.4	57	34,600	711,149	12,427	22	98,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	93.5	59	31,900	659,722	11,259	21	97,800

Alternative 4 – Adding Elevated 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.7	58	24,900	511,318	8,814	21	74,000
(FM 1103 to Pine Street)	Express Lanes	19.6	58.8	65	10,000	196,929	3,031	18	28,800
Northbound	Express Lanes	19.9	59.6	65	9,200	182,890	2,804	18	31,400
(Pine Street to FM 1103)	Main lanes	20.7	70.6	59	22,900	472,576	8,011	21	72,700

Alternative 5 – Adding At-Grade & Partially Elevated 3 Lanes in each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	88.5	61	25,900	532,787	8,744	20	74,700
(FM 1103 to Pine Street)	Express Lanes	14.3	42.9	65	15,100	216,400	3,310	13	44,400
Northbound	Express Lanes	12.4	37.2	66	15,500	192,848	2,915	11	49,300
(Pine Street to FM 1103)	Main lanes	20.7	92.5	62	23,900	493,834	7,925	20	76,200

Alternative 7 – Adding 3 Lanes Capacity in Each Direction on New Alignment	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	52	29,000	599,364	11,435	24	83,600
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	55	26,900	557,774	10,177	23	82,400

Alternative 8a – Adding 3 Lanes Capacity in Each Direction on FM 2252	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	56	26,600	550,241	9,855	22	75,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	58	24,900	514,743	8,876	21	74,500

Alternative 8b – Adding 3 Lanes Capacity in Each Direction on FM 1976	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	54	27,400	568,083	10,438	23	79,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	55	26,600	550,623	9,999	23	80,000

No-Build – No Capacity Improvement	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Mid-day Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.1	48	30,600	629,415	13,042	26	87,700
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	70.8	52	28,700	592,541	11,462	24	87,600

Table 4-3: IH 35 PEL Traffic Summary - PM Peak Period for Year 2035

Alternative 1 & 6 Adding At-Grade / Depressed 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	134.3	64	22,400	460,112	7,242	19	106,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	132.7	41	38,900	803,448	19,475	30	106,300

Alternative 2 Maximize Lanes within Existing ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	84.6	54	20,100	412,312	7,705	23	92,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	89.2	24	30,000	621,188	26,352	53	94,800

Alternative 3 Maximize Lanes with Minimal Additional ROW	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	96.4	59	21,100	434,080	7,355	21	98,300
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	93.5	25	31,900	659,369	26,895	51	97,800

Alternative 4 Adding Elevated 3 Lanes in Each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.7	57	15,400	317,162	5,571	22	74,000
(FM 1103 to Pine Street)	Express Lanes	19.6	58.8	65	6,200	121,586	1,868	18	28,800
Northbound	Express Lanes	19.9	59.6	48	16,400	325,579	6,849	25	31,400
(Pine Street to FM 1103)	Main lanes	20.7	70.6	33	21,300	441,309	13,267	37	72,700

Alternative 5 Adding At-Grade & Partially Elevated 3 Lanes in each Direction	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	88.5	61	16,200	332,647	5,432	20	74,700
(FM 1103 to Pine Street)	Express Lanes	14.3	42.9	66	9,000	128,061	1,946	13	44,400
Northbound	Express Lanes	12.4	37.2	42	18,300	226,934	5,383	18	49,300
(Pine Street to FM 1103)	Main lanes	20.7	92.5	38	27,100	559,544	14,741	33	76,200

Alternative 7 Adding 3 Lanes Capacity in Each Direction on New Alignment	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	53	17,900	369,835	6,920	23	83,600
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	31	23,200	481,482	15,775	41	82,400

Alternative 8a Adding 3 Lanes Capacity in Each Direction on FM 2252	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	55	16,700	345,888	6,270	23	75,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	32	22,900	475,239	14,943	39	74,500

Alternative 8b Adding 3 Lanes Capacity in Each Direction on FM 1976	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
IH 35 Southbound	Main lanes	20.6	72.7	55	16,900	350,115	6,310	22	79,500
(FM 1103 to Pine Street)	Express Lanes								
IH 35 Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	71.0	31	23,000	475,303	15,299	40	80,000

No-Build No Capacity Improvement	Facility	Distance (mile)	Lane-miles (mile)	Average Speed (mph)	Average Peak Period Volume	Total Vehicle-miles	Total Vehicle-hours	Average Travel Time (min)	Average DAILY Volume
Southbound	Main lanes	20.6	72.1	48	18,900	389,071	8,030	25	87,700
(FM 1103 to Pine Street)	Express Lanes								
Northbound	Express Lanes								
(Pine Street to FM 1103)	Main lanes	20.7	70.8	20	25,800	534,421	27,361	64	87,600

