

3. ALTERNATIVES ANALYSIS

As described in the following sections, preliminary concepts were developed and screened. Following three rounds of screening, the remaining concepts were developed into alternatives and were then carried forward for further evaluation in subsequent sections of this DEIS.

3.1 Preliminary Concept Development

In addition to the *No Build Alternative* and a previously developed alternative (the 2007 Alternative), concepts were developed based on stakeholder and public input gathered during a series of public meetings and workshops. The preliminary concepts included five concepts adding new highway facilities, one parkway concept, two minimal intersection improvement projects, Transportation System Management, and Travel Demand Management. Two localized design options, which could be added to many of the concepts, were also explored during the initial screening to see if they benefitted the project: Option 1 and Option 2.

3.1.1 Concept A—US 290 Depressed Mainlanes

Concept A is a conventional controlled-access highway with frontage roads. In this concept, the westbound US 290 frontage road west of William Cannon Drive is located on the north side of Williamson Creek. The mainlanes of US 290 are depressed under SH 71 and direct connector ramps are present at the “Y.” There is a single-point flying-T intersection for the frontage roads at the “Y.”

3.1.2 Concept B—US 290 Mainlanes North of Williamson Creek Without Direct Connectors

Concept B was a conventional controlled-access highway with frontage roads. With this concept, the east and westbound mainlanes of US 290 west of William Cannon Drive were positioned on the north side of Williamson Creek, and the frontage roads for US 290 between William Cannon Drive and the “Y” were positioned along the existing US 290 corridor. A CFI was constructed at William Cannon Drive and US 290 as part of the interim intersection improvements. Under Concept B, this CFI would remain. A single-point flying-T intersection would handle the frontage roads at the “Y” and no direct connector ramps would connect US 290 and SH 71 at the “Y.”

3.1.3 Concept C—US 290 Mainlanes North of Williamson Creek With Direct Connectors

Concept C involves the same components of Concept B: a controlled-access highway with frontage roads where the mainlanes of US 290 west of William Cannon Drive are on the north side of Williamson Creek and the US 290 frontage roads are in the existing US 290 corridor. However, with Concept C, direct connector ramps are proposed at the “Y” to connect US 290 and SH 71.

3.1.4 Concept D—US 290 Express Lanes With Frontage Roads

Concept D included express lanes along US 290 from MoPac to the west end of the project, with frontage roads. There would be two express lanes in each direction constructed in the center of what would ultimately be a controlled-access facility. Access to the express lanes was limited to each end and possibly one other location for special use such as access for the Capital Metro Transportation Authority’s (Capital Metro’s) new park and ride, ACC, and Seton Southwest Hospital near RM 1826/Convict Hill Road. With Concept D, express lanes were grade separated from the crossing streets and a single-point flying-T intersection was proposed for the frontage roads at the “Y.”

3.1.5 Concept E-1—Improvements at William Cannon Drive and SH 71

Concept E-1 involved only minimum improvements. This concept focused on providing US 290 grade separations at William Cannon Drive and improvements for SH 71. This concept did not involve any other improvements within the project corridor and did not add capacity.

3.1.6 Concept E-2—Grade Separations at William Cannon Drive Only

Concept E-2 involved only minimum improvements. This concept focused on providing US 290 grade separations at William Cannon Drive only. This concept did not involve any other improvements within the project corridor and did not add capacity.

3.1.7 Concept F—Parkway Concept

Concept F was a parkway concept which was developed through a series of meetings during 2013–2014 with the Fix290 community group. The concept was a parkway facility with non-continuous frontage roads and an at-grade intersection at SH 71.

3.1.8 2007 Alternative

In 2007, TxDOT participated in a mediation process to seek and find a consensus-developed roadway design for US 290/SH 71 through Oak Hill. In addition to TxDOT, participant groups in the mediation included Fix290, Consensus 290, OHAN, and OHBPA. During the mediation, three of the four community groups developed general support for the TxDOT non-parkway facility option (now referred to as “the 2007 Alternative”) while the Fix290 group was strongly committed to their position that a smaller, at-grade parkway option was the only viable and acceptable solution for the project corridor. The 2007 Alternative was developed as a conventional highway with frontage roads and direct connectors elevated over mainlane bridges at the “Y” in Oak Hill. The 2007 Alternative had project limits extending from Scenic Brook Drive to Joe Tanner Lane.

3.1.9 Transportation System Management (TSM)

Transportation system management (TSM) is a set of low-cost (non-capital-intensive) strategies to enhance safety, reduce congestion, and improve traffic flow. Specific strategies include traffic signal synchronization, freeway operations improvements (changeable

message signs and ramp metering), and incident management (clearing accidents and breakdowns quickly to allow traffic to move more smoothly). Other methods can include bus pullouts (to remove stopped buses from the traffic stream), intersection improvements (signal priority for transit vehicles), and queue jumper lanes (to get transit vehicles to the front of the line at intersections).

TSM would not increase the overall capacity of US 290 or SH 71, although it would address some access/egress issues and other minor safety and operational issues. TSM could be incorporated as an enhancement into any build concept.

3.1.10 Transportation Demand Management (TDM)

Transportation demand management (TDM) includes managing or decreasing the demand for auto-related travel to increase the operating efficiency of transportation facilities. Managing or decreasing the demand for auto-related travel can be accomplished by providing alternatives to single-occupant vehicles (transit, carpool, vanpool, bicycle), incentives/disincentives to single-occupant vehicles (congestion pricing, high-occupancy vehicle [HOV] lanes, travel time advantages for HOVs), alternative work environments (telecommuting and flex time), and parking management.

