

## 1   **2.0   ALTERNATIVES**

2   This section describes the full range of preliminary alternatives considered for the proposed action and  
3   discusses the screening process to determine which alternatives are considered reasonable and why  
4   they were advanced for further study. A discussion of the other alternatives and the rationale for their  
5   elimination from further consideration is also included. A description of the design characteristics and  
6   the underlying engineering considerations of the reasonable alternatives are provided following the  
7   screening discussion. This section also provides a detailed summary comparing the alternatives  
8   considered and provides the rationale for the identification of a preferred alternative for the proposed  
9   project.

10

### 11   **2.1   PROCESS USED TO DEVELOP AND EVALUATE ALTERNATIVES**

12   Pursuant to 23 USC §139, TxDOT and FHWA, as joint lead agencies, have involved Cooperating and  
13   Participating agencies and the public in a formal scoping process for the US 181 Harbor Bridge Draft EIS.  
14   Federal, state, and local agencies and the public have been afforded the opportunity to participate in  
15   defining the need and purpose and determining the range of alternatives to be considered for the  
16   proposed project. Cooperating and Participating agencies have also had the opportunity to collaborate  
17   on the methodologies to be used and level of detail required in the analysis of the alternatives (see  
18   **Section 8.0** for a list of the Cooperating and Participating agencies on the proposed project). **Section 1.1**  
19   describes the primary objectives of the scoping process and a summary of the process is included in  
20   **Section 8.0**.

21

#### 22   **2.1.1   Development of Alternatives**

23   Through this formal scoping process, a preliminary set of alternatives for the replacement of the Harbor  
24   Bridge was established (**Figure 2.1-1** in **Appendix A**). These alternatives include the No Build  
25   Alternative, six separate build alternatives (Blue, Green, Red, Orange, Tunnel and West) and a  
26   Transportation System Management (TSM) alternative (not depicted on **Figure 2.1-1** since it is not an  
27   alignment which can be graphically shown). The No Build Alternative is included per 40 CFR  
28   §1502.14(d), which requires that the Draft EIS include the consideration of taking no action. Because  
29   the transportation network, including the crossing of the Inner Harbor, is well-established, the  
30   geographic extent of the alternatives considered for the proposed project necessarily centered on the  
31   location of the existing bridge. One of the alternatives (the Green Alternative) would follow the existing  
32   alignment and would replace the bridge in nearly the same location. Other alternatives were then  
33   conceptualized along alignments both to the east and west of the existing US 181 alignment. The  
34   interchange at I-37 and the Crosstown Expressway (alternately known and interchangeably referred to  
35   herein as State Highway 286) was a major engineering consideration, and therefore preliminary  
36   alternatives were designed to factor in the connection to that existing interchange (the Red and Orange  
37   Alternatives). With the existing alignment occurring so close to Corpus Christi Bay, the only feasible way  
38   of designing an alternative to the east of US 181 was to carry it out into the bay to connect to US 181  
39   north of the existing bridge (the Blue Alternative). The Tunnel and West Alternatives were

1 recommended by the public at the August 9, 2011, scoping meeting and were considered along with the  
2 other preliminary alternatives.

3  
4 Since the Harbor Bridge system (comprised of the Harbor Bridge and six other highway bridges that  
5 carry US 181 in the project area) is eligible for the National Register of Historic Places (NRHP), the  
6 requirements of 23 CFR §774 (regulations for implementing Section 4(f) of the Department of  
7 Transportation Act) apply to the project. As a result, additional alternatives were considered in order to  
8 comply with Section 4(f) regulations. These additional Section 4(f) alternatives are not screened here,  
9 using the criteria to be described below, but rather are analyzed in the Draft Section 4(f) Evaluation  
10 (**Section 5.0**) using the feasible and prudent screening criteria defined in 23 CFR §774.17. Based on  
11 collaboration with Cooperating and Participating agencies and the public, and the analysis presented in  
12 **Section 5.4**, none of the alternatives that would avoid the use of Section 4(f) properties, including the  
13 Harbor Bridge system, were determined to be feasible and prudent.

### 14 15 **2.1.2 Screening Criteria**

16 TxDOT and FHWA have considered a range of alternatives for the proposed action, in accordance with  
17 40 CFR 1502.14. In addition, FHWA's Section 4(f) regulations [23 CFR §774.3(d)] are applicable to the  
18 development of project alternatives because the proposed project involves the replacement (use) of the  
19 Harbor Bridge system, which is eligible for NRHP listing. Therefore, a method for determining the  
20 reasonable alternatives used two screening criteria. The first criterion is that an alternative is  
21 considered reasonable and is carried forward for detailed evaluation in the Draft EIS if the alternative  
22 meets the need and purpose for the project; meeting the project objectives is not required for an  
23 alternative to be considered reasonable. The second criterion is that an alternative must avoid the use  
24 of Section 4(f) properties, unless there is no feasible and prudent way to do so (refer to **Section 5.4** and  
25 23 CFR §774.17). (Note that a prudent alternative would by definition meet the need and purpose for  
26 the project.)

27  
28 To determine whether an alternative meets the need and purpose of the project, measures of  
29 effectiveness established by the joint-lead agencies through collaboration with Cooperating and  
30 Participating agencies and the public during the formal scoping process were applied. **Section 2.1.3**  
31 below describes these measures of effectiveness.

32  
33 Alternatives that do not meet the need and purpose for the project, or are not feasible and prudent  
34 Section 4(f) avoidance alternatives, have been eliminated from detailed consideration in this Draft EIS.

### 35 36 **2.1.3 Measures of Effectiveness**

37 To evaluate whether a preliminary alternative serves the purpose of the proposed project and thereby  
38 addresses the identified needs (see **Section 1.1**), the joint lead agencies developed the following  
39 measures of effectiveness. **Table 2.1-1** identifies a set of criteria for each project purpose, along with  
40 detailed measures for evaluating the effectiveness of each alternative in meeting those criteria.

1 To maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship  
 2 Channel, an alternative would need to reduce the cost and frequency of structure maintenance relative  
 3 to the existing condition and extend the operational life of the structure well beyond the life of the  
 4 existing bridge. To meet these criteria, the proposed structure would be designed with non-corrodible  
 5 building or maintenance materials (such as concrete) and other elements requiring less maintenance  
 6 over the life of the structure; the bridge would not be designed as a fracture-critical structure; and the  
 7 design-life of the proposed structure would be 75 to 100 years.

8  
 9 To improve safety for the public traveling on US 181 and to establish a reliable, long-term hurricane  
 10 evacuation route, an alternative would need to correct the existing design deficiencies and upgrade the  
 11 facility to current National Highway System (NHS) standards (23 CFR §625.4) and the standards in  
 12 TxDOT’s Roadway Design Manual and Bridge Design Manual where appropriate. These improvements  
 13 would include providing shoulders on the bridge and approaches, reducing the vertical grade and  
 14 horizontal curvature, providing longer ramps where needed and providing adequate spacing between  
 15 ramps. To serve as a reliable, long-term hurricane evacuation route, the proposed improvements would  
 16 be designed to meet the State’s standards for determining transportation routes for hurricane  
 17 evacuation in the Corpus Christi area.

18

<b>Project Purpose</b>	<b>Criterion</b>	<b>Measure</b>
Maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel	Reduces the cost and frequency of structure maintenance	Uses non-corrodible building or maintenance materials (such as concrete) and other elements to limit the extent, frequency and cost of routine and structural maintenance over the life of the structure
	Extends the operational life of the structure well beyond the expected life of the existing bridge	Uses a non-fracture-critical design and a 75-100-year design-life for the proposed structure
Improve safety for the traveling public, including during hurricane evacuations	Corrects design deficiencies	Adds shoulders to the structure and approach sections; reduces the vertical grade and corrects sharp horizontal curves; provides ramp lengths commensurate with design speed; provides sufficient spacing for exit ramps
	Upgrades facility to current design standards where appropriate, allowing for a minimal number of design exceptions when justified due to design or environmental constraints	Proposed design meets FHWA standards for the National Highway System (23 CFR 625.4) and TxDOT’s Roadway Design Manual and Bridge Design Manual, including associated references
	Serves as a reliable, long-term hurricane evacuation route	Meets State standards for determining transportation routes for hurricane evacuation in the Corpus Christi area

19 Source: US 181 Harbor Bridge EIS Team 2013

20

## 1    **2.2    DESCRIPTION OF PRELIMINARY ALTERNATIVES**

2    The EIS scoping process began with four preliminary build alternatives (Blue, Green, Red and Orange),  
3    the No Build Alternative and the TSM Alternative. These alternatives originated as part of the *U.S. 181*  
4    *(Harbor Bridge) Feasibility Study* prepared for the proposed project and completed in 2003. The No  
5    Build Alternative and the TSM Alternatives are required to be considered in this Draft EIS by 40 CFR  
6    §1502.14 and FHWA Technical Advisory T6640.8a, respectively. In response to comments received from  
7    the public and Cooperating and Participating agencies at the first scoping meeting, held August 9, 2011,  
8    two new build alternatives (the Tunnel Alternative and the West Alternative) were added to the  
9    preliminary set.

10

11   The following sections provide a brief description of each preliminary alternative. Each of the  
12   alternatives described below, if implemented, with the exception of the No Build Alternative and the  
13   TSM Alternative, would remove the existing Harbor Bridge and replace it with a new structure. Existing  
14   and proposed access points are discussed in **Section 4.2**.

15

### 16    **2.2.1    Blue Alternative**

17   The Blue Alternative begins at Beach Avenue on US 181 and generally follows the existing alignment of  
18   US 181 to just north of Burleson Street. The alignment then veers east across Corpus Christi Beach and  
19   out into Corpus Christi Bay, passing to the north of the USS *Lexington* museum. The alignment  
20   continues south across the bay and crosses the ship channel at 205 feet above mean high water (MHW),  
21   turning west and crossing Shoreline Drive at Spur 544. The alignment then follows I-37 west to North  
22   Staples Street. The total length of the Blue Alternative is 3.04 miles.