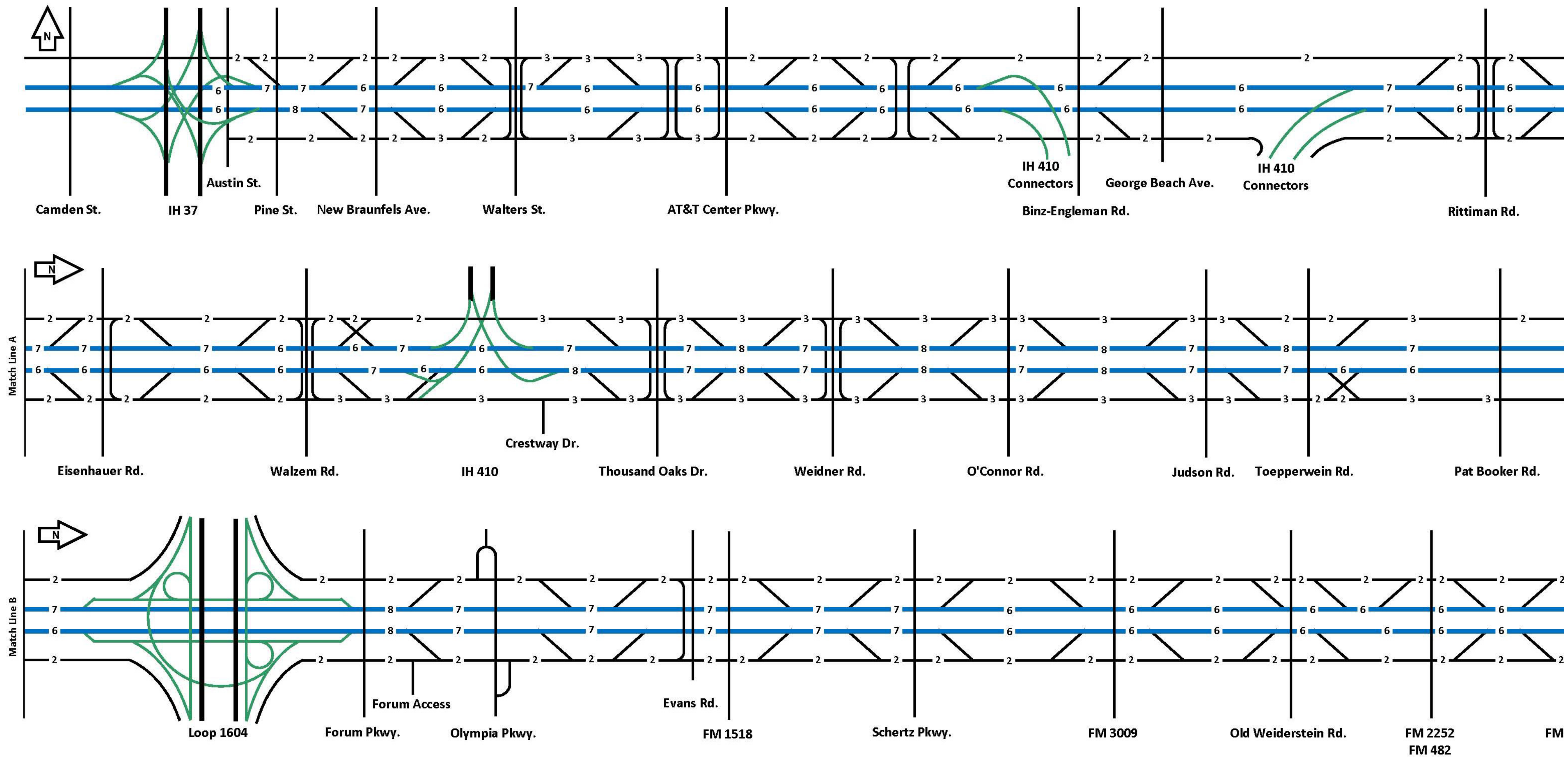
Appendix A

Line Diagrams for Six of the Nine Alternatives,

No-Build Alternative

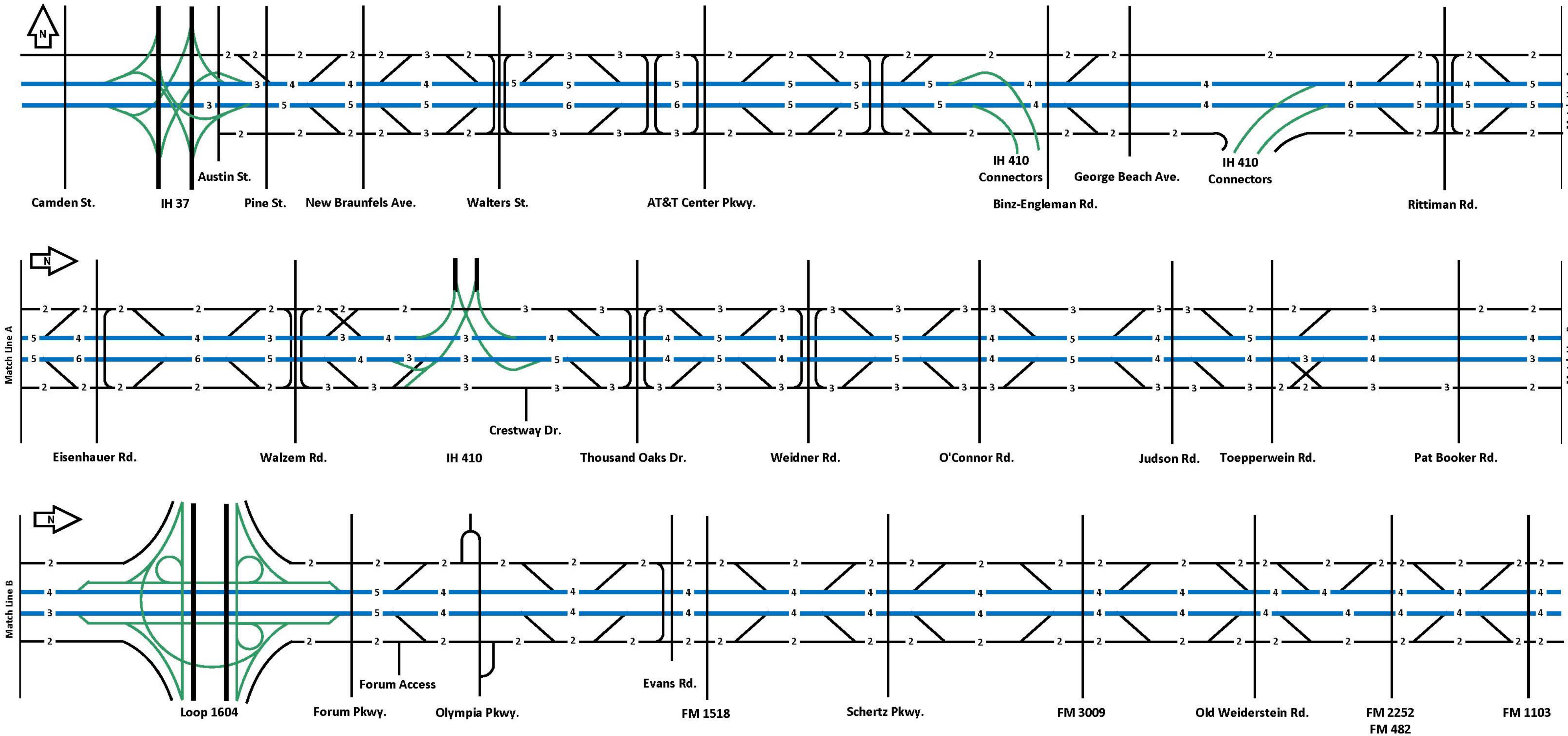
Historical Trend in Annual Average Daily Traffic