This concept would not increase the overall capacity of US 290 and SH 71, though it would address some issues associated with access/egress and other minor safety and operational issues. TDM could be incorporated as an enhancement in any of the build concepts.

3.1.11 Localized Design Options

3.1.11.1 Option 1

Option 1 included extending the mainlane through Circle Drive with the transition past Circle Drive. This option could be added to Concepts A through D and Concept F.

3.1.11.2 Option 2

Option 2 involved providing a westbound US 290 exit ramp to RM 1826 that is braided with an entrance from SH 71. This option would provide better access for ACC and could be added to Concepts A, B, C, and F.

3.2 Public Response to Preliminary Concepts

There were several opportunities for public participation following project initiation in November 2012 including a project scoping open house and several workgroup meetings on topics including environmental constraints, bike and pedestrian improvements, and design concepts. Feedback gathered in May 2013 at a design concept preview meeting held during Open House #2 and at an online Virtual Open House was used to further develop and refine the concepts described above. The concepts were then presented during an open house on October 22, 2013, along with a community survey garnering public opinion about the proposed concepts.

3.3 Screening Evaluation Criteria

The concepts and design options described in the sections above were presented during Open House #3 held on October 22, 2013. Additionally, draft primary and secondary evaluation screening criteria were also presented to the public for their comment during this open house. According to the community survey results gathered during this open house, approximately 64 percent of respondents agreed or strongly agreed that the process for evaluating the concepts was appropriate and 59 percent of the respondents agreed or strongly agreed that the evaluation criteria for the project were appropriate. Approximately 11 percent and 16 percent of respondents disagreed or strongly disagreed with the concept evaluation process and the evaluation criteria, respectively.

3.3.1 Phase 1 Screening

The Phase 1 Evaluation Criteria were focused on whether or not a concept met the project's purpose and need as described in **Section 2**, which involved three major performance criteria: (1) improve mobility and operational efficiency, (2) increase multimodal travel options for people and goods, and (3) improve safety and emergency response. The concepts were evaluated using the Phase 1 evaluation criteria in December 2013. Four of the concepts were eliminated from further study because they did not meet the project's purpose and need. These included Concept E-1 and Concept E-2, which were minimal construction options focusing primarily on providing grade separation and improvements to the William Cannon Drive intersection, and the TSM and TDM concepts. As stand-alone concepts, they would neither add capacity nor provide improvements throughout the corridor to address the project's purpose and need. Moreover, during the public involvement process, Options 1 and 2, the localized design options, were suggested. These are options that can be included with several of the concepts, but do not constitute an entire concept on their own. They were not carried forward into Phase 2 screening.

3.3.2 Phase 2 Screening

The Phase 2 Evaluation Criteria focused on the six concepts remaining after the Phase 1 evaluation was completed (Concepts A, B, C, D, and F, and the 2007 Alternative) and the *No Build Alternative* and assessed how well each concept met the project's purpose and need utilizing detailed traffic modeling techniques. Phase 2 also evaluated some quantifiable impacts such as the number of residential and commercial displacements, impacts on transit, and access modifications for each concept. The criteria evaluated during Phase 2 included:

- Improve mobility and operational efficiency: Traffic studies were performed using the CAMPO regional traffic demand model as the basis for determining the project traffic volumes for the design year (2040). Travel times along the mainlanes of US 290 and SH 71 mainlanes and frontage roads were calculated using CORSIM and SYNCHRO modeling software.

- Increase multimodal travel options for people and goods: The concepts were evaluated on their ability to provide the opportunity for multimodal travel options, enhancing transportation of people and goods. The evaluated measures included the ability to add sidewalks, add bike/pedestrian elements, provide the opportunity for high capacity transit in the corridor, and provide the opportunity for local bus service to utilize the corridor.
- Improve safety and emergency response: Each concept was evaluated on its ability to correct geometric deficiencies, upgrade the facility to current standards, serve as a reliable route for emergency response organizations, and provide detours during accidents.
- Potential displacements: The number of residential and commercial displacements required for each concept was determined.
- Preliminary project cost: Preliminary construction costs, right-of-way acreage, right-of-way cost, and utility relocation effort was determined for each of the concepts.

The concepts were screened using the Phase 2 evaluation criteria in June 2014. The results narrowed the remaining concepts from seven to two *Build Alternative* concepts plus the *No Build Alternative* to be carried forward into schematic development and environmental evaluation, as shown on **Table 3-1**. Results of the Phase 2 screening included:

- Concept B was determined to be essentially an interim version of Concept C (same concept without direct connectors) and thus was eliminated from consideration as a stand-alone alternative.
- Concept D was determined to be substantially less effective in reducing travel times than other options and thus was eliminated from further consideration.
- One concept, developed collaboratively with a local citizens group (Concept F), would involve construction of a parkway-type facility, including discontinuous frontage roads and an at-grade intersection at SH 71. This concept would not provide acceptable local connectivity or serve as a reliable route for emergency responders due to the lack of continuous frontage roads. It would also require seven commercial displacements, while the others would avoid those displacements. Based on these factors it was determined that Concept F would not meet the project's purpose and need and would not be carried forward.
- The 2007 Alternative was determined to be substantially less effective in reducing travel times than other concepts due to its failure to extend past Circle Drive and was unpopular with many members of the public due to its three-level interchange at SH 71.

