ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE
U.S. Border Patrol Rio Grande Valley Sector, Texas

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol

July 2008

COVER SHEET

ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE
OF TACTICAL INFRASTRUCTURE
U.S. BORDER PATROL RIO GRANDE VALLEY SECTOR, TEXAS

Responsible Agencies: U.S. Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Border Patrol (USBP).

Coordinating Agencies: U.S. Army Corps of Engineers (USACE) - Galveston District, the U.S. Section of the International Boundary and Water Commission (IBWC), and U.S. Department of the Interior.

Affected Location: U.S./Mexico international border in southernmost portions of Starr, Hidalgo, and Cameron counties, Texas.

Project Description: The Project includes the construction, operation, and maintenance of tactical infrastructure to include pedestrian fencing, patrol roads, and access roads along approximately 70 miles of the U.S./Mexico international border within the USBP Rio Grande Valley Sector, Texas. The Project will be implemented in 21 discrete sections. Individual sections will range from approximately 1 mile to more than 13 miles in length.

Report Designation: Environmental Stewardship Plan (ESP).

Abstract: CBP plans to construct, operate, and maintain approximately 70 miles of tactical infrastructure, including primary pedestrian fence, patrol roads, and access roads along the U.S./Mexico international border in the USBP Rio Grande Valley Sector, Texas. Individual sections will range from approximately 1 to 13 miles in length. The tactical infrastructure will cross multiple land use types, such as agricultural, rural, suburban, and urban. Impacted parcels are both publicly and privately owned. The Project will also encroach on portions of the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) and Texas Parks and Wildlife Department Wildlife Management Areas (WMAs) in the Rio Grande Valley.

This ESP analyzes and documents environmental consequences associated with the Project.

The public may obtain additional copies of the ESP from the Project Web site at *www.BorderFencePlanning.com*; by emailing *information@BorderFencePlanning.com*; or by written request to Mr. Loren Flossman, Program Manager, SBI Tactical Infrastructure, Suite 7.2C, 1300 Pennsylvania Ave, NW, Washington, DC 20229, Tel: (877) 752-0420, Fax: (703) 752-7754.

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EXECUTIVE SUMMARY

Background

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996, as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this Environmental Stewardship Plan (ESP) is covered by the Secretary's April 1, 2008, waiver (see **Appendix A**). Although the Secretary's waiver means that U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to continue to protect valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared the following ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the U.S. Border Patrol (USBP) Rio Grande Valley Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

As it moves forward with the project described in this ESP, CBP will continue to work in a collaborative manner with local governments, state, and Federal land managers; and the interested public to identify environmentally sensitive resources and develop appropriate best management practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

Goals and Objectives of the Project

The goal of the project is to increase border security within the USBP Rio Grande Valley Sector with an ultimate objective of reducing illegal cross-border activity. The project further meets the objectives of the Congressional direction in the Fiscal Year (FY) 2007 DHS Appropriations Act (Public Law [P.L.] 109-295), Border Security Fencing, Infrastructure, and Technology appropriation to install fencing, infrastructure, and technology along the border.

The USBP Rio Grande Valley Sector identified 21 distinct areas along the border that experience high levels of illegal cross-border activity. This activity occurs in remote areas and in areas that are not easily accessed by USBP agents, near ports of entry (POEs) where concentrated populations might live on either side of the border, or in locations that have quick access to U.S. transportation routes.

The Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. borders between POEs in the USBP Rio Grande Valley

Sector. The Project will help provide USBP agents with a tactical advantage in countering illegal cross-border activities within the USBP Rio Grande Valley Sector by improving enforcement, preventing terrorists and terrorist weapons from entering the United States, reducing the flow of illegal drugs and other contraband, and enhancing response time, while creating a safer work environment for USBP agents.

Public Outreach and Coordination

CBP notified relevant Federal, state, and local agencies of the Project and requested input on environmental concerns such parties might have regarding the Project. CBP has coordinated with the U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); State Historic Preservation Office (SHPO); and other Federal, state, and local agencies.

A Draft Environmental Impact Statement (EIS) was prepared previous to issuance of the waiver, copies were mailed to interested parties, it was posted on a public Web site, and a 45-day public review and comment period was announced. Public open houses were advertised and held at the McAllen Convention Center, the Brownsville Convention Center, and at VFW Post 8256 in Rio Grande City, Texas, on December 11, 12, and 13, 2007, respectively. Although the Secretary issued the waiver, CBP has continued to work in a collaborative manner with agencies and has considered and incorporated agency and public comments into this ESP. CBP responses to public comments on the Draft EIS will also be provided on the *www.BorderFencePlanning.com* Web site. Analysis from the Draft EIS has been used to develop this ESP.

Description of the Project

CBP plans to construct, operate, and maintain tactical infrastructure consisting of 21 discrete sections of primary pedestrian fence, and patrol roads, and access roads along the U.S./Mexico international border in the USBP Rio Grande Valley Sector, Texas. The tactical infrastructure will be constructed in areas of the border that are not currently fenced. Locations are based on the USBP Rio Grande Valley Sector assessment of local operational requirements where such infrastructure will assist USBP agents in reducing illegal cross-border activities. Congress appropriated funds for this project in CBP's fiscal year (FY) 2007 and 2008 Border Security Fencing, Infrastructure, and Technology Appropriations (Public Law [P.L.] 109-295; P.L. 110-161). Rio Grande Valley Sector Individual fence sections will range from approximately 1 to 13 miles in length.

Environmental Impacts, Mitigation, and Best Management Practices

Table ES-1 provides an overview of potential environmental impacts by specific resource areas. **Chapters 2** through **12** of this ESP address these impacts in more detail.

CBP followed specially developed design criteria to reduce adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts without compromising operational requirements. Design criteria to reduce adverse environmental impacts include selecting a location for tactical infrastructure that will avoid or minimize impacts on environmental and cultural resources, consulting with Federal and state agencies and other stakeholders to avoid or minimize adverse environmental impacts and develop appropriate BMPs, and avoiding physical disturbance and construction of solid barriers in wetlands/riparian areas and streambeds, where practicable. BMPs will include implementation of a Spill Prevention Control and Countermeasure (SPCC) Plan, Storm Water Pollution Prevention Plan (SWPPP), Environmental Protection Plans (EPPs), and Unanticipated Discovery Plan.

CBP will enter into a programmatic mitigation agreement with the Department of the Interior (DOI) and fund a mitigation pool for adverse impacts that cannot be avoided.

Table ES-1. Summary of Environmental Impacts, Mitigation, and BMPs

Resource Area	Effects of the Project	Best Management Practices/Mitigation
Air Quality	Short- and long-term negligible to minor adverse impacts will be expected.	BMPs to reduce dust and control PM_{10} emissions. Construction equipment will be kept in good operating condition to minimize exhaust Construction speed limits will not exceed 35 miles per hour.
Noise	Short-term moderate adverse impacts will be expected.	Mufflers and properly working construction equipment will be used to reduce noise. Generators will have baffle boxes, mufflers, or other noise abatement capabilities.
Land Use	Short- and long-term minor to moderate adverse impacts will be expected.	None required.
Geology and Soils	Short- and long-term negligible to minor adverse impacts will be expected.	Construction related vehicles will remain on established roads and areas with highly erodible soils will be avoided when possible. Gravel or topsoil would be obtained from developed or previously used sources.

Resource Area	Effects of the Project	Best Management Practices/Mitigation
Water Use and Quality		
Hydrology and Groundwater	Grading and contouring will result in short- and long-term negligible direct adverse impact.	None required.
Surface Waters and Waters of the United States	Short- and long-term direct and indirect negligible adverse impacts will be expected.	Construction activities will stop during heavy rains. All fuels, oils, and solvents will be collected and stored. Where practicable alternatives exist stream crossings will not be located at bends to protect channel stability. Equipment maintenance, staging, laydown, or fuel dispensing will occur upland to prevent runoff. Fence types will allow conveyance of water.
Floodplains	Short- and long-term minor adverse impacts will be expected.	In Sections O-1 through O-3, use of movable fence design that would mitigate potential floodplain impacts during flood events.
Biological Resources		
Vegetation Resources	Short- and long-term negligible to minor adverse impacts will be expected.	Construction equipment will be cleaned to minimize spread of non-native species. Removal of trees and brush in habitats of federally listed species will be limited to the smallest amount needed to meet the objectives of the project. Invasive plants that appear on project area will be removed. Fill material, if required, will be weed-free to the maximum extent practicable.

Resource Area	Effects of the Project	Best Management Practices/Mitigation
Wildlife and Aquatic Resources	Short- and long-term negligible to moderate adverse impacts will be expected.	Ground disturbance during migratory bird nesting season will require migratory bird nest survey and possible removal and relocation. Small openings will be integrated into fence design to allow for passage of small animals. To prevent entrapment of wildlife all excavated holes or trenches will either be covered or provided with wildlife escape ramps. All vertical poles and posts that are hollow will be covered to prevent entrapment and discourage roosting.
Special Status Species	Short- and long-term minor to major adverse, and minor beneficial impacts will be expected. Fragmentation of ocelot and jaguarundi habitat.	A biological monitor will be onsite during construction to account for occurrences of special status species. If Federally protected species are encountered, construction will stop until the biological monitor can safely remove the individual or it moves away on its own. Construction will only resume with the approval of the biological monitor. Bollard fence will allow transboundary migration of small animals. See **Chapter 7.3** and **Appendix E** for impacts on special status species. Placement of 438 wildlife openings in Sections O-1 through O-3 and O-11 through O-21.
Cultural Resources	Long-term minor to major adverse impacts will be expected.	Any unanticipated archeological resources discovered would halt construction until authorized to proceed by a qualified archaeologist.
Visual Resources	Short- and long-term minor to major adverse impacts will be expected.	None required.

Resource Area	Effects of the Project	Best Management Practices/Mitigation
Socioeconomic Resources and Safety	Short-term negligible to moderate and long-term moderate beneficial impacts will be expected. Short-term negligible to major adverse impacts will be expected.	None required.
Utilities and Infrastructure	Short-term negligible to minor adverse impacts are expected.	None required.
Hazardous Materials and Wastes	Short-term negligible adverse impacts will be expected.	All waste materials and other discarded materials will be removed from the project area as quickly as possible.

ENVIRONMENTAL STEWARDSHIP PLAN FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE U.S. BORDER PATROL RIO GRANDE VALLEY SECTOR, TEXAS

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1. GENERAL PROJECT DESCRIPTION

1.1 INTRODUCTION TO THE ENVIRONMENTAL STEWARDSHIP PLAN

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996 as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this Environmental Stewardship Plan (ESP) is covered by the Secretary's April 1, 2008, waiver (73 Federal Register [FR] 65, pp. 18293–24, **Appendix A**). Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to continue to protect valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared the following ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP Rio Grande Valley Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

As it moves forward with the project described in this ESP, CBP will continue to work in a collaborative manner with local governments, state, and Federal land managers; and the interested public to identify environmentally sensitive resources and develop appropriate best management practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

This ESP is divided into 15 chapters plus appendices. The first chapter presents a detailed description of the Project. Subsequent chapters present information on the resources present, and evaluate the direct, indirect, and cumulative effects of the Project. The ESP also describes measures CBP has identified—in consultation with Federal, state, and local agencies—to avoid, minimize, or mitigate impacts on the environment, whenever possible. The following resource areas are presented in this ESP: air quality; noise; land use; geological resources and soils; water use and quality; biological resources (i.e., vegetation, wildlife and aquatic species, special status species); cultural resources; aesthetics and visual resources; socioeconomic resources, environmental justice, and safety; utilities and infrastructure; hazardous materials and wastes. Some environmental resources were not included in this ESP because they were not relevant to the analysis. These potential resource areas include sustainability (omitted because the Project will use minimal amounts of resources during construction and maintenance), construction safety (omitted because construction workers will be subject to Occupational Safety and Health Administration (OSHA) standards and the Project will not introduce new or unusual safety risks), and climate because the Project will not affect the climate, however air emissions and their impacts on air quality are discussed in **Chapter 2**.

Appendix A contains the Secretary's published April 1, 2008 waiver. **Appendix B** provides information on primary pedestrian fence designs. **Appendix C** provides air quality emissions calculations. **Appendix D** presents the Biological Survey Report and **Appendix E** presents the Biological Resources Plan. **Appendix F** contains detailed maps of fence sections and **Appendix G** contains detailed maps of fence sections showing soils.

CBP will follow specially developed design criteria to reduce adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts to the extent possible. Design criteria to reduce adverse environmental impacts include avoiding physical disturbance and construction of solid barriers in wetlands/riparian areas and streambeds, where practical. Consultation with Federal and state agencies and other stakeholders will augment efforts to avoid or minimize adverse environmental impacts. Appropriate BMPs will be developed to protect natural and cultural resources to the extent practicable.

1.2 USBP Background

The mission of CBP is to prevent terrorists and terrorist weapons from entering the United States, while also facilitating the flow of legitimate trade and travel. In supporting CBP's mission, U.S. Border Patrol (USBP) is charged with establishing and maintaining effective control of the borders of the United States. USBP's mission strategy consists of five main objectives:

- Establish substantial probability of apprehending terrorists and their weapons as they attempt to enter illegally between the Ports of Entry (POEs)
- Deter illegal entries through improved enforcement
- Detect, apprehend, and deter smugglers of humans, drugs, and other contraband
- Leverage "smart border" technology to multiply the effect of enforcement personnel
- Reduce crime in border communities and consequently improve quality of life and economic vitality of targeted areas.

USBP has nine administrative sectors along the U.S./Mexico international border. Each sector is responsible for implementing an optimal combination of personnel, technology, and infrastructure appropriate to its operational requirements. The USBP Rio Grande Valley Sector is responsible for 17,000 square miles of land in southeastern Texas, including the following counties: Cameron, Willacy, Hidalgo, Starr, Brooks, Kenedy, Kleberg, Nueces, San Patricio, Jim Wells, Bee, Refugio, Calhoun, Goliad, Victoria, Dewitt, Jackson, and Lavaca. The areas affected by the Project include the southernmost portions of Starr, Hidalgo, and Cameron counties, Texas, within the USBP Rio Grande Valley Sector. Within the USBP Rio Grande Valley Sector, areas for tactical infrastructure improvements have been identified that will help the Sector gain more effective control of the border and significantly contribute to USBP's priority mission of homeland security.

1.3 GOALS AND OBJECTIVES OF THE PROJECT

The goal of the project is to increase border security within the USBP Rio Grande Valley Sector with an ultimate objective of reducing illegal cross-border activity. The Project further meets the objectives of the Congressional direction in the Fiscal Year (FY) 2007 DHS Appropriations Act (Public Law [P.L.] 109-295), Border Security Fencing, Infrastructure, and Technology appropriation to install fencing, infrastructure, and technology along the border.

The Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. borders between POEs in the USBP Rio Grande Valley Sector. The Project will help to deter illegal entries within the USBP Rio Grande Valley Sector by improving enforcement efficiency, thus preventing terrorists and terrorist weapons, illegal aliens, drugs, and other cross border violators and contraband from entering the United States, while providing a safer work environment for USBP agents. The USBP Rio Grande Valley Sector identified 21 distinct areas along the border that experience high levels of illegal cross–border activity. This activity occurs in remote areas and in areas that are not easily accessed by USBP agents, near POEs where concentrated populations might live on either side of the border, or in locations that have quick access to U.S. transportation routes.

1.4 DESCRIPTION OF THE PROJECT

CBP plans to construct, operate, and maintain tactical infrastructure consisting of primary pedestrian fence, concrete flood protection structures/concrete fence, patrol roads, and access roads along the U.S./Mexico international border in the UBSP Rio Grande Valley Sector, Texas. Individual fence sections will range from approximately 1 mile in length to more than 13 miles in length. Each tactical infrastructure section is considered to be an individual project and can proceed to completion independent of the other sections. These 21 sections of tactical infrastructure are designated as Sections O-1 through O-21 as identified on **Figures 1-1** through **1-3** and are shown in more detail in **Appendix F**. **Figure 1–4** shows a schematic of the typical temporary and permanent impact area for tactical infrastructure.

Design criteria that have been established based on USBP operational needs require that, at a minimum, any fencing must meet the following requirements:

- Built 15 to 18 feet high and extend below ground

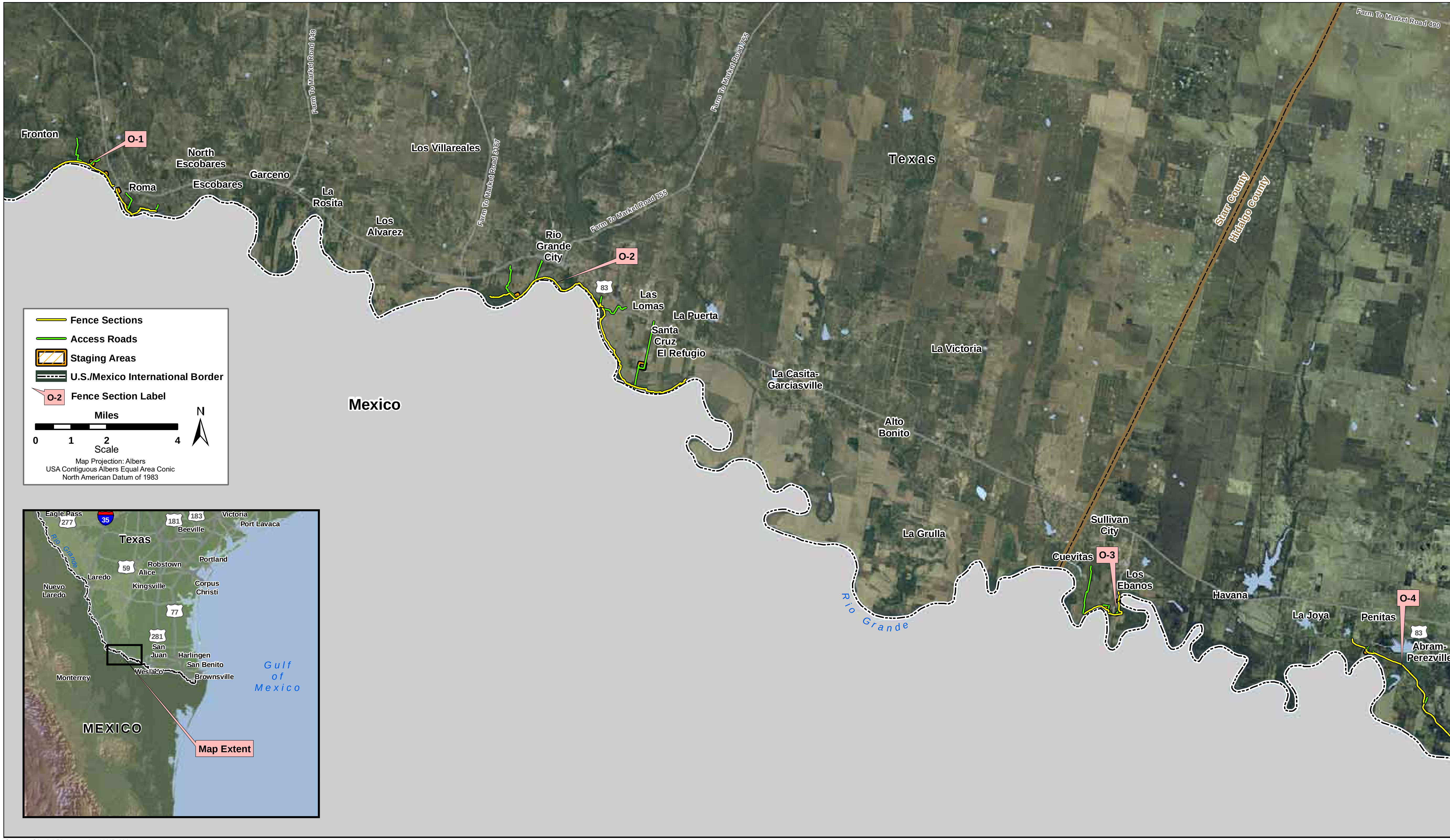
- Capable of withstanding a crash of a 10,000-pound (gross weight) vehicle traveling at 40 miles per hour
- Capable of withstanding vandalism, cutting, or various types of penetration
- Semi-transparent, as dictated by operational need
- Designed to survive extreme climate changes
- Designed to reduce or minimize impacts on small animal movements
- Engineered not to impede the natural flow of surface water
- Aesthetically pleasing to the extent possible.

In addition, the United States Section, International Boundary and Water Commission (USIBWC) has design criteria for tactical infrastructure to avoid adverse impact on floodplains, levees, and flood control operations (IBWC 2007). Examples of primary pedestrian fence are included in **Appendix B.**

Sections O-1 through O-3 and O-11 through O-21

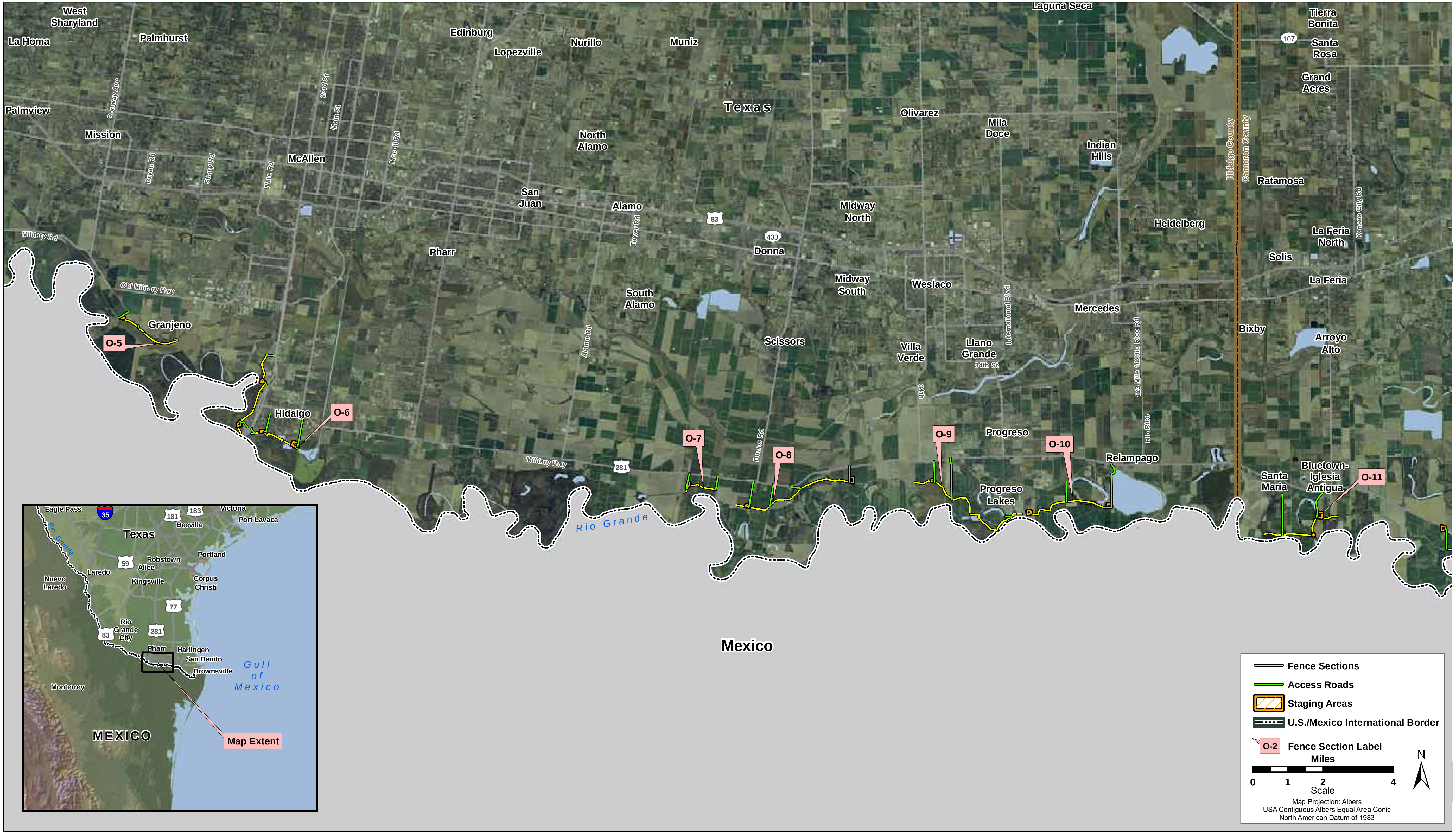
In Sections O-1 through O-3 and O-11 through O-21, the Project consists of installing primary pedestrian fence along a route that minimizes environmental impacts, while meeting USBP operational needs. Sections O-1 through O-3 primarily follow a route along existing USBP patrol roads near the Rio Grande. CBP coordinated with USIBWC on the development of movable fence designed to mitigate potential impacts to the floodplain for Sections O-1 through O-3. During a flood event, sections of the fence in Sections O-1 through O-3 would be moved in order to allow easier passage of flood waters. The Project alignment for Sections O-11 through O-21 follows the USIBWC levee system associated with the Rio Grande. In most cases, the Project section alignments along the USIBWC levee will be placed approximately 30 feet from the north toe of the levee (i.e., lowest point of the base of the structure facing away from the Rio Grande). This configuration will allow the infrastructure to be placed in an existing levee right-of-way (ROW) without disturbing current USIBWC operations or USBP patrol roads. Several locations along the levee ROW will require the purchase of private property. Some tactical infrastructure sections will also encroach on portions of the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) and Texas Wildlife Management Areas (WMAs) in the Rio Grande Valley. Controlled access gates to the area on the Rio Grande side of the tactical infrastructure will be strategically located to provide access to landowners, farmers, land managers, water and irrigation personnel, emergency services, recreationists, and others requiring such access.

The Project within Sections O-1 through O-3 and O-11 through O-21 will impact an approximate 60-foot-wide corridor for fence and patrol roads. Vegetation within the corridor will be cleared and grading will occur where needed.