CDM Smith



- 0 General Purpose Lanes
- Major Cross Facilities
- 0 Arterials / Frontage Roads / Ramps
- Collector Distributors / Direct Connectors

Figure A-1: IH 35 Planning and Environmental Linkage Alternative – 1 & 6 Line Diagram



- General Purpose Lanes
- Major Cross Facilities
- Arterials / Frontage Roads / Ramps
- Collector Distributors / Direct Connectors

Figure A-2: IH 35 Planning and Environmental Linkage Alternative – 2 Line Diagram

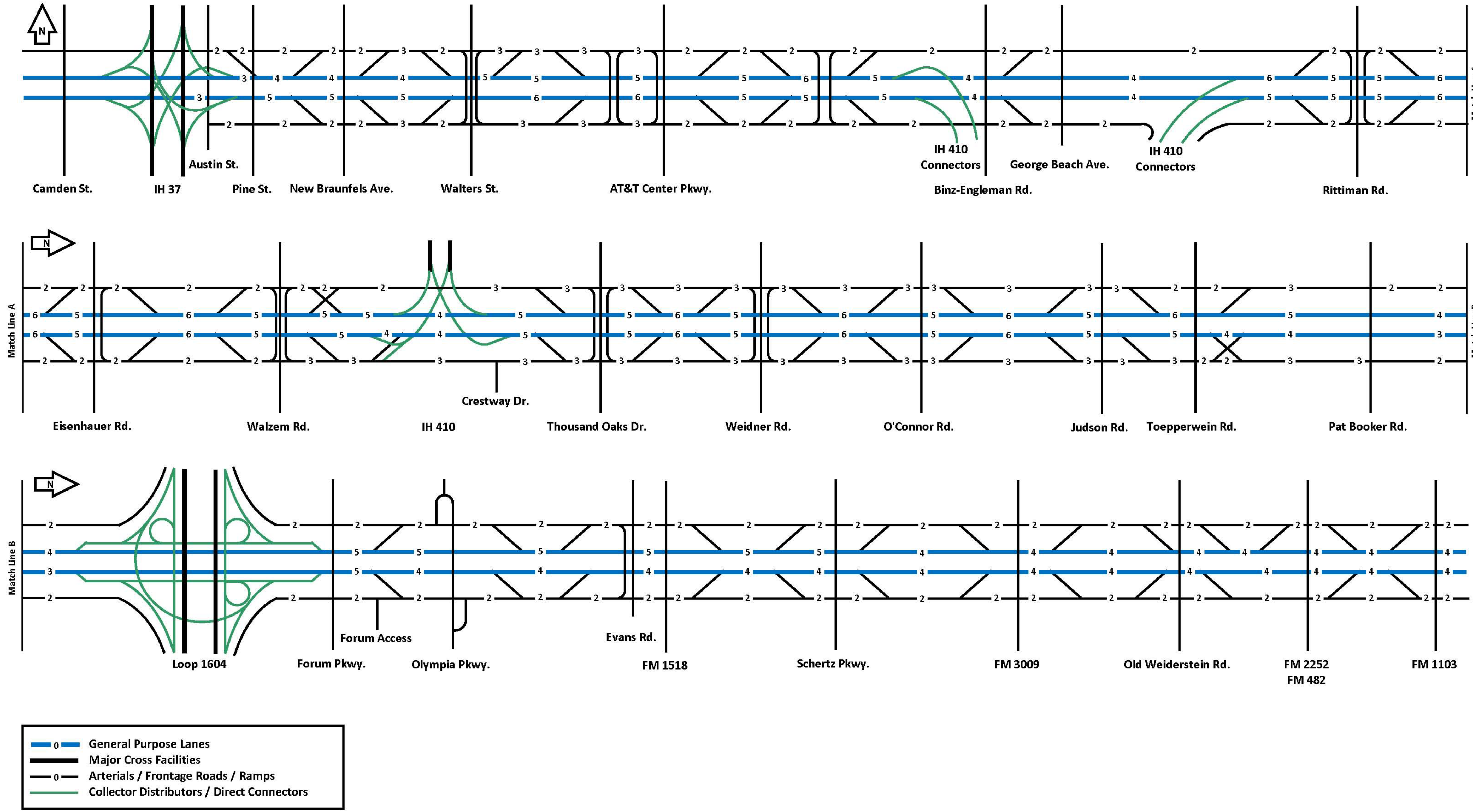


Figure A-3: IH Planning and Environmental Linkage Alternative – 3 Line Diagram

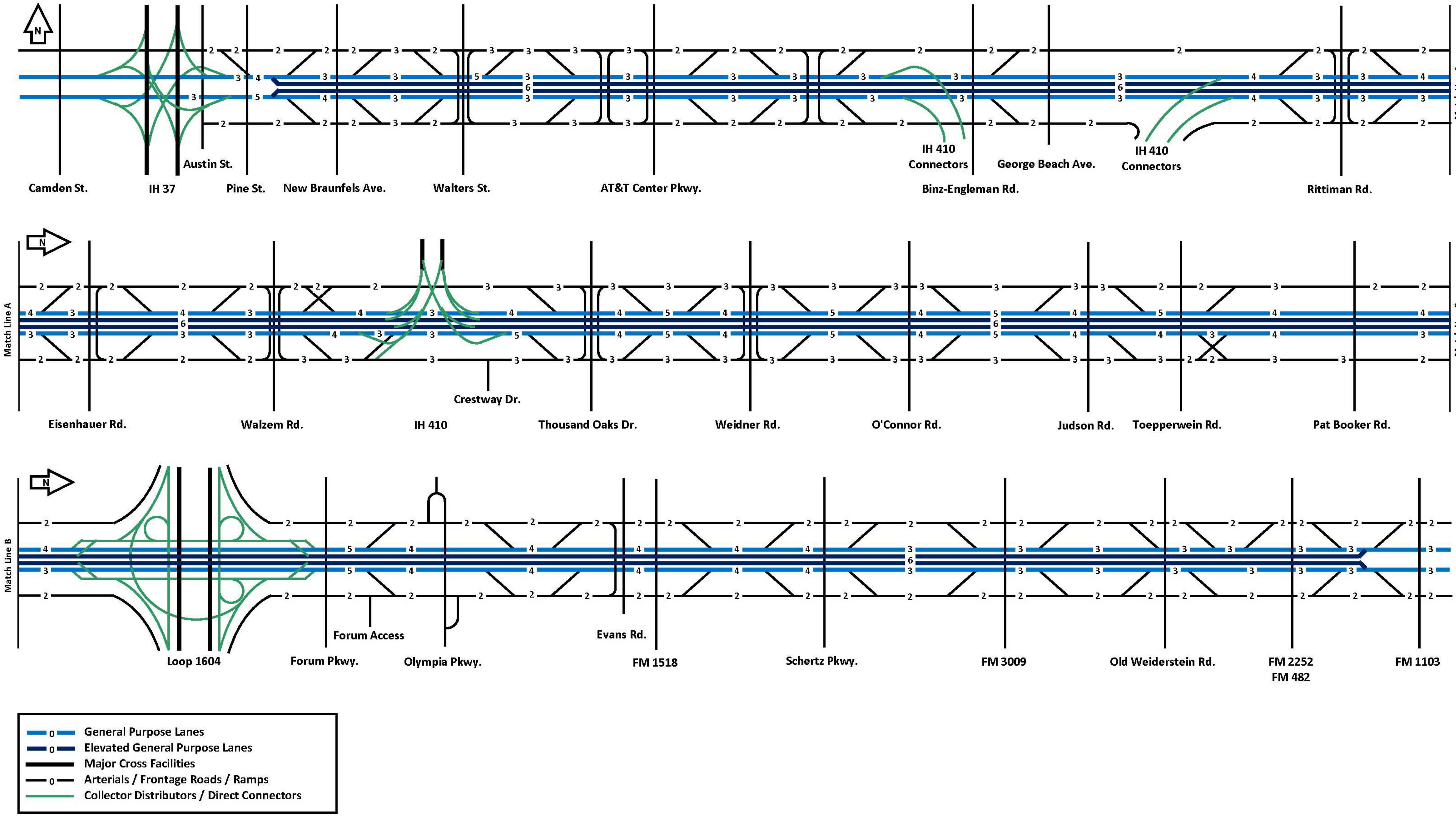


Figure A-4: IH 35 Planning and Environmental Linkage Alternative – 4 Line Diagram