Table 3-1. Concept Screening Decision Results

Concept	Phase I Screening	Phase II Screening	Moving Forward for Detailed Analysis
Concept A	Carried forward	One of two concepts that best meets all aspects of the Project's Purpose and Need. Carried forward.	Yes
Concept B	Carried forward	Concept B is a subset of Concept C without a provision for direct connectors at the "Y." The ultimate concept (Concept C) would be analyzed and see if traffic warrants direct connector ramps. Did not move forward.	No
Concept C	Carried forward	One of two concepts that best meets all aspects of the Project's Purpose and Need—Carried forward.	Yes
Concept D	Carried forward	Does not provide the desired mobility improvements. Did not move forward.	No
Concept E-1	Did not meet the Project's Purpose and Need—Did not move forward	--	No
Concept E-2	Did not meet the Project's Purpose and Need—Did not move forward	--	No
Concept F	Carried forward	Does not adequately satisfy the safety and mobility aspects of the Purpose and Need. Did not move forward.	No
2007 Alternative	Carried forward	Does not provide the desired mobility improvements. Did not move forward.	No
TSM	Did not meet the Project's Purpose and Need—Did not move forward	--	No
TDM	Did not meet the Project's Purpose and Need—Did not move forward	--	No
No Build Alternative	Per NEPA Regulations the <i>No Build Alternative</i> would be analyzed in the EIS	Per NEPA Regulations the <i>No Build Alternative</i> would be analyzed in the EIS.	Yes—Per NEPA Regulations the <i>No Build Alternative</i> would be analyzed in the EIS

Source: Project Team, 2017

Concepts A and C remained following the Phase 2 screening. These concepts have been developed into Alternatives (*Alternatives A* and *C*). They were carried forward to the Phase 3 Screening and are evaluated to an equivalent level of detail in this DEIS, along with the *No Build Alternative*.

3.3.3 Phase 3 Screening

A third set of criteria was developed in order to evaluate *Alternatives A* and *C* (and the *No Build Alternative*), which were carried forward from the Phase 2 screening. This phase included an analysis of human and natural impacts using quantifiable data where possible for each criterion (**Table 3-2**). Noise, air, community, cultural resources, aesthetics, water resources, threatened and endangered species, vegetation and visual impacts were each analyzed under *Alternatives A* and *C*. Additionally, the Phase 3 screening analyzed the mobility and operational efficiency of *Alternatives A* and *C* according to 2040 traffic data (up from 2035 used in the Phase 2 screening). Performance measures, criteria, and evaluation parameters are summarized below.

- **Improve Mobility and Operational Efficiency:** Traffic studies were performed for *Alternatives A* and *C* and the *No Build Alternative*. The CAMPO regional traffic demand model was used as the basis for determining the project traffic volumes for the design year (2040). Travel times along the mainlanes of US 290 and SH 71 mainlanes and frontage roads were calculated using CORSIM and SYNCHRO modeling software. Additionally, the at-grade crossings of the shared-use path and streets were documented.
- **Potential Property Impacts:** The number of residential and commercial displacements and the total length of control of access to be purchased were determined for each alternative.
- **Potential Air and Noise Impacts:** Average noise levels by decibel, number of potential noise impacts, and average decibel increase for residents were calculated. Air quality was assessed by analyzing MSAT and CO impacts for each alternative.
- **Potential Natural Resources Impacts:** Water resources were analyzed by comparing acres of additional impervious cover, acres of floodplain within the proposed right-of-way, acres of wetland impacted, and other criteria. Threatened and endangered species were analyzed by comparing the acres of potential habitat for songbirds within the right-of-way, the presence or absence of karst species within the right-of-way, and the potential to improve water quality and thus minimize impacts to salamander species.
- **Potential Cultural Resources Impacts:** The number of eligible historic, recorded archeological, and Section 4(f)/6(f) resources were analyzed for each alternative.
- **Potential Vegetation Impacts:** Acres of riparian woodlands to be removed and the number of large trees to be removed were analyzed for each alternative.
- **Potential Socioeconomic Impacts:** Community impacts were assessed by comparing the number of environmental justice (EJ) communities with disproportionate impacts for each alternative, as well as determining where the greatest changes in access would occur (in length).

- Potential Aesthetic and Visual Impacts: Aesthetic and visual impacts were assessed by comparing proposed elevated structures (in linear feet), the acreage of disturbance or restoration proposed at Williamson Creek, and the volume of concrete bridges and culverts that would be removed within the floodplain (in cubic yards).
- Preliminary Project Cost: Preliminary construction costs, right-of-way acreage, right-of-way cost, and utility relocation effort were determined for each alternative.