Source of Aerial Photography: NAIP 2005

Figure 1-1. Locations of Tactical Infrastructure – Sections O-1 through O-4



Source of Aerial Photography: NAIP 2005

Figure 1-2. Locations of Tactical Infrastructure – Sections O-5 through O-10

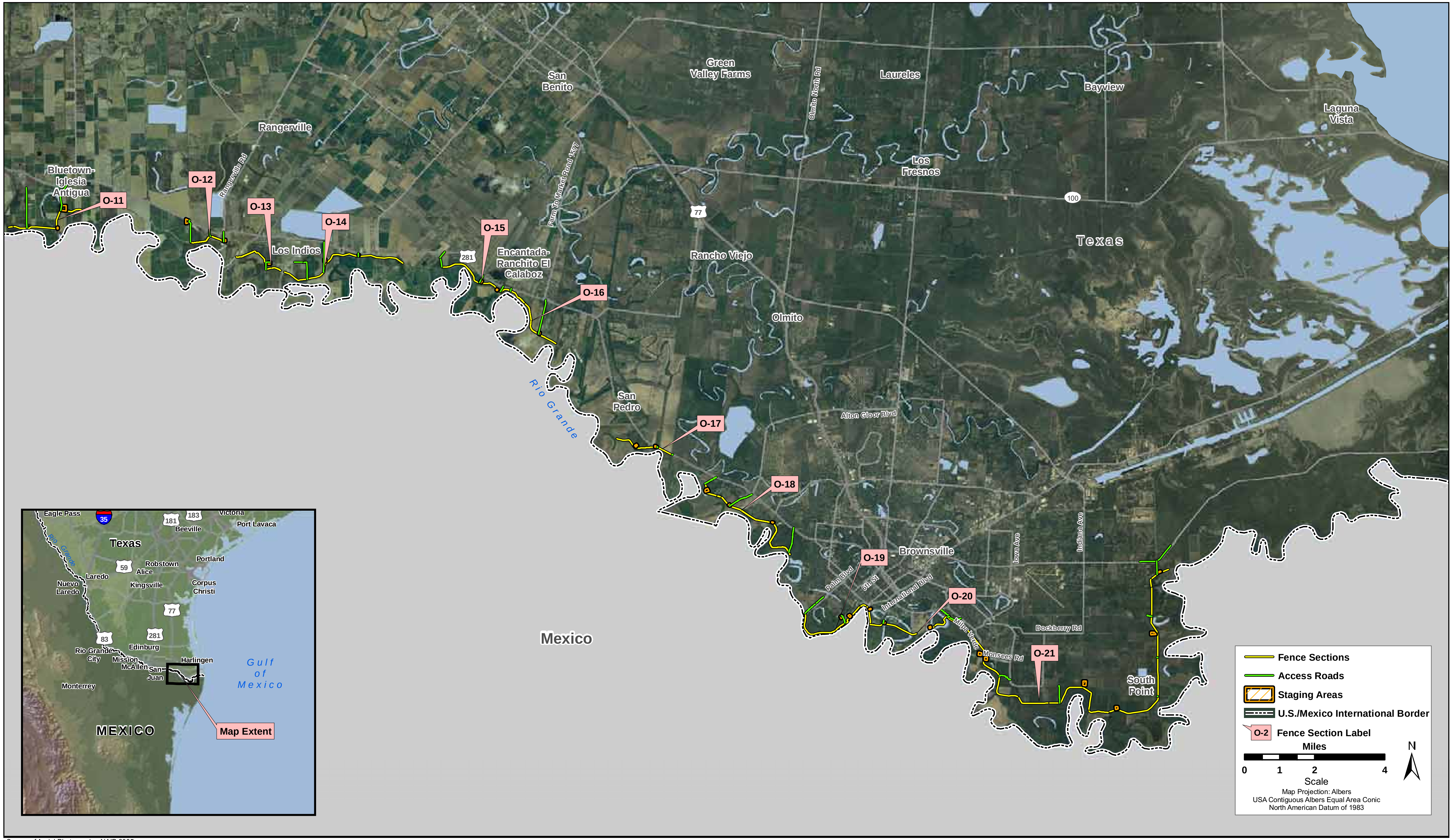


Figure 1-3. Locations of Tactical Infrastructure – Sections O-11 through O-21

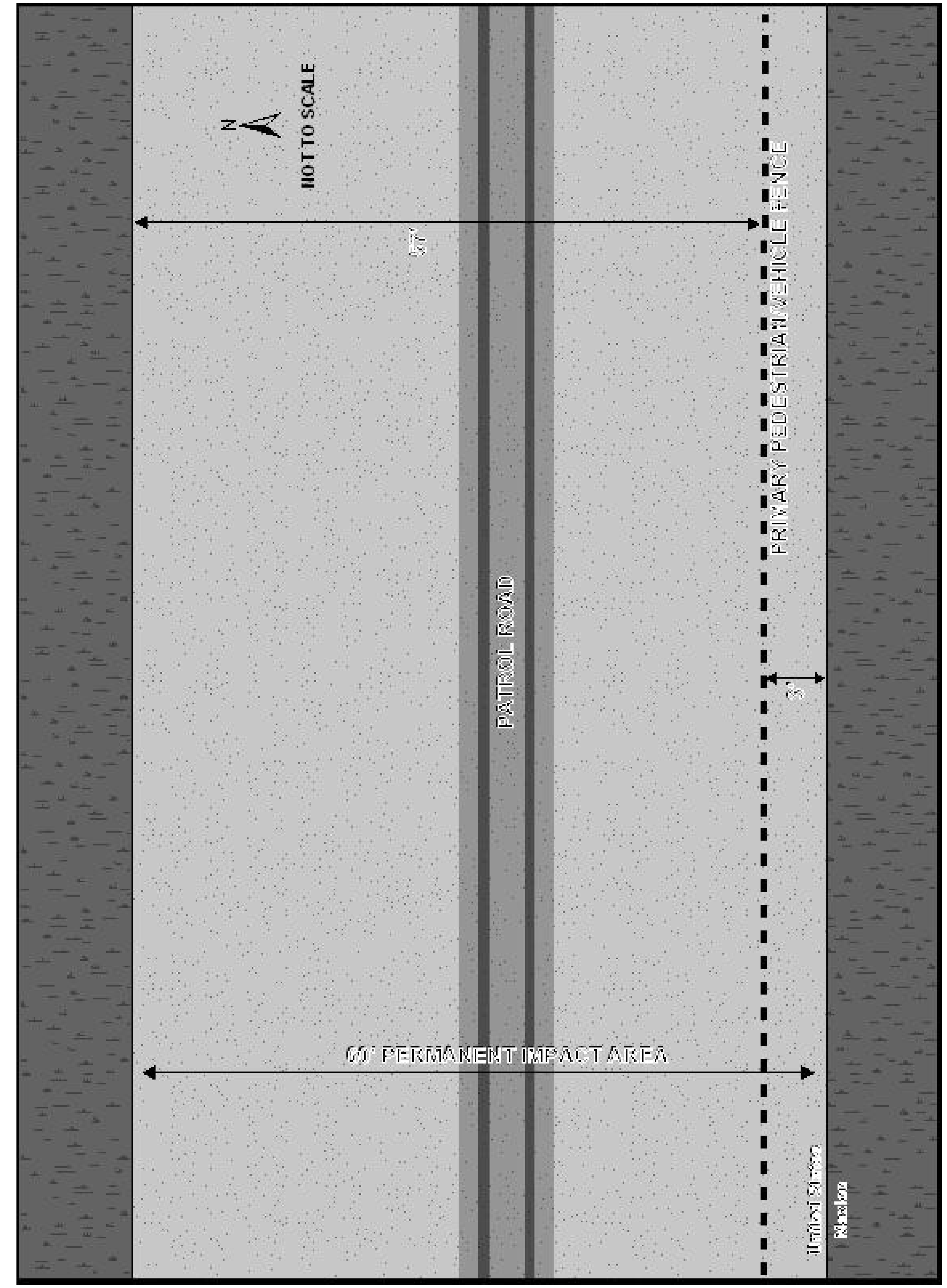


Figure 1-4. Schematic of Project Impact Areas

Wherever possible, existing roads and previously disturbed areas will be used for construction access and staging areas. Any necessary aggregate or fill material will be clean material obtained by construction contractors from commercially available sources that will not pose an adverse impact on biological or cultural resources.

Fence maintenance will either be performed by USBP Rio Grande Valley Sector personnel or contracted personnel. The fences will be made from nonreflective steel. No painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain event to avoid potential future flooding. Sand, brush, and trash that builds up against the fence will also be removed as needed. Brush removal could include mowing, removal of small trees and application of herbicide if needed. During normal patrols, Sector personnel will observe the condition of the fence. Any destruction or breaches of the fence will be repaired, as needed.

Sections O-4 through O-10

Each tactical infrastructure section within Hidalgo County where USIBWC levee currently exists will be constructed as concrete flood control structures/concrete fence (Sections O-4 through O-10).

For these sections within Hidalgo County, CBP will transfer funds through the USIBWC to Hidalgo County for the purpose of constructing a concrete flood protection structure/concrete fence on the Rio Grande side of the existing levee. The Hidalgo County Drainage District No. 1 (HCDD No. 1), Hidalgo County, Texas, and the USIBWC have developed a Memorandum of Understanding (USIBWC and HC 2007) and Individual Work Orders for the rehabilitation and reconstruction of flood control levees in the Lower Rio Grande Valley Flood Control Project. CBP will enter into a cooperative arrangement with Hidalgo County and the USIBWC to fund construction of the concrete flood protection structure/concrete fence.

The concrete flood protection structure/concrete fence will not be continuous but will be constructed in 7 distinct sections (see **Figures 1-1** and **1-2**), Sections O-4 through O-10). The USIBWC plans to relocate approximately 0.7 miles of the existing levee in Section O-6 east of the Old Hidalgo Pumphouse to a new location approximately 300 feet south to avoid adverse impacts on the Old Hidalgo Pumphouse. The concrete flood protection structure/concrete fence will be constructed into the new levee in Section O-6 once the relocation is completed by USIBWC.

The concrete flood protection structure/concrete fence will range from 15 to 18 feet high based on USIBWC requirements not to impact floodwaters in Mexico in accordance with international treaty obligations. A guard rail or bollard fence will be constructed on top of the concrete flood protection structure/concrete fence for the safety of drivers on the patrol road atop the levee. Controlled access gates to the area on the Rio Grande side of the tactical infrastructure will be strategically located to provide access to landowners, farmers, land managers, water and irrigation personnel, emergency services, recreationists, and others requiring such access.

Included in the Hidalgo County concrete flood control structure/concrete fence sections will be a patrol road on the river side of and adjacent to the bottom of the concrete flood protection structure/concrete fence (see **Figure 1-5**). A Memorandum of Agreement (MOA) between CBP and USIBWC will be developed to address each agency's responsibilities associated with maintaining the concrete flood protection structure/concrete fence, patrol roads, and access roads.

The concrete flood protection structure/concrete fence will be constructed within the footprint of USIBWC levees, and the patrol roads and all construction activities will be contained within the USIBWC ROW. Construction of the concrete flood protection structure/concrete fence will consist of the following:

1. Removal and stockpiling of levee soils. Levee cut-and-fill requirements are estimated to be 978,592 cubic yards. Temporary stockpiling of soils will occur within the USIBWC ROW or on approved construction staging areas.
2. Installation of temporary sheet piles or concrete forms where the levee soils have been removed.
3. Placement of preformed concrete panels or pouring of concrete to form the concrete flood protection structure/concrete fence. The estimated quantity of concrete required for the concrete flood protection structure/concrete fence is 230,778 cubic yards.
4. Replacement of levee soils behind the concrete flood protection structure/concrete fence and repair of the 16- to 24-foot-wide patrol road on top of the USIBWC levee.
5. Construction of a USBP patrol road adjacent to and on the river side of the concrete flood protection structure/concrete fence.

Construction of the concrete flood protection structure/concrete fence will impact a corridor between 24 and 40 feet wide on the river side of the levee. This construction corridor consists of approximately 24 feet of existing levee on the Rio Grande side of the levee that will be removed. Up to 16 additional feet within the USIBWC ROW will be temporarily impacted by construction. A preconstruction survey will be conducted to identify any wetlands or sensitive habitat within the USIBWC ROW and such areas will be avoided to the maximum extent practical, and mitigated when unavoidable. In addition, preconstruction subsurface excavation below the levee will be conducted. Any resources discovered will be treated in accordance with the unanticipated discovery plan.

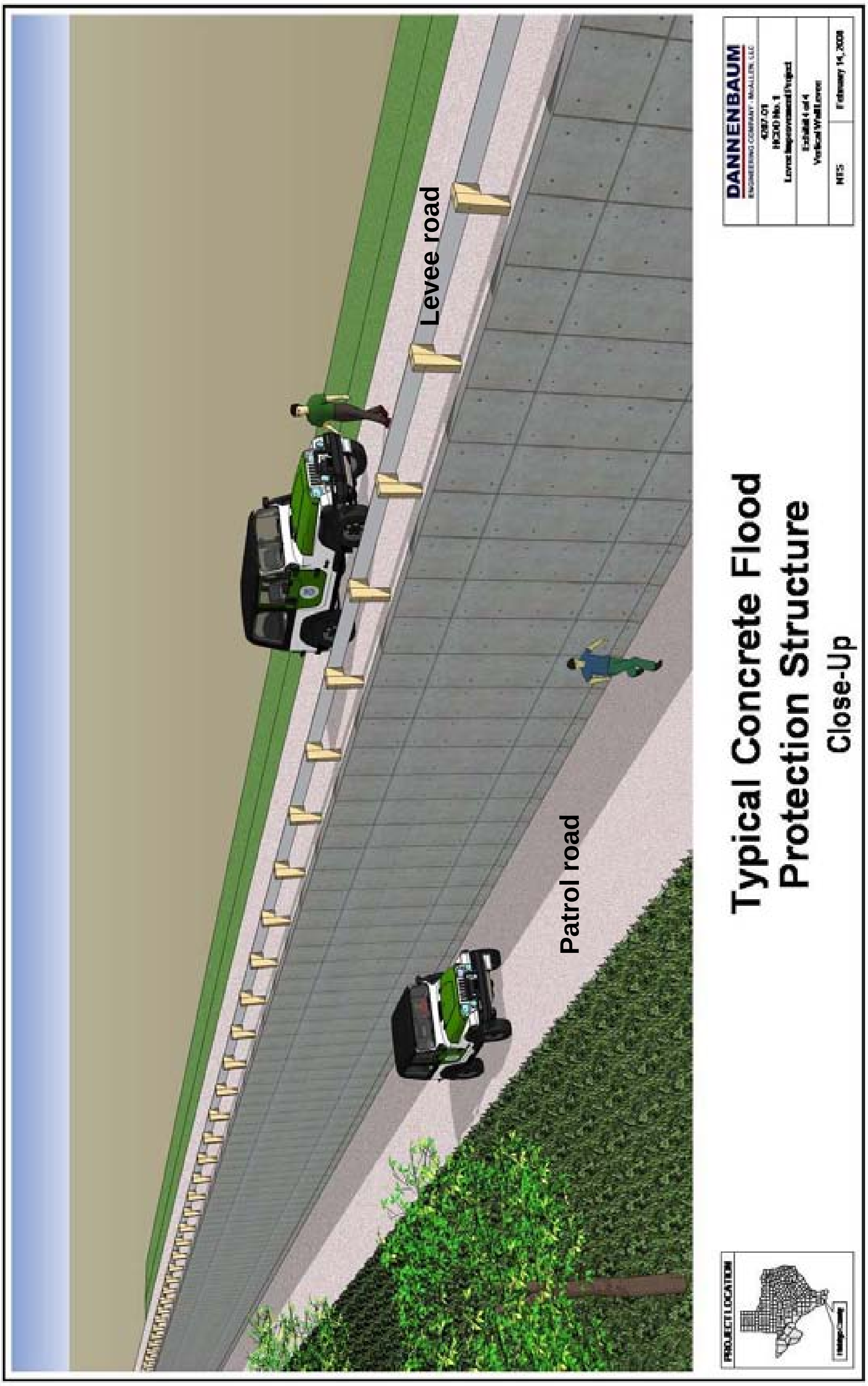


Figure 1-5. Conceptual Drawing of Concrete Flood Protection Structure/Concrete Fence

The total area that will be permanently impacted by the construction of the concrete flood protection structure/concrete fence will be approximately 106.2 acres. The other tactical infrastructure sections will permanently impact approximately 365 acres. Wherever possible, existing roads and previously disturbed areas will be used for construction access and staging areas. It is estimated that 23 construction crews will work simultaneously on the construction of the concrete flood protection structure/concrete fence. In addition to the laborers, these crews will use standard construction equipment and vehicles, such as dump trucks, excavators, and concrete pump trucks. Construction of the concrete flood protection structure/concrete fence will begin approximately in June 2008 and continue through December 2008. **Figure 1-6** shows a typical cross section for Sections O-4 through O-10. **Table 1-1** presents a general summary of Sections O-1 through O-21.

Construction of other tactical infrastructure might be required in the future as mission and operational requirements are continually reassessed. To the extent that additional actions are known, they are discussed in **Chapter 13**, Related Projects and Potential Effects, of this ESP.

USBP is working closely with local landowners and municipalities that will be affected by the tactical infrastructure. On a case-by-case basis, U.S. Army Corps of Engineers (USACE) might purchase the land between the tactical infrastructure and the Rio Grande on behalf of USBP, if operationally necessary.

1.5 PUBLIC OUTREACH AND COORDINATION

Prior to the waiver, CBP prepared an Environmental Impact Statement (EIS) to address the potential effects of the Planned Action. A Notice of Availability (NOA) for the draft EIS was published in the *The Monitor, The Brownsville Herald*, and *The Valley Morning Star, La Frontera* and *El Nuevo Heraldo* on November 16 and 18, and December 5 and 11, 2007, announcing the release of document for a 45-day public comment period. In addition, public open houses were held at the McAllen Convention Center, the Brownsville Convention Center, and at VFW Post 8256 in Rio Grande City, Texas on December 11, 12, and 13, 2007, respectively.

Although the Secretary of DHS issued the waiver, and thus, CBP has no responsibilities under the National Environmental Policy Act (NEPA) for this project, CBP reviewed, considered, and incorporated comments received from the public and other Federal, state, and local agencies, as appropriate, during the preparation of this ESP. CBP responses to public comments on the Draft EIS will also be provided on the *www.BorderFencePlanning.com* Web site. Analysis from the Draft EIS has been used to develop this ESP.

In addition to the past public involvement and outreach program, CBP has continued to coordinate with various Federal and state agencies during the development of this ESP. These agencies are described in the following paragraphs.

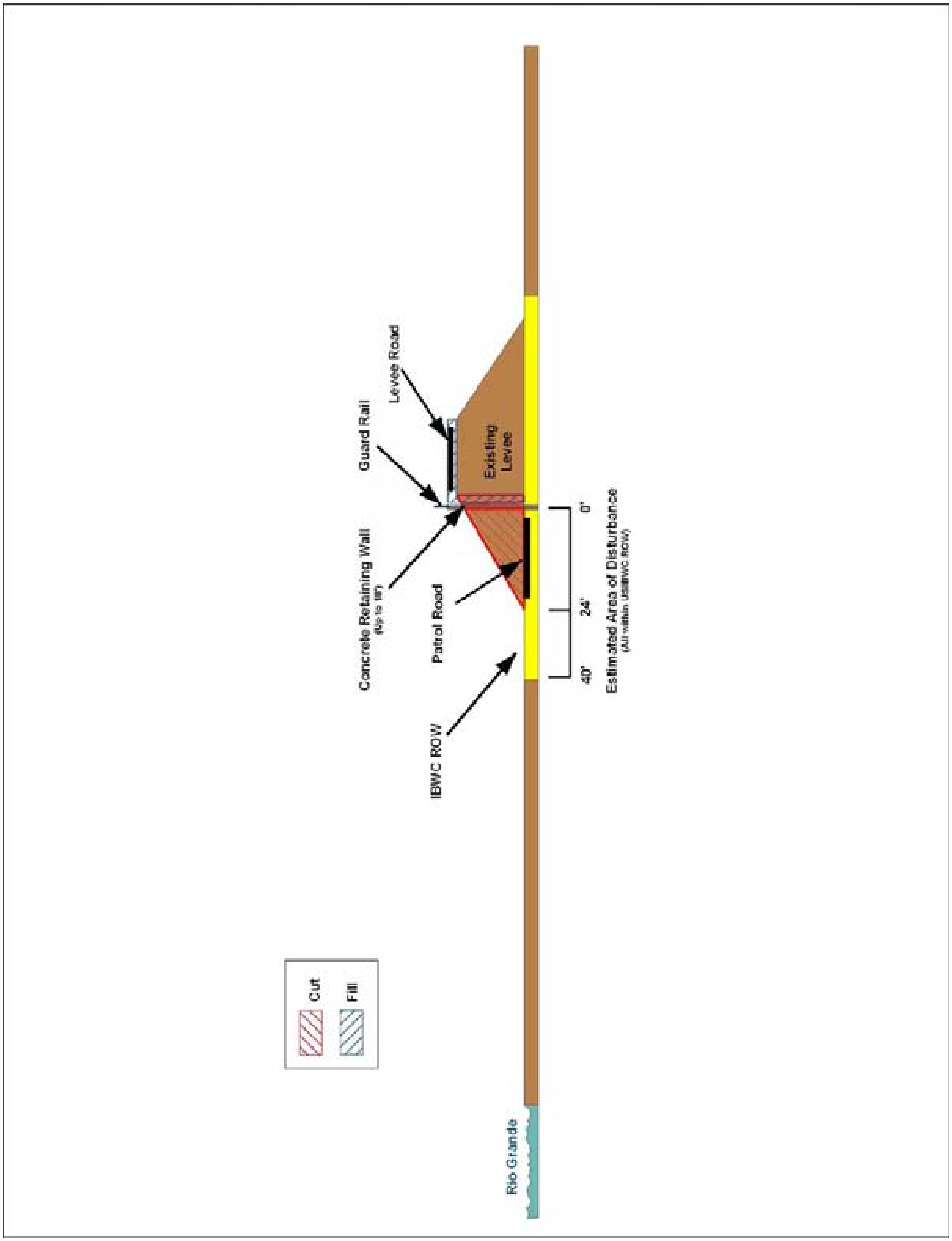


Figure 1-6. Typical Schematic for Sections O-4 through O-10

Table 1-1. Primary Pedestrian Fence and Concrete Flood Protection Structure/Concrete Fence Sections, USBP Rio Grande Valley Sector

Section Number	Associated USBP Station	General Location	Length of Primary Pedestrian Fence Section (miles)	Length of Concrete Flood Protection Structure/ Concrete Fence Section (miles)
O-1	Rio Grande City	Near Roma POE	3.75	0
O-2	Rio Grande City	Near RGC POE	8.74	0
O-3	McAllen	Los Ebanos POE	1.90	0
O-4	McAllen	From Peñitas to Abram	0	4.35
O-5	McAllen	Future Anzalduas POE	0	1.76
O-6	McAllen	Hidalgo POE	0	3.86
O-7	Weslaco	Proposed Donna POE	0	0.90
O-8	Weslaco	Retamal Dam	0	3.20
O-9	Weslaco	West Progreso POE	0	3.87
O-10	Weslaco	East Progreso POE	0	2.43
O-11	Harlingen	Joe's Bar - Nemo Road	2.31	0
O-12	Harlingen	Weaver's Mountain	0.92	0
O-13	Harlingen	West Los Indios POE	1.58	0
O-14	Harlingen	East Los Indios POE	3.59	0
O-15	Harlingen	Triangle - La Paloma	1.93	0
O-16	Harlingen	Ho Chi Minh - Estero	2.97	0
O-17	Brownsville	Mulberry Lane to Riverbend Resort Water Tower ramp	1.61	0
O-18	Brownsville	Fresnos Pump Road to PUB Fence Line (west)	3.58	0
O-19	Brownsville	Extension of Palm Boulevard to Fort Brown Golf Course (River Levee Dr.)	3.37	0
O-20	Brownsville	Fort Brown Golf Course (River Levee Dr.) to Veterans POE (west)	0.93	0
O-21	Fort Brown	Veterans International Bridge to Sea Shell Inn	12.99	0
		Total	**50.17**	**20.37**

- U.S. Section, International Boundary and Water Commission. CBP has coordinated with USIBWC to ensure that any construction along the international border does not adversely affect International Boundary Monuments or substantially impede floodwater conveyance within international drainages.
- U.S. Army Corps of Engineers, Galveston District. CBP has coordinated all activities with USACE to identify potential jurisdictional waters of the United States, including wetlands, and to develop measures to avoid, minimize or compensate for losses to these resources.
- U.S. Fish and Wildlife Service (USFWS). CBP has coordinated extensively with USFWS to identify listed species that have the potential to occur in the project area and have cooperated with the USFWS to prepare a Biological Resources Plan (BRP) that presents the analysis of potential effects to listed species and the BMPs proposed to reduce or off-set any adverse impacts. A copy of the BRP is contained in **Appendix E**.

1.6 MITIGATION PLAN

CBP applied various design criteria to reduce adverse environmental impacts associated with the Project, including selecting a route that avoids or minimizes effects on environmental and cultural resources. Nonetheless, CBP has determined that construction, operation, and maintenance of tactical infrastructure in USBP Rio Grande Valley Sector will result in adverse environmental impacts. These impacts will be most adverse during construction. Mitigation initiatives that are available during implementation of the Project include the following:

- CBP will require construction contractors to prepare Environmental Protection Plans (EPPs) that include BMPs on general construction activities, soils, cultural resources, air and water quality, noise, vegetation and biological resources. These BMPs are specified in construction documents. BMPs specifically developed to protect sensitive species are included in the Biological Resources Plan (see **Appendix E**).
- CBP will continue to consult with the USFWS, the Texas Parks and Wildlife Department (TPWD), THC, Native American tribes, and others to identify appropriate mitigation measures.
- CBP coordinated with USIBWC on the development of movable fence designed to mitigate potential impacts to the floodplain in Sections O-1 through O-3. During a flood event, these sections would be moved in order to allow easier passage of flood waters.
- **Appendix D** contains the Biological Survey Report for the Project.
- **Appendix E** contains the Biological Resources Plan which details BMPs and mitigation.

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2. AIR QUALITY

2.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Clean Air Act (CAA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CAA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for air quality.

The air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. The measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million (ppm), micrograms per cubic meter ($\mu g/m^3$), or milligrams per cubic meter (mg/m^3). The air quality in a region is a result of not only the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography, the size of the topological "air basin," and the prevailing meteorological conditions. The discussion of air quality-related laws and standards, below, is provided as background information and context for the impact analysis.

To protect public health and welfare, USEPA developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to impact human health and the environment. USEPA established both primary and secondary NAAQS under the provisions of the CAA. NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulate matter equal to or less than 10 microns in diameter [PM_{10}] and particulate matter equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources along with maintaining visibility standards.

The Federal CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. The State of Texas has adopted the NAAQS as the Texas Ambient Air Quality Standards (TAAQS) for the entire State of Texas. **Table 2-1** presents the primary and secondary USEPA NAAQS that apply to the air quality in the State of Texas. The Texas Commission on Environmental Quality (TCEQ) has established air pollution control regulations.

Table 2-1. National Ambient Air Quality Standards

Pollutant	Standard Value		Standard Type
CO			
8-hour Average [a]	9 ppm	(10 mg/m^3)	Primary and Secondary
1-hour Average [a]	35 ppm	(40 mg/m^3)	Primary
NO_2			
Annual Arithmetic Mean	0.053 ppm	(100 μg/m^3)	Primary and Secondary
O_3			
8-hour Average [b]	0.08 ppm	(157 μg/m^3)	Primary and Secondary
1-hour Average [c]	0.12 ppm	(240 μg/m^3)	Primary and Secondary
Pb			
Quarterly Average		1.5 μg/m^3	Primary and Secondary
PM_{10}			
Annual Arithmetic Mean [d]		50 μg/m^3	Primary and Secondary
24-hour Average [a]		150 μg/m^3	Primary and Secondary
$PM_{2.5}$			
Annual Arithmetic Mean [e]		15 μg/m^3	Primary and Secondary
24-hour Average [f]		35 μg/m^3	Primary and Secondary
SO_2			
Annual Arithmetic Mean	0.03 ppm	(80 μg/m^3)	Primary
24-hour Average [a]	0.14 ppm	(365 μg/m^3)	Primary
3-hour Average [a]	0.5 ppm	(1,300 μg/m^3)	Secondary

Source: USEPA 2007a

Notes: Parenthetical values are approximate equivalent concentrations.

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[c] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1. As of June 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 14 8-hour ozone nonattainment Early Action Compact Areas.

[d] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 μg/m^3.

[e] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 μg/m^3.

[f] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m^3.

These regulations are contained in Texas Administrative Code (TAC) Title 30. The TCEQ has also promulgated rules regulating the emissions of toxic substances which are defined as those chemicals listed in TAC Title 30, Chapter 113 plus any other air pollutant that is considered a health hazard, as defined by OSHA.

These air pollutant control programs are detailed in State Implementation Plans (SIPs), which are required to be developed by each state or local regulatory agency and approved by USEPA. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA.

USEPA classifies the air quality in an air quality control region (AQCR), or in subareas of an AQCR according to whether the concentrations of criteria pollutants in ambient air exceed the primary or secondary NAAQS. All areas within each AQCR are therefore designated as either "attainment," "nonattainment," "maintenance," or "unclassified" for each of the six criteria pollutants. Attainment means that the air quality within an AQCR is better than the NAAQS, nonattainment indicates that criteria pollutant levels exceed NAAQS, maintenance indicates that an area was previously designated nonattainment but is now attainment, and unclassified means that there is not enough information to appropriately classify an AQCR, so the area is considered in attainment.

Greenhouse Gases. Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, barring other influences, the trapped heat results in the phenomenon of global warming.

In April 2007, the U.S. Supreme Court declared that carbon dioxide (CO_2) and other greenhouse gases are air pollutants under the CAA. The Court declared that the USEPA has the authority to regulate emissions from new cars and trucks under the CAA.

Many gases exhibit these "greenhouse" properties. The majority of greenhouse gases come mostly from natural sources but are also contributed to by human activity. Additional information on sources of greenhouse gases is included in **Chapter 2.3**.

2.2 AFFECTED ENVIRONMENT

The Project is within the southernmost portions of Starr County, Hidalgo County, and Cameron County, Texas, within the Brownsville-Laredo Intrastate Air Quality

Control Region (BLIAQCR). The BLIAQCR is composed of Cameron County, Hidalgo County, Jim Hogg County, Starr County, Webb County, Willacy County, and Zapata County, Texas. The BLIAQCR is classified as being in attainment/unclassified for all criteria pollutants.