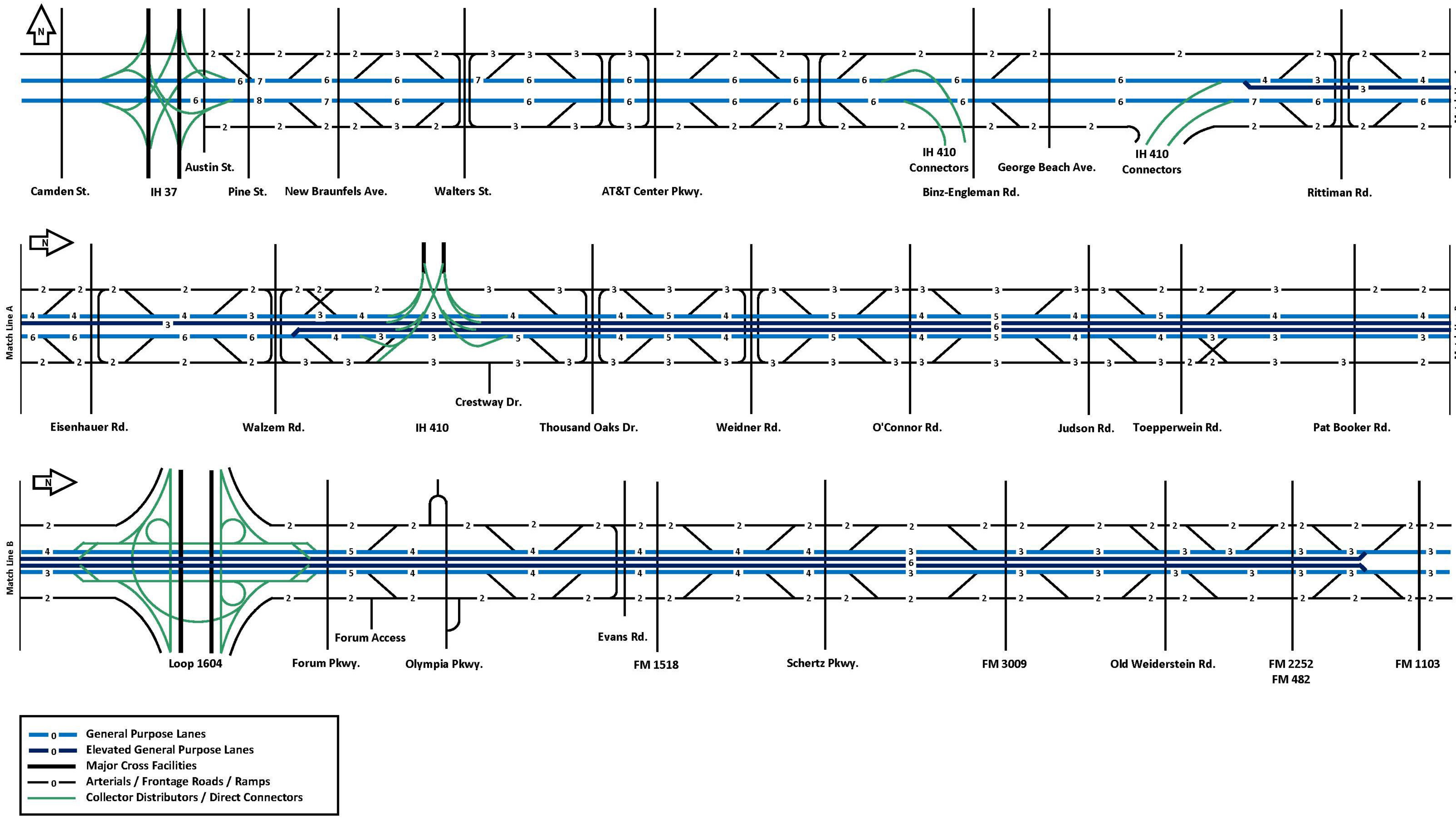


Figure A-5: IH 35 Planning and Environmental Linkage Alternative – 5 Line Diagram