Table 3-2. Phase 3 Screening Evaluation Table

Key: Deciding Parameters, Better +, Worse -, No Difference						
Performance Measures	Criterion	Evaluation Parameters	Evaluation Parameters (Units)	Alternative A	Alternative C	No Build Alternative
Mobility						
Improve mobility and operational efficiency	Improves US 290 operational efficiency—increases roadway capacity and reduces travel time during peak hour for 2040 traffic	Through 2040 volume of US 290 mainlanes and frontage roads	Vehicles/day	152,030	151,120	61,400
		WESTBOUND MAINLANES: Travel time along WB US 290 mainlanes Old Fredericksburg Rd to Circle Drive, pm peak	Minutes	3.5	3.4	9.5
		WESTBOUND FRONTAGE ROADS: Travel time along WB US 290 FTG RD from Old Fredericksburg Rd to Circle Drive, PM Peak pm peak	Minutes	7.7	7.5	9.5
		EASTBOUND MAINLANES: Travel time along EB US 290 mainlanes from Circle Drive to Old Fredericksburg Rd, am peak	Minutes	3.5	3.5	7.9
		EASTBOUND FRONTAGE ROAD: Travel time along EB US 290 FTG RD from Circle Drive to Old Fredericksburg Rd, am peak	Minutes	7.9	7.7	8.4
	Improves SH 71 operational	Through 2040 volume of SH 71	Vehicles/day	57,760	62,040	41,750

Key: Deciding Parameters, Better +, Worse -, No Difference

Performance Measures	Criterion	Evaluation Parameters	Evaluation Parameters (Units)	Alternative A	Alternative C	No Build Alternative
	efficiency—increases roadway capacity and reduces travel time during peak hour for 2040 traffic	WESTBOUND MAINLANES: Travel time along WB US 290 and SH 71 from Old Fredericksburg Rd to Silvermine Drive, pm peak	Minutes	2.8	2.9	5.7
		WESTBOUND FRONTAGE ROADS: Travel time along WB US 290 and SH 71 from Old Fredericksburg Rd to Silvermine Drive, pm peak	Minutes	5.4	4.9	5.7
		EASTBOUND MAINLANES: Travel time along EB SH 71 and US 290 from Silvermine Drive to Old Fredericksburg Rd, am peak	Minutes	2.8	2.9	6.2
		EASTBOUND FRONTAGE ROAD: Travel time along EB SH 71 and US 290 from Silvermine Drive to Old Fredericksburg Rd, am peak	Minutes	6.5	5.6	6.7
	Minimize conflicts between pedestrians/bicyclists and motor vehicles	Number of at-grade crossings of the shared-use path and streets	Number	19	23	N/A

Cost and Human Impacts

Potential property impacts	Minimize residential relocations	Number of residential relocations	Each	1	1	N/A
	Minimize commercial displacements	Number of commercial displacements	Each	4	4	N/A
	Changes in access	Control of access purchased	Length of control of access to be purchased	10,480	10,890	N/A
Potential noise impacts	Minimize noise impacts to sensitive receivers	Average noise levels (<i>No Build</i> 2013 and <i>Build</i> 2040 with noise walls)	Decibels	61.5	62.1	61.4

Key: Deciding Parameters, Better +, Worse -, No Difference

Performance Measures	Criterion	Evaluation Parameters	Evaluation Parameters (Units)	Alternative A	Alternative C	No Build Alternative
		Number of potential noise impacts (<i>No Build</i> shows noise impacts as of 2013. <i>Build Alternatives A and C</i> show projected impacts)	Each	176	172	98
		Average decibel (dB) increase for all residents	Decibels	0.1	0.7	N/A
Potential air quality impacts	Minimize impacts to air quality	Reduces MSAT?	Yes/No	Yes	Yes	Yes
		Exceeds CO threshold?	Yes/No	No	No	No
Community impacts	Minimize impacts to EJ communities	Are there EJ communities with disproportionate impacts?	Yes/No	No	No	No
	Minimize impacts to community cohesion/access	Change in length of access—SB Patton Ranch Rd to EB US 290	Length	2,700	1,070	0*
		Change in length of access—SB Old Bee Cave Rd to EB US 290	Length	2,000	4,950	0*
		Change in length of access—WB US 290 to McCarty Lane	Length	2,500	1,100	0*
		Change in length of access—NB drive (Jim's Restaurant) to WB SH 71	Length	0	1,350	0
		Change in length of access—EB SH 71 to SB drive (McDonald's)	Length	0	1,450	0
		Change in length of access—WB SH 71 to NB drive (McDonald's)	Length	0	1,400	0
		Change in length of access—WB SH 71 to NB drive (Jim's Restaurant)	Length	0	1,400	0
		Total change in the length of access points in/out where there is a difference between <i>Alternatives A and C</i>	Length	7,200	12,720	0
		Community values	Feet of elevated structure	Linear Feet	10,840	14,000

Key: **Deciding Parameters**, Better +, Worse -, No Difference

Performance Measures	Criterion	Evaluation Parameters	Evaluation Parameters (Units)	Alternative A	Alternative C	No Build Alternative
Aesthetics and visual impacts		Area of Williamson Creek disturbance/restoration (including reconstruction of Old Bee Cave Road, William Cannon, and US 290 bridges)	Acres	0.84	0.69	N/A
		Volume of concrete bridges and culverts within floodplain removed	Cubic Yards	2,933	2,933	0
Preliminary project cost	Minimize construction cost	Preliminary total implementation cost estimate	\$ Million	536	542	N/A
	Minimize right-of-way cost	Right-of-way area	Acres	74.58	75.19	N/A
		Preliminary right-of-way estimated cost	\$ Million	26.5	26.8	N/A
Minimize utility relocation cost	Preliminary utility relocation cost	\$ Million	7.7	7.7	N/A	
Cultural Resources Impacts						
Cultural resources	Minimize impacts to NHRP structures	Number of NHRP structures or properties affected by the project	Each	0	0	N/A
	Minimize impacts to recorded arch. sites	Number of recorded archeological sites affected by the project	Each	4	4	4
	Avoid impacts to Section 6(f) and 4(f) properties	Number of Section 6(f) and 4(f) properties affected by the project	Each	0	0	N/A
Natural Resource Impacts						
Potential water resources impacts	Minimize Edwards Aquifer Recharge Zone and Contributing Zone impacts	Acres of additional impervious cover in the Edwards Aquifer Recharge Zone and Contributing Zone	Acres	74.0	73.6	N/A
	Minimize 100-year floodplain (FEMA) impacts	Acres of floodplain within proposed right-of-way	Acres	70.72	70.96	58.16
	Minimize flood-stage flow in Williamson Creek	100-year flow rate of Williamson Creek at William Cannon Drive	Cubic Feet per second	10,114	10,114	11,159