23

### 24    **2.2.2    Green Alternative**

25   The Green Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181  
26   south to Burleson Street. The alignment then veers approximately 145 feet to the west of the existing  
27   Harbor Bridge and crosses the Inner Harbor at a height of 207 feet, continuing on the west side of  
28   existing US 181 to I-37 and following the existing alignment of I-37 to the interchange with the  
29   Crosstown Expressway. The total length of the Green Alternative is 5.06 miles.

30

### 31    **2.2.3    Red Alternative**

32   The Red Alternative begins at Beach Avenue on US 181, veers west of existing US 181 just north of  
33   Burleson Street and then crosses the Inner Harbor (216 foot clearance) approximately 1,000 feet west of  
34   existing US 181. The alignment then extends south to I-37 at the interchange with the Crosstown  
35   Expressway, continuing south along the Crosstown Expressway ending at Laredo Street. The total length  
36   of the Red Alternative is 5.98 miles.

37

### 38    **2.2.4    Orange Alternative**

39   The Orange Alternative begins at Beach Avenue on US 181, veers west of US 181 at Burleson Street and  
40   then crosses the Inner Harbor (210 foot clearance) approximately 175 feet west of existing US 181. The

1 alignment then veers west again and extends south, crosses I-37, and follows the Crosstown Expressway  
2 south ending at Laredo Street. The total length of the Orange Alternative is 6.0 miles.

### 4 **2.2.5 Tunnel Alternative**

5 The Tunnel Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181  
6 south to Burleson Street where the north entrance to the tunnel would be located. The alignment then  
7 veers slightly to the west of the existing US 181, continuing west of the existing highway and Harbor  
8 Bridge and underneath the Inner Harbor at an approximate depth of 65 feet. From the south tunnel  
9 entrance, the alignment then continues south on the west side of the existing US 181 to I-37 and follows  
10 I-37 to North Staples Street. The total length of the Tunnel Alternative is 2.24 miles.

### 12 **2.2.6 West Alternative**

13 The West Alternative begins at Beach Avenue on US 181 and then veers to the west nearly parallel to  
14 the Inner Harbor. The alternative then turns south, crossing Navigation Boulevard and the Inner Harbor  
15 (206 foot clearance) approximately 6,700 feet west of existing US 181 and continuing south generally  
16 parallel and to the east of Nueces Bay Boulevard to I-37. Along I-37, the transition for the West  
17 Alternative extends west to Up River Road and east to North Staples Street. Along the Crosstown  
18 Expressway, the transition for the West Alternative extends south ending between Comanche Street and  
19 Laredo Street. The total length of the West Alternative is 7.59 miles.

### 21 **2.2.7 Transportation System Management**

22 The TSM Alternative takes into consideration the overall operation of the roadway, including various  
23 modes of transportation. The objective of implementing a TSM Alternative is to improve traffic flow and  
24 reduce travel delay by maximizing the efficiency of the existing facility with limited reconstruction  
25 activity. Typical TSM elements include ridesharing, high-occupancy vehicle lanes, traffic signal timing  
26 optimization and restriping of existing pavement sections. The TSM Alternative is limited to traffic  
27 management improvements within the existing right of way.

### 29 **2.2.8 No Build Alternative**

30 The No Build Alternative would involve taking no action to address the safety and other problems  
31 identified in the need for the proposed project as discussed in **Section 1.3**. Routine maintenance of the  
32 US 181 facility and the Harbor Bridge structure would continue, including pavement work, structural  
33 repairs, painting and other rehabilitation efforts.

## 35 **2.3 ALTERNATIVES SCREENING SUMMARY**

36 This section is organized by project purpose and by the criteria established under each individual  
37 purpose. The build alternatives are discussed relative to whether they satisfy the established measures  
38 of effectiveness for each criterion. The No Build Alternative and the TSM Alternative were screened  
39 along with the build alternatives, and since these alternatives do not satisfy any of the established  
40 measures of effectiveness they do not meet the need and purpose for the project. The No Build

1 Alternative, however, is carried forward for full consideration in the Draft EIS for comparison purposes  
2 in accordance with 40 CFR §1502.14(d). Various alignment shifts and design changes relative to the  
3 reasonable build alternatives have also been evaluated in an effort to avoid or minimize impacts to  
4 properties to which Section 4(f) applies, such as parks and recreational facilities or wildlife and  
5 waterfowl refuge lands. (See **Section 5.0** for a detailed evaluation of the alternatives to the use of  
6 Section 4(f) properties).

### 8 **2.3.1 Evaluation With Respect to Project Need and Purpose**

#### 9 *2.3.1.1 Maximize the Long-term Highway Operability of the US 181 Crossing of the Corpus Christi Ship* 10 *Channel*

##### 11 Criterion: Reduces the cost and frequency of structure maintenance

12 Corrosion is a major factor to overcome in maintaining the structural integrity of the Harbor Bridge. The  
13 current steel bridge resides in a saltwater environment, requiring routine cleaning and painting to  
14 minimize corrosion. The combination of salt-laden air, year-round windy conditions, and warm air  
15 temperatures increases the potential for steel corrosion to occur (TxDOT 2012a).

16  
17 The structural rehabilitation necessary to extend the service life of the existing Harbor Bridge another 15  
18 to 20 years was completed in 2011, although the bridge will still require routine maintenance. Over the  
19 past 30 years, maintenance costs have exceeded \$70 million, and an analysis by the TxDOT Bridge  
20 Division found that extending the service life of the current Harbor Bridge to 2086 would cost an  
21 estimated \$279,471,206 in 2012 dollars (or \$401,430,000 using probable 2012 net present value) (HDR,  
22 Inc. 2012).

23  
24 To reduce the need for frequent and costly maintenance of the structure, each of the build alternatives  
25 proposing a new Harbor Bridge structure (Blue, Green, Red, Orange and West) would be designed with  
26 concrete and other non-corrodible materials. Maintenance would still be required with any of the build  
27 alternatives, including the Tunnel Alternative. However, by eliminating materials susceptible to  
28 corrosion, the criterion to reduce the cost and frequency of maintenance would be satisfied.

29  
30 The No Build Alternative and the TSM Alternative would not replace the existing Harbor Bridge;  
31 therefore the routine maintenance to prevent corrosion and the anticipated structural maintenance to  
32 extend the operational life of the structure would still be needed. The No Build Alternative and the TSM  
33 Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

##### 34 35 Criterion: Extends the operational life of the structure well beyond the expected life of the existing 36 bridge

37 As stated under the previous criterion, even with major structural maintenance, the bridge would  
38 remain fracture-critical, and therefore the design-life of the existing bridge would remain uncertain.  
39 Each of the build alternatives, with the exception of the TSM Alternative, would be designed with a non-  
40 fracture-critical bridge and a 75- to 100-year life. Routine maintenance costs would be incurred over the

1 life of any new structure (including a tunnel), although structural repairs of the type required for  
2 maintaining the integrity of the existing structure are not expected during the design-life of a non-  
3 fracture critical, non-steel structure.

4

5 The No Build Alternative and the TSM Alternative would not replace the existing structure, and the  
6 fracture-critical, steel structure would remain in place. Therefore, the No Build Alternative and the TSM  
7 Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

8

9 *2.3.1.2 Improve Safety for the Traveling Public, Including During Hurricane Evacuations*

10 Criterion: Corrects design deficiencies

11 The Blue, Green, Red, Orange, Tunnel and West Alternatives would correct design deficiencies  
12 associated with the existing facility and upgrade the facility to current FHWA and TxDOT design  
13 standards. Specifically, each of these alternatives would provide shoulders on the proposed structure  
14 and approach sections; reduce the vertical grade and minimize or eliminate the horizontal curvature on  
15 both the north and south ends of the existing bridge; provide entrance and exit ramps with acceleration  
16 and deceleration distances as recommended by the standards for the safety of motor vehicles; and  
17 provide sufficient spacing between exit ramps.

18

19 In the case of the Blue, Red, Orange and West Alternatives, these design deficiencies (as described in  
20 **Section 1.3.2**) would primarily be corrected by placing US 181 on a new location alignment and  
21 removing the existing US 181 facility between the areas of Beach Avenue and the US 181/I-37  
22 interchange, where the majority of design deficiencies are found. The Green Alternative and the Tunnel  
23 Alternative, which essentially follow the existing alignment, would address the horizontal curvature by  
24 proposing to straighten the highway alignment as much as practicable. The Green Alternative would  
25 address the exit ramp spacing by designing a standard right-hand exit to Staples Street and a dedicated  
26 u-turn lane at that intersection to return to the downtown area via a new eastbound frontage road. The  
27 Tunnel Alternative would utilize the existing left-hand exit for US 181 southbound to downtown Corpus  
28 Christi.

29

30 The TSM alternative would be designed to correct minor design deficiencies but would not add  
31 shoulders to the existing bridge or reduce the vertical grade. Without these safety improvements, the  
32 TSM alternative would not satisfy this criterion and would not meet the need and purpose for the  
33 project.

34

35 The No Build Alternative would not correct the design deficiencies associated with the existing facility  
36 and would not upgrade the facility to current design standards. Therefore, the No Build Alternative  
37 would not satisfy this criterion and would not meet the need and purpose for the project.

38

1 Criterion: Upgrades facility to current design standards where appropriate, allowing for a minimal  
2 number of design exceptions when justified due to design or environmental constraints

3 Each of the build alternatives and the TSM alternative would be designed to meet the NHS design  
4 standards (23 CFR §625.4) and the standards in TxDOT's Roadway Design Manual and Bridge Design  
5 Manual, including applicable reference documents. The Blue, Green, Red, Orange, West and Tunnel  
6 Alternatives would each satisfy this criterion. The TSM Alternative would not make the upgrades  
7 necessary to improve safety for the traveling public, namely adding shoulders to the existing bridge and  
8 reducing the vertical slope; therefore, the TSM Alternative would not satisfy this criterion and would not  
9 meet the need and purpose for the project.