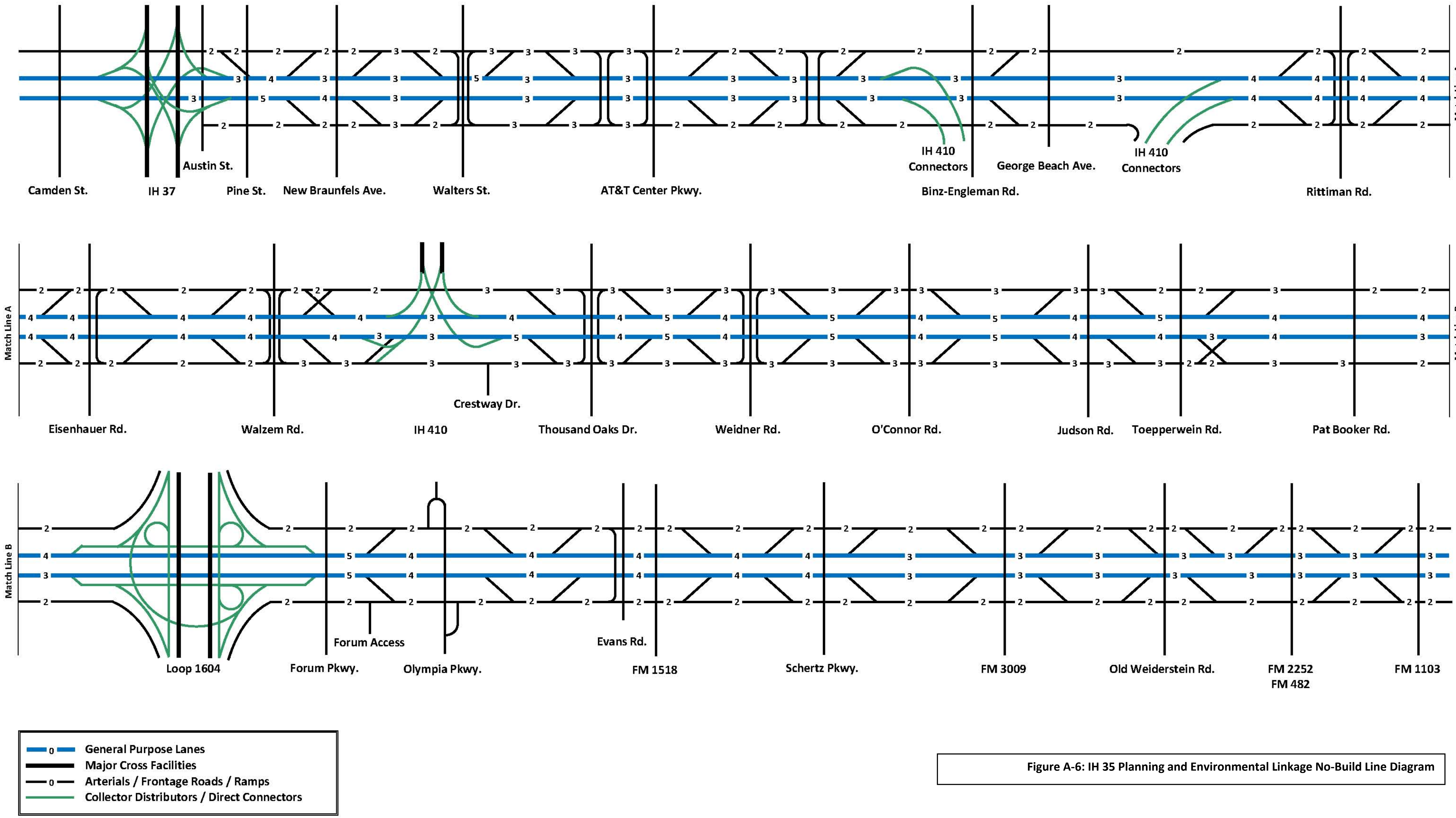
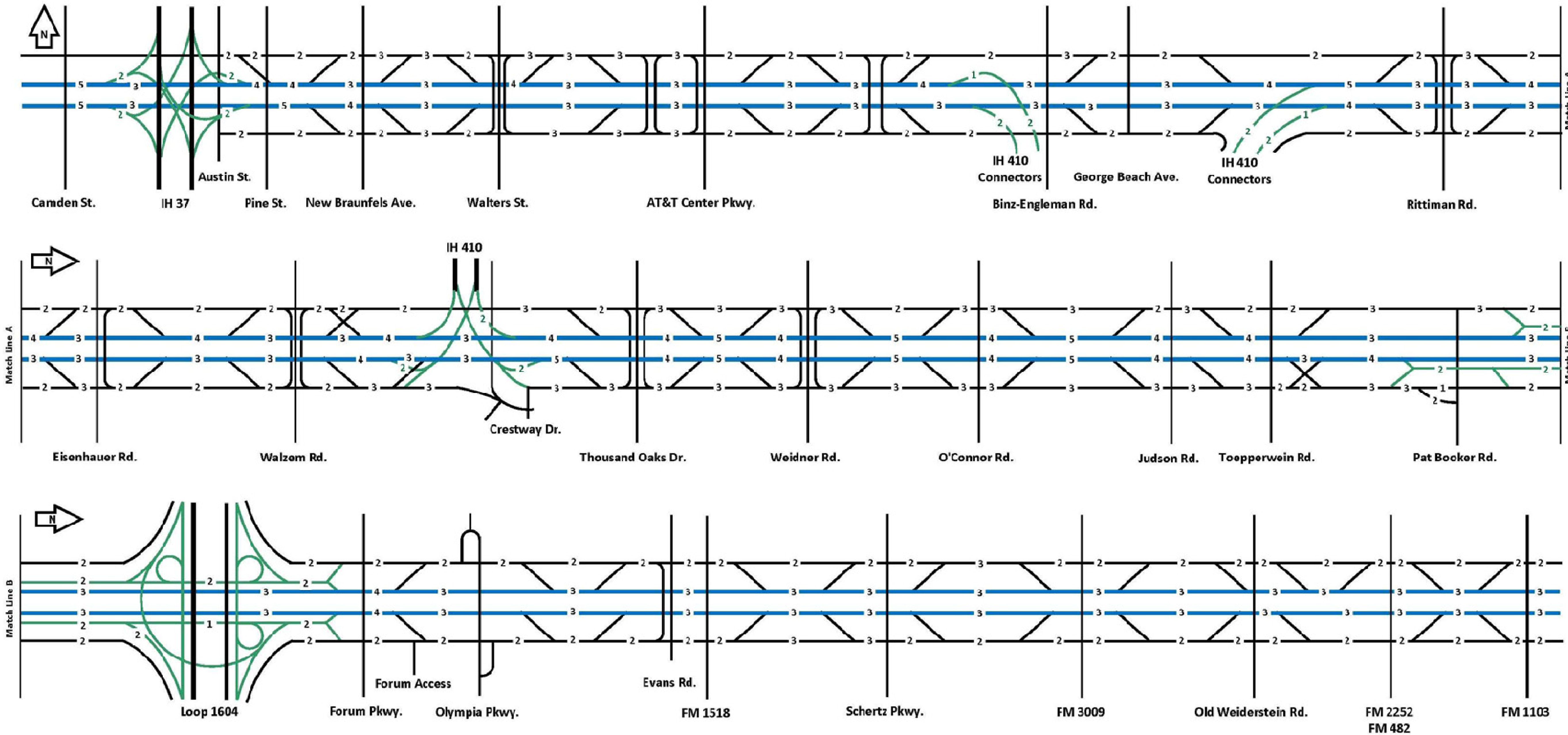


Figure A-6: IH 35 Planning and Environmental Linkage No-Build Line Diagram



0	General Purpose Lanes
	Major Cross Facilities
0	Arterials / Frontage Roads / Ramps
	Collector Distributors / Direct Connectors