Key: Deciding Parameters, Better +, Worse -, No Difference

Performance Measures	Criterion	Evaluation Parameters	Evaluation Parameters (Units)	Alternative A	Alternative C	No Build Alternative
	Minimize recharge features affected	Number of known recharge features filled	Each	1	1	N/A
	Minimize stream/creek crossings	Acres of streams and water bodies within right-of-way	Acres	3.40	4.78	2.73
	Maximize improvement of water quality	Total suspended solid (TSS) removal	Pounds	82,837	83,220	18,428
		Number of water quality ponds constructed	Each	17	15	0
	Minimize impacts to wetlands	Acres of wetland impacted	Acres	0.03	0.03	0
Threatened endangered species potential impacts	Minimize endangered songbird impacts	Acres of potential habitat within proposed right-of-way	Acres	0	0	0
	Minimize endangered karst species impacts	Presence/absence within the proposed right-of-way	Yes/No	No	No	No
	Minimize endangered salamander species impacts	Is water quality improved?	Yes/No	Yes	Yes	No
Vegetation impacts	Minimize riparian woodland impacts	Area of riparian woodlands removed by the project	Acres	6.06	5.2	0
	Minimize impacts to large trees (larger than 35-inch diameter at breast height [DBH])	Number of trees (all species) removed (greater than 35-inch DBH)	Number	29	26	0
DOES THE ALTERNATIVE MEET THE STATED PURPOSE AND NEED				YES	YES	NO
RECOMMENDED ALTERNATIVE?				YES	NO	NO

3.3.3.1 Environmental Least Harm Analysis

Major results of the environmental least harm analysis are summarized as follows:

- Improve Mobility and Operational Efficiency
 - *Criterion: Improves operational efficiency along US 290 and SH 71 by increasing roadway capacity and reducing travel time during peak hours for 2040 traffic.* Travel times along US 290 and SH 71 would be reduced by similar amounts under *Alternatives A and C*.
 - *Criterion: Minimize conflicts between pedestrians/bicyclists and motor vehicles.* *Alternative A* consists of 19 at-grade crossings of shared-use path and streets, which is 4 fewer than *Alternative C*, with 23.
- Potential Property Impacts
 - *Criterion: Minimize residential and commercial relocations and displacements.* *Alternatives A and C* result in the same number of residential relocations (1) and commercial displacements (4).
 - *Criterion: Changes in access.* *Alternative A* results in a total length of 10,480 linear feet of control of access to be purchased, which is slightly less than *Alternative C*, at 10,890 linear feet.
- Minimize Noise Impacts to Sensitive Receivers
 - The number of potential noise impacts is similar for *Alternatives A and C*. *Alternative A* would result in a slightly lower average decibel increase for all residents at 0.1 dB, versus 0.7 dB for *Alternative C*.
- Minimize Impacts to Air Quality
 - Both *Alternatives A and C* would reduce MSAT, and neither would exceed the threshold for CO.
- Community Impacts
 - *Criterion: Minimize impacts to EJ communities.* Neither alternative impacts EJ communities disproportionately.
 - *Criterion: Minimize impacts to community cohesion/access.* *Alternative A* results in 7,200 linear feet of total change in length of access points in/out, which is 5,520 linear feet less than *Alternative C*.
- Aesthetics and Visual Impacts
 - *Alternative A* proposes 10,840 linear feet of elevated structures, which is 3,160 less than *Alternative C*, with 14,000. The acreage of Williamson Creek disturbance/restoration proposed (including reconstruction of Old Bee Cave Road, William Cannon Drive, and US 290 bridges) is under 1.0 acre for both alternatives. The cubic yards of concrete bridges and culverts within floodplains to be removed is the same for *Alternatives A and C* (2,933 cy).