10

11 The No Build Alternative would not upgrade the existing facility to current design standards; therefore  
12 the No Build Alternative would not satisfy this criterion and would not meet the need and purpose for  
13 the project.

14

15 Criterion: Serves as a reliable, long-term hurricane evacuation route

16 Under the State of Texas Hurricane Response Plan (Texas Department of Public Safety 2010), a  
17 supplement to the State of Texas Emergency Management Plan, TxDOT is assigned the responsibility to  
18 identify the most appropriate highways meeting evacuation requirements; to implement short- and  
19 long-term solutions to reduce congestion on highway evacuation routes; and to prioritize infrastructure  
20 projects that address obstructions on evacuation routes.

21

22 The Green, Red, Orange and West Alternatives would each meet TxDOT's standards for an appropriate  
23 hurricane evacuation route for the Corpus Christi area. These alternatives would provide adequate  
24 capacity to facilitate evacuation and, with improved geometry and a non-fracture-critical design, would  
25 also provide the reliable, long-term solution needed to serve this purpose of the proposed project.

26

27 Although US 181 including the Harbor Bridge is currently designated a hurricane evacuation route in the  
28 State plan, the No Build Alternative and the TSM Alternative would not provide a reliable, long-term  
29 solution because these alternatives would not add shoulders to the existing bridge and would not  
30 address other design deficiencies related to safety. Without these more substantive corrections, US 181  
31 under the No Build Alternative or the TSM Alternative would not satisfy this hurricane evacuation  
32 criterion and would not meet the need and purpose for the proposed project.

33

34 In evaluating the Blue Alternative, which has an alignment that veers out into Corpus Christi Bay, TxDOT  
35 notes two elements that could be potentially problematic for hurricane evacuation: 1) the bridge  
36 structure would be over water for a distance greater than 7,700 feet and, therefore, more exposed in  
37 the event of a major hurricane; and 2) the bridge columns placed out in the bay would increase the  
38 likelihood that storm-surge debris could render the highway inoperable after a hurricane, hampering  
39 recovery efforts and the influx of emergency personnel and supplies.

40



1 The Tunnel Alternative similarly includes elements that would be potentially problematic during a  
2 hurricane evacuation. Although the tunnel carrying US 181 under the Inner Harbor would be designed  
3 to minimize flooding, reducing the likelihood of storm-surge flooding to zero percent is not feasible, and  
4 the implications of a flooded hurricane evacuation route include endangerment and loss of human life.  
5 In its Technical Guidelines for Hurricane Evacuation Studies the U.S. Army Corps of Engineers (1995)  
6 advises that “[i]n choosing roadways for the hurricane evacuation network, care should be taken to  
7 designate only those roads that are not expected to flood from rainfall or storm-surge while the  
8 evacuation is in progress.” TxDOT and FHWA agree with and adopt this guideline. Another implication  
9 of a flooded tunnel includes a delay in the recovery efforts following a hurricane. Flood waters would  
10 need to be pumped from the tunnel, adding time to the duration between the end of the storm event  
11 and the start of the recovery effort. Pumping of flood waters from the tunnel is assumed to yield results  
12 that are unpredictable at best, due to the range of potential functionality of the pumping apparatus,  
13 from operating at full capacity, to intermittent operation, to malfunction and inaction.

14  
15 For reasons stated, TxDOT, as the state agency responsible for identifying the most appropriate  
16 hurricane evacuation routes for the Corpus Christi area, would not be able to recommend the Blue  
17 Alternative or the Tunnel Alternative to the Texas Department of Public Safety’s (DPS) Division of  
18 Emergency Management for inclusion in Texas’ Hurricane Response Plan. TxDOT officials met with  
19 officials from DPS on January 23, 2012, and the TxDOT officials relayed their concerns and discussed  
20 these recommendations. DPS has not expressed any objection to TxDOT’s recommendations.

21  
22 In light of the foregoing, the Blue, Tunnel and TSM Alternatives would not serve as reliable, long-term  
23 hurricane evacuation routes for the Corpus Christi area and would, for that reason, not meet the need  
24 and purpose for the project.

25

### 26 **2.3.2 Summary of the Screening Results**

27 Based on the preceding screening analysis, the following build alternatives (see **Figure 2.3-1** in  
28 **Appendix A**) meet the need and purpose for the proposed project and are given full consideration as  
29 *reasonable alternatives* in the Draft EIS: Green Alternative, Red Alternative, Orange Alternative and  
30 West Alternative. The No Build Alternative is also given full consideration as a means of comparing the  
31 effects of each of the build alternatives. The Blue Alternative, Tunnel Alternative and TSM Alternative  
32 do not meet the need and purpose for the project and are, therefore, not considered reasonable and  
33 will not be considered further in the Draft EIS.

34

35 The range of *reasonable alternatives* was established based on the input from and collaboration with  
36 Cooperating and Participating agencies and the public, and further modified and refined by TxDOT and  
37 FHWA to that presented herein; the joint lead agencies developed the screening analysis using the  
38 measures of effectiveness presented in **Section 2.1.3**.

39

## 1    **2.4    RANGE OF REASONABLE ALTERNATIVES**

2    This section describes the reasonable build alternatives in greater detail and includes a discussion of the  
3    engineering considerations applicable to the design as means to satisfy the purpose of the project as  
4    well as the project objectives. The alternatives are depicted in **Figures 2.4-1** through **2.4-4** in **Appendix**  
5    **A**, and proposed typical sections are presented in **Appendix D**. The No Build Alternative is described in  
6    **Section 2.2.8**.

### 7 8    **2.4.1    Description of the Reasonable Build Alternatives**

#### 9    *2.4.1.1 Green Alternative*

10    The Green Alternative (see **Figure 2.4-1** in **Appendix A**) would follow the existing US 181 alignment,  
11    having construction limits beginning 500 feet north of Beach Avenue on the north and ending at I-37 on  
12    the south, with a reconstructed interchange at the Crosstown Expressway and a transition back to  
13    existing I-37 ending just east of the Buddy Lawrence Drive overpass; the transition back to the existing  
14    Crosstown Expressway would be at Laredo Street. The location of the new bridge would be slightly  
15    offset to the west of the existing bridge to allow US 181 to remain open to traffic while construction  
16    proceeded on the new bridge. The new bridge along the Green Alternative would not include a  
17    fracture-critical design and is proposed with an approximate low-chord elevation of 207 feet, meaning  
18    the bottom of the bridge structure would be 207 feet above MHW. This compares with the existing  
19    bridge's low-chord elevation of 138 feet. In the context of the Harbor Bridge's location over the Corpus  
20    Christi Ship Channel, the low-chord elevation corresponds to the air-draft clearance for vessels entering  
21    and exiting the Inner Harbor at the Port of Corpus Christi; a vessel's air-draft clearance is the measure  
22    from the water surface elevation to its highest-most point, usually the top of the mast or a radio  
23    antennae.

24  
25    The Green Alternative would have three 12-foot main lanes in each direction with a median barrier and  
26    12-foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and  
27    pedestrian shared use path separated from the main lanes by a two-foot concrete barrier. The  
28    proposed bicycle and pedestrian shared use path would extend from east of N. Staples Street on the  
29    south to Gulf Spray Avenue on the north. Two-lane, one-way frontage roads in each direction would also  
30    be included north of the Inner Harbor between Beach Avenue and Breakwater Avenue. The typical right  
31    of way width for this alternative would vary between 228 and 459 feet depending on the section of the  
32    alignment; the bridge and approach section would be the narrowest section, while the section of US 181  
33    including frontage roads would typically be the widest.

34  
35    The Green Alternative would also include a reconstructed interchange at the Crosstown Expressway and  
36    I-37, including reconstruction of the four existing direct connector ramps (I-37 westbound to Crosstown  
37    Expressway southbound, I-37 eastbound to Crosstown Expressway southbound, Crosstown Expressway  
38    northbound to I-37 westbound and Crosstown Expressway northbound to I-37 eastbound).

39

1 The preliminary construction cost estimate for the Green Alternative is \$558 million. Costs for right of  
2 way acquisition, utility relocation and mitigation would be added to this figure with further design  
3 details as applicable.

#### 4 5 *2.4.1.2 Red Alternative*

6 The Red Alternative (see **Figure 2.4-2** in **Appendix A**) would be on a new location alignment west of  
7 existing US 181 and the Harbor Bridge. The new bridge would be 1,000 feet to the west of the existing  
8 bridge. This alternative would include a reconstructed interchange at I-37 and the Crosstown  
9 Expressway. The construction limits for the Red Alternative would be 500 feet north of Beach Avenue  
10 on the north and Crosstown Expressway at Laredo Street on the south, with a transition back to existing  
11 I-37 at Buddy Lawrence Drive on the west and Shoreline Boulevard on the east. The new bridge along  
12 the Red Alternative would not be fracture-critical and is proposed with an approximate low-chord  
13 elevation of 216 feet.

14  
15 The Red Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot  
16 inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and  
17 pedestrian shared use path on the main span of the bridge and the bridge approaches, separated from  
18 main lane traffic by a two-foot concrete barrier. The proposed bicycle and pedestrian shared use path  
19 would extend from Winnebago Street on the south to Beach Avenue on the north. Two-lane, one-way  
20 frontage roads in each direction would also be included north of the Inner Harbor between Beach  
21 Avenue and Coastal Avenue. The typical right of way width for this alternative would vary between  
22 approximately 200 feet for the bridge section over the Inner Harbor and 430 feet for the main lane  
23 sections of US 181 with frontage roads.

24  
25 The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the  
26 bridge would be removed as part of this proposed alternative. The existing US 181 south of the Inner  
27 Harbor would be converted to an at-grade boulevard section, improving and widening N. Broadway  
28 Street to access the existing surface streets downtown. The Tancahua Street and Carancahua Street  
29 bridges over I-37 would be reconstructed in their existing locations. North of the Inner Harbor,  
30 proposed US 181 would return to the existing alignment at Burleson Street with a northbound exit to be  
31 provided at Beach Avenue.