Figure A-7: IH 35 Planning and Environmental Study - Existing Configuration

Table A-1: Historical Trend in Annual Average Daily Traffic

Facility	Location	Annual Average Daily Traffic						Average Annual Growth Rate			
		1990	1997	2000	2007	2009	2010	1990-2000	2000-2007	1997-2007	2007-2010
IH 35											
IH 35	North of FM 1103	43,000	58,000	72,000	85,000	86,000	104,000	5.3%	2.4%	3.9%	7.0%
IH 35	North of FM 482	44,000	61,000	73,000	90,000	94,000	113,000	5.2%	3.0%	4.0%	7.9%
IH 35	South of Comal County Line	0	0	0	95,000	99,000	113,000	N/A	N/A	N/A	6.0%
IH 35	South of FM 3009	0	0	0	125,000	117,000	149,000	N/A	N/A	N/A	6.0%
IH 35	South of Guadalupe County Line	53,000	77,000	105,000	139,000	130,000	159,000	7.1%	4.1%	6.1%	4.6%
IH 35	South of Loop 1604	58,000	83,000	107,000	155,000	141,000	150,000	6.3%	5.4%	6.4%	-1.1%
IH 35	South of Judson Road	98,000	125,000	141,000	186,000	173,000	182,000	3.7%	4.0%	4.1%	-0.7%
IH 35	North of SL 368	120,000	152,000	169,000	210,000	191,000	200,000	3.5%	3.2%	3.3%	-1.6%
IH 35	South of SL 368	111,000	144,000	161,000	184,000	199,000	182,000	3.8%	1.9%	2.5%	-0.4%
IH 35	South of FM 1976	115,000	148,000	162,000	179,000	181,000	176,000	3.5%	1.4%	1.9%	-0.6%
IH 35	South of Rittiman Road	127,000	162,000	169,000	185,000	193,000	181,000	2.9%	1.3%	1.3%	-0.7%
IH 35	North of WW White Road	75,000	103,000	108,000	113,000	118,000	107,000	3.7%	0.6%	0.9%	-1.8%
IH 35	Northeast of Coliseum	95,000	128,000	134,000	137,000	137,000	130,000	3.5%	0.3%	0.7%	-1.7%
IH 35	East of IH 37	111,000	150,000	159,000	158,000	152,000	151,000	3.7%	-0.1%	0.5%	-1.5%
IH 35	West of Ih 37	0	171,000	186,000	195,000	186,000	190,000	N/A	0.7%	1.3%	-0.9%
IH 35	South of SS 536	0	153,000	180,000	180,000	168,000	159,000	N/A	0.0%	1.6%	-4.1%
IH 35	South of US 90	92,000	136,000	159,000	151,000	141,000	135,000	5.6%	-0.7%	1.1%	-3.7%
IH 410											
IH 410	North of FM 78	55,000	59,000	65,000	73,000	69,000	76,000	1.7%	1.7%	2.2%	1.4%
IH 410	North of IH 10 East	52,000	62,000	69,000	83,000	70,000	80,000	2.9%	2.7%	3.0%	-1.2%
IH 410	South of IH 10 East	45,000	58,000	65,000	88,000	65,000	70,000	3.7%	4.4%	4.3%	-7.3%
IH 410	West of US 281	187,000	185,000	179,000	168,000	215,000	200,000	-0.4%	-0.9%	-1.0%	6.0%
IH 410	East of US 281	172,000	180,000	189,000	167,000	139,000	146,000	0.9%	-1.8%	-0.7%	-4.4%
IH 410	West of Nacogdoches Road	155,000	164,000	178,000	160,000	144,000	147,000	1.4%	-1.5%	-0.2%	-2.8%
IH 410	West of SL 368	103,000	120,000	125,000	122,000	126,000	118,000	2.0%	-0.3%	0.2%	-1.1%
IH 410	West of IH 35	109,000	123,000	127,000	139,000	137,000	119,000	1.5%	1.3%	1.2%	-5.0%
IH 10											
IH 10	East of IH 35	103,000	106,000	113,000	128,000	125,000	126,000	0.9%	1.8%	1.9%	-0.5%
IH 10	West of US 281	102,000	104,000	111,000	130,000	127,000	123,000	0.8%	2.3%	2.3%	-1.8%
IH 10	East of New Braunfels Avenue	66,000	78,000	82,000	95,000	82,000	85,000	2.2%	2.1%	2.0%	-3.6%
IH 10	North of Martin Luther King Drive	40,000	48,000	55,000	81,000	67,000	71,000	3.2%	5.7%	5.4%	-4.3%
IH 10	West of WW White Road	38,000	46,000	54,000	81,000	67,000	72,000	3.6%	6.0%	5.8%	-3.9%
IH 10	West of IH 410	36,000	45,000	52,000	78,000	65,000	72,000	3.7%	6.0%	5.7%	-2.6%
IH 10	East of IH 410	39,000	60,000	62,000	92,000	56,000	72,000	4.7%	5.8%	4.4%	-7.8%
IH 37											
IH 37	South of IH 35	139,000	125,000	131,000	129,000	129,000	129,000	-0.6%	-0.2%	0.3%	0.0%
IH 37	North of Cesar Chavez Boulevard	96,000	97,000	110,000	117,000	111,000	115,000	1.4%	0.9%	1.9%	-0.6%
IH 37	South of IH 10	84,000	92,000	104,000	119,000	111,000	104,000	2.2%	1.9%	2.6%	-4.4%
SL 368											
SL 368	South of IH 410	11,100	12,200	14,100	15,200	18,000	16,500	2.4%	1.1%	2.2%	2.8%
SL 368	West of Harry Wurzbach	17,900	17,200	20,000	22,000	18,200	22,000	1.1%	1.4%	2.5%	0.0%
SL 368	South of Austin Hwy	21,000	24,000	27,000	31,000	26,000	28,000	2.5%	2.0%	2.6%	-3.3%