2.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Environmental consequences on local and regional air quality conditions near a Federal action are determined based upon the increases in regulated pollutant emissions compared to existing conditions and ambient air quality. Specifically, the impact in NAAQS "attainment" areas would be considered significant if the net increases in pollutant emissions from the Federal action will result in any one of the following scenarios:

- Cause or contribute to a violation of any national or state ambient air quality standard
- Expose sensitive receptors to substantially increased pollutant concentrations
- Represent an increase of 10 percent or more in an affected AQCR emissions inventory
- Exceed any Evaluation Criteria established by a SIP.

Regulated pollutant emissions associated with the Project will not contribute to or affect local or regional attainment status with the NAAQS. Project activities will generate air pollutant emissions from the construction projects, maintenance activities, and the operation of generators to supply power to construction equipment. BMPs will include a Dust Control Plan.

Construction Projects. Minor, short-term, adverse impacts will be expected from construction emissions and land disturbance associated with the Project. The Project will result in impacts on regional air quality during construction activities, primarily from site-disturbing activities and operation of construction equipment.

The construction projects will generate total suspended particulate and PM_{10} emissions as fugitive dust from ground-disturbing activities (e.g., grading, trenching, soil piles) and from combustion of fuels used with construction equipment. Fugitive dust emissions will be greatest during the initial site preparation activities and will vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity.

Construction operations will also result in emissions of criteria pollutants as combustion products from construction equipment. These emissions will temporary. The NAAQS emissions factors and estimates were generated based on guidance provided in USEPA AP-42, Volume II, *Mobile Sources*. Fugitive dust emissions for various construction activities were calculated using emissions factors and assumptions published in USEPA's AP-42 Section 11.9. The emissions for CO_2 were calculated using emissions coefficients reported by the Energy Information Administration (EIA 2007).

For purposes of this analysis, the project duration and affected project site area that will be disturbed (as described in **Chapter 1.4**) were used to estimate fugitive dust and all other pollutant emissions. The construction emissions presented in **Table 2-2** include the estimated annual construction PM_{10} emissions associated with the Project. These emissions will produce slightly elevated short-term PM_{10} ambient air concentrations. However, the impacts will be temporary, and will fall off rapidly with distance from the construction sites. As seen in **Table 2-2**, the emissions of the NAAQS pollutant is high and could contribute to the deterioration of the air quality in the region. However, the impact of the Project on air quality does not exceed 10 percent of the regional values.

Table 2-2. Estimates of Total Construction Emissions, in Tons Per Year

Description	NO_x	VOC	CO	CO_2	SO_x	PM_{10}
Construction Emissions	470.443	70.127	549.588	55.00	9.409	662.118
Maintenance Emissions	0.042	0.005	0.021	0.20	0.010	0.005
Generator Emissions	22.777	1.859	4.907	100.0	1.498	1.601
Emissions	**493.263**	**71.992**	**554.516**	**155.200**	**10.917**	**663.724**
Federal *de minimis* Threshold	NA	NA	NA	NA	NA	NA
BLIAQCR Regional Emissions	44,137	73,577	317,422	995,000	2,940	132,788
Percent of BLIAQCR Regional Emissions	**1.118**	**0.098**	**0.175**	**0.016**	**0.369**	**.499**

Source: USEPA 2007b

The construction emissions presented in **Table 2-2** include the estimated annual emissions from construction equipment exhaust associated with the Project in calendar year (CY) 2008 and operation of agricultural mowers and diesel-powered generators. Early phases of construction projects involve heavier diesel equipment and earthmoving, resulting in higher nitrogen oxide (NO_x) and PM_{10} emissions. Later phases of construction projects involve more light gasoline equipment and surface coating, resulting in more CO and volatile organic compound (VOC) emissions. However, the impacts will be temporary, fall off rapidly with distance from the construction site, and will not result in any long–term impacts.

Maintenance Activities. The pedestrian fence and patrol road will require associated mowing approximately two times per year to maintain vegetation height and allow enhanced visibility and security. It was assumed that two 40-horsepower (hp) agricultural mowers will be used to mow the vegetation in the project area approximately 14 days per year. No adverse impacts on local or regional air quality are anticipated from these future maintenance activities.

Generators. Construction activities will require six diesel-powered generators to power construction equipment. It is assumed that these generators will be approximately 75 hp and operate approximately 8 hours per day for 190 working days. The emissions factors and estimates were generated based on guidance provided in USEPA AP-42, Volume I, *Stationary Internal Combustion Sources*.

Greenhouse Gases. USEPA has estimated that the total greenhouse emissions for Texas was 189 million metric tons of carbon equivalent (MMTCE) in 1999. Of this, an estimated 995,000 tons of CO_2 are associated with the BLIAQCR regions. Therefore, construction emissions of CO_2 represent less than 10 percent of the regional emissions (USEPA 2007c).

Normal border patrol activities will continue during and following construction. The vehicles used for surveillance of the existing border area are generating CO_2 that is accounted for in the Texas greenhouse gas inventory. No new sources of CO_2 will result from activities associated with the Project. Therefore, no net increase of greenhouse emissions is expected. Emissions factors, calculations, and estimates of emissions are shown in detail in **Chapter 2.3**.

Summary. **Table 2-2** illustrates that the emissions from the Project will be much less than 10 percent of the emissions inventory for BLIAQCR (USEPA 2007b). The estimated annual CO_2 emissions of power plants within the BLIAQCR are 775,000 tons while vehicles add another estimated 220,000 tons. Therefore, no adverse impacts on regional or local air quality are anticipated from implementation of the Project.

In summary, no adverse impacts on regional or local air quality are anticipated from implementation of the Project. The total of direct and indirect emissions from the Project will not be regionally significant (e.g., the emissions are not greater than 10 percent of the BLIAQCR emissions inventory). Emissions factors, calculations, and estimates of emissions for the Project are shown in detail in **Appendix C**.

3. NOISE

3.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations with respect to noise.

Sound is defined as a particular auditory effect produced by a given source, for example the sound of rain on a rooftop. Sound is measured with instruments that record instantaneous sound levels in decibels. A-weighted sound level measurement is used to characterize sound levels that can be sensed by the human ear. “A-weighted” denotes the adjustment of the frequency range for what the average human ear can sense when experiencing an audible event. C–weighted sound level measurement correlates well with physical vibration response of buildings and other structures to airborne sound. Impulsive noise resulting from demolition activities and the discharge of weapons is assessed in terms of C-weighted decibels (dBC).

Noise and sound share the same physical aspects, but noise is considered a disturbance while sound is defined as an auditory effect. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Noise can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. It can be readily identifiable or generally nondescript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day. How an individual responds to the sound source will determine if the sound is viewed as music to one’s ears or as annoying noise. Affected receptors are specific (i.e., schools, churches, or hospitals) or broad (e.g., nature preserves or designated districts) areas in which occasional or persistent sensitivity to noise above ambient levels exists. Predictors of wildlife response to noise include noise type (i.e., continuous or intermittent), prior experience with noise, proximity to a noise source, stage in the breeding cycle, activity, and age. Potential impacts of noise on wildlife are discussed in **Chapter 7.2** and **7.3**.

Most people are exposed to sound levels of 50 to 55 A-weighted decibels (dBA) or higher on a daily basis. Studies specifically conducted to determine noise impacts on various human activities show that about 90 percent of the population is not significantly bothered by outdoor sound levels below 65 dBA (USEPA 1974). Studies of community annoyance in response to numerous types of environmental noise show that A-weighted Day Night Average Sound Level

(ADNL) correlates well with impact assessments and that there is a consistent relationship between ADNL and the level of annoyance.

Ambient Sound Levels. Noise levels in residential areas vary depending on the housing density and location. As shown in **Figure 3-1**, a suburban residential area is about 55 dBA, which increases to 60 dBA for an urban residential area, and 80 dBA in the downtown section of a city.

Construction Sound Levels. Building construction, modification, and demolition work can cause an increase in sound that is well above the ambient level. A variety of sounds come from graders, pavers, trucks, welders, and other work processes. **Table 3-1** lists noise levels associated with common types of construction equipment that are likely to be used for the Project. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

Table 3-1. Predicted Noise Levels for Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)
Clearing and Grading	
Bulldozer	80
Grader	80–93
Truck	83–94
Roller	73–75
Excavation	
Backhoe	72–93
Jackhammer	81–98
Building Construction	
Concrete mixer	74–88
Welding generator	71–82
Pile driver	91–105
Crane	75–87
Paver	86–88

Source: USEPA 1971

3.2 AFFECTED ENVIRONMENT

The tactical infrastructure for the USBP Rio Grande Valley Sector passes through areas with different acoustical environments. The ambient acoustical environment in the USBP Rio Grande Valley Sector is primarily impacted by vehicular traffic, aircraft operations, agricultural equipment, and industrial noise sources.

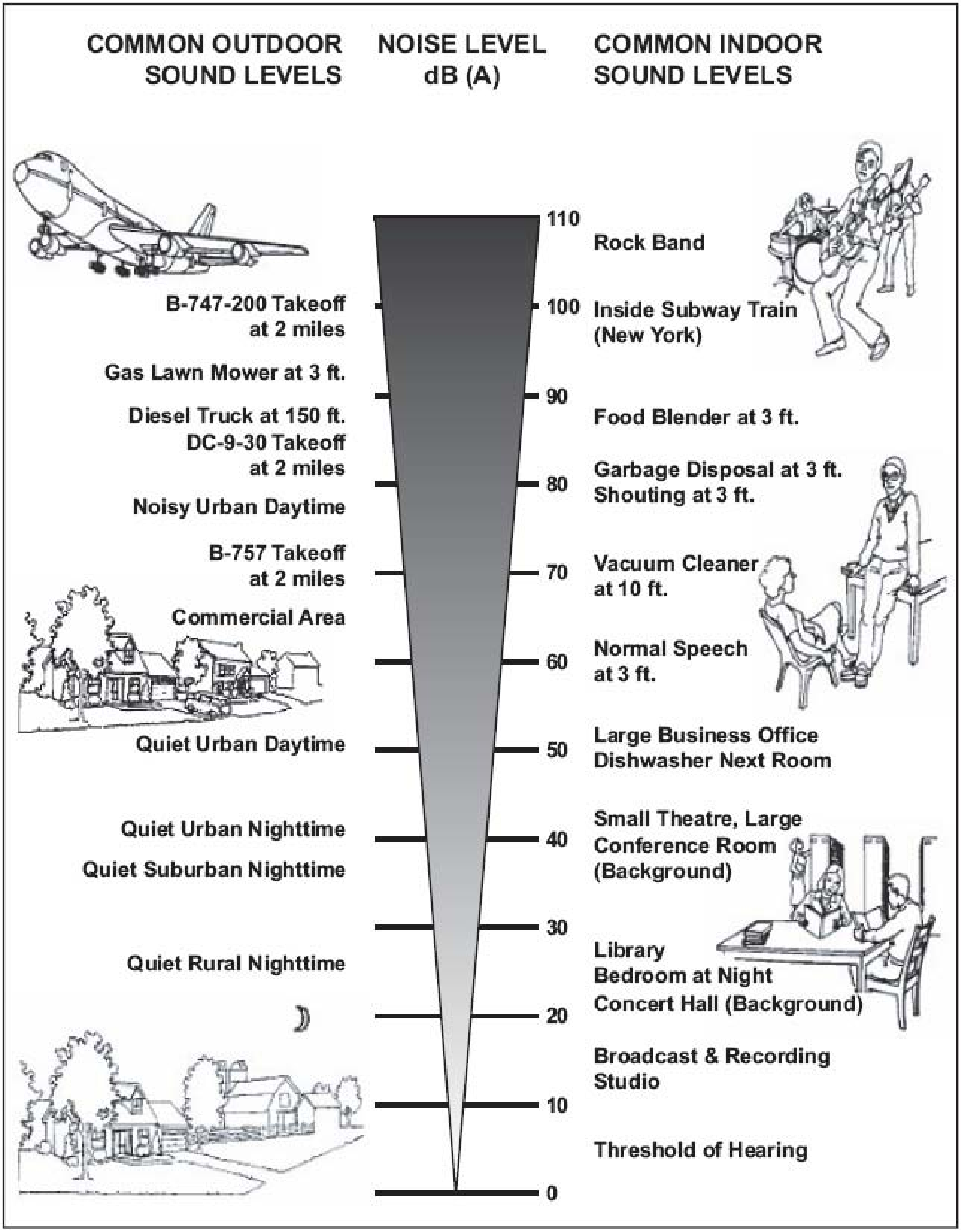

Figure 3-1. Common Noise Levels

The Rio Grande Valley area is composed of many different cities, towns, and communities. The City of Brownsville is in the eastern section of the Rio Grande Valley project area, and Rio Grande City is on the western edge of the project area. In between these two cities lie the municipalities of McAllen, Alamo, Weslaco, Progreso, Mercedes, Harlingen, and San Benito. Several subdivisions and smaller communities also exist along the border. Each of these cities and towns has its own ambient sound level depending on the size of the municipality and the nearby activities.

State Route (SR) 83 passes in the vicinity of Rio Grande City and SR 281 is adjacent to Progreso, Texas. County Route (CR) 433 traverses the towns of McAllen, Alamo, Weslaco, and Mercedes. SR 77 traverses the cities of Harlingen and Brownsville. CR 56 is also a major transportation route into the Rio Grande Valley. Traffic along each of these roads contributes to the ambient acoustical environment in the Rio Grande Valley.

Brownsville/South Padre Island International Airport is approximately 4 miles east of the City of Brownsville. An average of 126 aircraft operations are performed at the Brownsville/South Padre Island International Airport daily (AirNav 2007a). There is a railroad track on the west side of Brownsville that traverses north from the U.S./Mexico international border. The B&M Railroad, MP Railroad, and Union Pacific Railroad are stationed at this location. In addition, there are numerous commercial facilities in the city. It is estimated that sites near Brownsville have ambient noise levels comparable to an urban environment (50–80 dBA). McAllen Miller International Airport is approximately 2 miles south of the City of McAllen (Section O-6). An average of 172 aircraft operations occur daily at McAllen Miller International Airport (AirNav 2007b).

Along the U.S./Mexico international border in areas west of Brownsville, agricultural activities are prominent. Agricultural equipment used in these areas can produce noise levels up to 100 dBA (OSU 2007). While farms are generally spread out, noise from agricultural activities is likely to extend past the farm boundaries. Agricultural activities contribute to the ambient acoustical environment in the USBP Rio Grande Valley Sector. The impact corridor also crosses and borders remote wildlife areas such as the LRGVNWR. These areas and the USBP Rio Grande Valley Sector in general likely have ambient noise levels that are comparable to rural or suburban areas (25 to 55 dBA) (see **Figure 3-1**).

3.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short-term moderate adverse impacts are expected from the Project. Sources of noise from the implementation of the Project include operation of construction equipment including limited use of pile drivers, and noise from construction vehicles. Noise from construction activities and vehicle traffic can impact wildlife as well as humans. Impacts on nesting, feeding, and migration could all occur on various species due to construction noise. For specific information regarding impacts on wildlife from noise, see **Chapter 7.2** and **7.3**.

Construction Noise. The construction of the tactical infrastructure will result in noise impacts on populations in the vicinity of the sites. Construction of the fence sections and the patrol roads adjacent to the fence will result in grading and construction noise. Populations that could be impacted by construction noise include adjacent residents, personnel or visitors to one of the nearby wildlife refuges or recreation areas, or employees in nearby office or retail buildings. Construction noise levels for the Project were calculated using typical construction equipment. Noise from construction assumes several different pieces of construction equipment operating simultaneously (see **Table 3-1**). Because noise attenuates over distance, a gradual decrease in noise level occurs the further a receptor is away from the source of noise. Construction noise levels will decrease as the distance increases from the source. At 50 feet the noise level will be 85 dBA, at 300 feet the noise level will be 70 dBA, and at 5,280 feet (i.e., 1 mile) the noise level will be 45 dBA.

Implementation of the Project is expected to have temporary impacts on the noise environment from the use of heavy equipment during construction activities. Therefore, it is anticipated that implementation of the Project will have moderate short-term adverse impacts as a result of the construction activities.

Vehicular Noise. Noise impacts from increased construction traffic will be temporary. Most of the major roadways in the vicinity pass by residential areas. Therefore, it is anticipated that the Project will have short-term minor adverse noise impacts as a result of the increase in traffic, most notably in the areas around Brownsville, McAllen, Granjeno, Progreso, Santa Maria, and Relampago.

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4. LAND USE

4.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations on land use.

The term “land use” refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws. There is, however, no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, “labels,” and definitions vary among jurisdictions.

Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. Tools supporting land use planning include master plans/management plans and zoning regulations. Land use constraints due to sound are described in **Chapter 4**.

The National Land Cover Dataset (NLCD) 1992 was the first land cover mapping project with a national (conterminous) scope. It is likely the most widely used land cover dataset in the United States and no other national land cover mapping program had ever been undertaken. The NLCD 1992 provides 21 different land cover classes for the lower 48 states. The NLCD was updated in 2001 and included 29 categories. The NLCD does not cover prime and unique farmlands, see **Chapter 5** for discussion of prime and unique farmlands.

4.2 AFFECTED ENVIRONMENT

The NLCD 2001 was used to classify the existing land use categories within the 150-foot impact corridor and lands between the project area and the U.S./Mexico international border. The NLCD 2001’s different land cover classifications were generalized into the following four categories: planted/cultivated, developed, undeveloped, and WMAs and refuges (including National Wildlife Refuges [NWRs]). Specific land uses in each classification are described below (TPWD 2007a, USEPA 2001, and USFWS 2007a).

- *Planted/Cultivated* – This category is characterized by herbaceous vegetation that has been planted or intensively managed for the production of food, feed, or fiber or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75–100 percent of this land use. Specific land uses within this classification include cultivated crops (areas used for production of annual and perennial crops and land that is actively tilled) and pasture/hay (areas of grasses, legumes, and grass-legume mixtures planted for livestock grazing or the production of seed or hay crops). The land can be irrigated or nonirrigated.

- *Developed* – This category is characterized by a high percentage (30 percent or greater) of constructed materials (e.g., asphalt, concrete, buildings). Specific land uses within this classification include developed open space (areas of a mixture of some constructed materials and less than 20 percent vegetative cover in the form of grass lawns that include large-lot single-family housing units, parks, and golf courses), developed low intensity (areas of a mixture of some constructed materials including 21–49 percent impervious surfaces such as single-family housing units and vegetation), developed medium intensity (areas of a mixture of constructed materials including 50–79 percent impervious surfaces such as single-family housing units and vegetation), and developed high intensity (areas of a mixture of constructed materials including 80–100 percent impervious surfaces such as apartment complexes, rowhouses, and commercial/industrial facilities and some vegetation). This category also includes open space used for facilities such as floodways and levees, and utility easements.
- *Undeveloped* – This category is characterized by open water (such as naturally occurring and man-made lakes, reservoirs, rivers, and streams, and covered with less than 25 percent vegetation or soil), and barren land (barren areas of bedrock and other earthen material with less than 15 percent vegetative cover). It also could include native vegetation/habitat of low-to-high quality deciduous forest (areas dominated by deciduous trees with greater than 20 percent vegetative cover), evergreen forest (areas dominated by evergreen trees with greater than 20 percent vegetative cover), shrub/scrub (areas dominated by shrubs with greater than 20 percent vegetative cover), and woody and emergent herbaceous wetlands (areas of forest and shrubland vegetation accounting for greater than 20 percent of the vegetative cover where the soil is periodically saturated with or covered with water).
- *Wildlife Management Areas and Refuges* – WMAs in the project area are operated by the Wildlife Division of the TPWD. The TPWD has 51 WMAs, encompassing 756,464 acres of land. WMAs are established to represent habitats and wildlife populations typical of each ecological region of Texas. WMAs are established as sites to perform research on wildlife populations and habitat, conduct education on sound resource management, and to provide public hunting, hiking, camping, bird watching and a host of other outdoor recreational opportunities, all of which are compatible with the conservation of this valuable resource. WMAs located in the project area are part of the Las Palomas WMA, Lower Rio Grande Valley Units. The Las Palomas WMA has 3,311 acres of land for the preservation of native brush nesting habitat, and farmland and wetlands for white-winged doves.

The Las Palomas WMA is composed of 18 units, including many in Cameron and Hidalgo counties, with tracts ranging in size from 2 acres to 604 acres. Long-term management of WMAs in Texas is guided by the *TPWD Land and Water Resources Conservation and Recreation Plan* (TPWD 2005). A discussion of the compatibility of the Project with this plan is discussed in **Chapter 4.3**.

- *National Wildlife Refuges* – NWRs are a designation for certain protected areas of the United States managed by the USFWS. The NWR system is a network of lands and waters managed to protect wildlife and wildlife habitat. The system consists of more than 500 refuges across the nation. The NWRs in the project area are part of the LRGVNWR. The LRGVNWR helps connect the natural existing tracts of brush lands that remain along the last stretch of the Rio Grande. The LRGVNWR components are within the lower four counties of Texas and contain more than 90,000 acres. The LRGVNWR system is still in the acquisition phase, through the purchasing of properties and conservation easements, and could eventually encompass 132,500 acres. The current 100 LRGVNWR tracts complement an existing wildlife corridor, lands managed for the benefit of wildlife by the TPWD, National Audubon Society, The Nature Conservancy, private landowners, and the Santa Ana and Laguna Atascosa NWRs. The long-term USFWS management of the LRGVNWR is guided by the *Lower Rio Grande Valley and Santa Ana National Wildlife Refuges Comprehensive Conservation Plan* (USFWS 1997a).

The existing land use in the Rio Grande Valley ranges from well-developed urban centers of commerce (i.e., Laredo and Brownsville), to areas of intensive agricultural activities, to extensive areas of recreation and wildlife management activities. The following is a brief description of the existing land use in Cameron, Hidalgo, and Starr counties (USACE 1994).

- *Cameron County* – More than half of Cameron County is dedicated to highly intensive and specialized farming (54 percent). Major crops are citrus, cool-season vegetables, cotton, and grain sorghum. A large portion of the urban land is devoted to recreational activities. The county supports fishing, hunting, water sports, and a variety of other recreational activities year round. Major recreational activities are centered around South Padre Island and NWRs (e.g., Santa Ana). Major urban areas are Brownsville, Harlingen, and San Benito.
- *Hidalgo County* – The major land use is agriculture (63 percent). Agricultural crops include cotton, grains, vegetables, citrus, and sugar cane. Rangeland (26 percent) is used primarily for cattle production. Commercial activities include food processing, shipping, tourism, and mineral operations. Tourism peaks during the winter season and centers around the Bentson-Rio Grande Valley State Park, Santa Ana NWR, and other recreational areas. Major urban areas are McAllen, Pharr, and Edinburg.

- *Starr County* – Rangeland constitutes 87 percent of the county's land use with the majority of the activities involving the production of cattle, sheep, hogs, and horses. Most agricultural land (12 percent) is irrigated and is used for the production of sorghum, cotton, and vegetables. Rio Grande City is the county seat and a major urban center. A major recreational area is Falcon International Reservoir.

The Rio Grande Valley contains numerous recreational/special land use areas. Most of these special land use areas are outside of highly urbanized centers. These lands have been established for various recreational activities but also for flood control, scenic, historic, and wildlife management uses. **Figure 4-1** presents WMAs and NWRs in the Rio Grande Valley. **Figures 1-1** through **1-3** present the areas surrounding the fence sections. **Chapter 9** describes the aesthetics and visual resources of the Rio Grande Valley.

4.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Constructing the tactical infrastructure is expected to result in long-term minor to moderate adverse impacts on land use. The severity of the impact will vary depending on the amount of changed land use, degree of incompatibility of the tactical infrastructure with existing land use, or the degree to which access to various land use types is restricted or limited by the Project. Short-term minor adverse impacts are expected to occur from construction.

As mentioned in **Chapter 4.1**, impacted land use categories were analyzed by using the NLCD classifications generalized into four main categories: planted/cultivated, developed, undeveloped, and WMAs and refuges. Furthermore, land uses directly impacted within the 150-foot impact corridor and those land uses indirectly impacted (land uses adjacent to the project area continuing south to the U.S./Mexico international border) were quantified using these categories to help determine the acreage directly and indirectly impacted from the Project. The impact corridor is classified by approximately 28 percent planted/cultivated, 41 percent developed, 22 percent undeveloped, and 8 percent WMAs and refuges. **Table 4-1** outlines the land uses and acreage directly impacted by the 150-foot impact corridor. **Table 4-2** outlines the land uses and acreage indirectly impacted by the Project.

Table 4-3 outlines the communities within or adjacent to the tactical infrastructure section that is expected to be affected by the tactical infrastructure.

Construction of the tactical infrastructure sections will require the government to acquire various interests in land. Under current law, the Secretary of Homeland Security has the authority to contract for or buy an interest in land that is adjacent to or in the vicinity of the international land border when the Secretary deems the land essential to control and guard the boundaries and borders of the United States (8 U.S.C. 1103(b)).

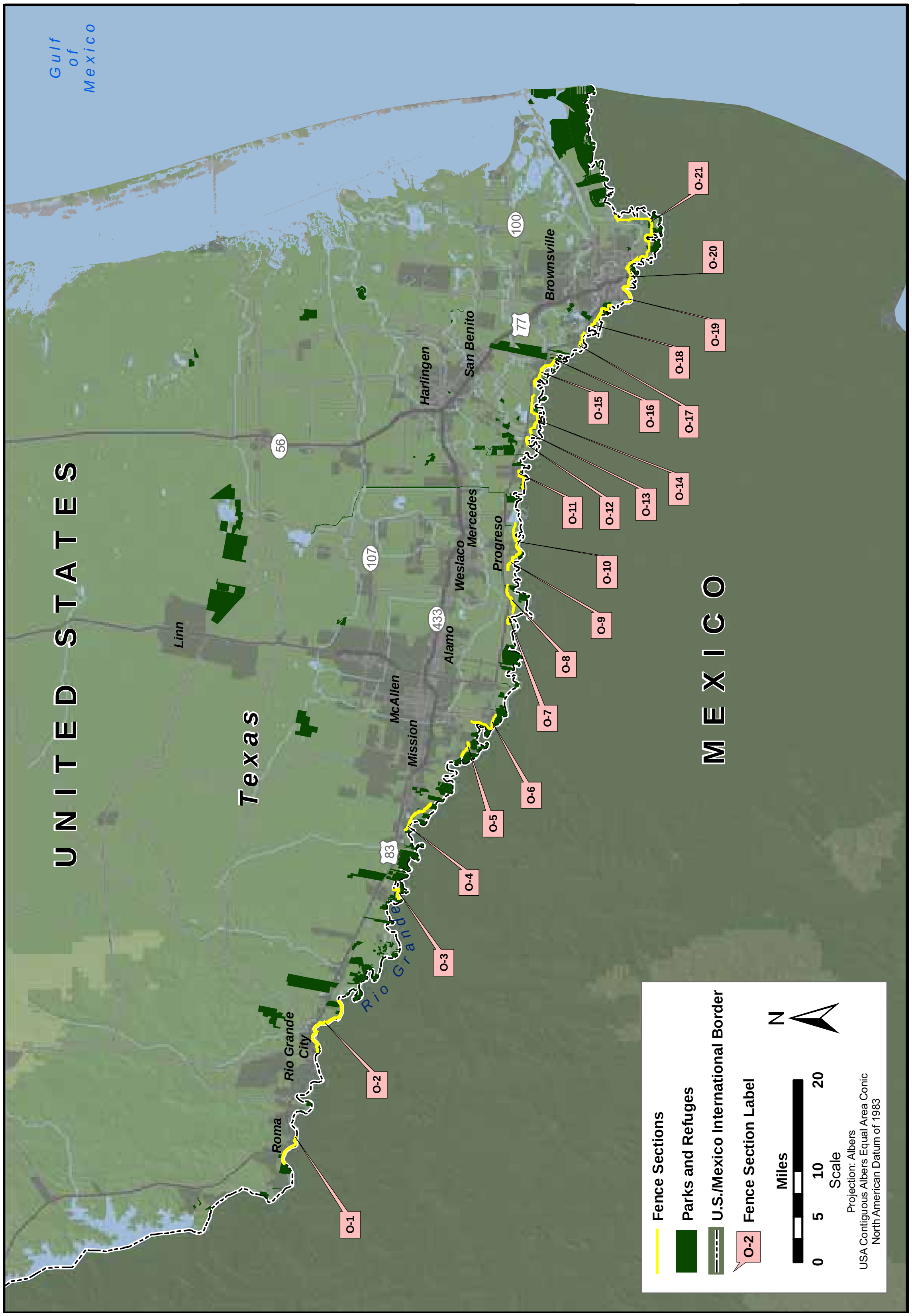

Figure 4-1. Wildlife Management Areas and Refuges in the Rio Grande Valley

Table 4-1. Land Use Directly Impacted by the Project

Fence Section Number	Land Use Category				Total
	Planted/ Cultivated	Developed	Undeveloped	WMAs and NWRs	
O-1	-	19.32	43.40	6.45	69.17
O-2	53.80	28.19	56.22	20.43	158.65
O-3	6.46	9.81	7.41	11.78	35.46
O-4	4.04	62.51	10.16	3.82	80.53
O-5	5.61	6.64	19.17	1.13	32.55
O-6	19.31	44.69	5.45	2.71	72.15
O-7	7.52	7.08	0.25	2.71	17.56
O-8	27.32	24.89	4.43	3.70	60.35
O-9	46.39	24.57	0.20	-	71.16
O-10	22.55	12.66	2.64	5.54	43.39
O-11	18.66	15.29	0.04	9.42	43.41
O-12	2.35	12.03	3.90	-	18.29
O-13	11.48	14.87	2.95	0.06	29.37
O-14	17.99	44.72	3.64	-	66.35
O-15	4.63	22.99	9.11	-	36.74
O-16	10.57	26.37	4.47	0.41	41.81
O-17	8.74	20.63	0.83	-	30.21
O-18	4.33	26.50	11.53	23.78	66.14
O-19	-	31.11	30.84	-	61.95
O-20	-	9.15	7.48	-	16.63
O-21	92.18	67.75	61.12	15.55	236.61
Total	**363.97**	**531.79**	**285.23**	**107.47**	**1,288.46**

Because the tactical infrastructure sections will traverse both public and private lands, various methods could be used to acquire the necessary interests in land. These methods include, among other things, acquiring permanent easements, ROW, or outright purchase.