32  
33 The Red Alternative would reconstruct the I-37/Crosstown Expressway interchange, including four  
34 direct-connector ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound,  
35 Crosstown Expressway northbound to I-37 westbound and I-37 eastbound to Crosstown Expressway  
36 southbound).

37  
38 The preliminary construction cost estimate for the Red Alternative is \$637 million. Costs for right of way  
39 acquisition, utility relocation and mitigation would be added to this figure with further design details as  
40 applicable.

### 1 2.4.1.3 Orange Alternative

2 The Orange Alternative (see **Figure 2.4-3 in Appendix A**) would be on a new location alignment west of  
3 existing US 181 and the Harbor Bridge. The location of the new bridge would be offset approximately  
4 100 feet to the west of the existing bridge to allow the existing bridge to remain open to traffic while  
5 construction proceeded on the new bridge. The new bridge along the Orange Alternative would not  
6 include a fracture-critical design and is proposed with an approximate low-chord elevation of 210 feet.

7  
8 The Orange Alternative would have three 12-foot lanes in each direction with a median barrier and 12-  
9 foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and  
10 pedestrian shared use path separated from main lane traffic by a two-foot concrete barrier. The  
11 proposed bicycle and pedestrian shared use path would extend from Winnebago Street on the south to  
12 Beach Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included  
13 north of the Inner Harbor between Beach Avenue and Elm Street. The typical right of way width for this  
14 alternative would vary between approximately 200 feet for the bridge section over the harbor and 430  
15 feet for the main lane sections of US 181 with frontage roads.

16  
17 This alternative would include a reconstructed interchange at I-37 and the Crosstown Expressway. The  
18 construction limits for the Orange Alternative would be 400 feet north of Beach Avenue on the north  
19 and Crosstown Expressway at Laredo Street on the south, with a transition back to existing I-37 at Buddy  
20 Lawrence Drive on the west and Shoreline Boulevard on the east. The reconstruction of the I-  
21 37/Crosstown Expressway interchange with the Orange Alternative would include four direct-connector  
22 ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound, Crosstown  
23 Expressway northbound to I-37 westbound and I-37 eastbound to Crosstown Expressway southbound).

24  
25 The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the  
26 bridge would be removed as part of this proposed alternative. The existing US 181 would be converted  
27 to an at-grade boulevard section, similar to the Red Alternative, improving and widening N. Broadway  
28 Street to access the existing surface streets downtown. The Tancahua Street and Carancahua Street  
29 bridges over I-37 would be reconstructed in their existing locations. North of the Inner Harbor,  
30 proposed US 181 would return to the existing alignment at Burleson Street with a northbound exit to be  
31 provided at Beach Avenue.

32  
33 The preliminary construction cost estimate for the Orange Alternative is \$630 million. Costs for right of  
34 way acquisition, utility relocation and mitigation would be added to this figure with further design  
35 details as applicable.

36  
37 **2.4.1.4 West Alternative**

38 The West Alternative (see **Figure 2.4-4 in Appendix A**) would be on a new location alignment west of the  
39 existing US 181 and the Harbor Bridge. The new bridge would be approximately a mile and a quarter to  
40 the west of the existing bridge. This alternative would include a new interchange at I-37 near Nueces  
41 Bay Boulevard and a reconstructed interchange at I-37 and the Crosstown Expressway, including

1 reconstruction of two of the existing direct connector ramps (I-37 eastbound to Crosstown Expressway  
2 southbound and Crosstown Expressway northbound to I-37 westbound; the other two existing direct  
3 connector ramps would be removed). The construction limits for the West Alternative would be  
4 approximately 800 feet north of Beach Avenue on the north and I-37 on the south, with a transition  
5 back to existing I-37 approximately 450 feet past Up River Road on the west and N. Staples Street on the  
6 east; the transition back to the existing Crosstown Expressway would extend to approximately 600 feet  
7 south of Comanche Street. The new bridge along the West Alternative would not include a fracture-  
8 critical design and is proposed with an approximate low-chord elevation of 206 feet.

9  
10 The path of the West Alternative runs parallel to and east of Nueces Bay Boulevard from I-37 to the  
11 Inner Harbor. North of the harbor, the eastward path of existing US 181 crosses the U.S. Army Corps of  
12 Engineers primary dredged spoils placement area for the ongoing maintenance dredging of the ship  
13 channel, a distance of approximately one and a third miles. The proposed West Alternative would  
14 return to the existing US 181 alignment approximately one quarter mile north of Burleson Street with  
15 the northbound exit to be provided at Beach Avenue. There would be a southbound US 181 entrance  
16 ramp at Beach Avenue and a southbound exit ramp to Burleson Street as well. The existing northbound  
17 exit and southbound entrance at Burleson Street would be removed with the West Alternative. In  
18 addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson  
19 Street would also be removed.

20  
21 The West Alternative would have three 12-foot lanes in each direction with a median barrier and 12-  
22 foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and  
23 pedestrian shared use path separated from main lane traffic by a two-foot concrete barrier. The  
24 proposed bicycle and pedestrian facilities would extend from Peabody Avenue at the I-37 westbound  
25 frontage road on the south to Gulfspray Avenue on the north. The typical right of way width for this  
26 alternative would be 320 feet to 570 feet.

27  
28 The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the  
29 bridge would be removed as part of this proposed alternative. The proposed design for existing US 181  
30 south of the Inner Harbor would be the same as that for the Red and Orange Alternatives and reference  
31 can be made to **Section 2.4.1.2** above for a description. North of the Inner Harbor, proposed US 181  
32 would return to the existing alignment north of Burleson Street with a northbound exit to be provided at  
33 Beach Avenue.

34  
35 The preliminary construction cost estimate for this alternative is \$679 million. Costs for right of way  
36 acquisition, utility relocation and mitigation would be added to this figure with further design details as  
37 applicable.

## 1 **2.4.2 Engineering Considerations**

### 2 *2.4.2.1 National and State Highway Design Standards*

3 In developing the engineering design for the proposed build alternatives, project engineers have the  
4 requirements of several design manuals as well as other guidance to consider. One of the primary  
5 considerations is the requirement to bring the design of the existing facilities (US 181, I-37 and the  
6 Crosstown Expressway) into compliance with the current NHS standards, described in 23 CFR §625.4.  
7 Project engineers are also required to adhere to the standards in TxDOT's Roadway Design Manual and  
8 Bridge Design Manual; a minimal number of design exceptions may be employed where justified and  
9 necessary to avoid substantively impacting human and natural environmental resources. These  
10 combined standards require the engineers to consider, among other details, providing shoulders on any  
11 new bridge structure and the approaches, lessening the steepness of the vertical grade from 5 percent  
12 to 4 percent, providing a main lane design speed of 70 miles per hour, adding bicycle and pedestrian  
13 facilities into the design where appropriate, and providing adequate acceleration and deceleration  
14 distances on the entrance and exit ramps. Engineers also need to consider traffic congestion, measured  
15 by the Level of Service (LOS), and how the proposed designs blend with the existing network of local  
16 streets and adjacent land uses. With respect to the bridge design itself, although details relating to the  
17 type of structure are still in the conceptual stage, the proposed bridge would not have a fracture-critical  
18 design as the existing bridge does.

19  
20 At this stage of the proposed project, engineers have produced preliminary schematic designs for each  
21 of the four reasonable build alternatives. (Refer back to **Section 2.4.1** for a description of the  
22 preliminary engineering design relative to the current design standards mentioned above). The  
23 proposed typical sections for the build alternatives are included in **Appendix D**, showing the number and  
24 dimensions of the travel lanes and shoulders, the relation of the bicycle and pedestrian shared use path  
25 to the vehicle lanes, and the usual width of the proposed right of way, which varies greatly depending  
26 on the point along the alignment. At this stage of the preliminary design, the typical sections for each of  
27 the four reasonable build alternatives are identical. An existing typical section is also included in  
28 **Appendix D** for reference.

### 29 30 *2.4.2.2 Bicycle and Pedestrian Accommodations*

31 A design element of the proposed project is to improve conditions for bicyclists and pedestrians and to  
32 allow them to have safe, convenient access to the transportation system consistent with the U.S.  
33 Department of Transportation's March 2010 policy statement on bicycle and pedestrian  
34 accommodation, TxDOT's 2011 "Guidelines Emphasizing Bicycle and Pedestrian Accommodations," and  
35 the 2013 proposed rule by the U.S. Access Board on Accessibility Guidelines for Pedestrian Facilities in  
36 the Public Right-of-Way; Shared Use Paths. Bicycle and pedestrian facilities have been incorporated into  
37 the proposed design throughout the project area, and take into account the Corpus Christi Metropolitan  
38 Planning Organization's (MPO) adopted Bicycle and Pedestrian Plan (2005) as well as input from the  
39 local cycling community. A major concept of the bicycle and pedestrian accommodations, as described  
40 under each of the proposed build alternatives (see **Section 2.4.1**), is the inclusion of a ten-foot bicycle  
41 and pedestrian shared use path—for use by both bicyclists and pedestrians—on the proposed bridge

1 structure and the approach roadways. This proposed bicycle and pedestrian shared use path would be  
2 separated from vehicle traffic on the main lanes by a two-foot concrete barrier. Details relating to the  
3 bicycle and pedestrian shared use path ingress and egress are subject to ongoing coordination with the  
4 City of Corpus Christi and the Corpus Christi MPO and would be finalized during the detailed design  
5 stage.