SL 368	South of Mulberry Avenue	19,200	22,000	20,000	22,000	19,900	21,000	0.4%	1.4%	0.0%	-1.5%
US 281											
US 281	North of IH 410	51,000	79,000	93,000	118,000	103,000	77,000	6.2%	3.5%	4.1%	-13.3%
US 281	South of IH 410	54,000	71,000	75,000	102,000	114,000	81,000	3.3%	4.5%	3.7%	-7.4%
US 281	South of Sunset Road	85,000	108,000	112,000	133,000	122,000	125,000	2.8%	2.5%	2.1%	-2.0%
US 281	North of Basse Road	85,000	107,000	106,000	128,000	113,000	119,000	2.2%	2.7%	1.8%	-2.4%
US 281	North of Hildebrand Avenue	103,000	122,000	128,000	147,000	134,000	138,000	2.2%	2.0%	1.9%	-2.1%
FM 78											
FM 78	West of IH 410	16,300	15,100	15,100	16,200	8,000	16,700	-0.8%	1.0%	0.7%	1.0%
FM 78	East of IH 410	17,600	22,000	23,000	27,000	21,000	25,000	2.7%	2.3%	2.1%	-2.5%
FM 78	West of Summer Fest Drive	12,100	13,400	19,200	21,000	16,200	19,700	4.7%	1.3%	4.6%	-2.1%
FM 78	East of Foster Road	14,500	20,000	23,000	28,000	28,000	30,000	4.7%	2.9%	3.4%	2.3%
FM 78	North of Upper Seguin Road	11,700	15,900	21,000	26,000	28,000	13,300	6.0%	3.1%	5.0%	-20.0%
FM 78	North of Legion Drive E	10,400	12,900	17,600	21,000	19,400	11,500	5.4%	2.6%	5.0%	-18.2%
FM 78	East of Loop 1604	21,000	21,000	22,000	22,000	21,000	13,600	0.5%	0.0%	0.5%	-14.8%
FM 78	East of FM 1518	13,500	14,700	14,500	22,000	25,000	26,000	0.7%	6.1%	4.1%	5.7%
FM 78	West of Mill Street	17,500	15,800	15,200	21,000	24,000	27,000	-1.4%	4.7%	2.9%	8.7%
FM 78	West of FM 3009	13,100	15,000	15,300	20,000	22,000	26,000	1.6%	3.9%	2.9%	9.1%
FM 78	East of FM 3009	10,700	12,900	12,900	15,800	17,100	18,200	1.9%	2.9%	2.0%	4.8%
FM 78	East of FM 1103	6,800	8,300	8,900	9,300	9,400	9,200	2.7%	0.6%	1.1%	-0.4%
FM 2252											
FM 2252	North of IH 410	46,000	45,000	37,000	41,000	33,000	33,000	-2.2%	1.5%	-0.9%	-7.0%
FM 2252	North of Wurzbach Parkway	26,000	34,000	26,000	24,000	21,000	21,000	0.0%	-1.1%	-3.4%	-4.4%
FM 2252	West of O'Connor Road	30,000	39,000	32,000	32,000	30,000	31,000	0.6%	0.0%	-2.0%	-1.1%
FM 2252	East of Toepperwein Road	7,500	16,200	16,700	18,800	18,500	18,700	8.3%	1.7%	1.5%	-0.2%
FM 2252	East of Loop 1604	5,800	15,000	16,100	24,000	16,800	20,000	10.7%	5.9%	4.8%	-5.9%
FM 2252	East of Marbach Lane	4,400	6,700	8,000	12,100	11,500	12,900	6.2%	6.1%	6.1%	2.2%
FM 2252	West of Natural Bridge Caverns Road	3,100	6,000	7,000	8,900	8,800	10,000	8.5%	3.5%	4.0%	4.0%
Loop 1604											
SL 1604	North of Nacogdoches Road	15,800	44,000	53,000	78,000	76,000	70,000	12.9%	5.7%	5.9%	-3.5%
SL 1604	South of Nacogdoches Road	20,000	48,000	61,000	86,000	85,000	78,000	11.8%	5.0%	6.0%	-3.2%
SL 1604	North of IH 35	21,000	49,000	61,000	85,000	88,000	81,000	11.3%	4.9%	5.7%	-1.6%
SL 1604	South of IH 35	19,800	39,000	68,000	72,000	31,000	65,000	13.1%	0.8%	6.3%	-3.4%
SL 1604	South of Pat Booker Road	18,300	37,000	50,000	63,000	75,000	56,000	10.6%	3.4%	5.5%	-3.9%
SL 1604	South of Kitty Hawk Road	18,300	30,000	38,000	28,000	49,000	48,000	7.6%	-4.3%	-0.7%	19.7%
SL 1604	South of FM 78	9,400	16,100	21,000	30,000	27,000	26,000	8.4%	5.2%	6.4%	-4.7%
FM 3009											
FM 3009	North of FM 2252	3,200	4,300	6,300	10,300	11,300	12,200	7.0%	7.3%	9.1%	5.8%
FM 3009	North of IH 35	4,500	7,000	11,200	20,000	28,000	26,000	9.5%	8.6%	11.1%	9.1%
FM 3009	South of IH 35	9,100	15,100	23,000	27,000	28,000	27,000	9.7%	2.3%	6.0%	0.0%
FM 3009	South of Green Valley Road	8,700	14,700	21,000	27,000	28,000	28,000	9.2%	3.7%	6.3%	1.2%
FM 3009	North of FM 78	7,200	11,100	12,600	16,700	16,900	17,700	5.8%	4.1%	4.2%	2.0%
FM 1103											
FM 1103	South of IH 35	2,600	4,100	4,000	6,500	10,600	10,800	4.4%	7.2%	4.7%	18.4%
FM 1103	North of Weil Road	1,950	2,500	2,500	5,100	8,200	8,600	2.5%	10.7%	7.4%	19.0%
FM 1103	North of FM 78	3,400	3,800	3,800	6,600	8,900	9,500	1.1%	8.2%	5.7%	12.9%

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