For the tactical infrastructure sections that are on Federal lands, the most likely means of acquisition will be an ROW obtained from the relevant Federal land manager. On private land, the government will purchase the land or acquire some interest in land from the relevant landowner. Acquisition from private landowners is a negotiable process that is carried out between the government

Table 4-2. Land Use Indirectly Impacted by the Project

Fence Section Number	Land Use Category				Total
	Planted/ Cultivated	Developed	Undeveloped	WMAs and NWRs	
O-1	0.22	15.39	158.40	5.21	179.23
O-2	12.42	15.42	330.18	85.42	443.44
O-3	31.77	26.60	231.10	427.12	716.59
O-4	865.81	96.21	399.68	824.92	2,186.61
O-5	540.06	69.73	283.92	1,323.30	2,217.02
O-6	51.30	32.22	98.91	955.62	1,138.05
O-7	103.40	22.52	43.13	98.20	267.25
O-8	1,709.53	186.23	216.88	738.53	2,851.17
O-9	523.47	91.84	207.40	186.42	1,009.14
O-10	754.02	31.07	76.12	22.78	883.99
O-11	248.46	15.90	69.84	91.66	425.87
O-12	85.26	9.33	34.48	-	129.06
O-13	453.12	42.44	82.54	37.77	615.87
O-14	874.80	139.98	206.61	232.14	1,453.53
O-15	449.43	114.63	150.26	93.71	808.03
O-16	320.84	85.94	113.99	47.04	567.81
O-17	248.09	18.19	94.57	-	360.86
O-18	677.87	44.03	245.66	128.39	1,095.95
O-19	0.22	232.13	64.46	-	296.81
O-20	60.73	35.31	208.92	-	304.96
O-21	2,547.26	381.05	1,562.77	1,401.96	5,893.04
Total	**10,558.09**	**1,706.17**	**4,879.82**	**6,700.20**	**23,844.28**

and the landowner on a case-by-case basis. The government also has the statutory authority to acquire such interests through eminent domain.

Agricultural lands within the 60-foot impact corridor will not be available for future crop production. In addition, residential, industrial, commercial, and undeveloped lands within the impact corridor will not be available for future development.

Landowners whose properties are affected could receive use of a gate within the fence that will allow them to access other portions of their property to reduce potential inconvenience.

Table 4-3. Communities Affected by the Project

Fence Section Number	Community Affected
O-1	Roma
O-2	Rio Grande City
O-3	Los Ebanos
O-4	Peñitas
O-5	Granjeno
O-6	Hidalgo
O-7	Agriculture south of Donna
O-8	Agriculture south of Donna
O-9	Progreso Lakes Community
O-10	Progreso
O-11	Agriculture south of Santa Maria
O-12	Los Indios
O-13	Los Indios
O-14	Los Indios
O-15	La Paloma
O-16	Encatada-Ranchito El Calaboz
O-17	San Pedro/River Bend Community
O-18	Brownsville
O-19	Brownsville
O-20	Brownsville
O-21	Brownsville

Short-term minor indirect adverse impacts on recreation are expected during the construction activities associated with the Project. However, impacts will be localized and short-term. Long-term minor adverse impacts on recreation are expected after construction because access to recreational areas along the tactical infrastructure sections could be limited or restricted to potential users. Long-term indirect beneficial impacts on recreational areas could occur as a result of decreased cross-border violators coming into these recreational areas. In addition, by reducing the amount of illegal traffic within and adjacent to the project area, disturbance to lands north of the fence will be reduced.

Construction and operation of tactical infrastructure will increase border security in the UBSP Rio Grande Valley Sector and may result in a change to illegal traffic patterns. However, changes to illegal alien traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

4.4 COMPATIBILITY OF THE PROJECT WITH MAJOR LAND MANAGEMENT PLANS

This section discusses the compatibility of the Project with each of the four major land use categories introduced in **Chapter 4.1**. The Project will be incompatible with these plans if they conflict with any of the stated goals or current or planned development or land use described in the plans.

***LRGVNWR and Santa Ana NWR Comprehensive Conservation Plan*.** This plan contains five major refuge goals, supported by a series of objectives and implementation strategies. Goal I is to protect biological diversity, land, and waters. Goal I strategies include land acquisition, management of habitat and wildlife resources on refuge lands, and strengthening existing and establishing new cooperative efforts. The Project is incompatible with Goal I where the tactical infrastructure will impact habitat and wildlife resources on refuge lands. However, to the extent that mitigation strategies lead to the possible acquisition of additional refuge land to be added to the system, the Project is potentially compatible with Goal I acquisition strategies.

Goal II is to protect water rights, water management, and the management of wetlands. Objectives or strategies under Goal II include protecting existing water rights holdings; improving the efficiency of water delivery systems; and protecting, enhancing, and rehabilitating refuge wetlands. Any access difficulties caused by the Project for holders of water rights will be incompatible with Goal II objectives and strategies. Access by water rights holders in any of the 21 tactical infrastructure sections will be through controlled access gates and access will not be denied. The Project will be compatible with the objective of improving water delivery systems because some irrigation canals within the impact corridor will be improved with culverts, leading to less water loss through percolation or evaporation, and improving water transmission. The Clean Water Act (CWA) surface water and wetlands mitigation plan involves restoring or enhancing more wetland acreage than the actual amount of wetlands that are impacted, which is compatible with wetland strategies under Goal II.

Goal III is to protect and improve water quality, with the objectives of improving refuge water quality and reducing contaminant-related fish and wildlife resource losses. The Project is expected to have negligible adverse impacts on water quality, mainly short term due to construction activities. No long-term compatibility issues are expected from the continued operation of the tactical infrastructure because no long-term water quality impacts are expected.

Goal IV is to protect cultural resources. The Project is compatible with Goal IV to the extent that potential effects on all cultural resources within the project area will be coordinated with the THC. To mitigate impacts, construction monitors and avoidance for specified resources will be implemented. In addition, archaeological data recovery, resource recordation, and other mitigation measures will be discussed with the THC and other parties.

Goal V is to provide compatible wildlife dependent public uses, recreational opportunities, interpretation, and education. The Project will provide increased border security and gain effective control of the nation's borders, and in turn, create safer recreational areas along the U.S./Mexico international border. The Project might be incompatible with Goal V if access to LRGVNWR tracts is hindered. However this is not expected because access gates will be constructed to allow for access to the LRGVNWR.

***Lower Rio Grande/Rio Bravo Binational Ecosystem Group Management Plan*.** This plan establishes a binational vision, objectives, strategies, and specific activities for the protection and restoration of native plants and animals within the Tamaulipan bush land habitat on both sides of the U.S./Mexico international border. The overall purpose of the plan is to foster joint participation in the ecosystem management of natural areas in the Lower Rio Grande/Rio Bravo Tamaulipas-Texas for sustainable resource management. The objectives of the plan are grouped into three main categories: water conservation, species and habitat, and conservation education.

The Project is consistent with the goal of water conservation because there will be only a short-term negligible impact on water quality due to construction activities. Under the plan, water quality objectives will be achieved through the gathering and studying data, fostering partnerships, and making recommendations to partner groups. The Project will not hinder the ability to continue gathering and studying data, fostering partnerships, and making recommendations to partner groups with respect to water conservation. Therefore, the Project will have no impact on this aspect of the plan.

5. GEOLOGY AND SOILS

5.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations on geological and soils resources.

Geology and soils resources include the surface and subsurface materials of the earth. Within a given physiographic province, these resources typically are described in terms of topography, soils, geology, minerals, and paleontology, where applicable.

Topography is defined as the relative positions and elevations of the natural or human-made features of an area that describe the configuration of its surface. Regional topography is influenced by many factors, including human activity, seismic activity of the underlying geologic material, climatic conditions, and erosion. Information describing topography typically encompasses surface elevations, slope, and physiographic features (i.e., mountains, ravines, hills, plains, deltas, or depressions).

Site-specific geological resources typically consist of surface and subsurface materials and their inherent properties. Principal factors influencing the ability of geologic resources to support structural development are seismic properties (i.e., potential for subsurface shifting, faulting, or crustal disturbance), topography, and soil stability.

Soils are the unconsolidated materials overlying bedrock or other parent material. They develop from the weathering processes of mineral and organic materials and are typically described in terms of landscape position, slope, and physical and chemical characteristics. Soil types differ in structure, elasticity, strength, shrink-swell potential, drainage characteristics, and erosion potential, which can affect their ability to support certain applications or uses. In appropriate cases, soil properties must be examined for compatibility with particular construction activities or types of land use.

Prime and unique farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of a specific crop when treated and managed according to acceptable farming methods. Soil qualities, growing season, and moisture supply are needed for well-managed soil to produce a sustained high yield of crops in an economic manner. The land could be cropland, pasture, rangeland, or other land, but not urban built-up land or water. The intent of the FPPA is to minimize the extent that Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses.

The implementing procedures of the FPPA and Natural Resources Conservation Service (NRCS) require Federal agencies to evaluate the adverse impacts (direct and indirect) of their activities on prime and unique farmland, as well as farmland of statewide and local importance. Determination of whether an area is considered prime or unique farmland and potential impacts associated with a Project are based on preparation of the Farmland Conversion Impact Rating Form AD-1006 for areas where prime farmland soils occur and by applying criteria established at Section 658.5 of the FPPA (7 CFR Part 658). The NRCS is responsible for overseeing compliance with the FPPA and has developed the rules and regulations for implementation of the Act (see 7 CFR Part 658, 5 July 1984).

5.2 AFFECTED ENVIRONMENT

Physiography and Topography. The USBP Rio Grande Valley Sector occupies Starr, Hidalgo, and Cameron counties in Texas along the U.S./Mexico international border. The USBP Rio Grande Valley Sector occurs in a subtropical semi-arid zone in the Gulf Coastal Plains Physiographic Province of Texas. The impact corridor will occur in the Coastal Prairies and Interior Coastal Plains subprovinces, of the larger Gulf Coastal Plains. Sections O-7 to O–21 occur in the Coastal Plains subprovince, which is characterized by young deltaic sands, silts, and clays that have eroded to nearly imperceptible slopes occupied by flat grasslands. Trees are uncommon except along streams; on coarser underlying sediments of ancient streams; within fencerows; on lands protected as refuges; and along the Rio Grande, where sugarberry, Texas ebony, honey mesquite, Mexican palm trees, and citrus plantations can be found. Sections O-1 to O-7 occur in the Interior Coastal Plains subprovince, which is characterized by alternating belts of resistant uncemented sands among weaker shales that erode into long, sandy ridges. In the impact corridor, trees are few, and barretal shrublands dominate (Wermund 2007). The topographic profile of the surrounding area is a nearly level to rolling, slightly to moderately dissected plain that has formed between the Balcones Escarpment to the north, the Rio Grande to the southwest, and the Gulf of Mexico to the southeast. Elevations in the impact corridor range from approximately mean sea level (MSL) to 10 feet above MSL along Section O-21 and grade gently higher with slightly steeper topography to the west to approximately 50 to 80 feet above MSL along Section O-1 (TopoZone.com 2007).

Geology. The surface geology of the Gulf Coastal Plains is characterized by broad subparallel bands of sedimentary rocks deposited in the Tertiary and Quaternary Periods of the Cenozoic Era. The western end of the impact corridor is in the Breaks of the Rio Grande, a region of steep-sided, narrow, and deep valleys created as the north-south-trending Rio Grande tributaries eroded the resistant Tertiary formations. The Breaks of the Rio Grande terminate near the Starr-Hidalgo County line and define the beginning of the Rio Grande Valley, which consists of Quaternary alluvial sediments. From oldest to youngest (west to east), the Tertiary-deposited sediments include the Jackson Group (made up of the Whitsett, Manning, Wellborn, Caddell, Yazoo, and Moodys Branch formations), the Catahoula and Frio formations undivided, the Goliad Formation, and Uvalde gravels. Quaternary-deposited sediments of the Rio Grande Valley include fluviatile terrace deposits, the Lissie and Beaumont formations, wind–blown deposits, and the most recent alluvium deposits (DHS 2004). Onsite surveys revealed that the bottom of Los Negros Creek contains a massive, unvegetated fossil reef composed of oyster shells, possibly the largest such reef in Starr County and a candidate for Natural Heritage Site listing.

The Jackson Group consists of volcanic and marine sediments deposited during the Eocene Epoch of the Tertiary Period. It is composed mostly of sandstone and tuffaceous clay with some crossbeds of white volcanic ash. The Jackson Group is overlain by the Catahoula and Frio formations, which are composed of mudstone; sandstone; light-brown clays; gray sandy clays; and, in the basal layer, dark greenish sandy clays. Towards the end of the Tertiary period, large river systems deposited calcareous muds formed from Cretaceous-age marls and limestones, over broad areas of the low coastal plain. Overlying the Catahoula and Frio formations is the Goliad Formation and Uvalde gravels. The Goliad Formation includes clay, sand, marble, and caliche with abundant reworked Cretaceous Period invertebrate fossils; the caliche is locally popular and used to surface roads. The Uvalde gravels are found on interstream ridges and divides and are composed of rounded flint pebbles and cobbles weathered from Lower Cretaceous-age formations (DHS 2004).

During the Quaternary period, a series of interglacial and glacial periods produced an active environment of fluviatile deposition and subsequent erosion. Ancient river systems transported enormous quantities of suspended sand and mud and, during interglacial periods, deposited the sediments into accumulating deltas and fluvial plains at the Gulf of Mexico. During glacial periods, the drop in sea level eroded underlying fluvial deposits creating new deltas miles into the gulf. During this time, the ancestral Rio Grande cut through the older Tertiary formations and remnant meander scars in the floodplain were converted into 3– to 10-foot-high river terraces composed of unsorted coarse sand and gravel (DHS 2004).

The Lissie Formation consists of thick beds of sand interbedded with clay and silt with the clays predominating in the upper part. It contains thin lenses of rounded gravels composed of ferruginous sandstones, quartz, and other siliceous rocks.

Large amounts of silicified wood are found among the gravel sheets. This formation is characterized by many undrained circular or irregular depressions and relict windblown sand and clay dunes that are stabilized in a northwest–trending direction. The sands and clays of the Lissie formation are overlain by the bluish-gray clays of the Beaumont Formation, which were deposited by ancient rivers in the form of deltas or natural levees. Broad faint ridges, containing more sand than the flats between them, are the remnants of natural levees that formed as the ancient river shifted across the coastal lowlands. The flat lowlands of the Beaumont Formation form a featureless and often marshy plain, called the Coastal Prairie, as it approaches the Gulf Coast (DHS 2004).

The recent alluvial deposits of the Rio Grande Valley are composed of sedimentary rocks resulting from dissection of previous sedimentation and floodplain deposition during the Modern-Holocene Period. In the Pleistocene Epoch, interglacial deltas formed by the Rio Grande were combined into a larger delta that extended farther beyond the current Gulf Coast. The modern coastal barrier island system was formed by the subsidence and compaction of this ancient delta. During the sea level rise of the Holocene, brackish water inundated the ancient valley, creating an estuarine environment that was eventually replaced by fertile floodplain deposits of the Rio Grande Valley as it graded to its present level (DHS 2004).

Soils. Generally the soils occurring in the impact corridor are loamy to clayey, moderately to slowly permeable, and occur on nearly level to gentle slopes. None of the soil map units occurring within the portion of the impact corridor in Starr County are designated as farmland of importance. Hydric soils are soils that are saturated, flooded, or have ponding long enough during the growing season to develop anaerobic (oxygen-deficient) conditions in upper horizons. The presence of hydric soil is one of the three criteria (i.e., hydric soils, hydrophytic vegetation, and wetland hydrology) used to determine that an area is a wetland based on the USACE *Wetlands Delineation Manual*, Technical Report Y-87-1 (USACE 1987).

In Hidalgo County, soils of the Camargo, Cameron, Laredo, Matamoros, Olmito, Reynosa, Rio Grande, and Runn series within the impact corridor are classified as prime farmland soils; and soils of the Arents and Raymondville series within the impact corridor are classified as prime farmland soils if irrigated. In Cameron County, soils of the Camargo, Cameron, Laredo, Matamoros, Olmito, and Rio Grande series within the impact corridor are classified as prime farmland soils; and the Harlingen series and Laredo-Olmito complex soils within the impact corridor are classified as prime farmland soils if irrigated. In Starr County, no soils that potentially occur within the impact corridor are classified as hydric. In Hidalgo County, soils of the Grulla series occur within the impact corridor and are classified as partially hydric. In Cameron County, ustifluvents and soils of the Chargo, Grulla, Sejita, and Tiocano series occur within the impact corridor soils and are classified as partially hydric (NRCS 2007).

See **Appendix G** for maps of soil units within the project area.

5.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Physiography and Topography. Short- and long-term minor adverse impacts on the natural topography are expected. Grading, contouring, and trenching associated with the installation of the tactical infrastructure sections will impact approximately 508 acres, which will result in minor alterations of the existing microtopography. However, the existing topography of much of the impact corridor was previously altered to construct the levees, provide access roads, and to level agricultural fields for irrigation. Any additional topographic alterations associated with the installation of the tactical infrastructure is expected to be minor. The Project area will be regraded and contoured following installation of the tactical infrastructure. This will minimize modifications to existing flood-flow characteristics.

The Storm Water Pollution Prevention Plans (SWPPPs) should contain one or more site maps that show the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the Project. The SWPPPs will list BMPs the discharger will use to protect storm water runoff along with the locations of those BMPs. Additionally, the SWPPPs will contain a visual monitoring program, a chemical monitoring program for nonvisible pollutants to be implemented if there is a failure of BMPs, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

Minor adverse impacts due to potential increased sheet flow as a result of grading, contouring, and trenching are expected to be temporary and mitigated by the implementation of the BMPs developed during preparation of the SWPPP.

Geology. Short- and long-term negligible to minor impacts on geologic resources could occur at locations if bedrock is at the surface. Geologic resources could affect the placement of the fence or patrol roads due to the occurrence of bedrock at the surface, or as a result of structural instability. Site–specific geotechnical surveys will be conducted prior to construction to determine depth to bedrock. In most cases, it is expected that Project design and engineering practices will be implemented to mitigate geologic limitations to site development.

Soils. Short-term minor direct adverse impacts on soils are expected. Soil disturbance and compaction due to grading, contouring, and trenching associated with the installation of the tactical infrastructure sections will impact approximately 508 acres. Permanent soil disturbance due to grading, contouring, and trenching associated with the installation of the fence is expected to impact approximately 85 acres. The volume of soil disturbance cannot be determined due to the operational sensitivity of disclosing the exact depth of soil disturbance. However, displaced soil will be properly stockpiled to prevent erosion and sedimentation and excess soils will be disposed of properly if not utilized during regrading and recontouring activities following installation of the fence. In areas where soils have not been previously disturbed by levee development, agricultural activities, and other land uses prior to this Project, minor adverse effects on natural soil structure and soil organisms are expected.

Increased soil erosion due to the construction activities will be minimized with the implementation of BMPs as established during the development of the SWPPP. Implementing these BMPs will minimize soil erosion impacts in the western portion of the impact corridor associated with the Project (in Sections O-1, O-2, and O-3). This area is characterized by low ridges with moderately steep-sided bluffs and narrow arroyos. Soil disturbance on steep slopes has the potential to result in excessive erosion due to instability of the disturbed soils and high runoff energy and velocity. Adverse effects associated with sediments that could potentially be transported from construction sites and deposited in the Rio Grande will be minimized as a result of implementation of the BMPs as established in the SWPPP. Construction activities necessary for site development (i.e., grading, excavating, placement of fill, compaction, mixing, and augmentation) are expected to directly impact existing soils, however BMPs will be implemented to reduce these impacts, where practical. Due to the semi-arid climate of the region, wind erosion could potentially impact disturbed soils in areas where vegetation has been removed. However, following construction activities, the areas disturbed will be revegetated with native species to the maximum extent practicable to reestablish native plant communities and help stabilize soils.

Long-term minor direct adverse impacts on prime farmland soils in Hidalgo and Cameron counties will occur as a result of construction activities. No soils associated with farmland of local, unique, or statewide importance are identified for Starr, Hidalgo, and Cameron counties. In areas not currently being used for agriculture, the impact corridor will be linear and limited in extent; therefore, any impacts on the areas considered prime farmland are expected to be minor. In the areas where crops, such as sorghum and sugar cane, are currently being grown in the impact corridor, construction will result in the permanent loss of existing cropland.

Construction and operation of tactical infrastructure will increase border security in the UBSP Rio Grande Valley Sector and may result in a change to illegal traffic patterns. However, changes to illegal alien traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

6. WATER USE AND QUALITY

6.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Clean Water Act (CWA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CWA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for hydrology and groundwater.

Hydrology and Groundwater. Hydrology results from the redistribution of water through the processes of evapotranspiration, surface runoff, and subsurface flow. Hydrology is influenced primarily from temperature and total precipitation that determine evapotranspiration rates, topography which determines rate and direction of surface flow, and soil properties that determine rate of subsurface flow and recharge to the groundwater reservoir. Groundwater consists of subsurface hydrologic resources that function to recharge surface water and is important for drinking and domestic use, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations.

Surface Water and Waters of the United States. While issuance of the waiver eliminated the requirement for CBP to comply with the CWA, the applicable thresholds and standards have been used to evaluate the potential impacts on surface water and waters of the United States. Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community, locale, or region.

Waters of the United States are defined within the CWA of 1972, as amended. USEPA and the USACE assert jurisdiction over (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) nonnavigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-around or have continuous flow at least seasonally, and (4) wetlands that directly abut such tributaries.

Wetlands are an important natural system and habitat, performing diverse biologic and hydrologic functions. These functions include water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, wildlife habitat provision, unique flora and fauna niche provision, storm water attenuation and storage, sediment detention, and erosion protection. Wetlands are considered a subset of the waters of the United States under Section 404 of the CWA. The term "waters of the United States" has a broad meaning under the CWA and incorporates deepwater aquatic habitats and special aquatic habitats (including wetlands). The USACE defines wetlands as "those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR Part 328).

Floodplains. Floodplains are areas of low-level ground present along rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic systems in which each component helps to maintain the characteristics of the environment that supports it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and a diversity of plants and animals. Floodplains provide a broad area to spread out and temporarily store floodwaters. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body (FEMA 1986).

Floodplains are subject to periodic or infrequent inundation due to rain or melting snow. Risk of flooding typically hinges on local topography, the frequency of precipitation events, and the size of the watershed above the floodplain. Flood potential is evaluated by FEMA, which defines the 100-year floodplain. The 100–year floodplain is the area that has a 1 percent chance of inundation by a flood event in a given year. Certain facilities inherently pose too great a risk to be in either the 100- or 500-year floodplain, such as hospitals, schools, or storage buildings for irreplaceable records. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreational and preservation activities, to reduce the risks to human health and safety.

6.2 AFFECTED ENVIRONMENT

***Hydrology and Groundwater*.** The impact corridor is in the Rio Grande Drainage Basin, which occupies an area of approximately 355,500 square miles. Much of the Rio Grande drainage basin is composed of rural, undeveloped land used primarily for farming and ranching. Water development projects in the Rio Grande Valley have disrupted natural flow regimes, including structures such as Anzalduas Dam, Falcon Dam, and Amistad Dam. Substantial quantities of surface water are diverted from the Rio Grande to meet municipal, industrial, and agricultural demands in Texas and Mexico, with a significant portion used in the Rio Grande Valley for farming and urban applications. Most of the water diverted in the Rio Grande Valley is not returned to the river as irrigation tailwater or treated wastewater effluent because the land naturally slopes away from the river channel. The return flows are usually discharged into constructed drainage ditches/channels and floodways that eventually flow into the Arroyo Colorado and then into the Laguna Madre estuary, and ultimately into the Gulf of Mexico (Moore et al. 2002).

The major aquifer underlying the Rio Grande Valley is the Gulf Coast Aquifer. The aquifer consists of alternating beds of clay, silt, sand, and gravel that are hydrologically connected to form a large, leaky, artesian system. Challenges related to withdrawal of groundwater from the Gulf Coast Aquifer include land-surface subsidence, increased chloride content in the groundwater from the southwestern portion of the aquifer, and saltwater intrusion along the coast (USACE 2000).

In Cameron County, the major source of groundwater is the Rio Grande Valley Alluvium Aquifer, which consists of recent deposits of unconsolidated sand, silt, gravel, and clay. This aquifer is close to the Rio Grande in an area generally bounded by the river on the south and Highway 83 on the north. Water in the Rio Grande Valley Alluvium Aquifer is characterized by high concentrations of chloride, dissolved solids, boron, and sodium. This water does not meet U.S. drinking water standards and is used primarily to support agriculture (USACE 2000).

Surface Waters and Waters of the United States. The predominant surface water feature in the area is the Rio Grande (named the Rio Bravo in Mexico). The Rio Grande drainage is one of the longest rivers in North America, and an important hydrologic basin to both the United States and Mexico. The allocation of Rio Grande water between the two countries is governed by a treaty signed in 1944.

The main channel of the Rio Grande has formed south of the impact corridor, which is positioned north of the IBWC levee system (Moore et al. 2002). In 1932, an agreement was reached between the United States and Mexico to develop a coordinated plan to protect the Rio Grande Valley against flooding from the Rio Grande in both countries (IBWC 2007). This agreement was enacted by the IBWC and resulted in designing the Lower Rio Grande Flood Control Project (LRGFCP) (IBWC 2007).

The LRGFCP addresses flood protection of urban, suburban, and highly developed irrigated farm lands in the Rio Grande delta in both countries. The LRGFCP levees are grass-covered earthen structures, with a distance between the U.S. and Mexico levees ranging from approximately 400 feet to 3 miles. The LRGFCP is jointly operated by the USIBWC and Mexican IBWC to convey excess floodwaters of the Rio Grande to the Gulf of Mexico via the river channel and U.S. and Mexican interior floodways (IBWC 2007). The LRGFCP includes approximately 270 miles of levees in the Rio Grande Valley.

Surface water features that could be potentially classified as waters of the United States in the impact corridor include the Rio Grande and contributing/associated arroyos, resacas, lakes, ponds, drainage canals, channelized streams, and wetlands including those formed from irrigation wastewater flows or groundwater seepage (see **Figures 1-1** through **1-3**). Arroyos are deep, narrow intermittently flooded drainages that flow from ridges and bluff faces into the Rio Grande. Resacas are curved, linear oxbow lakes (former mainstem channels cut off as the river naturally meandered across the historic floodplain) that are deep enough to expose the groundwater or are filled artificially. Dams and levees for flood control and water storage along the Rio Grande have severed the natural surface water connection between the river and most of the resacas, although groundwater flows are thought to be intact. Resacas are typically filled by pumping water from the Rio Grande, rainfall, or input of irrigation return flows.