#### 7 *2.4.2.3 Bridge Height – Navigational Air-Draft Clearance*

8 In pursuing the objective to *provide the transportation infrastructure to support the economic*  
9 *opportunities in the area*, when designing the proposed build alternatives project engineers are  
10 considering the height of the proposed bridge, which will determine the air-draft clearance vessels  
11 would need to maintain to call at the Inner Harbor at the Port of Corpus Christi (the Port). The existing  
12 Harbor Bridge provides 138 feet of vertical clearance at MHW, which means the maximum air-draft for  
13 vessels calling at the Port’s Inner Harbor is 138 feet. The existing Harbor Bridge was designed and built  
14 in the 1950s and, as a result, it accommodates vessel sizes of the post-World War II era. As the maritime  
15 industry has evolved with the expansion of global trade, the growth in size of modern ships and cargo  
16 has outgrown the Harbor Bridge’s 138-foot vertical restriction. The 138-foot navigational restriction is  
17 “impacting operations” at the port (Cambridge Systematics, Inc. 2010, 3-17), but also the ability of the  
18 state to meet the increasing freight traffic demands expected as a result of the expansion of the Panama  
19 Canal. The 138-foot restriction also affects vessels with a light air draft greater than 138 feet, requiring  
20 them to take on ballast water after unloading in order to reduce air draft and clear the bridge when  
21 exiting the Inner Harbor, a costly and time-consuming exercise (Harrington and Cortelyou, Inc. 2010).  
22 This process represents “cost and time lost” and “makes the use of these larger vessels unprofitable”  
23 (Harrington & Cortelyou, Inc. 2010, 5).

24  
25 The Panama Canal expansion, expected to be completed in 2014, will increase the Canal’s annual  
26 capacity by 75 percent, and while the demand for freight on the West Coast of the U.S. is likely to  
27 continue to be substantial in the future, the expansion of West Coast ports to accommodate increased  
28 freight shipments faces constraints, a result of which could be substantially more cargo being brought  
29 into Texas ports (Cambridge Systematics, Inc. 2011, 1).

30  
31 Considering the minimum 201- to 205-foot vertical restriction at the Panama Canal and the importance  
32 the expansion of the canal is projected to play in the overall State plan for accommodating the increase  
33 in freight traffic along the Gulf Coast, the vertical restriction of the bridges proposed with each of the  
34 four build alternatives ranges from 206 feet to 216 feet. The difference among the alternatives with  
35 respect to the proposed bridge heights is due to the angle in which the bridge would cross the ship  
36 channel. Because the design proposes to provide 205 feet of vertical clearance above the full width of  
37 the ship channel, the alternatives that cross at less of a perpendicular angle would need to be  
38 constructed at a higher elevation to provide that level of clearance.

#### 1 2.4.2.4 Level of Service

2 The measure of the operational condition of a highway as perceived by the driver is characterized as  
3 that highway's LOS. LOS is broken into categories ranging from A to F, with A representing free-flow  
4 operations and F representing very congested traffic conditions. In the publication *A Policy on*  
5 *Geometric Design of Highways and Streets*, the American Association of State Highway and  
6 Transportation Officials (AASHTO) recommends that urban freeways and their auxiliary facilities should  
7 generally be designed for LOS C in urban areas. TxDOT has adopted these standards, stating in their  
8 Roadway Design Manual (TxDOT 2010a) that “[f]or acceptable degrees of congestion, urban freeways  
9 and their auxiliary facilities should generally be designed for level of service C...in the design year,” and  
10 that “[i]n heavily developed urban areas, level of service D may be acceptable.” Both US 181 and I-37  
11 within the project area are considered urban freeways. The project area is not, however, considered  
12 heavily developed; therefore LOS C is the design standard for the proposed project.

13  
14 Analysis of design-year (2043) traffic conditions for the build alternatives and the No Build Alternative  
15 has been conducted for the proposed project, and these studies indicate that any of the build  
16 alternative scenarios (Green, Red, Orange or West) would operate between LOS A and LOS C in the p.m.  
17 peak hour in the year 2043 (URS 2013a). The No Build Alternative would operate between LOS D and E  
18 in 2043 (URS 2013b).

#### 19 20 2.4.2.5 Connectivity of US 181 to the Local Roadway System

21 Project engineers are preliminarily designing the build alternatives in pursuit of the objective *to consider*  
22 *their connectivity to the local roadway system and address the effects that connectivity has on adjacent*  
23 *neighborhoods*. **Section 1.5.2** discusses the effect that the original late-1950s and early-1960s  
24 construction of US 181 and I-37 had on the downtown Corpus Christi area and the neighborhoods in  
25 that vicinity, namely the change in access to and from the neighborhoods and the central business  
26 district. **Sections 4.5** and **7.3.4.1** also discuss the effect of changes in access on local communities.  
27 More contemporarily, as the downtown area has expanded to include a new convention center and an  
28 arts and entertainment district, the design of the US 181/I-37 interchange and the access to and from  
29 the Harbor Bridge has resulted in traffic congestion issues on US 181 and local downtown roadways  
30 during major events.

31  
32 In the attempt to address these connectivity issues, the design of the proposed build alternatives  
33 provides an opportunity to enhance vehicular, bicycle and pedestrian travel to and from adjacent  
34 neighborhoods and the downtown area relative to the existing local roadway network. Under the Red,  
35 Orange, and West Alternatives the opportunity for enhancement is primarily through the proposed  
36 placement of US 181 on a new location alignment and the removal of the existing US 181 alignment  
37 between roughly Beach Avenue and the US 181/I-37 interchange, to be replaced with a new, at-grade  
38 city street between I-37 and the Inner Harbor. This action would eliminate the embankment of US 181  
39 with the intent of removing or minimizing the barrier between the adjacent neighborhoods and the  
40 Corpus Christi CBD. Along with adding bicycle and pedestrian facilities to the proposed highway design,  
41 eliminating the existing US 181 embankment would then allow for greater mobility for vehicles as well



1 as bicyclists and pedestrians to travel to and from the downtown area and other major destinations as  
 2 well, including North Beach, the Texas State Aquarium, the USS *Lexington* museum, the Bayfront Science  
 3 Park, the Congressman Solomon P. Ortiz International Center, and Whataburger Field.

4  
 5 The engineering design of the Green Alternative, which would largely reconstruct US 181 in its existing  
 6 location, would not preclude the addition of similar connectivity enhancements but would leave the  
 7 barrier in place downtown. US 181 would be reconstructed at a higher elevation and would therefore  
 8 allow for perpendicular streets that currently end at the embankment on the east side of US 181 to  
 9 carry under US 181 to connect to Tancahua Street on the west side of US 181. This would improve east-  
 10 west mobility in the downtown area without providing improvement to north-south mobility.

### 11 12 **2.4.3 Design Comparison Summary**

13 **Table 2.4-1** below provides a summary comparison of the design of the reasonable build alternatives  
 14 and the No Build Alternative. The cost estimate is a preliminary estimate of construction costs, not  
 15 including the cost for right of way acquisition, property displacements and relocations, utility relocation  
 16 or any necessary mitigation. The estimated maintenance costs represent expenditures over the 75-year  
 17 design life of the proposed project.

Alternative	Bridge Height* (ft over MHW)	Alternative Length (mi)	Main Bridge Span Length (ft)	Length of Mainlanes on Structure (mi within project limits)	Estimated New Right of Way Required (ac)	Estimated Construction Cost (millions <sup>^</sup> )	Estimated 75 yr Maintenance Cost <sup>^</sup>
Green	207	5.06	1,045	2.93	30.5	\$558	\$19,247,228
Red	216	5.98	1,515	2.76	50.4	\$637	\$27,903,876
Orange	210	6.00	1,208	2.80	49.8	\$630	\$22,249,427
West	206	7.59	1,500	3.42	69.8	\$679	\$27,627,600
No Build	138	NA	600	NA	0.0	NA	\$279,471,206

19 Source: US 181 Harbor Bridge EIS Team 2013

20 \*Equates to low-chord elevation necessary to provide 205-foot navigational clearance across the full width of the ship channel  
 21 in the Inner Harbor.

22 <sup>^</sup>Estimates are based on 2013 dollars.

## 23 24 **2.5 EVALUATION OF THE DEGREE TO WHICH THE ALTERNATIVES MEET THE NEED AND** 25 **PURPOSE AND OBJECTIVES**

26 A detailed evaluation of the degree to which each alternative meets the need and purpose and  
 27 objectives of the proposed project is included in **Section 5.6.2.5** and summarized here. Each of the build  
 28 alternatives would satisfy the need and purpose, as described in **Section 2.3**, but due to the differences  
 29 in alignment they would do so to varying degrees. The most notable difference among the alternatives  
 30 is with respect to hurricane evacuation, where access to the proposed facility from adjacent  
 31 neighborhoods would not be evenly accommodated. Primary among the differences would be the  
 32 degree of access from the Hillcrest neighborhood in the Northside community under the West

1 Alternative (see **Section 3.5.3.3** for a description of the community boundaries in the project area). In  
2 this instance the three existing entrances to I-37 from the Northside community (Padre Street, Brownlee  
3 Boulevard, and N. Port Avenue) would be removed and cannot be accommodated in the proposed  
4 design due to geometric design constraints. Residents in the Hillcrest neighborhood would travel to  
5 downtown Corpus Christi to access I-37, the primary hurricane evacuation route for the area. The next  
6 available entrance would also be outside the neighborhood, over a mile from N. Port Avenue to the west  
7 past Buddy Lawrence Drive. In the event that the other major hurricane evacuation route serving  
8 Corpus Christi, US 181 northbound, were needed by Hillcrest residents, they would need to travel east  
9 to downtown, against the flow of evacuating traffic, to access the route, as entrances to US 181  
10 northbound from within the Northside community also cannot be accommodated with the proposed  
11 design of the West Alternative. Currently, drivers in the Northside neighborhoods can access US 181 via  
12 I-37 (accessed from the entrance ramp on Antelope Street just east of Brownlee Boulevard). Given the  
13 geometric design constraints that would prevent the accommodation of adequate access to the  
14 proposed facility from the Northside community, the West Alternative does not satisfy the hurricane  
15 evacuation element of the need and purpose for the proposed project as well as the other build  
16 alternatives. The Green, Red, and Orange Alternatives would remove the Brownlee Boulevard entrance  
17 to I-37 while maintaining the entrance at N. Port Avenue and another entrance at N. Staples Street. In  
18 this way, these alternatives would provide adequate access to the primary hurricane evacuation route in  
19 the Corpus Christi area, satisfying this element of the need and purpose.