- Preliminary Project Cost
 - *Criteria: Minimize construction, right-of-way, and utility relocation costs.* Project costs, including construction, right-of-way, and utility relocation, are approximately \$6 million less for *Alternative A*, at a total cost of \$570.2 million, than for *Alternative C*, which results in a total cost of \$576.5 million.
- Cultural Resources
 - *Criteria: Minimize impacts to historic, archeological, Section 4(f), and Section 6(f) resources.* The number of NRHP-eligible resources (0), recorded archeological sites (4), and Section 6(f) and/or 4(f) properties (0) affected by the project is the same for *Alternatives A* and *C*.
- Water Resources
 - *Criteria: Minimize impacts to the Edwards Aquifer Recharge Zone and Contributing Zone, 100-Year floodplain, flood-stage flow in Williamson Creek, and recharge features.* Water resources impacts were similar for *Alternatives A* and *C*. The number of acres of proposed additional impervious cover in the Edwards Aquifer Recharge Zone and Contributing Zone is a difference of 0.4 acre between *Alternatives A* and *C*. The acres of floodplain within the proposed right-of-way is a difference of 0.24 between *Alternatives A* and *C*. Cubic feet-per-second of the 100-year flow rate of Williamson Creek at William Cannon Drive is the same for both alternatives, at 10,114; the additional number of known recharge features filled is 1 for both alternatives.
 - *Criterion: Minimize stream/creek crossings.* The acres of streams and water bodies within the right-of-way is more than 1 acre less for *Alternative A*, at 3.40 acres (4.78 under *Alternative C*).
 - *Criterion: Maximize improvement of water quality.* The amount of total suspended solids (TSS) proposed to be removed is a difference of 383 lbs. between *Alternatives A* and *C*. *Alternative A* proposes to construct 17 water quality ponds, which is two more than the 15 water quality ponds for *Alternative C*.
 - *Criterion: Minimize impacts to wetlands.* *Alternatives A* and *C* result in the same acreage of impacted wetlands.
- Threatened and Endangered Species
 - *Criteria: Minimize impacts to endangered songbirds, karst species, and salamander species.* Neither alternative revealed potential habitat within the proposed right-of-way for songbirds, nor did they reveal the presence of suitable karst feature habitat in the right-of-way. Water quality is improved for both alternatives, thus minimizing impacts to the endangered salamanders.
- Vegetation Impacts

- *Criteria: Minimize impacts to riparian woodlands and large trees. Alternatives A and C would result in less than a 1-acre difference of impacts to riparian woodlands. Alternative A would remove three more large trees than Alternative C, but the total number of trees removed is anticipated to be the same for either alternative.*

3.3.3.2 Engineering and Constructability Analysis

Alternatives A and C were developed to satisfy the purpose and need for the project. This required the development of freeway mainlanes with grade separations at key intersecting roadways for through traffic, along with one-way frontage roads to accommodate the local traffic needs. In addition, each alternative includes shared-use paths and sidewalks throughout the project limits, consideration for bus pull-outs along frontage roads, and possible accommodation for future transit in the corridor. Both alternatives are similar but have differences that are measurable in performance.

Traffic Projections

The design-year traffic projections were forecasted by applying the CAMPO travel demand model. This updated version of the CAMPO travel demand model was approved by the Transportation Planning and Programming (TP&P) division of TxDOT and includes a base year of 2010 and future years of 2020 and 2040. The traffic projection study included these tasks:

- Evaluation of the 2010 Base Model traffic assignments
- Modification of the 2040 highway network to represent the *No Build* and *Build* alternative geometry and roadway connectivity
- Application of CAMPO's 2040 travel demand model and a multi-modal multi-class user equilibrium vehicle assignment process to develop peak period and daily traffic assignments for *No Build* and *Build Alternatives*

Level of Service

As mentioned previously, the measure of the operational condition of a highway as perceived by the driver is characterized as that highway's LOS. LOS is broken into categories ranging from A to F, with A representing free-flow operations and F representing very congested traffic conditions. In the publication *A Policy on Geometric Design of Highways and Streets*, the American Association of State Highway and Transportation Officials (AASHTO) recommends that urban freeways and their auxiliary facilities should generally be designed for LOS C in urban areas. TxDOT has adopted these standards, stating in their Roadway Design Manual (TxDOT, 2014) that "[f]or acceptable degrees of congestion, urban freeways and their auxiliary facilities should generally be designed for level of service C...in the design year," and that "[i]n heavily developed urban areas, level of service D may be acceptable." The study corridor and surrounding area is considered to be heavily developed; therefore, a LOS D design standard would be acceptable for the proposed project.

Analysis of design-year 2040 traffic conditions for the *Build Alternatives* has been conducted for the proposed project, and these planning studies indicate that *Alternatives A and C* are projected to operate at LOS C or better during the peak-hour periods in the year 2040. The *No Build Alternative* is projected to operate at LOS F conditions during the peak periods.

Travel Time Evaluation

Another fundamental measure of the operational condition of a highway is travel time. As part of the alternative screening process, each alternative's ability to improve the project's operational efficiency and reduce travel time during the design year peak-hour period was analyzed. The study corridor under *Alternatives A and C*, as well as the *No Build* scenario, were modeled utilizing micro-simulation software to evaluate the travel times along the corridor. The analysis included travel times along the mainlanes and frontage roads in each peak hour direction of travel. The results of the analysis indicated that each of the proposed *Build Alternatives* are projected to provide a significant reduction in peak-hour travel time compared to the *No Build Alternative*.

Change in Access

Because the alternatives convert the existing two-way highway to a pair of one-way frontage roads, local access would change. For driveways and collector roadways that intersect a one-way frontage road, the existing left-turn movement would change. This movement would require a right turn onto the one-way frontage road to the next U-turn to complete the left turn. Conversely, for destinations that are on the left side of the facility, drivers would be required to travel beyond the destination and use the U-turn. While this does require more travel distance, it greatly improves safety by reducing conflict points between left-turning vehicles and on-coming traffic. A detailed access study of left turns was conducted that provided the change in access for a total of 117 locations for each alternative. The summary of the differences in change of access between alternatives is shown in **Table 3-3**.