The impact corridor for Sections O-1, O-2, and O-3 are characterized by rugged river banks and steep bluffs, arroyos, and rapid erosion; there are no levees constructed within these sections. The impact corridor for Sections O-4 through O-21 are characterized by lakes, ponds, levees, public water canals, irrigation canals, and drainage ditches.

Some surface water features occur adjacent to or within the impact corridor associated with the Project (see **Figures 1-1** through **1-3**). Approximately 0.33 mile will parallel the Rio Grande to the Los Negros Creek Unit of the LRGVNWR. Section O-2 crosses some arroyos that convey flows directly to the Rio Grande. Approximately 0.70 miles of Section O-3 will avoid some natural riparian areas along the Rio Grande of the Los Ebanos unit of the LRGVNWR. Section O-6 will parallel the Pharr San Juan Main Canal. Section O-7 will cross the Donna Canal and tie into the Donna POE. Section O-9 will be constructed between an irrigation district settling basin and Moon Lake in the Progress Lakes area. Section O-11 will begin where the IBWC levee adjoins the Santa Maria Canal then will parallel the levee to and cross the La Feria Canal. Section O-12 will cross the Harlingen Canal and parallel the north side of the canal. Section O-13 will begin where the IBWC levee intersects the San Benito Canal. Section O-18 will begin where the IBWC levee intersects the Los Fresnos pump canal on its east bank. Section O-21 will be constructed a short distance along the El Jardin Canal.

Wetlands are also potentially jurisdictional waters of the United States and can be associated with all of the above surface water features. Potential jurisdictional wetlands have been identified along the impact corridor based on vegetation and hydrology. Wetland indicator species are annotated in the plant species list in **Appendix D** and wetland plant communities identified during field surveys include (1) Mule's Fat Shrubland, (2) Black Willow Woodland/Shrubland, (3) Giant Reed Herbaceous Vegetation, (4) Common Reed Herbaceous Vegetation, (5) Alkali Sacaton Herbaceous Vegetation, (6) Narrowleaf Cattail Herbaceous Vegetation, and (7) Smartweed Herbaceous Vegetation. A few floating aquatic communities are also present on some small ponds. Although a summary is provided herein, a more complete description of these potential wetland communities is presented in **Appendix D**. Mule's Fat Shrubland is associated with near to surface groundwater or occasional standing water, characterized by stands in Sections O-3, O-13, and O-18. Black Willow Woodland/Shrubland is associated with Rio Grande canals, drainage ditches, and ponds, characterized by stands in Sections O-3, O-8, O-13, O-14, and O-20. Giant Reed Herbaceous Vegetation is associated with ditch and canal banks, standing water in ditches, and near to surface groundwater, characterized by stands in Sections O-2, O-9, and O-14. Common Reed Herbaceous Vegetation was observed in narrow strips along canal banks and is relatively rare within the impact corridor. Alkali Sacaton Herbaceous Vegetation occupies shallow depressions that likely capture runoff, and was observed as stands only in Section O-4. Narrowleaf Cattail stands occur along perennial water bodies, specifically pond shorelines as characterized in Section O-8. Smartweed Herbaceous Vegetation was observed in the bottom of one canal or large irrigation ditch in Section O-14.

Wetland delineations were conducted using the *USACE Wetlands Delineation Manual, Technical Report Y-87-1.* The parameters for performing wetland boundary assessment typically include (1) the predominance (greater than 50 percent) of hydrophytic (wetland) vegetation, (2) the presence of hydric (wetland) soils, and (3) evidence of wetland hydrology. In undisturbed field conditions for wetlands, all three of these diagnostic criteria must be present to fulfill wetlands classification criteria (USACE 1987). The Cowardin et al. (1979) classification of wetlands was used to characterize aquatic resource habitats (wetlands and streams) in the project area. The Cowardin et al. (1979) wetland classification uses a hierarchical classification approach, beginning with Systems and Subsystems, and narrows to a more specific level of Classes, Subclasses, and Dominance Types based on habitat types. Each System is a "complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphic, chemical, or biological factors" (Cowardin et al. 1979). There are five Systems in the Cowardin et al. (1979) wetland classification nomenclature: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. The wetland delineations and permitting process are followed by a jurisdictional determination (JD) by the USACE prior to any construction activities.

Identification and delineation of waters of the United States (i.e., jurisdictional wetlands and waters) within the impact corridor was completed in December 2007, when rights of entry (ROEs) and LRGVNWR Special Use Permits were obtained. The tactical infrastructure will be designed to avoid or minimize impacts on wetlands and drainages, and to prevent impounding or otherwise altering waters.

During December 2007, a jurisdictional wetland survey was conducted for the impact corridor. On 15 January 2008, the Department of the Army, Galveston District, Corps of Engineers, Corpus Christi Regulatory Field Office issued a JD (SWG-2008-0040) that 33 sites near the impact corridor are waters of the United States and are subject to USACE jurisdiction under Section 404 of the CWA. Approximately 23.79 acres of wetlands are within the impact corridor (see **Table 6-1**).

Table 6-1. Jurisdictional Wetlands and Waters of the United States that Occur Near the Impact Corridor

Identification Number	Habitat Type*	Fence Section	Size (acres)
WL1	PEM/PSS	O-10	0.42
WL2	PEM	O-9	2.62
WL4	PEM/ditch	O-8	0.11
WL6	PEM/POW	O-5	0.38
WL8	Stream	O-1	0.36
WL11	Arroyo	O-1	0.08
WL12	Arroyo	O-1	2.85
WL14	PFO/PEM	O-1	0.37
WL15	Arroyo	O-1	0.12
WL16	PFO/PEM	O-2	0.36
WL18	PSS/PEM	O-20	0.02
WL19	PEM/POW	O-17	0.5
WL20	PSS/PEM	O-17	2.65
WL23	PFO along ditch	O-11	3.25
WL25	POW/PFO/PEM	O-12	1.08
WL26	PSS/POW/PEM	O-13	0.79
WL29	PFO/PEM	O-13	0.09
WL30	PFO/PSS	O-13	0.18
WL31	PSS/PEM	O-13	0.14
WL32	PEM	O-13	0.14
WL33	PEM	O-13	0.44
WL36	PFO	O-18	0.04
WL37	PEM/PSS	O-18	0.17
WL38	POW/PEM	O-18	0.68
WL46	PFO/PEM	O-21	0.27
WL47	POW/PEM	O-21	1.82
WL51	PEM	O-2	1.6
WL52	PFO	O-2	0.25
WL53	PFO	O-2	0.22
WL54	PFO	O-2	0.22
WL55	Stream	O-2	0.04
WL56	PFO	O-2	1.13
WL57	PFO	O-20	0.4
		Total	**23.79**

Notes: *PEM-Palustrine Emergent Marsh; PSS-Palustrine Scrub/Shrub; POW-Palustrine Open Water; PFO-Palustrine Forested

The use of irrigation and application of fertilizers, pesticides, and herbicides has resulted in the contamination of flows in agricultural drainage ditches and ponded water of resacas in the Rio Grande Valley. Some of these waters can eventually be discharged into the Laguna Madre (USFWS 1991). Because resacas are also integral parts of the urban storm water drainage system in the Rio Grande Valley, they are subject to urban nonpoint source pollution such as pesticides (e.g., chlordane), automotive oil, grease, metals, fertilizers, sewage, and dissolved salts. Resacas are also affected negatively if they receive contaminated river water for municipal water storage or irrigation. In addition, illegal dumping into resacas has contributed to the contamination within these waterways (DOI 1996).

Floodplains. The impact corridor associated with Section O-1 is depicted as occurring in the 100-year floodplain of the Rio Grande, as identified on the January 24, 1978, the Federal Emergency Management Agency (FEMA) flood insurance rate map (FIRM) Panel No. 4805750010A for Starr County, Texas. The impact corridor associated with Section O-2 is depicted as occurring in the 100-year floodplain of the Rio Grande, as identified on the January 24, 1978, FEMA FIRM Panel Nos. 4805750014A and 4805750015A for Starr County, Texas. Sections O-1 and O-2 are designated as Zone A. Zone A areas on FEMA flood insurance maps indicate areas that correspond to the 100-year floodplain determined in the Flood Insurance Study (FIS) by approximate methods (FEMA 1987, FEMA undated). Due to the uncertainty of the methodology, it cannot be determined if portions of the impact corridor associated with Sections O-1 and O-2 occur in the 100-year floodplain, as they are located on bluffs and the valley rim. As described in **Chapter 5.2**, the topography of these sections is characterized by rugged river banks (at the Rio Grande), arroyos, and heavy erosion with no levees.

The impact corridor associated with Section O-3 is also depicted as occurring in the 100-year floodplain of the Rio Grande, as identified on the January 2, 1981, FEMA FIRM Panel No. 4803340375B for Hidalgo County, Texas. Section O-3 will be within FEMA Zone A23, which is one of the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the FIS by detailed methods (FEMA 1987, FEMA undated). The topography and surface waters of Section O-3 are similar to that of Sections O-1 and O-2.

The impact corridor associated with Sections O-4 through O-21 does not lie within the 100-year floodplain for the Rio Grande. These fence sections will follow existing levees as discussed in **Chapter 1.4**, and will be located outside the current FEMA 100-year flood zone for the Rio Grande and the IBWC international drainage. Areas outside (north of) the 100-year flood zone are generally zoned B, C, and X. FEMA defines Zones B, C, and X as zones that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees (FEMA 1987, FEMA undated). Some areas of Zone A occur within the impact corridor of Sections O–7, O-10, O-11, O-15, and O-17.

Constructing the tactical infrastructure within the floodplain has the potential to affect flood flows if the tactical infrastructure is not maintained to remove blockages to flow (debris and wrack) following high flow events. Periodic maintenance of the primary pedestrian fence to remove vegetation and debris will minimize the potential to modify flood flows. Additionally, as previously stated, the land naturally slopes away from the river channel.

An SWPPP will be developed with BMPs to manage storm water runoff from the Project. Erosion and sediment control and storm water management practices during and after construction will be implemented consistent with the SWPPP.

6.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Hydrology and Groundwater. Short- and long-term negligible direct adverse impacts on the hydrology of the Rio Grande are expected to occur as a result of the grading and contouring associated with Sections O-1, O-2, and O-3. Grading and contouring is expected to alter the topography and remove vegetation from approximately 105 acres within the floodplain of the Rio Grande, which could in turn increase erosion potential and increase runoff during heavy precipitation events. Revegetating the area with native vegetation following construction along with other BMPs to abate runoff and wind erosion could reduce the impacts of erosion and runoff. Additionally, the small increase in impervious surface within the floodplain will result in negligible increases in the quantity and velocity of storm water flows to the Rio Grande. BMPs will be developed as part of the required SWPPPs to manage storm water both during and after construction. Therefore, impacts are expected to be negligible.

Short-term and long-term negligible to minor localized adverse impacts on hydrology are expected for Sections O-10 through O-21. These sections will be constructed and operated behind the levee system, outside the Rio Grande floodplain. Most of the levee system is operated by the USIBWC, but small segments of the levee system (e.g., in Section O-19) are privately owned.

Short-term direct minor adverse construction-related impacts on groundwater resources in Starr, Hidalgo, and Cameron counties are also expected. During construction, water is required for mixing and pouring concrete, watering of road and construction surfaces for dust suppression, and for washing construction vehicles. Water use for construction is temporary, and the volume of water used for construction is minor when compared to the amount used annually in the area for municipal, agricultural, and industrial purposes. The source for construction water is currently unknown. Prior to construction, a water source with a current allocation and all appropriate permits will be identified.

The potential for short-term negligible adverse impacts on groundwater related to an increase in storm water runoff will also occur. Implementation of storm water and spill prevention BMPs developed consistent with the SWPPPs and other applicable plans will minimize potential runoff or spill-related impacts on groundwater quality during construction, operation, and maintenance.

Surface Water and Waters of the United States. Short- and long-term direct and indirect negligible adverse impacts on water quality will be expected. Implementation of the Project will increase impervious surface area and runoff potential. Approximately 508 acres of soil will be disturbed due to grading, contouring, and trenching. Surface waters that will be affected either directly or indirectly include the Rio Grande (Sections O-1, O-3, and O-6), arroyos (Section O-2), an irrigation canal (Section O-5), the Donna Canal (Section O-7), the settling basin and Moon Lake (Section O-9), the Santa Maria Canal (Section O–11), the Harlingen Canal (Section O-12), the San Benito Canal (Section O–13), Los Fresnos pump canal (Section O-18), and El Jardin Canal (Section O–21).

An SWPPP will be developed with BMPs to manage storm water runoff from the Project. The SWPPPs will include erosion and sediment control and storm water BMPs for activities resulting during and after construction. All relevant Federal, state, and local regulations will be used as guidelines in developing SWPPP BMPs. Based on these requirements, adverse impacts associated with storm water runoff on surface water quality will be reduced to negligible impacts.

Impacts on surface water and wetlands that are potentially jurisdictional waters of the United States will be avoided to the maximum extent practicable. Impacts that cannot be avoided will be minimized by the implementation of BMPs, which will be developed using all relevant Federal, state, and local regulations as guidelines. Impacts include filling wetlands and moving the alignment of irrigation canals and drainage ditches. Currently, wetland vegetation is routinely removed mechanically from canal banks as a maintenance action to improve flow and reduce water loss to evapotranspiration.

CBP will avoid or minimize impacts on wetlands and water bodies to the maximum extent practical, including following pre- and post-construction BMPs. If wetland impacts cannot be avoided, CBP will develop a wetlands mitigation plan in cooperation with USACE guidelines.

An SWPPP will be developed with BMPs to manage storm water runoff from the Project area until final project stabilization. All relevant Federal, state, and local regulations will be used as guidelines in developing SWPPP BMPs. A description of any permanent measures that will be installed during the construction process to control pollutants in storm water discharges will be included in the SWPPP. The SWPPP will also include a visual monitoring program and a chemical monitoring program if there is a failure of BMPs. No sections of the Rio Grande adjacent to the tactical infrastructure are listed on the

303(d) list for sediment, therefore a sediment monitoring plan is not necessary. Based on the application of BMPs, there will be no to negligible effects on water quality associated with point source or nonpoint source runoff from the Project area. Following final stabilization of the site, operation and maintenance of the tactical infrastructure will be expected to cause negligible adverse impacts on water quality.

Floodplains. Impacts on floodplains will be avoided to the maximum extent practicable. Acknowledging the potential shortfalls of the methodology to estimate the floodplain limits in Sections O-1 through O-3, potential short- and long-term minor adverse impacts on the Rio Grande floodplain will occur as a result of construction activities. Section O-1 impacts will include 5.26 miles of floodplain, Section O-2 will include 7.30 miles of floodplain, and Section O-3 will include 1.86 miles of floodplain. The permanent width of the impact corridor will be 60 feet (see **Figure 2-4**); therefore, the Project will impact approximately 105 acres of floodplains along Sections O-1, O-2, and O-3.

Some areas of the 100-year floodplain occur within the impact corridor of Sections O-7, O-10, O-11, O-15, and O-17. No impacts on floodplains or USIBWC international floodplains are expected in Sections O-4 through O-21. These sections will be constructed and operated on the non river side of the levee system. Most of the levee system is operated by the USIBWC, but small segments of the levee system (e.g., in Section O-19) are privately owned.

USBP has determined that Sections O-1 through O-3 cannot be practicably located outside the floodplain. The current floodplain extends past local communities and roads strategic to the operations of USBP. In order to operate outside the existing floodplain, USBP will have to move all operations northward several miles in some areas. This will not meet USBP mission needs. Therefore, in order to mitigate potential impacts on the floodplain in Sections O-1 through O-3, CBP coordinated with USIBWC on the development of movable fence designed to mitigate potential impacts to the floodplain. During a flood event, sections of the fence in these sections would be moved in order to allow easier passage of flood waters.

Maintenance, as part of the Project, includes maintaining the primary pedestrian fence free of debris, so that the aboveground portion of the fence remains permeable. CBP will mitigate unavoidable impacts on floodplains using planning guidance developed by the USACE.

7. BIOLOGICAL RESOURCES

7.1 VEGETATION

7.1.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations for vegetation resources.

Vegetation resources include native or naturalized (nonnative) plants and serve as habitat for a variety of wildlife species. This section describes the affected environment for native and nonnative vegetation, including a summary of the climate that drives the development of plant communities in this region, basic classification of identified plant communities, noxious and invasive nonnative plant species, and a summary of plant species and communities observed within the impact corridor during surveys conducted in the latter portion of 2007. More detailed information on the vegetation resources documented during the field surveys, including methodologies and classification hierarchies, is presented in the Biological Survey Report (see **Appendix D**).

7.1.2 Affected Environment

The climate within the impact corridor is semiarid-subtropical/subhumid within the Modified Marine climatic type, in which summers are long and hot and winters are short, dry, and mild (Larkin and Bomar 1983, Bailey 1995). The marine climate results from the predominant onshore flow of tropical maritime air from the Gulf of Mexico. Onshore air flow is modified by a decrease in moisture content from east to west and by intermittent seasonal intrusions of continental air.

Average temperatures in Brownsville/McAllen range from a low of 50/48 degrees Fahrenheit [°F] in January to a low of 76/75 °F in July, and a high of 64/69 °F in December to a high of 97/96 °F in August. Annual low and high temperatures for Brownsville range from 12 °F to 63 °F and 93 °F to 107 °F, respectively. The average annual precipitation of the Rio Grande Delta recorded in Brownsville and McAllen ranges from 22 to 30 inches (Brownsville recorded 21.7 inches and McAllen 22.6 inches for 2006), and the distribution of rainfall is irregular. Wind speeds are stable ranging from 10.4 miles per hour (mph) to 17.3 mph during the year. A long growing season is experienced, from 314 to 341 days. The evaporation rate during the summer season is high, about twice the amount of precipitation.

The vegetation of the Rio Grande Delta of southern Texas has generally been classified under the Dry Domain, Tropical/Subtropical Steppe Division (Bailey 1995). The area surrounding the impact corridor is more regionally classified as the Southwestern Plateau and Plains Dry Steppe and Shrub Province. TPWD (2007b) provides discussion and describes vegetation geography to biotic provinces and natural regions using topographic features, climate, vegetation types, and terrestrial vertebrates. This system places the project area in the Tamaulipan Biotic Province, South Texas Brush Country (Rio Grande Basin) Natural Region, and the Level III Ecoregions of the Southern Texas Plains and Western Gulf Coastal Plain.

Occurring within the Rio Grande Valley (technically a delta) of southern Texas and northern Mexico, Tamaulipan Brushland represents a unique ecosystem (USFWS 1988). The characteristic natural vegetation is dense and thorny, and plant species distribution can be correlated with geologic formations. The Rio Grande floodplain supports tall, dense riparian forest, woodland, shrubland, and herbaceous vegetation while the xeric upland areas support mostly spiny shrubs, short-stature trees, and dense nonnative grasslands. Between the 1920s and 1980s, more than 95 percent of the native brushland (includes woodland and forest formations) and 90 percent of the riparian vegetation had been converted to agriculture and urban land use (USFWS 1988). In 1988, it was estimated that 98 percent of the lush, subtropical region of the Rio Grande Delta had been cleared of native vegetation in the United States and a large but unknown percentage cleared in Mexico.

NatureServe (2007) has defined ecological systems to represent recurring groups of biological communities that occur in similar physical environments and are influenced by similar dynamic ecological processes such as fire or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. For this reason, the results of the field surveys conducted in 2007 are presented in terms of ecological systems as defined by NatureServe (2007): (1) Tamaulipan Calcareous Thornscrub, (2) Tamaulipan Mesquite Upland Scrub, (3) Tamaulipan Mixed Deciduous Thornscrub, (4) Tamaulipan Savanna Grassland, (5) Tamaulipan Arroyo Shrubland, (6) Tamaulipan Floodplain, (7) Tamaulipan Palm Grove Riparian Forest, and (8) North American Arid West Emergent Marsh. Further details on these ecological systems, including a crosswalk to TPWD biotic communities and photodocumentation, are provided in **Appendix D**.

Habitats observed, sampled, and photographed within the impact corridor range from upland thorn-scrub, barretal (thicket), and ramaderos (arroyos) on the western end of Section O-1, upper and mid-valley riparian forest and woodland communities throughout the middle sections, and sabal palm and mid-delta thorn forests within Section O-21. Different vegetation types observed and sampled included 12 woodland and forest communities, 7 shrublands, and 18 herbaceous communities. Much of the vegetation cover within the fence sections consists of nonnative grassland species (buffelgrass, switchgrass, windmill grass, Bermuda grass) that are themselves dominant (approximately 281 acres) or often include an overstory of honey mesquite, retama, or huisache shrubs or small trees (approximately 97 acres).

Agricultural fields occur within much of the impact corridor and include sugar cane, sorghum, Johnsongrass, sunflowers, cotton, row crop vegetables particularly onions, citrus trees (grapefruit and orange), or fields that were fallow at the time they were visited (approximately 64 acres). Urban development and private property with single homes occurs within several tactical infrastructure sections as do roads and trails (approximately 69 acres).

A description of each plant community observed within the impact corridor prepared from sampling using observation points, and its approximate areal extent in acres is provided in **Appendix D**. **Table 7-1** provides a summary of the ecological systems and biotic communities observed in the impact corridor during the 2007 survey, which are addressed in more detail in **Appendix D**.

Plant species recorded within the impact corridor for Sections O-1 through O-21 and their wetland indicator status (NRCS 2007) when appropriate are included in **Appendix D**. A total of 301 plant species were identified and recorded. Of these, 4 occurred in every fence section (huisache, switchgrass, buffelgrass, and honey mesquite). Section O-1 was the most floristically diverse of the 21 sections studied, with 189 plant species recorded. This was the only section in which Taumalipan Calcareous Thornscrub, a species-rich ecological system, occurred.

USFWS, TPWD, National Audubon Society, The Nature Conservancy, and private landowners have worked together to protect and restore a wildlife corridor through this biologically diverse region. The LRGVNWR was established in 1979 to begin connecting the natural existing tracts of brush lands left in this region through purchase of lands from willing sellers to augment the existing wildlife corridor. Found within the southern four counties of Texas, the refuge currently contains more than 90,000 acres and is considered a top priority acquisition area by USFWS. **Table 7-2** is a summary of the LRGVNWR units that will be crossed by the impact corridor. The project will avoid some habitat-rich areas of the LRGVNWR, including the Arroyo Ramirez (Section O-1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O-16) units of the LRGVNWR.

Fourteen noxious weeds or invasive nonnative plant species were identified within the impact corridor. Under the Texas Agricultural Code, three of these species are considered noxious: (1) giant reed (identified in 11 sections), (2) Brazilian pepper tree (identified in 2 sections), (3) and athel tamarisk (identified in 2 sections) (see **Appendix D**). Additionally, TPWD has listed the Brazilian peppertree, recorded in Sections O-9 and O-19, as a prohibited exotic species.

Table 7-1. Ecological Systems Present in Each Tactical Infrastructure Section

Ecological System [Biotic Community]	Fence Sections																				
	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21
Tamaulipan Calcareous Thornscrub [Barretal and Upland Thornscrub]	X	X																			
Tamaulipan Mesquite Upland Scrub [Chihuahuan Thorn Forest, Upper Valley Flood Forest, and Mid-Valley Riparian Woodland]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tamaulipan Mixed Deciduous Thornscrub [Chihuahuan Thorn Forest and Upland Thornscrub]	X	X	X																		
Tamaulipan Savanna Grassland [Upper Valley Flood Forest and Mid-Valley Riparian Woodland]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Tamaulipan Arroyo Shrubland [Ramadero]	X	X																			

Tamaulipan Floodplain [Upper Valley Flood Forest and Mid-Valley Riparian Woodland]	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X			X
Tamaulipan Palm Grove Riparian Forest [Sabal Palm Forest]																					X
North American Arid West Emergent Marsh [Distributed in all Biotic Communities]	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X

Table 7-2. LRGVNWR Units Crossed by the Tactical Infrastructure

Section	Unit of the LRGVNWR	Mileage Intersected	Acreage Impacted
O-1	Los Negros Creek	0.33	2.4
O-2	Rio San Juan	0.16	0.63
O-2	Los Velas West; Los Velas	1.06	7.62
O-3	Los Ebanos	0.7	4.8
O-4	Peñitas	0.08	0.59
O-6	Pharr Settling Basin	0.32	2.5
O-6	Pate Bend	0.11	0.2
O-7	Monterrey Banco	0.88	4.7
O-8	La Coma	0.17	1.26
O-10	Rosario Banco	0.35	2.5
O-13	Culebron Banco	0.1	0.06
O-16	Tahuachal Banco	0.01	0.03
O-18	Palo Banco; Phillips Banco	1.32	9.97
O-21	Jeronimo Banco; Boscaje de la Palma	0.62	4.4

7.1.3 Direct and Indirect Effects of the Project

To obtain information to support the impact analyses presented herein, vegetation surveys were conducted for 2 weeks during the months of October and December 2007. Due to the late summer/fall timing of field visits, some plant species were likely not identifiable and consequently were not included in the species list or were identified to the genus level in **Appendix D**.

A 60-foot-wide corridor containing the pedestrian fence and patrol road for Sections O-1 through O-3 and O-11 through O-21 will be cleared during construction. A 40-foot-wide corridor containing the pedestrian fence and patrol road will be cleared for Section O-4 through O-11. A small acreage will be allowed to revegetate and will be maintained following construction to support long-term maintenance, sight distance, and patrol activities. Maintenance activities on revegetated sites, (e.g., mowing, herbicide application, noxious species control) will be targeted primarily for herbaceous species (grasses) and will result in long-term minor to moderate adverse impacts due to loss of plant species diversity and habitat structure. The impact corridor (approximately 50 miles long by 60 feet wide and approximately 20 miles long by 40 feet wide) totals approximately 461 acres. Existing land use and vegetation types composing the approximately 461 acres include developed lands (urban land, private residences, open water, and agricultural land) (approximately 30 percent of the impact corridor); nonnative grasslands and herbaceous vegetation (approximately 52 percent of the impact corridor); natural to disturbed thornscrub shrublands and woodlands (approximately 4 percent of the impact corridor); and natural and disturbed floodplain shrublands, woodlands, and forests (approximately 13 percent of the impact corridor). A summary of the LRGVNWR units impacted by the impact corridor is presented in **Table 7-2**. The impact corridor will entirely avoid the potentially species-rich Arroyo Ramirez (Section O–1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O–16) units of the LRGVNWR.

The loss of 49 acres of vegetation (includes agricultural cropped lands and agricultural fallow fields) from approximately 138 acres of developed lands will result in short- and long-term negligible to minor adverse impacts due to the potential for the disturbed land to become a nursery for nonnative plant species to propagate and invade surrounding plant communities. Further, the loss of approximately 49 acres of agricultural land will result in long-term minor to moderate adverse impacts due to these lands becoming unavailable for future revegetation projects that use native plant species to provide diversity and wildlife habitat as brushlands.

Potential impacts due to removal of individual large mature native trees of Texas ebony, sabal palm, eastern cottonwood, sugarberry, and honey mesquite could be reduced by avoidance (avoidance of these large trees will require protection of the soil and root zone at least to the canopy drip-line, a zone up to 50–75 feet wide), or minimization by transplanting individuals (e.g., of the sabal palms) to areas selected by the USFWS, TPWD, or other resource agencies. However, avoidance or transplant of all mature trees within the impact corridor is not feasible. Therefore, removal will result in long-term major adverse impacts, because these large mature trees are virtually irreplaceable.

The loss of approximately 242 acres of herbaceous vegetation, predominantly dominated by nonnative buffelgrass, switchgrass/Guineagrass, Bermuda grass, and windmill grass, will result in short- and long-term minor to moderate adverse impacts due to habitat conversion. Removal of nonnative plant species listed as noxious or invasive from the impact corridor will result in short- and long-term minor beneficial impacts on the local floristic composition and adjacent habitat.

The loss of approximately 19 acres of native and disturbed thornscrub shrubland and woodland habitat, predominantly honey mesquite and retama with a moderate to dense buffelgrass or switchgrass understory, will result in short- and long-term moderate adverse impacts due to habitat conversion. TPWD revegetated a portion of this acreage, the Anacqua Unit of the Las Palomas WMA, around 1985 and this woodland habitat currently supports one of the largest rural breeding colonies of white-winged doves within the Lower Rio Grande Valley. In the LRGVNWR units, a portion of this acreage also represents stands that were revegetated by the USFWS around 2002 and 2003. Within Sections O-1 and O-2, occurrences of Tamaulipan Calcareous Thornscrub (Chihuahuan Thornscrub and Barretal) will be avoided.