20  
21 With respect to the project objectives, identified in **Section 1.5**, differences among the alternatives are  
22 also evident. Considerable planning effort has been put forth by the City of Corpus Christi with the aim  
23 of revitalizing the downtown area while more fully incorporating the Sports, Entertainment, and Arts  
24 (SEA) District, and both of the project objectives (see **Section 1.5**) have elements related to supporting  
25 the City's community sustainability planning initiatives in this area. **Section 5.6.2.5** includes a detailed  
26 evaluation of how well each alternative satisfies the objectives of the proposed project and ultimately  
27 concludes that the Green Alternative does not meet the objectives of the proposed project well relative  
28 to the other build alternatives. By maintaining the existing US 181 barrier downtown, the Green  
29 Alternative only minimally improves accessibility and mobility, and reduces connectivity to the facility  
30 from adjacent neighborhoods. Therefore, the degree to which the Green Alternative meets the project  
31 objectives is low relative to the other build alternatives.

32  
33 The Red Alternative, by contrast, meets the project objectives very well by removing the US 181 barrier  
34 from downtown, which would improve mobility and access into and out of the SEA District and the  
35 downtown area and would therefore support the City's ability to implement its long-term community  
36 sustainability planning initiatives. The Red Alternative also preserves much of the existing connectivity  
37 to the facility from adjacent neighborhoods relative to the other build alternatives. The degree to which  
38 the Red Alternative meets the project objectives, therefore, is high.

39  
40 The Orange and West Alternatives would also remove the US 181 barrier downtown and provide the  
41 infrastructure to improve mobility and access into and out of the SEA District and the downtown area;  
42 however, these alternatives would not meet the project objectives well in that they would not support

1 the City's community sustainability planning initiatives as well as the Red Alternative. The Orange  
2 Alternative is aligned through the SEA District and would convert developed and developable properties  
3 within the SEA District to transportation right of way which would potentially negate some of the  
4 opportunities presented by the removal of the US 181 barrier. The West Alternative, similarly, is aligned  
5 in such a way that traffic (and potential business patrons) would be diverted away from the downtown  
6 area and the SEA District, potentially offsetting the opportunities that removing the US 181 barrier  
7 would present. The West Alternative, furthermore, reduces connectivity to the facility from adjacent  
8 neighborhoods, as described under the discussion of hurricane evacuation earlier in this section, which  
9 would affect residents during emergency situations but would also affect use of the facility for routine  
10 travel. Therefore, the degree to which both the Orange and West Alternatives meet the project  
11 objectives is considered low.

12

## 13 **2.6 IMPACT COMPARISON SUMMARY BY ALTERNATIVE**

14 Detailed assessments of the social, economic, and environmental impacts of the proposed alternatives  
15 are provided in **Sections 4.0, 5.0, 6.0** and **7.0** of this Draft EIS. Each of the alternatives has been  
16 evaluated to a comparable level of detail and this section provides a summary of those impacts, both  
17 beneficial and adverse, by alternative. **Table 2.6-1** provides a side by side comparison of the impacts of  
18 each of the build alternatives and the No Build Alternative.

1

**Table 2.6-1 Summary of Impact Comparison by Alternative**

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
<b>Consistency and Compatibility with Local Land Use Plans and Policies</b>	<ul style="list-style-type: none"> <li>•Inconsistent with future land use and community sustainability planning</li> <li>•Compatible with existing and future neighborhood land use</li> </ul>	<ul style="list-style-type: none"> <li>•Consistent with future land use and community sustainability planning</li> <li>•Incompatible with existing and future neighborhood land use</li> </ul>	<ul style="list-style-type: none"> <li>•Inconsistent with future land use and community sustainability planning</li> <li>•Incompatible with existing and future neighborhood land use</li> </ul>	<ul style="list-style-type: none"> <li>•Inconsistent with future land use and community sustainability planning</li> <li>•Incompatible with existing and future neighborhood land use</li> </ul>	<ul style="list-style-type: none"> <li>•Inconsistent with future land use and community sustainability planning</li> <li>•Compatible with existing and future neighborhood land use</li> </ul>
<b>Public Input</b>	<ul style="list-style-type: none"> <li>•Mixed support and opposition expressed by US 181 Harbor Bridge Technical and Citizens Advisory Committees</li> </ul>	<ul style="list-style-type: none"> <li>•Official endorsement by Corpus Christi MPO, City of Corpus Christi, Port of Corpus Christi Authority</li> <li>•Expressed support by US 181 Harbor Bridge Technical Advisory Committee</li> <li>•Mixed support and opposition expressed by US 181 Harbor Bridge Citizens Advisory Committees</li> </ul>	<ul style="list-style-type: none"> <li>•Mixed support and opposition expressed by US 181 Harbor Bridge Technical and Citizens Advisory Committees</li> </ul>	<ul style="list-style-type: none"> <li>•Opposition expressed by the US 181 Harbor Bridge Technical Advisory Committee and Citizens Advisory Committees</li> </ul>	<ul style="list-style-type: none"> <li>•General opposition expressed by the US 181 Harbor Bridge Technical and Citizens Advisory Committees and participants in community meetings</li> </ul>
<b>Residential Displacements</b>	15	39	102	13	0
<b>Business Displacements</b>	57	3	10	2	0
<b>Other Displacements</b>	3	4	3	1	0

**Table 2.6-1 Summary of Impact Comparison by Alternative**

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
<b>Economic Impacts<sup>1</sup></b>	<ul style="list-style-type: none"> <li>• \$670,535,437 increase in household earnings</li> <li>• 7,674 new jobs (for duration of project)</li> </ul>	<ul style="list-style-type: none"> <li>• \$761,544,606 increase in household earnings</li> <li>• 8,762 new jobs (for duration of project)</li> </ul>	<ul style="list-style-type: none"> <li>• \$757,476,431 increase in household earnings</li> <li>• 8,670 new jobs (for duration of project)</li> </ul>	<ul style="list-style-type: none"> <li>• \$816,784,096 increase in household earnings</li> <li>• 9,349 new jobs (for duration of project)</li> </ul>	<ul style="list-style-type: none"> <li>• No change</li> </ul>
<b>Community Impacts</b>	<ul style="list-style-type: none"> <li>• Leaves physical US 181 barrier in place between the Northside neighborhoods and downtown</li> <li>• Elimination of northbound exit to Burleson Street reduces access to North Beach</li> <li>• Reduction in access from downtown and South Central community</li> <li>• Avoids separation of the Washington-Coles and Hillcrest neighborhoods</li> </ul>	<ul style="list-style-type: none"> <li>• Separation of the Washington-Coles and Hillcrest neighborhoods affecting the cohesion of the Northside community</li> <li>• Elimination of northbound exit to Burleson Street reduces access to North Beach</li> <li>• Winnebago Street closure affects Northside mobility for drivers and non-drivers—comparable access replaced along Lake Street</li> </ul>	<ul style="list-style-type: none"> <li>• Separation of the Washington-Coles and Hillcrest neighborhoods affecting the cohesion of the Northside community</li> <li>• Substantial number of residential displacements; loss of 15% of households in Washington-Coles neighborhood affecting cohesion</li> <li>• Elimination of northbound exit to Burleson Street reduces access to North Beach</li> <li>• Winnebago Street closure affects Northside mobility for drivers and non-drivers—comparable access replaced along Lake Street</li> </ul>	<ul style="list-style-type: none"> <li>• Elimination of northbound exit to Burleson Street reduces access to North Beach;</li> <li>• Substantially reduced accessibility to US 181 and I-37 from the Hillcrest neighborhood, affecting hurricane evacuation and routine use</li> <li>• Avoids separation of the Washington-Coles and Hillcrest neighborhoods</li> </ul>	<ul style="list-style-type: none"> <li>• No direct impacts</li> </ul>

<sup>1</sup> Calculated based on construction cost of project using U.S. Bureau of Economic Analysis multipliers. The figures presented here represent the total economic impacts (direct + indirect + induced) for the proposed alternatives; direct impacts are detailed in **Section 4.5.6**, while indirect and induced economic impacts are detailed in **Section 6.5.1**.