Constructability

Construction sequencing concepts were developed for each alternative. Horizontal and vertical alignments, along with cross sections every 100 feet, were developed to aid in determining the constructability of the alternatives. Both alternatives, if constructed, would include challenges common to major urban roadway projects. These would be overcome with careful planning prior to construction and would include:

- Safe handling of heavy traffic in the construction zone
- Maintenance of local access
- Maintenance of utilities
- Use of large quantities of construction materials—approximate key quantities are shown in **Table 3-4**.

Table 3-3. Differences in Change of Access for the *Build Alternatives*

Change in Access	Lengths (ft)	
	Alternative A	Alternative C
SB Patton Ranch Rd to EB US 290	2,700	1,070
SB Old Bee Cave Rd to EB US 290	2,000	4,950
WB US 290 to McCarty Lane	2,500	1,100
NB drive (Jim's Restaurant) to WB SH 71	0	1,350
EB SH 71 to SB drive (McDonald's)	0	1,450
WB SH 71 to NB drive (McDonald's)	0	1,400
WB SH 71 to NB drive (Jim's Restaurant)	0	1,400
Total change in the length of access points in/out where there is a difference between <i>Alternatives A</i> and <i>C</i>	7,200	12,720

Source: Project Team, 2017

Note: EB=eastbound, NB=northbound, SB=southbound, WB=westbound

Table 3-4. Quantities of Construction Materials Needed for the *Build Alternatives*

Item	Unit	Alternative A	Alternative C
Excavation	CY	1,968,000	1,538,000
Embankment (Fill)	CY	429,000	509,000
Roadway Pavement	SY	616,000	587,000
Bridge	SF	920,000	1,047,000
Retaining Wall	SF	935,000	986,000

Source: Project Team, 2017

Note: CY=cubic yards, SY=square yards, SF=square feet

The construction sequencing concept is very similar for *Alternatives A* and *C*. Generally, the new frontage roads, intersecting streets, and storm drainage trunk lines would be constructed first while the traffic is located on the existing facilities. The intersecting streets would require multiple steps to construct while accommodating the traffic movements. After traffic is switched to the new frontage roads, the existing facility would be removed and the new mainlanes constructed in the middle. **Figures 3-1** through **3-3** are conceptual illustrations of the proposed construction phases. If funding were not available for the entire project, the frontage roads could be constructed first, which would improve some traffic and safety issues in the corridor (see **Figures 3-1** and **3-2**). Should additional funding become available, the construction of the mainlanes (**Figure 3-3**) would be constructed next, followed by the direct connector ramps between US 290 and SH 71. These options apply to both *Alternatives A* and *C*.

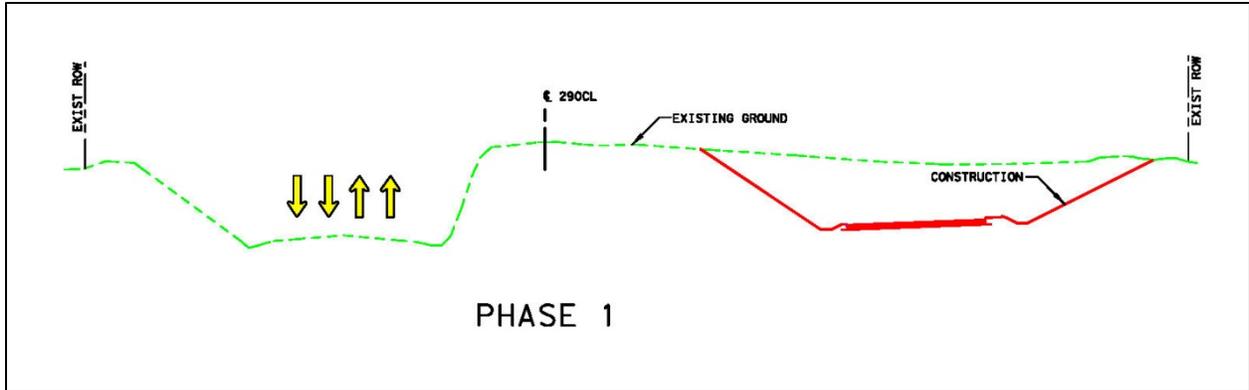


Figure 3-1. Phase 1 could consist of construction of the US 290 eastbound frontage roads.

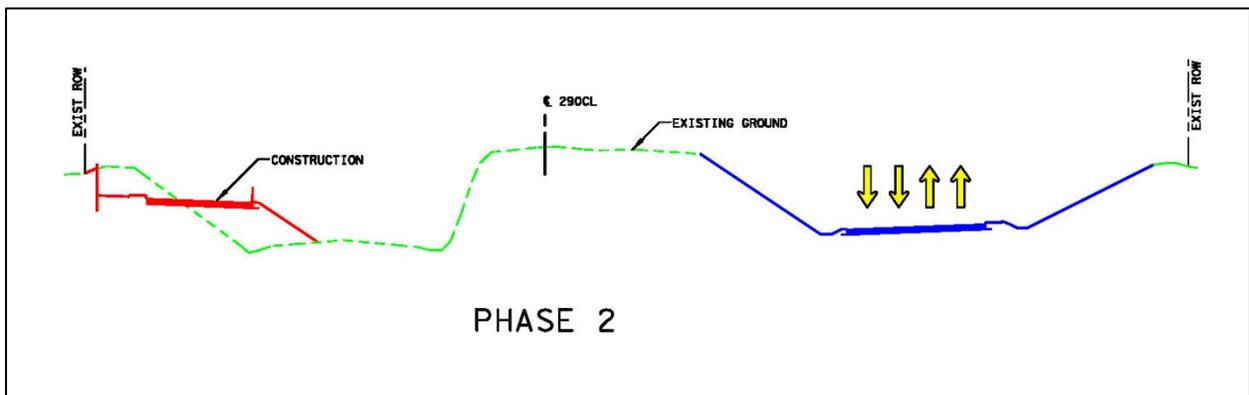


Figure 3-2. Phase 2 could consist of construction of the US 290 westbound frontage roads.