In Section O-1, sedimentary rock outcrops on south-facing slopes will be avoided during construction, resulting in short- and long-term moderate to major beneficial impacts, due to preservation of a unique habitat that in other sites supports federally listed plant species (e.g., the Zapata bladderpod). Loss of these unique sedimentary rock outcrops would be irreplaceable.

Within the impact corridor, approximately 376 vegetated acres occur, mostly within the Rio Grande floodplain. Existing vegetation is composed of approximately 65 percent buffelgrass, switchgrass, switchgrass/Guineagrass, and windmill grass nonnative grasslands; approximately 5 percent shrublands; and approximately 17 percent woodlands and forests. River health in terms of surface water flows, overbank flooding, and sediment deposition was previously impacted by USIBWC levee construction and management and the existing vegetation has recovered from that construction and from other land use impacts over the past 75–100 years. The loss of approximately 62 acres of native and disturbed floodplain shrubland, woodland, and forest habitat, predominantly honey mesquite (46 acres) and sugarberry (6 acres) and to a lesser extent sabal palm (8 acres), will result in short- and long-term moderate to major adverse impacts due to habitat conversion and the size and age of mature floodplain trees.

The Sugarberry Riparian Forest and Woodland community that has become established at the Arroyo Ramirez confluence with the Rio Grande represents one of the best examples of riparian woodland within Starr County and construction within the stand will result in long-term moderate to major adverse impacts. Tamaulipan Arroyo Shrublands (Ramaderos) will be crossed nearer the Rio Grande, on the floodplain, instead of on ridges and slopes but the impact level will be the same.

The fencing is expected to provide protection for vegetation in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. The western portion of Section O-19 is along the levee, potentially protecting remaining vegetation stands and wildlife habitat north of the levee in that area. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

In summary, short- and long-term adverse impacts on vegetation will range from negligible to major due to habitat loss and modification. Short- and long-term negligible to moderate (depending upon the location) beneficial impacts on rock outcrops and remaining vegetation north of the impact corridor will be expected from the potential protection from cross-border violators. Minor beneficial effects on floristic composition at the local level will result from the removal of plant species listed by the State of Texas as noxious or invasive nonnatives.

7.2 WILDLIFE AND AQUATIC RESOURCES

7.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Migratory Bird Treaty Act (MBTA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the MBTA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for wildlife and aquatic resources.

Wildlife and aquatic resources include native or naturalized animals and the habitats in which they exist.

7.2.2 Affected Environment

The Rio Grande Valley is a highly distinctive subregion of the South Texas Plains. The South Texas Plains ecoregion consists mostly of level to rolling terrain characterized by dense brush. Usually defined as Cameron, Willacy, Hidalgo, and Starr counties, the Rio Grande Valley contains the only subtropical area in Texas. The Rio Grande Valley brushland is considered an ecological transition zone between the temperate communities to the north and the primarily tropical communities to the south. This key community supports many rare, threatened, and endangered species and is a stopover for migrating neotropical birds (TPWD 2007a).

Most of the 70 miles of the impact corridor have been heavily disturbed by agriculture and grazing; however, some high-quality habitat was identified during the October and December 2007 surveys (see **Appendix D**). Unique habitat includes wetlands, riparian areas, arroyos, the LRGVNWR, Texas state parks, and WMAs.

There are presently three NWRs in the Rio Grande Valley: the Santa Ana NWR and LRGVNWR, which form a complex rather than two separate entities; and Laguna Atascosa NWR, which is outside the project area.

Santa Ana NWR contains one of the largest remaining tracts of subtropical riparian forest and native brushland in south Texas and provides habitat for more endangered and threatened species than any other U.S. NWR (USFWS 1988).

The LRGVNWR, established February 2, 1979, is a component of a multipartner effort attempting to connect and protect blocks of rare and unique habitat, known locally as The Wildlife Corridor. The Wildlife Corridor partnership includes the USFWS, TPWD, National Audubon Society, The Nature Conservancy, and private owners. Found within the lower four counties of Texas, the refuge currently contains more than 90,000 acres and is considered a top priority acquisition area by the USFWS. The refuge provides breeding and foraging habitat for numerous coastal wetland, inland wetland, and upland migratory bird species, and numerous other amphibians, reptiles, and mammal species (USFWS 2007b). Biotic communities along the survey corridor are described in **Chapter 7.1.2**.

Table 7-2 presents the LRGVNWR units that will be crossed by the impact corridor. The impact corridor will avoid some habitat rich areas, including the Arroyo Ramirez (Section O-1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O-16) units. There are several tracts of land owned by TPWD and private conservation organizations throughout the Rio Grande Valley. The TPWD administers the Las Palomas WMA in Cameron, Hidalgo, Starr, and Willacy counties. Bentsen-Rio Grande State Park is southwest of McAllen adjacent to the Rio Grande, and the Chihuahua Woods Preserve, operated by The Nature Conservancy is northeast of the state park. The National Audubon Society's Texas Sabal Palm Sanctuary is south of Brownsville along the Rio Grande (USFWS 1988).

The fauna representative of the Rio Grande Valley region are characterized as semitropical, with some tropical species at the northern limit of their ranges and, additionally, some Chihuahuan desert species. This region was once open grassland with a scattering of shrubs, low trees, and wooded floodplains along rivers. Overgrazing, the suppression of prairie fires, and other changes in land use patterns have transformed most of the grasslands into a thorn forest, covered with subtropical shrubs and trees (CBP 2003).

Common wildlife species observed during the October and December 2007 surveys are listed in **Appendix D.** Ninety-one species of vertebrates were recorded during the October and December 2007 surveys: 2 species of fish, 7 amphibians, 6 reptiles, 63 birds, and 13 mammals (see **Appendix D**). Section O-1, as with vegetation, was the most species-rich with 26 wildlife species recorded. However, the impact corridor will avoid some habitat-rich areas, including the Arroyo Ramirez (Section O-1).

Past collections of fish from the Rio Grande suggest two indigenous faunal assemblages, upstream and downstream. A total of 104 species of fish have been recorded from the lower Rio Grande (Falcon Reservoir to Boca Chica). The upstream fauna is dominated by minnows and sunfishes, while the downstream fauna includes dominant estuarine and marine species of herrings, drums, and jacks (USACE 1994).

Two fish species, Texas cichlid (*Herichthys cyanoguttatus*) and mosquito fish (*Gambusia affinis*), were observed in irrigation ditches during the October and December 2007 surveys (see **Appendix D**).

7.2.3 Direct and Indirect Effects of the Project

A 40- to 60-foot-wide corridor containing the pedestrian fence and patrol road will be cleared during construction and a portion maintained following construction to support long-term maintenance, sight distance, and patrol activities. For the period of construction, lay-down areas for materials and equipment will be identified within the disturbed areas, if possible. The impact corridor will follow the USIBWC levee system for the majority of its length; however, some tactical infrastructure sections will encroach on portions of unique or protected habitats.

The impact corridor will cross several Texas state parks and WMAs in the Rio Grande Valley and will intersect LRGVNWR at several locations (see **Table 7-2**). The impact corridor will entirely avoid the potentially more species-rich Arroyo Ramirez (Section O-1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O-16) units of the LRGVNWR. Potential threats to wildlife in these areas include habitat conversion, reduction in habitat connectivity, noise, and potential siltation of aquatic habitats. The western portion of Section O-19 starts at the levee and will potentially protect remaining habitat and the wildlife it supports north of the levee in that area.

For the length of approximately 70 miles, the area within the impact corridor that will be cleared of vegetation totals approximately 376 acres. The following paragraphs characterize the amount of each general habitat type that will be temporarily or permanently impacted and the impacts of that habitat conversion on wildlife species.

Approximately 49 acres of urban and agricultural land will undergo habitat conversion. Urban areas and agricultural lands often contribute to establishment and spread of nonnative plant species. The area within the impact corridor that is not occupied by the fence or the patrol road will be revegetated to native, low-growing herbaceous species which could provide foraging habitat for some wildlife species. This area will also be monitored for several years to reduce the opportunity for establishment and spread of nonnative plant species. This will result in long-term negligible beneficial impacts on wildlife species.

The loss of approximately 242 acres of herbaceous vegetation, more than half of this area dominated by nonnative buffelgrass, Bermuda grass, and windmill grass, will result in short-term, minor adverse impacts on wildlife due to habitat disturbance during construction and lack of habitat after construction until revegetation is accomplished. However, revegetation with native species as described above will result in negligible long-term beneficial impacts.

The loss of approximately 19 acres of disturbed thornscrub shrubland and woodland habitat, predominantly honey mesquite and retama, will result in short- and long-term moderate adverse impacts on wildlife due to habitat conversion.

The loss of approximately 62 acres of disturbed floodplain shrubland, woodland, and forest habitat, predominantly honey mesquite and sugarberry and, to a lesser extent, sabal palm, will result in short- and long-term, minor to moderate adverse impacts on wildlife.

The fencing is expected to provide protection for wildlife and wildlife habitats in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

Reduction in habitat connectivity resulting from implementation of the Project will likely impact wildlife movement, access to traditional water sources, and potential for gene flow. Smaller, less-mobile species might be more heavily impacted than larger species. However, smaller species will also be able to fit through the bollard-style fence for much of the fence sections (Sections O-1 through O-3 and O-10 through O-21). Although larger species, such as ungulates and carnivores, might not be able to pass through the fence, such species tend to be more mobile, have larger home ranges, and will be able to move between fence sections.

In Sections O-4 through O-10, some terrestrial species might not be able to access the Rio Grande in these sections because concrete flood control structures/concrete fence will be constructed instead of bollard fence. However, the concrete flood protection structure/concrete fence will not be contiguous, so opportunities for wildlife to access the Rio Grande will be possible in areas between these sections where the concrete flood protection structure/concrete fence will not be constructed. Furthermore, the Rio Grande is not the only source of water in the area. Resacas, livestock ponds, and other water sources are often available. In areas where the concrete flood protection structure/concrete fence will be in close proximity to the Rio Grande, the concrete flood protection structure/concrete fence will have short- and long-term minor to moderate impacts on aquatic species.

Although there is the potential to impact migratory birds during the actual construction, it is not anticipated that migratory birds will be affected by the presence of the fence given their mobility. The open area created along the impact corridor could serve to discourage movement across it for more brush- or woodland-specific species. However, the distance such species will have to traverse will be small relative to highways, towns, and other types of less suitable habitat, and it is anticipated that they could make the passage. The need for USBP pursuit and apprehension activities, which could serve to discourage passage by migratory bird and other wildlife movements, is expected to be reduced with the fence in place. As such, the impacts on wildlife movement are anticipated to be long-term, negligible to minor depending upon the species, and adverse.

In parallel with the impacts on wildlife movement anticipated from implementation of the project, implementing the project could cause some individuals of wildlife species to search for alternative water sources. However, alternative water sources are available and this impact will be negligible and adverse over both the short and long terms.

Finally, because the number of successful dispersals required to maintain genetic diversity is small, any restriction of wildlife movement resulting from the project is not anticipated to noticeably impact genetic diversity of most wildlife species. Hence the impact of the project on population genetic structure of wildlife species in general is anticipated to be long-term, negligible, and adverse.

Noise created during construction will be anticipated to result in short-term, minor to moderate, adverse impacts on wildlife. These impacts will include subtle, widespread impacts from the overall elevation of ambient noise levels during construction. Noise levels after construction are anticipated to return to close to current ambient levels. Elevated noise levels during construction could result in reduced communication ranges, interference with predator/prey detection, or habitat avoidance. More intense impacts will include behavioral change, disorientation, or hearing loss. Predictors of wildlife response to noise include noise type (i.e., continuous or intermittent), prior experience with noise, proximity to a noise source, stage in the breeding cycle, activity, and age. Prior experience with noise is the most important factor in the response of wildlife to noise, because wildlife can become accustomed (or habituate) to the noise. The rate of habituation to short-term construction is not known, but it is anticipated that most wildlife will be permanently displaced from the areas where the habitat is cleared and the fence and associated tactical infrastructure constructed, and temporarily dispersed from areas adjacent to the project areas, within and outside the impact corridor, during construction periods. See **Chapter 3.3** for additional details on expected noise levels associated with construction.

Removal of vegetation and grading during construction could temporarily increase siltation in the river and therefore have short-term minor adverse impacts on fish within the Rio Grande. Tactical infrastructure will be adjacent to the river bank, and could result in increased siltation in the Rio Grande. There is one state-listed fish species known to overlap with fence sections in the UBSP Rio Grande Valley Sector. The Rio Grande silvery minnow could potentially occur in the Rio Grande in three sections (O-18, O-19, and O-21). However, implementation of standard BMPs, such as use of silt fences, should reduce this potential impact to negligible.

In summary, implementation of the project will be anticipated to have short- and long-term, negligible to moderate adverse impacts, and long-term negligible beneficial impacts on wildlife due to habitat conversion; long-term, negligible to minor adverse impacts on wildlife due to loss of habitat connectivity; long-term, minor, direct, adverse impacts on wildlife due to construction noise; and negligible adverse impacts on aquatic habitats due to siltation from construction activities.

7.3 SPECIAL STATUS SPECIES

7.3.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Endangered Species Act (ESA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the ESA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for threatened and endangered species. Three groups of special status species are addressed in this ESP: Federal threatened and endangered species, state threatened and endangered species, and migratory birds. Each group has its own definitions, and legislative and regulatory drivers for consideration; these are briefly described below.

The ESA, as amended (16 U.S.C. 1531–1544 et seq.) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. Under the ESA, a Federal endangered species is defined as any species that is in danger of extinction throughout all or a significant portion of its range. The ESA defines a Federal threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

In 1973, the Texas legislature authorized the TPWD to establish a list of endangered animals in the state. State endangered species are those species which the Executive Director of the TPWD has named as being "threatened with statewide extinction." Threatened species are those species which the TPWD has determined are likely to become endangered in the future (TPWD 2007b). Listing and recovery of endangered species in Texas is coordinated by the TPWD.

In 1988, the Texas legislature authorized TPWD to establish a list of threatened and endangered plant species for the state. An endangered plant is one that is "in danger of extinction throughout all or a significant portion of its range." A threatened plant is one that is likely to become endangered within the foreseeable future (TPWD 2007b).

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712), as amended, implements various treaties for the protection of migratory birds. The MBTA defines a migratory bird as any bird listed in 50 CFR 10.13, which includes nearly every native bird in North America.

7.3.2 Affected Environment

Federal Species

Although 19 federally listed species have the potential to occur within the impact corridor (see **Table 7-3**), the following 14 are not anticipated to be impacted by the construction, maintenance, and operation of the tactical infrastructure:

- Green sea turtle (*Chelonia mydas*)
- Hawksbill sea turtle (*Eretmochelys imbricata*)
- Kemp's Ridley sea turtle (*Lepidochelys kempii*)
- Leatherback sea turtle (*Dermochelys coriacea*)
- Loggerhead sea turtle (*Caretta caretta*)
- Brown pelican (Pelecanus occidentalis)
- Least tern (Sterna antillarum)
- Northern Aplomado falcon (Falco femoralis septentrionalis)
- Piping plover (Charadrius melodus)
- Whooping crane (*Grus americana*)
- Ashy dogweed (Thymophylla tephroleuca)
- Johnston's frankenia (*Frankenia johnstonii*)
- South Texas ambrosia (Ambrosia cheiranthifolia)
- Star cactus (*Astrophytum asterias*).

Sea turtles and brown pelicans are coastal species, occupying habitats geographically separate from the impact corridor and any reasonably predictable impacts of fence construction, maintenance, and operation. While the historic ranges of the remaining species included this region of South Texas, available data indicate no known records of these species within or proximal to the impact corridor. Therefore, these 14 species are dismissed from further consideration.

No Federal threatened or endangered species were observed during the October and December 2007 surveys (see **Appendix D**). The following sections provide brief descriptions of the known distribution and habitat preferences of, and threats to, the federally listed species considered further in this ESP. Additional details on the biology of these species are provided in **Appendix D.**

Gulf Coast jaguarundi *(Herpailurus [=Felis] yaguarondi).* The Gulf Coast jaguarundi, listed as endangered on June 14, 1976, is a secretive species for which little about its exact distribution in Texas is known. The last confirmed sighting of a jaguarundi in Texas was at Laguna Atascosa NWR in November 2004 by an Ecological Service biologist and other Service staff during a 1-week period of time (Reyes 2008). Unconfirmed jaguarundi sightings in Hidalgo County include Bentsen Rio Grande State Park, Santa Ana NWR, LRGVNWR, Laguna Atascosa NWR, Cimarron Country Club, Wimberley Ranch, and the Anacua Unit of the TPWD's Las Palomas WMA, and other areas (Prieto 1990,

Table 7-3. Federal- and State-Threatened and Endangered Species in the Project Area, by County

Common Name	Scientific Name	County	Federal Status	State Status
Fish				
Blackfin goby	*Gobionellus atripinnis*	C		T
Opossum pipefish	*Microphis brachyurus*	C		T
Rio Grande silvery minnow	*Hybognathus amarus*	S, H, C		E
River goby	*Awaous banana*	H, C		T
Amphibians				
Black spotted newt	*Notophthalmus meridionalis*	S, H, C		T
Mexican burrowing toad	*Rhinophrynus dorsalis*	S		T
Mexican treefrog	*Smilisca baudinii*	S, H, C		T
Sheep frog	*Hypopachus variolosus*	S, H, C		T
South Texas siren (large form)	*Siren sp 1*	S, H, C		T
White-lipped frog	*Leptodactylus labialis*	S, H, C		T
Reptiles				
Black-striped snake	*Coniophanes imperialis*	H, C		T
Green sea turtle	*Chelonia mydas*	C	E	T
Hawksbill sea turtle	*Eretmochelys imbricata*	C	E	E
Kemp's Ridley sea turtle	*Lepidochelys kempii*	C	E	E
Leatherback sea turtle	*Dermochelys coriacea*	C	E	E
Loggerhead sea turtle	*Caretta caretta*	C	T	T
Indigo snake	*Drymarchon corais*	S, H, C		T
Northern cat-eyed snake	*Leptodeira septentrionalis septentrionalis*	S, H, C		T
Reticulate collared lizard	*Crotaphytus reticulatus*	S, H		T
Speckled racer	*Drymobius margaritiferus*	H, C		T
Texas horned lizard	*Phrynosoma cornutum*	S, H, C		T
Texas scarlet snake	*Cemophora coccinea lineri*	C		T
Texas tortoise	*Gopherus berlandieri*	S, H		T
Birds				
American peregrine falcon	*Falco peregrinus anatum*	S, H, C		E
Arctic peregrine falcon	*Falco peregrinus tundrius*	S, H, C		T
Brown pelican	*Pelecanus occidentalis*	C	E	E
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	S, H, C		T
Common black-hawk	*Buteogallus anthracinus*	S, H, C		T
Eskimo curlew	*Numenius borealis*	C		E
Gray hawk	*Asturina nitida*	S, H, C		T
Least tern	*Sterna antillarum*	S, H, C	E	E

Common Name	Scientific Name	County	Federal Status	State Status
Birds (continued)				
Mexican hooded oriole	*Icterus cucullatus cucullatus*	S		T
Northern Aplomado falcon	*Falco femoralis septentrionalis*	H, C	E	E
Northern beardless-tyrannulet	*Camptostoma imberbe*	S, H, C		T
Piping plover	*Charadrius melodus*	H, C	T	T
Reddish egret	*Egretta rufescens*	H, C		T
Rose-throated becard	*Pachyramphus aglaiae*	S, H, C		T
Sooty tern	*Sterna fuscata*	C		T
Texas Botteri's sparrow	*Aimophila botterii texana*	H, C		T
Tropical parula	*Parula pitiayumi*	S, H, C		T
White-faced ibis	*Plegadis chihi*	H, C		T
White-tailed hawk	*Buteo albicaudatus*	S, H, C		T
Whooping crane	*Grus americana*	S, H, C	E	E
Wood stork	*Mycteria americana*	S, C		T
Zone-tailed hawk	*Buteo albonotatus*	S, C		T
Mammals				
Coues' rice rat	*Oryzomys couesi*	S, H, C		T
Gulf Coast jaguarundi	*Herpailurus (=Felis) yaguarondi*	S, H, C	E	E
Ocelot	*Leopardus (=Felis) pardalis*	S, H, C	E	E
Southern yellow bat	*Lasiurus ega*	H, C		T
White-nosed coati	*Nasua narica*	S, H, C		T
Plants				
Ashy dogweed	*Thymophylla tephroleuca*	S	E	E
Johnston's frankenia	*Frankenia johnstonii*	S	E	E
South Texas ambrosia	*Ambrosia cheiranthifolia*	C	E	E
Star cactus	*Astrophytum asterias*	S, H,C	E	E
Texas ayenia	*Ayenia limitaris*	H,C	E	E
Walker's manioc	*Manihot walkerae*	S, H	E	E
Zapata bladderpod	*Lesquerella thamnophila*	S	E	E

Sources: TPWD 2007a and USFWS 2007b

Notes:

S = Starr County, Texas

H = Hidalgo County, Texas

C = Cameron County, Texas

E = Endangered

T = Threatened

Tewes 1992, Benn 1997). Additional unconfirmed sightings of a jaguarundi occurred at the Sabal Palm Grove Sanctuary in Cameron County in 1988 (Anonymous 1989) and at the Santa Ana NWR in March 1998 (Santa Ana National Wildlife Refuge data). Based upon sighting reports, personnel of the Santa Ana National Wildlife Refuge suspect the presence of jaguarundi on the refuge (Benn 1997). Possible counties where the jaguarundi might exist include Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, Nueces, San Patricio, Starr, Willacy, and Zapata. Jaguarundi still roam Central and South America in greater numbers than seen in the United States (USFWS 1990).

The habitat of the jaguarundi is similar to the ocelot and is found within the Tamaulipan Biotic Province which includes several variations of subtropical thornscrub brush. Potential habitat includes four areas of the Rio Grande Valley: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Jaguarundi prefer dense thornscrub habitats with greater than 95 percent canopy cover.

The greatest threat to jaguarundi populations in the United States is habitat loss and fragmentation in southern Texas. The jaguarundi requires a large hunting area and appropriate habitat is being lost to development and agriculture. This creates islands of habitat where the jaguarundi cannot migrate from area to area, leaving them vulnerable.

Ocelot *(Leopardus [=Felis] pardalis).* The ocelot, listed as endangered on March 28, 1972, is found from the southern extremes of Texas and Arizona and northern Mexico into northern Argentina, Paraguay, and Uruguay. Little is known of the exact distribution of the ocelot in Texas. Ocelots recorded by trapping or photo documentation include several areas within five counties: Cameron, Willacy, Kenedy, Jim Wells, and Hidalgo. Counties that have been identified as having potential ocelot habitat include Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, Nueces, San Patricio, Starr, Willacy, and Zapata (USFWS 1990).

The habitat of the ocelot is found within the Tamaulipan Biotic Province which includes several variations of subtropical thornscrub brush. Potential habitat includes four areas of the Rio Grande Valley: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Ocelots prefer dense thornscrub habitats with greater than 95 percent canopy cover.

Habitat loss and fragmentation especially along the Rio Grande pose a critical threat to the long-term survival of the ocelot. Efforts are underway to preserve key habitat and biological corridors necessary for ocelot survival (USFWS 1990).

Texas ayenia *(Ayenia limitaris).* The Texas ayenia was listed as endangered on September 23, 1994. This plant is an endemic species of southern Texas and northern Mexico whose historical range included Cameron and Hidalgo counties, Texas, and the states of Coahuila, Nuevo Leon, and Tamaulipas in Mexico. The status of Mexican populations is unknown at the time. The only confirmed population of the Texas ayenia lies on private property within Hidalgo County.

The Texas ayenia occupies dense subtropical woodland communities at low elevations. The current population occupies a Texas Ebony – Anacua (*Pithecellobium ebano-Ehretia anacua*) plant community. This plant community occurs on well-drained riparian terraces with canopy cover close to 95 percent. Species found in this community include la coma *(Bumelia celastrina),* brasil *(Condalia hookeri),* granjeno (*Celtis pollicki),* and snake-eyes *(Phaulothamnus spinesceris).* La coma was not documented in the impact corridor, but granjeno was common throughout most of the impact corridor and co-occurred with brasil and snake-eyes in Sections O-1 and O-2, indicating that these areas might provide suitable habitat for Texas ayenia. However, no Texas ayenia were observed during the October and December 2007 surveys (see **Appendix D**).

Habitat loss and degradation from agriculture or urban development have reduced the Texas Ebony – Anacua vegetation community by greater than 95 percent. Texas ayenia has been reduced to one known population of 20 individuals that is extremely vulnerable to extinction.

Walker's manioc *(Manihot walkerae).* Walker's manioc was listed as endangered on October 2, 1991. Historically, Walker's manioc is known only from the lower Rio Grande Valley of Texas (Hidalgo and Starr counties) and northern Tamaulipas, Mexico. Until recently, it was believed that this species was represented in the United States by a single plant in the wild, discovered in Hidalgo County in 1990. In 1995, Walker's manioc was found in three different areas on the LRGVNWR in Starr and Hidalgo counties (USFWS 1993, TPWD 2007c). High-quality habitat for Walker's manioc was observed in the impact corridor for Section O-1; however, no individuals of this species were found.

Walker's manioc usually grows among low shrubs, native grasses, and herbaceous plants, either in full sunlight, or in partial shade of shrubs. It is found in sandy, calcareous soil, shallowly overlying indurated caliche and conglomerate of the Goliad Formation on rather xeric slopes and uplands, or over limestone.

More than 95 percent of Walker's manioc native brush habitat has been cleared in the United States for agriculture, urban development, and recreation. The United States population has been reduced to a few scattered plants and makes the species vulnerable to extinction in the U.S.

Zapata bladderpod *(Lesquerella thamnophila).* The Zapata bladderpod was listed as endangered on November 22, 1999. This plant is an endemic species to southern Texas and possibly northern Mexico. Four populations are known in Starr County: two populations are found on the LRGVNWR and two occur on private land. Three populations are known from Zapata County: two are located on highway ROWs between the towns of Zapata and Falcon and another lies near Falcon Lake (USFWS 2004). High-quality habitat for Zapata bladderpod was observed in the survey corridor for Section O-1; however, no individuals of this species were found.

The Zapata bladderpod occurs on graveled to sandy-loam upland terraces above the Rio Grande floodplain. It is associated with highly calcareous sandstones and clays. The bladderpod is a component of an open *Leucophyllum fretescens – Acacia berlanderi* shrubland alliance. The shrublands are sparsely vegetated and include the following species *Acacia ridigula*, *Prosopis* sp., *Celtis pallida*, *Yucca treculeana*, *Zizyphus obtusifolia*, and *Guaiacum angustifolium* (USFWS 2004).

Habitat modification and destruction from increased road and highway construction and urban development; increased oil and gas exploration and development; and conversion of plant communities to improve pastures, overgrazing, and vulnerability due to low population numbers are all threats to the Zapata bladderpod (USFWS 2004).

State Species

There are 52 state-listed species that have the potential to occur within or proximal to the impact corridor in the southernmost portions of Starr, Hidalgo, and Cameron counties: 4 fish, 6 amphibians, 8 reptiles, 22 birds, 5 mammals, and 7 plants (see **Table 7-3**). Of these, 19 are also federally listed species. State-listed species observed during October and December 2007 surveys included the Mexican treefrog (*Smilisca baudinii*) and the Texas horned lizard (*Phrynosoma cornutum*). Potential habitats for the white-lipped frog (*Leptodactylus labialis*) and Mexican burrowing toad (*Rhinophrynus dorsalis*) were observed in Sections O-8 and O-2, respectively.

The following paragraphs provide brief descriptions of the distribution and habitat of state-listed species for which individuals or suitable habitat were observed during the October and December 2007 surveys (see **Appendix D**).

Mexican treefrog *(Smilisca baudinii).* The Mexican treefrog is state-listed as threatened in Texas. It is found along the coast of the Gulf of Mexico and inland from South Texas into northern Mexico. In Texas, it is found in the extreme southern tip of the state. This nocturnal frog prefers subhumid regions and breeding occurs year-round with rainfall. It is seen near streams and in resacas. It finds shelter under loose tree bark or in damp soil during the heat of the day (University of Texas 1998). This species was observed in Section O-10.