**Table 2.6-1 Summary of Impact Comparison by Alternative**

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
<b>Environmental Justice</b>	<ul style="list-style-type: none"> <li>•Impacts would not be disproportionately high and adverse</li> </ul>	<ul style="list-style-type: none"> <li>•Impacts would not be disproportionately high and adverse after the consideration of mitigation and offsetting benefits</li> </ul>	<ul style="list-style-type: none"> <li>•Large number of residential displacement effects and impacts to community cohesion would be disproportionately high and adverse</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced accessibility effects to US 181 and I-37 from the Hillcrest neighborhood would be disproportionately high and adverse</li> </ul>	<ul style="list-style-type: none"> <li>•No disproportionately high and adverse impacts</li> </ul>
<b>Traffic Noise</b>	<ul style="list-style-type: none"> <li>•574 sensitive receivers impacted</li> </ul>	<ul style="list-style-type: none"> <li>•655 sensitive receivers impacted</li> </ul>	<ul style="list-style-type: none"> <li>•587 sensitive receivers impacted</li> </ul>	<ul style="list-style-type: none"> <li>•471 sensitive receivers impacted</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>•Area is in attainment of EPA’s health-based standards</li> <li>•Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO</li> <li>•Overall MSAT emissions are expected to decline region-wide in the future</li> </ul>	<ul style="list-style-type: none"> <li>•Area is in attainment of EPA’s health-based standards</li> <li>•Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO</li> <li>•Overall MSAT emissions are expected to decline region-wide in the future</li> </ul>	<ul style="list-style-type: none"> <li>•Area is in attainment of EPA’s health-based standards</li> <li>•Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO</li> <li>•Overall MSAT emissions are expected to decline region-wide in the future</li> </ul>	<ul style="list-style-type: none"> <li>•Area is in attainment of EPA’s health-based standards</li> <li>•Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO</li> <li>•Overall MSAT emissions are expected to decline region-wide in the future</li> </ul>	<ul style="list-style-type: none"> <li>•Area is in attainment of EPA’s health-based standards</li> <li>•Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO</li> <li>•Overall MSAT emissions are expected to decline region-wide in the future</li> </ul>
<b>Tidal Wetlands and Waters of the U.S.</b>	<ul style="list-style-type: none"> <li>•Permanent impacts of 0.13 acre</li> </ul>	<ul style="list-style-type: none"> <li>•Permanent impacts of 0.25 acre</li> </ul>	<ul style="list-style-type: none"> <li>•Permanent impacts of 0.14 acre</li> </ul>	<ul style="list-style-type: none"> <li>•Permanent impacts of 0.46 acre</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Marsh Habitat</b>	<ul style="list-style-type: none"> <li>•0.32 acre</li> </ul>	<ul style="list-style-type: none"> <li>•0.68 acre</li> </ul>	<ul style="list-style-type: none"> <li>•0.32 acre</li> </ul>	<ul style="list-style-type: none"> <li>•6.68 acres</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Essential Fish Habitat</b>	<ul style="list-style-type: none"> <li>•0.0 acre</li> </ul>	<ul style="list-style-type: none"> <li>•0.42 acre</li> </ul>	<ul style="list-style-type: none"> <li>•0.0 acre</li> </ul>	<ul style="list-style-type: none"> <li>•0.59 acre</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Coastal Natural Resource Areas</b>	<ul style="list-style-type: none"> <li>•Impacts to floodplains and tidal waters</li> </ul>	<ul style="list-style-type: none"> <li>•Impacts to floodplains and tidal waters</li> </ul>	<ul style="list-style-type: none"> <li>•Impacts to floodplains and tidal waters</li> </ul>	<ul style="list-style-type: none"> <li>•Impacts to coastal shore areas, coastal wetlands, floodplains and tidal waters</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Cultural Resources</b>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge system (comprised of the Harbor Bridge and six concrete bridges that carry US 181 in the project area)</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge system</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge system</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge system</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>

**Table 2.6-1 Summary of Impact Comparison by Alternative**

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
	<ul style="list-style-type: none"> <li>•De minimis impact to SAU&amp;G Depot</li> </ul>				
<b>Section 4(f) Uses</b>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge System</li> <li>•Permanent incorporation of 92% of Lovenskiold Park</li> <li>•De minimis impact to SAU&amp;G Depot</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge System</li> <li>•Permanent Incorporation of 45% of Lovenskiold Park</li> <li>•Permanent incorporation of 59% of T.C. Ayers Park</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge System</li> <li>•Permanent Incorporation of 43% of Lovenskiold Park</li> <li>•Permanent Incorporation of 34% of T.C. Ayers Park</li> <li>•De minimis impact to Oveal Williams Senior Center</li> </ul>	<ul style="list-style-type: none"> <li>•Adverse effect to the Harbor Bridge System</li> <li>•Permanent incorporation of 2.83 acres (about 8%) of Rincon Channel Wetlands Interpretive Overlook</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Hazardous Materials</b>	<ul style="list-style-type: none"> <li>•Would displace gas station with Leaking Petroleum Storage Tank</li> </ul>	<ul style="list-style-type: none"> <li>•Would displace gas station with Leaking Petroleum Storage Tank</li> <li>•Construction within previously identified area with soil and groundwater contamination</li> </ul>	<ul style="list-style-type: none"> <li>•Would displace gas station with Leaking Petroleum Storage Tank</li> <li>•Construction within previously identified area with soil and groundwater contamination</li> </ul>	<ul style="list-style-type: none"> <li>•Would displace gas station with Leaking Petroleum Storage Tank</li> <li>•Would displace two 200,000 gallon aboveground petroleum storage tanks</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>
<b>Visual and Aesthetic Impacts</b>	<ul style="list-style-type: none"> <li>•Least visually intrusive</li> <li>•Most able to convey landmark status (refers to the quality of being a highly recognizable feature, rather than a “historic landmark”)</li> <li>•Most able to contribute to an iconic Corpus Christi skyline</li> </ul>	<ul style="list-style-type: none"> <li>•Visually and aesthetically intrusive in the Northside community</li> <li>•Able to still convey landmark status</li> <li>•Less able to contribute to an iconic Corpus Christi skyline</li> </ul>	<ul style="list-style-type: none"> <li>•Most visually and aesthetically intrusive in the Northside community</li> <li>•Able to convey landmark status</li> <li>•Able to contribute to an iconic Corpus Christi skyline</li> </ul>	<ul style="list-style-type: none"> <li>•Less visually and aesthetically intrusive in the Northside community</li> <li>•Visually and aesthetically intrusive in the Westside community (Oak Park neighborhood)</li> <li>•Least able to convey landmark status</li> <li>•Not able to contribute</li> </ul>	<ul style="list-style-type: none"> <li>•Not visually intrusive</li> <li>•Conveys landmark status</li> <li>•Contributes to iconic Corpus Christi skyline</li> </ul>

<b>Table 2.6-1 Summary of Impact Comparison by Alternative</b>					
<b>Resource/Evaluation Category</b>	<b>Alternatives</b>				
	<b>Green</b>	<b>Red</b>	<b>Orange</b>	<b>West</b>	<b>No Build</b>
				to an iconic Corpus Christi skyline	
<b>Construction Phase Effects</b>	<ul style="list-style-type: none"> <li>•Greater user effects (travel delays, alteration of traffic patterns for a longer duration) due to the construction overlap with the existing US 181 alignment</li> </ul>	<ul style="list-style-type: none"> <li>•User effects (travel delays, alteration of traffic patterns)</li> </ul>	<ul style="list-style-type: none"> <li>•User effects (travel delays, alteration of traffic patterns)</li> </ul>	<ul style="list-style-type: none"> <li>•User effects (travel delays, alteration of traffic patterns)</li> <li>•Affects U.S. Army Corps of Engineers ability to fulfill their obligation in the event emergency dredging operations were called for to maintain the ship channel during construction</li> <li>•Potential adverse water quality effects from disturbance of dredged sediments in Upland Confined Placement Area</li> </ul>	<ul style="list-style-type: none"> <li>•None</li> </ul>

1 Source: US 181 Harbor Bridge EIS Team 2013



## 2.7 SUMMARY OF THE LEAST OVERALL HARM ANALYSIS

The preceding **Section 2.6** provides a comparison of the impacts of the alternatives considered for the proposed project. Because each of the proposed build alternatives would result in the use of one or more properties protected by FHWA's Section 4(f) regulations, additional factors need to be considered in evaluating which alternative to identify as the preferred alternative. The full evaluation of these factors is described in the Draft Section 4(f) Evaluation in **Section 5.0** and is summarized here. The balancing of these factors leads to the conclusion that the Red Alternative would cause the least overall harm.

The factors to consider in the evaluation of the least overall harm alternative are defined in FHWA's Section 4(f) regulations at 23 CFR §774.3(c) and listed in **Section 5.6**. The first four factors relate to the net harm that each alternative would cause to Section 4(f) property, while the remaining three factors take into account any substantial problems the alternatives may have with issues other than Section 4(f). **Section 5.6** provides a detailed evaluation of each of these seven factors, the results of which are summarized here and in **Table 2.7-1**.

Least Overall Harm Criteria	Build Alternatives			
	Green	Red	Orange	West
Ability to Mitigate Adverse Impacts to 4(f) Properties	Medium	Medium	Medium	High
Severity of Harm to 4(f) Properties after Mitigation	Medium	Medium	Medium	Medium
Relative Significance of 4(f) Properties	Medium	Medium	Medium	High
Views of Officials with Jurisdiction	City of Corpus Christi - favorable toward impacts and conceptual mitigation	City of Corpus Christi - favorable toward impacts and conceptual mitigation	City of Corpus Christi - favorable toward impacts and conceptual mitigation	City of Corpus Christi - less favorable toward impacts and conceptual mitigation
	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation
Degree to which the Alternative Meets Need and Purpose and Objectives	Medium	High	Medium	Low
Magnitude of Impacts to Non-4(f) Resources After Mitigation	Medium	Low	High <sup>^</sup>	High
Cost Comparison	\$558 million	\$637 million	\$630 million	\$679 million

Source: US 181 Harbor Bridge EIS Team 2013

NOTE: high = TxDOT has the ability to reasonably mitigate the potential effects from the use of the Section 4(f) property; medium = some of the effects from the use could be offset by mitigation while others could not; low = TxDOT does not have the ability to reasonably mitigate the effects.

<sup>^</sup>The evaluation in **Section 5.6.2.6** presents the Orange Alternative as the alternative with the highest degree of adverse impacts to non-Section 4(f) resources after mitigation.

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## **2.7.1 Factors Related to Section 4(f)**

### *2.7.1.1 Ability to Mitigate Adverse Section 4(f) Impacts*

Based on TxDOT's coordination with the officials with jurisdiction over the Section 4(f) properties (the City of Corpus Christi and the Texas Historical Commission [THC]), the West Alternative has a high potential for the adverse impacts to Section 4(f) properties to be mitigated, while the Section 4(f) impacts of the Green, Red and Orange Alternatives have a medium potential to be mitigated. This is primarily based on the fact that the mitigation for the use of Lovenskiold Park by the Green, Red and Orange Alternatives would be in the form of monetary compensation, which the City of Corpus Christi has indicated would be applied to the enhancement of an existing park property elsewhere (Ben Garza Park) rather than the development of a replacement property for public recreational use. The end result would be that although enhancement of recreational function would be achieved there would be a net loss of park property available to the community with these alternatives. The Red and Orange Alternatives would mitigate the adverse impacts to T.C. Ayers Park by acquiring and developing a replacement property to be designated and operated as a public park. Additional mitigation options to offset the impacts of the Red and Orange Alternatives would include enhancements to the community swimming pool, expansion of the walking trail adjacent to the pool, and the development of bicycle and pedestrian connections between the various existing and to be created park properties in the Northside community.