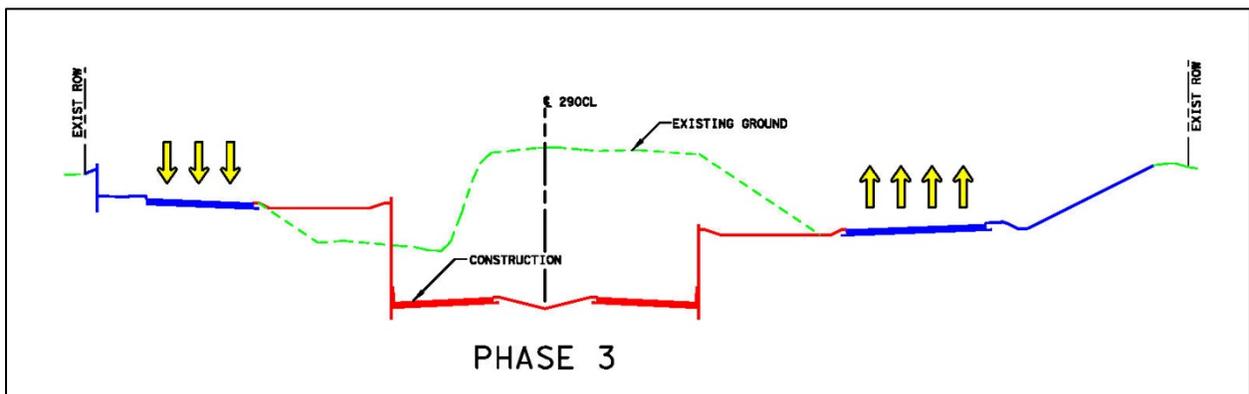


Figure 3-3. Phase 3 could consist of construction of the mainlanes.

3.4 Alternatives Considered in the DEIS

Plans, profile views, and typical sections for both *Alternative A* and *Alternative C* are available in **Appendix A, Schematic Designs for the Build Alternatives**.

3.4.1 *Alternative A*

Alternative A is a conventional controlled-access highway with frontage roads. New construction on roadway improvements would begin just east of Joe Tanner Lane where the existing mainlanes transition to an urban highway. With *Alternative A*, the mainlanes would be elevated over William Cannon Drive, and the westbound mainlanes and frontage road would be located north of Williamson Creek. The mainlanes would be depressed under SH 71 and direct connectors would be provided connecting eastbound SH 71 with US 290 and westbound US 290 to SH 71. Mainlanes would vary from four near William Cannon Drive to two near the western project limit. Grade-separated intersections would be constructed at Convict Hill Road, RM 1826, Scenic Brook Drive, and Circle Drive (South View Road). Mainlanes would generally be 12 feet wide with 10-foot-wide shoulders. Texas turnarounds, which allow vehicles traveling on a frontage road to U-turn onto the opposite frontage road, would be constructed on US 290 frontage roads at Scenic Brook Drive, RM 1826, Convict Hill Drive, and William Cannon Drive.

Along SH 71, the direct connector ramps would extend past Scenic Brook Drive where the mainlanes would transition to a five-lane (three lanes northbound, two lanes southbound) rural highway with Texas turnarounds. Bicycle and pedestrian facilities would be provided via a shared-use path which would be provided along the entire project length.

Alternative A is the *Recommended Alternative*.

3.4.2 *Alternative C*

Alternative C is a controlled-access highway with frontage roads. New construction on roadway improvements would begin just east of Joe Tanner Lane where the existing mainlanes transition to an urban highway. With *Alternative C*, the mainlanes would be elevated over William Cannon Drive with eastbound and westbound mainlanes located north of Williamson Creek. The frontage roads would be parallel to the existing highway. The mainlanes would remain elevated over the intersection with SH 71. West of SH 71, *Alternatives A* and *C* share the same design, and grade-separated intersections would be constructed at Convict Hill Road, RM 1826, Scenic Brook Drive, and Circle Drive (South View Road). Direct connectors would allow drivers to access westbound SH 71 and eastbound US 290. US 290 would consist of two to four 12-foot-wide lanes with 10-foot-wide shoulders. Texas turnarounds would be constructed on US 290 frontage roads at Scenic Brook Drive, RM 1826, and Convict Hill Drive.

Along SH 71, the direct connector ramps would extend past Scenic Brook Drive where the mainlanes would transition to a five-lane (three lanes northbound, two lanes southbound)

rural highway with Texas turnarounds. Bicycle and pedestrian facilities would be provided via a shared-use path which would be provided along the entire project length.

3.4.3 No Build Alternative

Consistent with the requirements of NEPA and FHWA guidelines, this analysis considers an alternative that assesses environmental effects if the proposed project were not built. This alternative, called the *No Build Alternative*, includes the routine maintenance improvements of the existing roads in the study area and the currently programmed, committed, and funded roadway projects. While the *No Build Alternative* does not meet the project needs, it provides a baseline condition to compare and measure the effects of the two *Build Alternatives*.