Texas horned lizard (*Phrynosoma cornutum).* The Texas horned lizard is state-listed as threatened in Texas. It ranges from the south-central United States to northern Mexico, throughout much of Texas, Oklahoma, Kansas, and New Mexico. It can be found in arid and semiarid habitats in open areas with sparse plant cover. Because horned lizards dig for hibernation, nesting, and insulation purposes, they commonly are found in loose sand or loamy soils (TPWD 2007d). This species was observed in Section O-2.

White-lipped frog *(Leptodactylus labialis).* The white-lipped frog is state-listed as threatened in Texas. It can be found in the extreme southern tip of Texas. This frog's habitat consists of various moist places including roadside ditches, irrigated fields, and low grasslands. This nocturnal frog burrows in the damp soil during the day and forages at night. Breeding takes place in the spring with heavy rains (University of Texas 1998). Potential habitat for this species was observed in Section O-8, but no individuals were found (see **Appendix D**).

Mexican burrowing toad *(Rhinophrynus dorsalis).* The Mexican burrowing toad is state-listed as threatened in Texas and can be found in extreme South Texas. This nocturnal toad prefers low areas with loose soil (e.g., cultivated fields) and feeds on termites and ants. Breeding occurs after heavy rains (University of Texas 1998). Potential habitat for this species was observed in Section O-2, but no individuals were found (see **Appendix D**).

Speckled racer (*Drymobius margaritiferus*). The speckled racer is state-listed as threatened in Texas. Within the United States, the speckled racer is restricted to Cameron and extreme southeastern Hidalgo counties. Habitat for the racer consists of mesic subtropical woodlands in the Lower Rio Grande Valley. Abundance of the speckled racer is uncommon to rare because much of the subtropical woodland habitat in the Lower Rio Grande Valley has been extensively modified for agriculture. The remaining habitat is highly fragmented. Speckled racers are usually encountered in areas with abundant groundcover near resacas or other wetland habitats.

Western indigo snake (*Drymarchon corais*). The western indigo snake is state-listed as threatened in Texas. Western indigo snakes are found primarily in semiarid shrublands on a variety of soil types throughout the Rio Grande Plains, the western Coastal Prairies, and the southern edge of the Hill Country region. Although much of the shrublands in the Lower Rio Grande Valley have been lost to agricultural practices, shrublands throughout the remainder of the range are in fair to good condition. Abundance of the indigo snake is generally uncommon throughout much of range.

Texas tortoise (*Gopherus berlandieri*). The Texas tortoise is state-listed as threatened in Texas. Texas tortoises are found primarily in semi-arid shrublands on a variety of soil types throughout the Rio Grande Plains and into the western Coastal Prairies region. Abundance of the Texas tortoise is generally common in suitable habitat, especially in the western Rio Grande Plains.

Migratory Birds

The Rio Grande Valley provides important habitat for migratory birds. The Central and Mississippi flyways meet here and the most southern tip of Texas is also the northernmost range for many bird species (USFWS 2001). Nearly 500 bird species, including neotropical migratory birds, shorebirds, raptors, and waterfowl, can be found in the Rio Grande Valley. For species such as the plain chachalaca, green jay, great kiskadee, and least grebe, this is the only area in the nation in which they can be observed (USFWS 2001). Additional details on migratory birds within the UBSP Rio Grande Valley Sector are contained in **Appendix D**, Biological Survey Report.

7.3.3 Direct and Indirect Effects of the Project

Federal Species

A 40- to 60-foot-wide corridor containing the pedestrian and patrol roads will be cleared during construction and a portion maintained following construction to support long-term maintenance, sight distance, and patrol activities. For the period of construction, lay-down areas for materials and equipment will be identified within disturbed areas. The impact corridor will follow the USIBWC levee system for the majority of its length; however, some fence sections will encroach on portions of unique or protected habitats. The fence alignment will cross several Texas state parks and WMAs in the Rio Grande Valley and will intersect LRGVNWR at several locations (see **Table 7-2**). However, the impact corridor will avoid some habitat-rich areas, including the Arroyo Ramirez (Section O-1), the Culebron Banco unit (Section O-13), and the Tahuachal Banco (Section O-16) units of the LRGVNWR. These lands are managed to provide a corridor for wildlife along the lower Rio Grande. Potential threats to federally listed species in these areas include trampling (for plants), habitat conversion, reduction of habitat connectivity, and noise.

Approximately 461 acres of vegetation will be cleared along the impact corridor. The impact corridor avoids known locations of individuals of Walker's manioc and Zapata bladderpod, but approaches several known locations of Texas ayenia. For this reason, impacts on federally listed plants are anticipated to be short-term, moderate, and adverse. Construction and operation of tactical infrastructure will increase border security in the USBP Rio Grande Valley Sector and may result in a change to illegal traffic patterns. However, changes to cross–border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

The loss of approximately 19 acres of disturbed thornscrub shrubland and woodland habitat, predominantly honey mesquite and retama, and of approximately 62 acres of native and disturbed floodplain shrubland, woodland, and forest habitat, predominantly honey mesquite and sugarberry and, to a lesser extent, sabal palm, will represent a loss or conversion of approximately 150 acres of potential ocelot and jaguarundi habitat.

The short- and long-term loss of potential habitat for these species is anticipated to result in short- and long-term, moderately adverse impacts on ocelots and jaguarundi. Long-term beneficial impacts due to protection of habitat provided by the fence along impact corridor will be anticipated to range from minor to moderate, depending upon the location.

Reduction of habitat connectivity within the portions of the wildlife corridor under development by USFWS, TPWD, and other entities (see **Chapter 7.2.2**) will result from implementation of the project. Such impacts on wildlife in general are discussed in detail in **Chapter 7.2.3**. Sufficient data are not available to determine the impacts of this on movement of these two species of cats as their actual movement corridors or movement patterns in the area affected by the fence are not known. If their primary movement is perpendicular to the river, then the fence could have the potential to substantially impact movements for some individuals. Such impacts on movement could correlate with reduced access to traditional water sources, and reduced gene flow between portions of the population for each species. It is important to recognize, however, that the fence is not a solid feature 70 miles long. There are substantial areas of habitat between fence sections through which the cats, which are relatively mobile species, could move. In addition, placement of 438 wildlife openings (i.e., holes in the base of the fence through which ocelot and jaguarundi could pass) have been incorporated in the fence design for Sections O1 through O-3, and O-10 through O-21. Consequently, impacts on these species relative to habitat connectivity with respect to Sections O-1 through O-3 and O-10 through O-21 are anticipated to be both short- and long-term, and range from minor to moderate depending upon the actual fence section. If the primary movement of individuals is parallel to the river, then the fence will have less of an impact on these species.

In Sections O-4 through O-10, some terrestrial species might not be able to access the Rio Grande in these sections because concrete flood control structures/concrete fence will be constructed instead of bollard fence. However, the concrete flood protection structure/concrete fence will not be contiguous, so opportunities for wildlife to access the Rio Grande will be possible in areas between these sections where the concrete flood protection structure/concrete fence will not be constructed. Furthermore, the Rio Grande is not the only source of water in the area. Resacas, livestock ponds, and other water sources are often available. In areas where the concrete flood protection structure/concrete fence will be in close proximity to the Rio Grande, the concrete flood protection structure/concrete fence will have short- and long-term minor to moderate impacts on federally-listed species.

Short-term moderate adverse impacts will be anticipated for ocelots and jaguarundi due to elevated noise levels during construction. These elevated noise levels could interfere with important communications, dispersal of individuals, and predator-prey interactions.

State Species

Under the Project, a 40- to 60-foot-wide corridor containing the new pedestrian fence and access/patrol roads on either side will be cleared during construction and a portion maintained following construction to support long-term maintenance, sight distance, and patrol activities. For the period of construction, lay-down areas for materials and equipment will be identified within the disturbed areas. The impact corridor will follow the USIBWC levee system for the majority of its length; however, some fence sections will encroach on portions of unique or protected habitats. The fence alignment will cross several Texas state parks and WMAs in the Rio Grande Valley and will intersect LRGVNWR at several locations (see **Table 7-2**). However, the impact corridor will avoid some habitat rich areas, including the Arroyo Ramirez (Section O-1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O-16) units of the LRGVNWR. Potential threats to state-listed species in these areas include habitat conversion during fence construction, increased mortality during construction and subsequent use of patrol roads, and noise.

Habitat loss or conversion for state-listed species in Sections O-1, O-2, O-8, and O-10 (i.e., Mexican treefrog, Mexican burrowing toad, Texas horned lizard, white–lipped lizard) will affect a small area and will be of little consequence to statewide viability of these species. BMPs to avoid and minimize impacts, such as pre-construction clearance surveys, are anticipated to reduce potential impacts to minor or lower in intensity. Increased heavy traffic in the short term, and patrol traffic in the long term will be anticipated to have a correlated increased potential for mortality of these species through roadkill. Noise created during construction will be anticipated to result in short-term, minor to moderate, adverse impacts on these state-listed species.

Long-term, minor to moderate, adverse impacts on state-listed species could result from construction and maintenance of tactical infrastructure. Potential impacts include habitat fragmentation, drainage of resacas and other freshwater wetlands, and vehicular traffic.

Overall, short-term minor to moderate adverse impacts from construction will be expected, while long-term minor adverse impacts from maintenance and operation will be expected due to potential mortality on associated roads. The fencing is expected to provide protection for state species in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

There is one state-listed fish species known to occur in habitat that could overlap with fence sections in the USBP Rio Grande Valley Sector. The Rio Grande silvery minnow could potentially occur in the Rio Grande in three sections (O-18, O-19, and O-21). Removal of vegetation and grading during construction could temporarily increase siltation in the river. However, implementation of standard BMPs, such as use of silt fences, will reduce this potential impact to negligible. Therefore short-term negligible adverse impacts on this species will be expected.

Habitat conversion and noise impacts on state-listed species in all other fence sections are anticipated to be negligible in both the short and long terms. These sections did not present high-quality habitat for state-listed species, and no species were observed in these sections during the surveys (see **Appendix D**).

Migratory Birds

A 40- to 60-foot-wide corridor containing the pedestrian fence and patrol roads will be cleared during construction and a portion maintained following construction to support long-term maintenance, sight distance, and patrol activities. For the period of construction, lay-down areas for materials and equipment will be identified within disturbed areas. The impact corridor will follow the USIBWC levee system for the majority of its length; however, some fence sections will encroach on portions of unique or protected habitats. The fence alignment will cross several Texas state parks and WMAs in the Rio Grande Valley and will intersect LRGVNWR at several locations (see **Table 7-2**). However, the impact corridor will avoid some habitat-rich areas, including the Arroyo Ramirez (Section O-1), the Culebron Banco (Section O-13), and the Tahuachal Banco (Section O-16) units of the LRGVNWR. Potential threats to migratory birds in these areas include habitat conversion during fence construction, increased mortality during construction and subsequent use of patrol roads, and noise.

Noise from vehicular traffic could be loud enough that territorial bird song could be distorted, resulting in difficulties in attracting and keeping females. Noise could cause disturbance to birds and render otherwise suitable habitat adjacent to the impact corridor less effective. Increased ambient noise is also associated with reduced fitness of birds due to reduction of foraging efficiency because they have to rely more on visual detection of predators, and because nestlings vocalize louder to attract the attention of the parents for feeding, which can also attract predators.

Approximately 376 acres of vegetation will be cleared along the impact corridor. Impacts on migratory birds could be substantial, given the potential timing of fence construction. However, implementation of BMPs to avoid or minimize adverse impacts could markedly reduce their intensity. The following is a list of BMPs recommended for reduction or avoidance of impacts on migratory birds:

- If all ground disturbing activities cannot be completed outside of migratory bird nesting season (approximately 1 February to 31 August) prior to the start of the project an environmental monitor will conduct migratory bird surveys at the project site before activities begin.

- The environmental monitor will locate and clearly mark bird nests 48 hours prior to ground disturbing activities. Active nests will be removed and relocated prior to clearing and ground disturbing activities. Migratory bird habitat will be removed to prevent the return of birds.
- Clearing, grubbing, and all other ground disturbing activities will be limited to areas cleared of migratory bird nests.

Although portions of the fence and associated tactical infrastructure will be constructed in areas virtually devoid of migratory bird nesting habitat, the required timing of the project, which places construction during the nesting season for migratory birds, likely precludes complete avoidance of impacts on migratory birds. However, given implementation of the BMPs to the maximum extent practicable, including site-specific pre-construction surveys, these construction-related impacts are anticipated to be short-term and range from negligible to moderate, based on location and construction timing for each fence section. The project is anticipated to have long-term, minor, and adverse impacts on migratory birds due to loss of habitat. The fencing is expected to provide protection for migratory birds in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

Assuming implementation of the above BMPs to the fullest extent feasible, impacts of the project on migratory birds are anticipated to be short- and long-term, minor, and adverse due to construction disturbance and associated loss of habitat.

8. CULTURAL RESOURCES

8.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the National Historic Preservation Act (NHPA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the NHPA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for cultural resources.

Cultural resources are commonly subdivided into archaeological resources (prehistoric or historic sites where human activity has left physical evidence of that activity but no structures remain standing), architectural resources (buildings or other structures or groups of structures that are of historic, architectural, or other significance), and traditional cultural resources (e.g., traditional gathering areas, locations referenced in origin myths or traditional stories).

Archaeological resources comprise areas where human activity has measurably altered the earth or where deposits of physical remains of human activity are found. Architectural resources include standing buildings, bridges, dams, and other structures of historic, architectural, engineering, or aesthetic significance. Traditional cultural resources include traditional cultural properties (TCPs), which are properties eligible for or listed in the National Register of Historic Places (NRHP) that Native Americans or other groups consider essential for the preservation of traditional cultures. Examples of TCPs are archaeological resources, prominent topographic features, habitat, plants, minerals, or animals and their physical location or resource.

The NRHP is the official listing of properties significant in United States history, architecture, or prehistory, and includes both publicly and privately owned properties. The list is administered by the National Park Service (NPS) on behalf of the Secretary of the Interior. Cultural resources that are listed in or eligible for listing in the NRHP (36 Code of Federal Regulations [CFR] 800.16(l)) are called historic properties. Properties are determined to be eligible for listing in the NRHP by the Secretary of the Interior (NPS) or by consensus of a Federal agency official and the SHPO. Generally, resources must be more than 50 years old to be considered for listing in the NRHP. More recent resources, such as Cold War-era buildings, might warrant listing if they have the potential to gain significance in the future or if they meet "exceptional" significance criteria. NRHP-listed properties of exceptional national significance can also be designated as National Historic Landmarks (NHLs) by the Secretary of the Interior.

Buildings, structures, sites, objects, or districts are property types that might be historic properties. To be listed in or eligible for listing in the NRHP, a resource must be one of these property types, generally should be at least 50 years of age or older, and must meet at least one of the four following criteria (36 CFR 60.4):

- The resource is associated with events that have made a significant contribution to the broad pattern of history (Criterion A).
- The resource is associated with the lives of people significant in the past (Criterion B).
- The resource embodies distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic value; or represents a significant and distinguishable entity whose components might lack individual distinction (Criterion C).
- The resource has yielded, or could be likely to yield, information important in prehistory or history (Criterion D).

In addition to meeting at least one of the above criteria, a historic property must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics it possessed in the past and its capacity to convey information about a culture or group of people, a historic pattern, or a specific type of architectural or engineering design or technology. Resources that might not be considered individually significant can be considered eligible for listing on the NRHP as part of a historic district. According to the NPS, an historic district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects that are historically or aesthetically united by plan or physical development.

According to 36 CFR Part 800, the Area of Potential Effect (APE) of a Federal undertaking is defined as the geographical area within which impacts on historic properties might occur if such properties hypothetically exist. The APE for this Project was developed in cooperation with THC and covers a larger area than that of the 60-foot impact corridor. Direct and indirect impacts should be accounted for in the APE. Examples of adverse effects as cited in 36 CFR 800.5(a)(2) include visual impacts and changes to the setting of a historic property where the setting contributes to the significance of the property. Other possible adverse impacts include damage or destruction of historic properties due to grading, construction, noise, or vibrations. Staging areas, access roads, and other project elements are part of the APE even if locations are identified later in project planning.

8.2 AFFECTED ENVIRONMENT

Area of Potential Effect. Direct impacts from construction will occur within a 60–foot-wide corridor to the north of the USIBWC levee in most cases. This will account for grading, vegetation removal, fence construction, and associated patrol and access roads. In Sections O-4 through O-10 in Hidalgo County, a 60–foot-wide corridor on the southern side of the IBWC levee will be affected. A second, larger APE has been developed for the project to account for impacts on architectural or other above-ground resources. These are largely visual effects and effects from noise and vibrations from construction. Topography, type, and density of vegetation and intervening development, orientation of streets and properties in relation to the alternatives, traffic patterns, and surrounding development all are factors considered in the definition and width of this latter APE for a specific location. The larger APE for architectural resources is irregular and might include an area adjacent to or as far as 0.5 miles from the corridor, depending on local factors.

Native American tribes (the Kiowa Tribe of Oklahoma and the Comanche Nation) with ancestral ties to lands within the UBSP Rio Grande Valley Sector have been contacted for input into the Project.

Archaeological and Historical Overview. The history of the Rio Grande Valley is rich, unique, and important. The Rio Grande has been a critical conduit for trade and transportation and a natural border between interests to the north and the south. Evidence of human occupation in the region is abundant. The area's archaeological record is dominated by open-air sites, burned rock middens, lithic artifact scatters, clay dunes in the Rio Grande delta, and shell middens near the coast. These sites are difficult to identify and date because of heavy erosion, shallow soil horizons, and extensive artifact removal by collectors. The lack of excavation of deeply stratified subsurface sites means that the chronology of the south Texas plains is poorly understood.

The pre-contact history of the South Texas plains can be divided into three general cultural periods:

- The Paleoindian period represents the first documented human occupation of the region. Evidence of the earliest Paleoindian complexes, Clovis and Folsom, have been found throughout South Texas, although most of this evidence is from surface collections of the distinctive fluted points that characterize these complexes.
- The Archaic period in South Texas is divided into the early, middle, and late subperiods based on subtle changes in material cultural and settlement patterns. During this period, hunting and gathering continued as the primary means of subsistence, but populations responded to fluctuations in regional climate by exploiting an increasingly wide range of plant and animal resources and geographic settings for settlement and

subsistence. Late Archaic sites are relatively common in the Project area, suggesting increasing population density through time (Hester et al. 1989).

- The Late Prehistoric period (A.D. 700–European Contact) is well-documented in the region and is characterized by the appearance of pottery and the bow and arrow, although point typologies have not been formalized (Hester et al. 1989).

Known Resources within the APE. Many historic properties are within the APE of the Project. The impact corridor for Section O-1 will cross the southwestern corner of the Roma Historic District, which is listed in the NRHP and is a designated NHL. Most of the project will be below the bluff on which the district sits. The corner is at the rear of the buildings of the district, and tucked back near the POE. The impact corridor will also skirt west and south of the Fort Brown Historic District (Sections O-19 and O-20), which is listed in the NRHP and is a designated NHL. However, the impact corridor will extend along the northern boundary of the lower portion of Fort Brown Historic District (Section O–19) near the fort earthworks. Appropriate archaeological measures will be taken to ensure that any intact archaeological remains are not adversely affected. In Brownsville, the impact corridor will be within a block of the city's Heritage District and the NRHP-listed GEM Building and Miller-Webb Drugstore Building (Section O-19) (NRHP nomination for the latter property is in progress by the property owner). The impact corridor will extend adjacent to or within the bounds of three additional NRHP-listed properties: just barely along the southern edge of the Fort Ringgold Historic District (Section O-2); cross the Louisiana-Rio Grande Canal Company Irrigation System Historic District (Section O-6); and immediately south of the Old Brulay (Nye) Plantation buildings (Section O-21). However in Section O-6, the corridor has been relocated away from the Old Hidalgo Pumphouse. The impact corridor will also be in the general vicinity of many other NRHP-listed properties, such as the Rancho Toluca Historic District (Section O–10) and the La Lomita Historic District, although well outside of their viewshed or boundaries. Additionally, the impact corridor will extend approximately 25 feet behind the Neale House (Section O-19, Brownsville), and about 200 feet behind the Landrum House (Section O-14), both Recorded Texas Historic Landmarks (RTHLs).

Archaeological sites that might occur in or near the impact corridor include sites of the prehistoric and historical periods. Historic archaeological sites will include forts, shipwrecks, farms and ranches, industrial archaeological sites such as potteries, early irrigation and agricultural sites and features, and historic trash scatters. Early Spanish and Mexican colonial remains also might exist. Two NRHP-listed districts are known to have archaeological components, Fort Ringgold and Fort Brown. Previously reported prehistoric archaeological resources within a mile of the impact corridor are primarily small open-air campsites and lithic scatters. Temporal and cultural affiliations of the sites are unclear, and few sites are very extensive. The recorders did not evaluate the

NRHP eligibility of most of them. Additional prehistoric sites are expected to be found.

Cultural Resources Surveys. Cultural resources surveys are underway or have been completed. The goal of these surveys is to identify cultural resources potentially affected by the Project and to evaluate them for NRHP eligibility. The preliminary findings of these surveys within the impact corridor completed to date are summarized below. Information about previously recorded archaeological, historical, and architectural sites within the 150-foot survey corridor and within a 1-mile radius of the corridor was gathered from the THC Historic Sites Atlas and Archaeological Sites Atlas. Additional research was conducted on the history, prehistory, and environmental nature of the areas. Reports of surveys previously conducted in the vicinity were gathered. This information was plotted on project maps, aerial photographs, and topographic maps to identify areas of interest for further identification and evaluation.

Pedestrian and subsurface archaeological surveys of accessible portions of fence sections began October 19, 2007, and have continued as access to parcels becomes available. The archaeological survey is being conducted in accordance with State and Federal guidelines by qualified professional archaeologists.

As of May 5, 2008, preliminary to-date findings of the archaeological survey of the areas to which CBP currently has legal survey access reflect the results of the survey of approximately 65 miles of the fence corridor and 18 miles of access roads and staging areas. This represents approximately 96 percent of the total project area. A draft report of the archaeological survey to date was submitted to the USACE and the THC in April 2008. The results of the archaeological survey to date include the discovery and documentation of 22 archaeological sites and 45 isolated occurrences. Archaeological investigations identified diverse prehistoric and historic archaeological components, representing prehistoric and historic periods. Historic sites and components are particularly common and span Texas history from the age of Spanish exploration and colonization (1513–1821) and Mexican Colonial (1822–1846) into the Texas Republic (1837–1846) and American periods (1846-present). Prehistoric sites include Archaic Period (6000 BC–AD 700) and Late Prehistoric Period (AD 700–1500) components located primarily in the easternmost Sections of the project area.

Seven sites (41SR390, 41SR392, and 41SR393 in Section 01; 41HG218 in Section 03; 41HG208 and 41HG210 in Section 04; and 41CF199 in Section 13) are recommended as eligible for the NRHP under Criterion D. Adverse impacts to these sites due to fence construction include loss of artifactual, contextual, stratigraphic, and paleoenvironmental information due to physical disturbance of the site areas. Three sites (41SR392, 41HG218, and 41CF199) will be adversely affected by the project in this manner, and will require mitigation through data collection. Adverse impacts can be mitigated for 41SR390 and 41SR393 by avoiding the site areas. Sites 41HG208 and 41HG210 are north of the levee in

Section 04 and do not fall within the current project APE (which is south of the levee). Fourteen sites (41SR391 in Section 01; 41HG207 in Section 03; 41HG209 in Section 04; 41HG211, 41HG212, 41HG213, and 41HG214 in Section 08; 41CF205 in Section 11; 41CF198 in Section 13; 41CF200 in Section 15; 41CF201, 41CF202, and 41CF203 in Section 16, and 41CF204 in Section 17) do not meet criteria for NRHP eligibility and are not recommended as eligible. NRHP eligibility could not be determined for one site (41HG215 in Section 10) because it was under irrigation during the survey. This site is north of the levee in Section 10 and does not fall within the current project APE. Archaeological surveys of the remaining portions of the project APE will occur as ROEs are gained. Mitigation of eligible sites that cannot be avoided is scheduled to begin in June 2008.

Consultations with federally recognized Indian tribes are ongoing. CBP has initiated consultation with tribes affiliated with the area. As of March 25, 2008, no information has been received by CBP regarding areas or resources of significance to them. No areas or resources of traditional, religious, or cultural significance to the tribes have been identified within the APE (direct construction impacts).

A survey of architectural and other historic-period resources has been completed. Fieldwork occurred between November 2007 and February 2008. A draft survey report has been submitted to the USACE and the THC. Findings of the survey were presented to the THC at a 17 March 2008 meeting. Findings were presented previously to the USACE-Galveston and Fort Worth. The APE was delineated and survey approach was developed with input from the THC. Buildings and other resources constructed prior to 1968 within the APE were surveyed. Preliminary research was performed to provide a historical context, identify previously recorded or recognized historic sites, and locate background property data in the area. The survey was conducted in accordance with state and Federal requirements by professionals meeting Federal professional qualification standards for architectural history. Of the 351 surveyed architectural or other historic-period resources, approximately 140 were either previously listed in or eligible for the NRHP or have been recommended NRHP-eligible as a result of the survey. The majority of the surveyed resources were residential or structures associated with irrigation, such as pumphouses and canals. The highest concentration of surveyed resources was in Section O-3, in the village of Los Ebanos. The resources found include residences and commercial structures, a church, a cemetery, and the hand-drawn ferry and crossing. The ferry and most of the village of Los Ebanos have been recommended as a historic district eligible for the NRHP. The Peñitas (Section O-4), McAllen and Old Hidalgo (Section O-6), La Feria (Section O-11), Harlingen (Section O-12), San Benito (Section O-13), and Los Fresnos (Section O-18) pumphouses, main canals, and some lateral canals were recommended as NRHP-eligible. The THC requested that the IBWC levee in the Lower Rio Grande Valley be considered for NRHP eligibility, and it was recommended NRHP-eligible from the survey. Additional properties were recommended NRHP-eligible both within and outside the Roma NHL Historic District, as well as the communities of Peñitas and Abram, along U.S. 281 in San Benito, and west and east Brownsville.

Other areas with high concentrations of surveyed historic resources are Roma (Section O-1); Brownsville (Sections O-18, O-19, and O-21); and San Benito (Section O-14).

CBP will evaluate identified resources for their NRHP eligibility in consultation with the THC and other parties.

Treatment of Historic Properties. CBP is fully committed to developing measures to avoid, minimize, or mitigate adverse effects of the Project on historic properties. CBP will consult with the THC, federally recognized Indian tribes, and others. Consultation regarding measures to avoid, minimize, or mitigate adverse effects on historic properties will occur on a property-specific and expedited basis, as appropriate. CBP will work with the THC, Indian tribes, and other consulting parties to consider a variety of measures. To ensure that archaeological sites as well as other types of properties are not inadvertently damaged or destroyed, monitoring of construction in selected areas by cultural resources professionals is being planned. BMPs will include an Unanticipated Discovery Plan for Cultural Resources.

Examples of cultural resources measures might include project redesign to accomplish operational needs such as restricting corridor width, special design of tactical infrastructure, landscaping or other visual screening, offsite or compensatory mitigation, archaeological data recovery, historic building recordation to state or Federal Historic American Building Survey/Historic American Engineering Record (HABS/HAER) standards, or other historical study.

8.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Section O-1 will extend below the southern boundary of the NHL-designated Roma Historic District and parallel the Rio Grande. Currently the fence will be built below the bluff and ascend at the southeastern corner of the historic district near the POE. The historic district will be adversely impacted visually at the southwestern corner. Section O-2 will cross the southern tip of the Fort Ringgold Historic District, including a portion of the archaeological component of the district. The historic buildings of Fort Ringgold are distant from the southern tip of the district, which slopes down to the Rio Grande; the Project's impacts on the viewshed and settings of these buildings are therefore minimized. Moreover, there is thick vegetation and intervening buildings between the historic buildings at Fort Ringgold and the Rio Grande to provide considerable visual screening. There will be no impact on viewsheds of the historic buildings in the Fort Ringgold Historic District. Although archaeological testing of the corridor had negative results, the corridor construction will be monitored by an archaeologist.