The impacts to the Rincon Channel Wetlands Interpretive Overlook resulting from the use of the property by the West Alternative have high potential to be mitigated. TxDOT would compensate for the loss of a portion of the refuge by working with the City to acquire additional acreage to add to the refuge and by developing habitat restoration to replace the lost function.

The use of the NRHP-eligible Harbor Bridge system would be mitigated, and TxDOT has coordinated the proposed mitigation with the THC; the mitigation would be the same for and is applicable to all the proposed build alternatives.

### *2.7.1.2 Severity of Harm After Mitigation*

The severity of harm to Section 4(f) properties after mitigation would be medium for all build alternatives. Because the use of Lovenskiold Park by the Green Alternative would result in the entire park being permanently incorporated into the transportation right of way, and the mitigation for the loss of the park would be applied to the nearby Ben Garza Park, there would be a medium degree of remaining harm to Lovenskiold Park. For the Red and Orange Alternatives, the use of Lovenskiold Park would involve permanent incorporation of approximately 45 percent of the land; 55 percent of the park would remain and development of recreational amenities at Ben Garza Park would offset the loss of function at the existing park. The mitigation for the adverse impacts to T.C. Ayers Park would consist of replacement of public park property nearby with amenities that would result in expanded recreational opportunities for the community. Based on coordination with the City of Corpus Christi and the affected neighborhoods in September 2013, this mitigation would be considered an overall benefit to the

1 community, and, as a result, the severity of harm to Section 4(f) properties after mitigation with the Red  
2 and Orange Alternatives would be medium. Approximately 2.83 acres of the Rincon Channel Wetlands  
3 Interpretive Overlook (about 8 percent) would be permanently incorporated into the right of way of the  
4 West Alternative, resulting in a medium degree of harm. The loss of acreage would be replaced and  
5 habitat restoration would be developed, but the elevated portion of the highway would encroach upon  
6 the open space element of the refuge that exists today, potentially affecting users' enjoyment of the  
7 refuge.

### 8 9 *2.7.1.3 Relative Significance of the Property*

10 With respect to the relative significance of the Section 4(f) properties, a general assessment of how each  
11 official administers their jurisdiction over their respective property was used to order the properties by  
12 relative significance; **Section 5.6.2.3** covers this analysis in detail. Ultimately, a determination was made  
13 that the Harbor Bridge system is the most significant Section 4(f) property affected by the proposed  
14 project, and implementation of any of the build alternatives would result in an equal use of this  
15 property. The NRHP-eligible San Antonio, Uvalde & Gulf Railroad Depot (SAU&G Depot), the Rincon  
16 Channel Wetlands Interpretive Overlook, and the Oveal Williams Senior Center are also relatively  
17 significant, among the remaining Section 4(f) properties. T.C. Ayers Park and Lovenskiold Park, while  
18 considered significant recreational resources according to the City of Corpus Christi, reflect a lesser  
19 degree of significance based on the low funding priority assigned to these properties by the City. The  
20 analysis in **Section 5.6.2.3** ultimately concludes that the West Alternative would use Section 4(f)  
21 properties with the most relative significance, while the Green, Red, and Orange Alternatives would use  
22 properties with a relatively lesser degree of significance.

### 23 24 *2.7.1.4 Views of Officials with Jurisdiction*

25 As noted previously in this section, TxDOT has coordinated routinely with the officials with jurisdiction  
26 over the Section 4(f) properties, and although review of the Draft Section 4(f) Evaluation contained in  
27 **Section 5.0** by the City and the THC is a condition precedent to approval of the Final Section 4(f)  
28 Evaluation, preliminary feedback indicates that with respect to the impacts and proposed mitigation to  
29 the properties under their jurisdiction, the City of Corpus Christi has not raised any objections and has  
30 agreed to work with TxDOT further on finalizing measures to minimize harm to their public parks and  
31 refuge lands. If a distinction can be made in this regard, it would be with respect to the Rincon Channel  
32 Wetlands Interpretive Overlook, which is overseen by the Department of Engineering within the City, as  
33 opposed to the Parks and Recreation Department. Since the land on which the Overlook sits is  
34 encumbered by a conservation easement made possible by a federal Coastal Management Program  
35 grant, the City has expressed concern regarding the efficacy of any potential conversion of the easement  
36 to transportation right of way.

## 1 **2.7.2 Factors Not Related to Section 4(f)**

### 2 *2.7.2.1 Degree to Which Alternatives Meet Need and Purpose and Objectives*

3 A detailed evaluation of the degree to which each alternative meets the need and purpose and  
4 objectives of the proposed project is included in **Section 5.6.2.5** and summarized in **Section 2.5**. The  
5 assessment shows that the Red Alternative would perform best, while the Green, Orange, and West  
6 Alternatives would all have deficiencies in regards to the need and purpose or project objectives.

### 8 *2.7.2.2 Magnitude of Adverse Impacts After Mitigation*

9 **Section 5.6.2.6** covers the comparison of the impacts and benefits of the build alternatives (see **Section**  
10 **2.6** as well) and concludes that after considering mitigation the magnitude of the impacts would be  
11 lowest with the Red Alternative, followed by the Green, the West, and finally the Orange Alternative.

### 13 *2.7.2.3 Comparison of Cost*

14 **Table 2.4-1** includes the estimated construction cost, including construction engineering, mobilization  
15 and contingency costs, of each build alternative and shows that the West Alternative would have the  
16 highest estimated cost (\$679 million) of any of the alternatives. The Red and Orange Alternatives would  
17 be similar in cost, at \$637 million and \$630 million estimated, respectively. The Green Alternative would  
18 have the lowest estimated construction cost (\$558 million) of any of the build alternatives. These cost  
19 estimates are exclusive of right of way acquisition costs, property displacement and relocation costs,  
20 utility adjustments and any necessary mitigation costs. Ultimately, and due to the preliminary nature of  
21 these estimates, the differences among the alternatives in terms of cost would not be considered  
22 substantial.

## 24 **2.8 IDENTIFICATION OF THE PREFERRED ALTERNATIVE**

25 **Table 2.8-1** provides a summary of the evaluation of all the factors considered in the comparison of  
26 reasonable alternatives for the proposed project, and **Figure 2.8-1** in **Appendix A** illustrates the detailed  
27 qualitative and quantitative screening process for the identification of the Preferred Alternative. Each of  
28 the four build alternatives meets the need and purpose for the proposed project. As discussed above,  
29 because there is no feasible and prudent avoidance alternative to the use of Section 4(f) property,  
30 FHWA may approve only the alternative that causes the least overall harm based on the factors set forth  
31 in 23 CFR §774.3(c), including, among other items, consideration of the degree of harm to Section 4(f)  
32 properties as well as the degree to which each alternative meets the need and purpose and objectives  
33 of the proposed project. The evaluation summarized in this chapter and presented throughout this  
34 Draft EIS leads to the identification of the Red Alternative as the Preferred Alternative.

36 The Red Alternative (described in **Section 2.4.1.2**) meets the need and purpose of the proposed project  
37 by providing a solution for the long-term highway operability of the US 181 crossing of the Corpus Christi  
38 Ship Channel, a non-fracture critical bridge structure with a 75 year design life. The Red Alternative also  
39 meets the need for improving safety for the travelling public, including during hurricane evacuations by  
40 correcting design deficiencies and upgrading the facility to current design standards.

1  
2 The Red Alternative best meets the objectives of the proposed project of providing the transportation  
3 infrastructure to support economic opportunity in the area and addressing connectivity to the local  
4 roadway system and its effect on adjacent neighborhoods. The Red Alternative would best meet these  
5 objectives because it would remove the US 181 barrier from downtown and improve mobility and  
6 access into and out of the SEA District and the downtown area. The Red Alternative would also best  
7 support the City of Corpus Christi's ability to implement its long-term community sustainability planning  
8 initiatives relative to the other alternatives. (See the detailed evaluation in **Section 5.6.2.5** and the  
9 summary in **Section 2.5**). The Red Alternative also preserves much of the existing connectivity to the  
10 facility from adjacent neighborhoods relative to the other build alternatives, including accommodating  
11 bicycle and pedestrian modes of travel to and from the adjacent communities.

12  
13 In addition, the Red Alternative was determined after mitigation to cause the least overall harm through  
14 the seven-factor evaluation presented in **Section 5.6** and summarized in **Section 2.7**. The Red  
15 Alternative also maximizes the engineering considerations and accommodates the navigational  
16 transportation needs of the Port of Corpus Christi. Also, the Red Alternative was the only alternative to  
17 receive official endorsement by Corpus Christi MPO, the City of Corpus Christi, and the Port of Corpus  
18 Christi Authority.

19

<b>Table 2.8-1 Alternative Comparison Summary</b>					
<b>Alternatives</b>	<b>Meets Purpose and Need (Yes/No)</b>	<b>Meets Purpose and Need and Objectives (High/Medium/Low)</b>	<b>Least Overall Harm (Rank 1-5)</b>	<b>Maximizes Engineering Considerations (High/Medium/Low)</b>	<b>Preferred Alternative (Yes/No)</b>
Green	Yes	Medium	2	Low	No
<b>Red</b>	<b>Yes</b>	<b>High</b>	<b>1</b>	<b>High</b>	<b>Yes</b>
Orange	Yes	Medium	3	Medium	No
West	Yes	Low	4	Low	No
No Build	No	NA	5	NA	No

20 Source: US 181 Harbor Bridge EIS Team 2013

21  
22 Cooperating and Participating Agencies and the public will have an opportunity to review and comment  
23 on this Draft EIS and the identification of the Preferred Alternative. A public hearing will be held  
24 following the statutory review periods mandated in 23 CFR §771.123(h)(i) and 43 TAC §2.103(d).  
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