Section O-3 will be near the Los Ebanos POE and ferry, and the southern and eastern side of the community of Los Ebanos. The village, ferry, landmark Las Cuervas ebony tree, and surrounding area have been recommended NRHP–eligible as a historic district as the result of the 2008 USBP architectural survey. Los Ebanos has a community cemetery on its western side that will be a contributing element of the historic district. The project will be approximately 250 feet from the ferry crossing, and will present substantial impacts on the viewshed and setting of the ferry and POE. The community of Los Ebanos will be surrounded to its south and east by the project. There will be adverse impacts on the viewshed and setting of the historic community, ferry, and ferry crossing area. Impacts on the village of Los Ebanos, ferry, and ferry crossing will be long–term, major, and adverse.

Section O-4 will be very near the Peñitas Pumphouse and main canal that has been recommended NRHP-eligible as the result of the 2008 architectural survey. There are several historic residences in Abram and Peñitas that will incur visual impacts. Project impacts on the pumphouse and main canal also will be visual, and long-term, moderate to major, and adverse.

Section O-5 is approximately one-quarter to one-half mile south of the La Lomita Historic District. Because there is substantial vegetative screening at the southern and eastern portions of the historic district, impacts on the viewshed and setting of this NRHP-listed historic district are not expected. Section O-5 also parallels the community of Granjeno and will be in the rear yards of a number of residences. The church, cemetery, and other four structures have been recommended NRHP-eligible as the result of the 2008 USBP survey. A resident has provided information that the impact corridor will cross the corner post remains of the last jacal structure in Granjeno and possibly the Rio Grande Valley. The project will be constructed on the southside of the levee so none of the NRHP-eligible properties will be adversely affected as the levee will provide visual and noise buffer. Section O-6 will extend north/south along the western boundary of the Louisiana-Rio Grande Canal Company Irrigation System Historic District. The relocated corridor will be a distance from the Old Hidalgo Pumphouse and will not visually affect it. It will cross into an area of open irrigation canals that are contributing properties of the historic district. The extension of the infrastructure into the canal system will constitute a direct adverse impact on those features of the historic district. In addition, the main canal of the McAllen pumphouse will incur adverse visual impacts.

Section O-7 will cause minor visual impacts on a small portion of the Donna main canal. A planned POE will surround the Donna pumphouse in the near future.

Section O-8 will cause minor visual impacts on the historic schoolhouse at the Runn Elementary School, which was previously determined NRHP-eligible.

In Section O-9, the main canal and settling basin for the Progreso Pumps will incur minor visual impacts. The elevated cistern of the Old San Pedro Ranch might be damaged or destroyed.

Section O-10 will pass approximately 0.38 miles (as measured from the closest point on the levee toe to the closest building, the house) south of the Toluca Ranch Historic District. Because the southern portion of the property has many mature trees and other vegetation, the house and other buildings will have some screening from the tactical infrastructure. Impacts on the viewshed and setting of the historic district will be negligible to minor.

Sections O-11 through O-17 will extend along the IBWC levee and south of Military Road (US 281) in largely agricultural fields. The resources that it will affect are primarily irrigation canals and pumphouses, as well as some residences on US 281. The alignment will cross main canals and laterals north of and associated with the La Feria (Section O-11) and Harlingen (Section O-12) pumphouses. It will cross the levee south of the San Benito pumphouse (Section O-13) and extend along its east lateral (Griffin Canal) beyond the Landrum House. Section O-14 will parallel the levee and Griffin Canal about 200 feet behind the Landrum House complex, which is an RTHL and is recommended NRHP-eligible for its historical and architectural significance as a result of the USBP survey. The house was constructed in 1902 for Frances and James Landrum (THC 2007). The house and associated outbuildings, and Griffin Canal will incur long-term, moderate to major visual adverse impacts. In addition, the Griffin Canal and ca.1950 multi-unit outbuilding could be affected. Section O-17 will run parallel to the main canal associated with the Barreda pumping station.

Section O-18 will begin at the main canal of the Los Fresno pumphouse, and pass close to three residences that have been recommended NRHP-eligible. The main canal will be visually affected, and two of the houses will incur long–term, moderate to major visual effects.

In Section O-19, the project curves northward close to the developed portion of Brownsville, west of the park near the POE, and continues south along the IBWC levee west of the Fort Brown Historic District, which is listed in the NRHP and is a designated NHL. The tactical infrastructure will be visible from 12th and Levee Streets and portions of nearby streets of Brownsville’s downtown. However, the POE infrastructure and the park located west of the POE will minimize the visual impact of the tactical infrastructure. The tactical infrastructure will be visible from a minor degree from the historic properties along Levee Street and 12th and 13th Streets, which are some of Brownsville’s most historic buildings and are in the city’s Downtown Heritage District. These include the Gem Building (400 East 13th Street), 409 East 13th Street and the Maltbry Building, El Jardin Hotel, Travelers (Colonial) Hotel, and Capitol Theater on Levee Street. Several historic residences are located on Fronton and St. Francis streets. Although there are no historic buildings on 12th Street southwest of Levee Street, those blocks might have diminished development potential from the infrastructure along the riverfront. The historic buildings in the nearby Heritage District might incur indirect diminished development and preservation possibilities as a consequence.

The Section O-19 route continues west of the historic buildings of Fort Brown that are now integrated into the University of Texas/Texas Southmost College campus, extends southerly immediately west of the Neale House, and then takes an easterly route along the northern side of the USIBWC levee. A golf course is south of the levee and within the boundaries of the NHL historic district. The historic buildings of Fort Brown are part of the university campus with other buildings, landscaping, streets, and parking lots. The historic buildings are a distance from the Project and are blocked by new development. The new development provides some measure of visual screening. The alignment will pass through the archaeological component of Fort Brown earthworks. A ground-penetrating radar study of Fort Brown conducted in 2004 indicates that remains might be partially intact. Since this property is of primary national historical significance, additional research will be conducted including consultation with THC on avoiding potential direct and indirect adverse impacts on Fort Brown earthworks. Visual impacts from the project are expected on the Neale House. In summary, there are long-term major adverse impacts on the viewshed and setting of historic properties in Section O-19 that will be expected.

Within Section O-19, the fence is designed without a foundation (“floating fence”) to prevent damage to the archaeological remains of the Fort Brown earthworks. A site protection and interpretation plan for the Fort Brown earthworks is proposed as part of the cultural resources mitigation plan. The ultimate effect of the fence on the future developmental potential of downtown Brownsville near Section O-19 is somewhat uncertain; however, the local business community has expressed concerns about Fort Brown earthworks through the city’s downtown heritage district coordinator.

The alignment will continue easterly on the levee from Section O-19. There are no historic properties in Section O-20. Section O-21 will parallel the southern boundary of the Old Brulay (Nye) Plantation at a distance of approximately 100 feet or less from the historic district complex. Construction of the tactical infrastructure at this location is planned to remain on the levee to minimize impacts. Gates are planned to facilitate continued farm operations at the Project location; nevertheless, long-term major adverse visual impacts are expected. The Nye Cemetery near the Brulay (Nye) Plantation is about 500 feet to the north of the impact corridor and will not be impacted. Section O-21 will also pass closely along the Piper Plantation/TD investment resources which have been recommended NRHP-eligible.

Archaeological resources between the 21 tactical infrastructure sections might be impacted by cross-border violators in areas where no tactical infrastructure would be constructed. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to USBP operations; and therefore, are considered unpredictable and beyond the scope of this ESP.

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9. VISUAL RESOURCES

9.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts on visual resources.

Aesthetics is the science or philosophy concerned with the quality of visual experience. One cannot meaningfully assess the impacts of an action on visual experience unless one considers both the stimulus (visual resources) and the response (viewers) aspects of that experience.

CBP does not currently have a standard methodology for analysis and assessment of impacts on visual resources. Accordingly, a standard methodology developed by another Federal agency was adopted for the analysis and assessment of impacts on visual resources for this Project. Methodologies reviewed included those developed by the NPS, the Bureau of Land Management (BLM), and the Federal Highway Administration (FHWA). It was determined that the FHWA methodology was the most applicable for this analysis due to its focus on linear corridors that include a variety of features and cross-cut a variety of landscapes. The FHWA methodology examines visual resources in similar ways (texture, contrast, visual quality) as those of NPS and BLM, but unlike those methodologies, the FHWA does not tie the assessment to the management goals for a given parcel of land (i.e., BLM- and NPS-owned land parcels typically have specific management goals and the assessment of impacts on visual resources within a given parcel is tied to the management priorities for those parcels).

The discussion in the following paragraphs summarizes the methology presented in FHWA Publication No. FHWA-HI-88-054: *Visual Impact Assessment for Highway Projects* (USDOT undated). Under the FHWA approach, the major components of the visual analysis process include establishing the visual environment of the project, assessing the visual resources of the project area, and identifying viewer response to those resources.

Establishing a Visual Environment. Two related steps are performed to characterize the visual environment: (1) develop a framework for visual assessment of the Project area and (2) define the physical limits of the visual environment that the Project might affect. The landscape classification process establishes the general visual environment of a project and its place in the regional landscape. The starting point for the classification is an understanding of the landscape components that make up the regional landscape, which then allows comparisons between landscapes. Regional landscapes consist of landforms (or topography) and land cover. It should be noted that land cover is not equivalent to land use, as that term is defined and used in **Chapter 4.1**. Land cover is essential for the identification of what features (e.g., water, vegetation, type of man-made development) dominate the land within a given parcel. Examples of land cover include an agricultural field, housing development, airport, forest, grassland, or reservoir. While there is some overlap with land use, land cover does not distinguish function or ownership of parcels.

Relatively homogenous combinations of landforms and land cover that recur throughout a region can be considered landscape types. To provide a framework for comparing the visual impacts of the Project, regional landscape is divided into distinct landscape units; these are usually enclosed by clear landform or land cover boundaries and many of the views within the unit are inward-looking. Landscape units are usually characterized by diverse visual resources, and it is common for several landscape types to be in view at any one time.

Assessing the Visual Resources. An assessment of the visual resources within a Project area involves characterization of the character and quality of those resources. Descriptions of visual character can distinguish at least two levels of attributes: pattern elements and pattern character. Visual pattern elements are primary visual attributes of objects; they include form, line, color, and texture. Awareness of these pattern elements varies with distance. The visual contrast between a project and its visual environment can frequently be traced to four aspects of pattern character: dominance, scale, diversity, and continuity.

Visual quality is subjective, as it relies on the viewer's enjoyment or interpretation of experience. For example, there is a clear public agreement that the visual resources of certain landscapes have high visual quality and that plans for projects in those areas should be subject to careful examination. Approaches to assessing visual quality include identifying landscapes already recognized at the national, regional, or local level for their visual excellence (e.g., NHLs, National Scenic Rivers); asking viewers to identify quality visual resources; or looking to the regional landscape for specific resource indicators of visual quality. One evaluative approach that has proven useful includes three criteria: vividness (the visual power or memorability of the landscape), intactness (the visual integrity of the natural and man-made landscape and its freedom from encroaching elements), and unity (the visual coherence and compositional harmony of the landscape considered as a whole). A high value for all three criteria equates to a high visual quality; combinations of lesser values indicate moderate or low visual quality. It should be noted that low visual quality does not necessarily mean that there will be no concern over the visual impacts of a project. In instances such as urban settings, communities might ask that projects be designed to improve existing visual quality.

Identifying Viewer Response. An understanding of the viewers who might see the project and the aspects of the visual environment to which they are likely to respond is important to understanding and predicting viewer response to the appearance of a project. The receptivity of different viewer groups to the visual environment and its elements is not equal. Viewer sensitivity is strongly related to visual preference; it modifies visual experience directly by means of viewer activity and awareness, and indirectly by means of values, opinions, and preconceptions. Because viewers in some settings are more likely to share common distractions, activities, and awareness of their visual environment, it is reasonable to distinguish among project viewers located in residential, recreational, and industrial areas.

Visual awareness is the extent to which the receptivity of viewers is heightened by the immediate experience of visual resource characteristics. Visual change heightens awareness, for example, a landscape transition, such as entering a mountain range or a major city, can heighten viewer awareness within that particular viewshed. Measures that modify viewer exposure, such as selective clearing or screening, can also be deliberately employed to modify viewer awareness. Viewers also tend to notice and value the unusual, so they might see more value in preserving the view towards a particularly dramatic stand of trees than the view towards more ubiquitous landscape features.

Local values and goals operate indirectly on viewer experience by shaping view expectations, aspirations, and appreciations. For example, at a regional or national level, viewers might be particularly sensitive to the visual resources and appearance of a particular landscape due to its cultural significance, and any visual evidence of change might be seen as a threat to these values or resources. Concern over the appearance of the tactical infrastructure often might be based on how it will affect the visual character of an area rather than on the particular visual resources it will displace.

9.2 AFFECTED ENVIRONMENT

Visual Environment. Based on the Physiographic Map of Texas (University of Texas 2006), the impact corridor crosses portions of the Coastal Prairies and Interior Coastal Plains subprovinces of the Gulf Coast Plains physiographic province. Within the Coastal Prairies subprovince (Sections O-7 through O-21), young deltaic sands, silts, and clays erode to nearly flat grasslands that form almost imperceptible slopes to the southeast. Minor steep slopes, from 1 foot to as many as 9 feet high, result from subsidence of deltaic sediments along faults. The Interior Coastal Plains subprovince (Sections O-1 through O-6) composes alternating belts of resistant uncemented sands among weaker shales that erode into long, sandy ridges.

Primary landform types present within the APEs include the Rio Grande channel, its active floodplain and terraces, the man-made levee and floodway system, arroyos feeding into the Rio Grande, low to moderate height cliffs formed through subsidence, soil erosion, downcutting of arroyos into the soft sediments, various irrigation canals and ditches, vegetation-covered dunes, small ponds, and low sand ridges. Within the relict floodplain are a number of abandoned meander loops, some containing water (ponds) and some only visible as traces on aerial photographs. The terraces and floodplain of the Rio Grande, which are parallel or adjacent to the river, range from extremely narrow landforms to broad level expanses as many as 3 miles wide in places. Flooding on the nearly level terraces along the Rio Grande is controlled by seven watershed structures built under P.L. 566.

Landcover overlying these landforms can be simplified into four primary types: agriculture, park/refuge, developed, and undeveloped. Each type can be broken down further (e.g., developed lands could be separated by the density or type of development, such as town vs. city, or residential vs. commercial). There are also certain features that cross-cut or link landcover types, such as transportation features (e.g., highways, paved and unpaved roads, bridges) or flood control features (e.g., the levee system).

At the macro level of analysis, the Rio Grande Valley is a distinct land unit. Within that larger land unit, combinations of landform types with the range of land cover types form smaller land units:

- Park/refuge land unit. This unit includes portions of the Rio Grande floodplain and terraces that have been subject to minimal development, so that the natural vegetation and topography dominate. Landcover types subsumed within this land unit include park/refuge and undeveloped. Landforms include the Rio Grande floodplain and terrace, vegetated dune ridges, arroyos, and cliffs. Transportation features include paved and unpaved roads, bridges, and trail networks; flood control features include the levee and floodway. This land unit can also include occasional structures and buildings. Primary examples are the discontiguous sections of the LRGVNWR (see **Figure 9-1**). This land unit is present within the impact corridor Sections O-1, O-2, O-3, O-4, O-5, O-7, O-8, O-10, O-11, O-13, O-16, O-18, and O-21.

Figure 9-1. Photograph View of Arroyo within Wildlife Refuge (Section O-1)

- Rural land unit. This unit includes the terraces of the Rio Grande where they are overlain by agriculture and range lands; however, the character of the underlying landforms is still clearly visible and plays a role in the placement of overlying features (see **Figure 9-2**). Typical features include field breaks, irrigation features, unpaved roads, occasional farmsteads or ranches typically located in clusters of trees, occasional water towers, and larger metal utility towers. This land unit is present within all 21 tactical infrastructure sections.

Figure 9-2. Photograph View of Typical Rural Land Unit (Section O-17)

- Town/Suburban Development land unit. This unit includes the terraces of the Rio Grande where they are overlain by low- to moderate-density development, often connected with gridded road networks (paved and unpaved). The underlying landforms are visible in places but, except for water sources (e.g., ponds, reservoirs, or lakes), the topography and form of the land do not play a significant role in the layout or location of overlying features. Typical features include houses, small outbuildings, driveways, planned landscaping, clumps or lines of trees, small commercial buildings, water towers, and overhead power lines on poles rather than towers. Examples will be the town of Los Ebanos in Section O-3 (see **Figure 9-3**), the town of Granjeno in Section O-5, and the subdivisions of Joann and Galaxia in Section O-18. This land unit is present within the impact corridor Sections O-1, O-3, O-4, O-5, O-6, O-9, O-14, O-15, O-16, O-17, O-18, O-19, O-20, and O-21.

Figure 9-3. Photograph View of Town of Los Ebanos (Section O-3)

- Urban/Industrial land unit. This unit includes the terraces of the Rio Grande where they are overlain by moderate- to high-density mixed use development. The underlying landforms are almost completely masked by man-made features and play little or no role in the layout or location of overlying features. Typical features include buildings of varying heights, sizes, and materials; a mixture of gridded and more organic road networks (primarily paved); planned park areas (often near water sources); open paved areas (e.g., parking areas); the larger POEs; industrial and commercial areas; overhead utility lines on poles; elevated roadways and overpasses; and elevated signage. Examples include the City of Roma in Section O-1, Rio Grande City in Section O-2 (see **Figure 9-4**), and Hidalgo in Section O-6. This land unit is present within the impact corridor Sections O-2, O-4, O-6, O-10, O-14, O-17, O-19, O-20, and O-21.

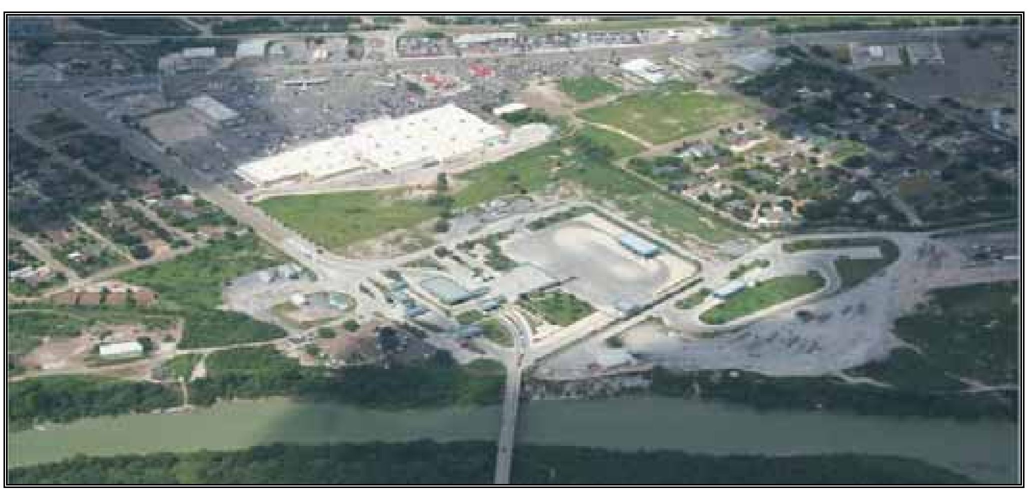

Figure 9-4. Photograph View of Rio Grande City POE (Section O-2)

Character and Quality of Visual Resources. **Tables 9-1** and **9-2** provide summaries of the quality and visual character, respectively, of visual resources observed within the land units within the UBSP Rio Grande Valley Sector. Values reflect visual character and visual quality of resources visible from distances of 50 feet to 1,000 feet (see **Figure 9-5**). It should also be noted that, at these distances, direct views of the Rio Grande and active floodplains are typically seen only from the vantage of riverfront parks, refuge trails, bridges across the river (POEs), tall office or residential buildings, or from the top of the levee. For viewers not occupying one of these vantage points, typical views toward the fences sections are obstructed by levees, buildings, or vegetation.

Table 9-1. Quality of Visual Resources within Typical Rio Grande Valley Land Units (Current Conditions)

	Vividness	Intactness	Unity	Rating
Park/Refuge	Moderate/High	Moderate/High	Moderate/High	Moderate/High
Rural	Moderate	Moderate/High	Moderate/High	Moderate/High
Town/Suburban Development	Moderate	Low/Moderate	Low/Moderate	Low/Moderate
Urban/Industrial	Low to High	Moderate	Low to High	Moderate

Additionally, the amount of visual clutter between the viewer and the impact corridor increases with distance.

In terms of visual quality, the analysis presumes that any view that includes the Rio Grande constitutes a high-quality view, except for views dominated by industrial or commercial elements (e.g., views of the POEs). Similarly, given that quality of view can be somewhat subjective, it is possible to find at least one low- and one high-quality view within any land unit type. For example, someone with an interest in old railroad bridges might find the view of the bridge in Section O–17 to be memorable, while other viewers might only see a large rusted metal structure blocking an otherwise natural view. Rather than simply provide a range of ratings of low to high for each, the quality of the most common views within a given land unit type was used.

In addition to these averaged assessments of visual character and quality of resources within each land unit type, there are a number of specific visual resources considered to be of particular importance because of their natural or cultural value, such as those listed in the following:

- LRGVNWR (Sections O-1, O-2, O-11, O-13, O-16, O-18, O-20, and O-21)
- Roma World Birding Center and Overlook (Section O-1)
- Roma Historic District and NHL (Section O-1)

Table 9-2. Character of Visual Resources within Typical Rio Grande Valley Land Units (Current Conditions)

Land Unit	Line	Color	Form	Texture
Park/Refuge	Mostly horizontal and gentle curves	Earthy (browns, greens) punctuated by seasonal brightness	Mostly curved, organic shapes	Low to moderate variety depending on mix of vegetation and inclusion of water elements
Rural	Primarily horizontal lines (fields, roads, canals), with occasional vertical elements (silos, utility towers, tree lines, buildings)	Earthy colors (bare earth and crops)	Mixture of angled and curved forms (roads and buildings vs. rolling hills and meandering river)	Relatively subtle variations in texture (mostly bare earth or crops)
Town/Suburban Development	Mixed vertical (trees, utility poles, water towers, buildings) and horizontal (similar heights of buildings, lines of trees or shrubs, roads, lawns) lines	Variety of colors due to mix of man-made and natural elements	Variety of forms due to mixture of man-made and natural elements	Variety of textures due to mix of man-made and natural elements
Urban/Industrial	Vertical lines more prominent than horizontal	Often a high variety of colors associated with buildings, signs, green spaces	Primarily rectilinear forms but can be punctuated by curves from more elaborate architecture or organic shapes of natural elements	Variety of textures related to different building materials against natural textures in green spaces

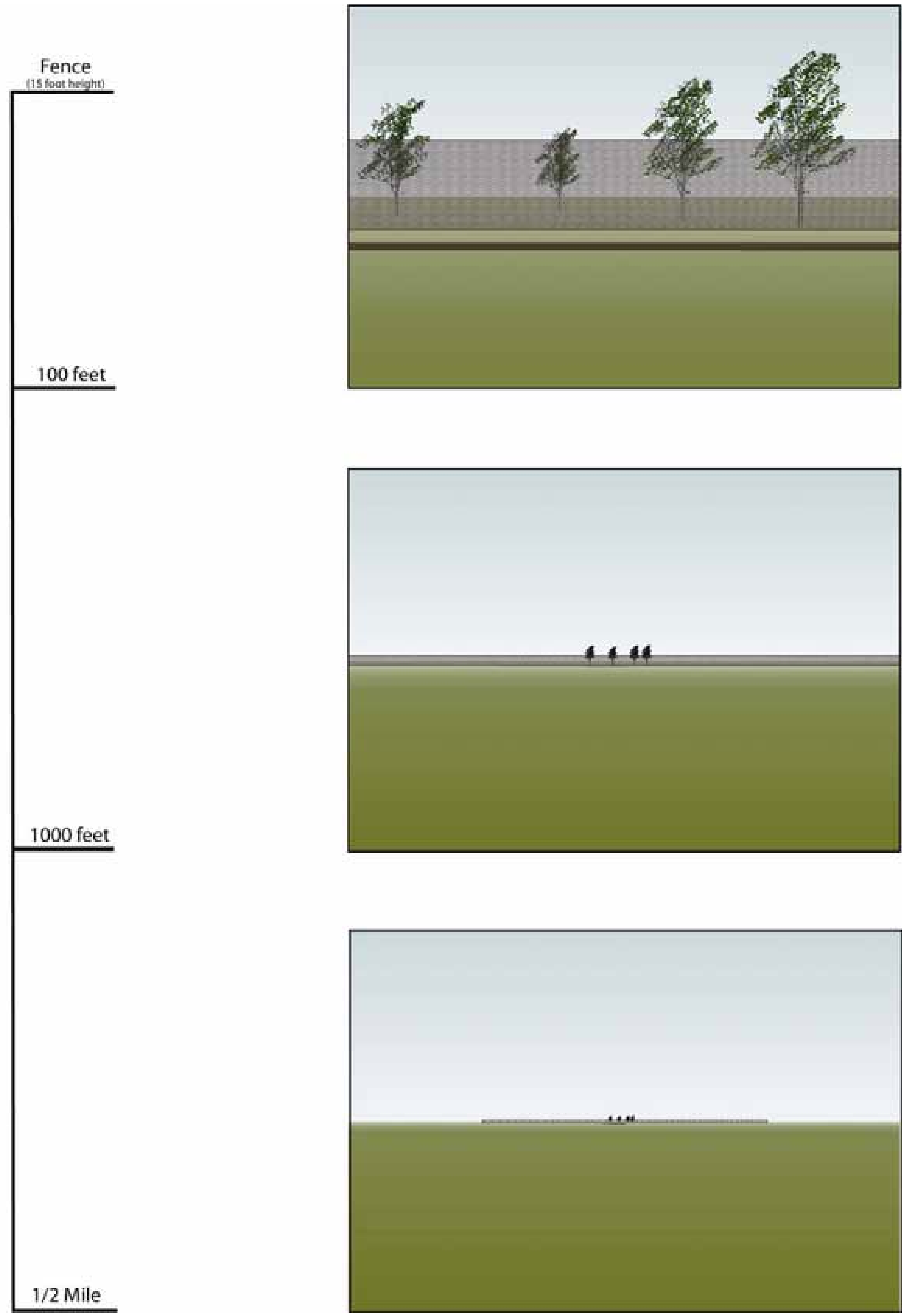

Figure 9-5. Schematic Showing Visibility of Fencing at Various Distances

- Fort Ringgold Historic District/Site 41SR142 (earthworks) (Section O-2)
- Los Ebanos Ferry Crossing (Section O-3)
- Peñitas Cemetery (Section O-4)
- Bentsen Rio Grande Valley State Park (Section O-4)
- La Lomita Historic District (Section O-5)
- Town of Granjeno and Granjeno Cemetery (Section O-5)
- Old Hidalgo Pumphouse Nature Park (Section O-6)
- Louisiana-Rio Grande Canal Company Irrigation System Historic District (Section O-6)
- Toluca Ranch Historic District (Section O-10)
- Sabas Cavazos Cemetery (Section O-13)
- Hope Park (Section O-19)
- Neale House (Section O-19)
- Fort Brown Historic District and NHL (Section O-19)
- City of Brownsville Lincoln Park (Section O-20)
- Stillman House (Section O-20)
- Santa Rosalia Cemetery (Section O-21)
- Audubon Texas Sabal Palm Sanctuary (Section O-21)
- Berry Farms Cemetery (Section O-21)
- Old Brulay Plantation Historic District and Brulay Cemetery (Section O–21).

Viewer Response. The pool of viewers making up the affected environment includes single individuals, such as rural landowners on whose property the fence will be constructed, and groups of individuals such as residents of the towns of Los Ebanos or Granjeno, business owners within the City of Hidalgo, or recreational users of public access recreation areas. Viewers could also include avocational groups such as local historical societies or local chapters of the National Audubon Society that have interests in preserving the settings of cultural or natural resources. These viewers are likely to have both individual responses to specific resources related to their experiences and emotional connection to those resources, as well as collective responses to visual resources considered to be important on a regional, state, or national level. Although individual viewer responses will be captured where possible from viewer comments, for the purposes of this analysis, the pool of affected viewers will be grouped into the following general categories:

- Residential viewers
  - Rural landowners, primarily farmers and ranchers
  - Town lots and suburban developments
  - Urban residents
- Commercial viewers
  - Rural farms, ranches, and isolated businesses
  - Town-based businesses
  - Urban businesses
- Industrial viewers
  - Rural industries (e.g., pump stations, pipeline monitors)
  - Town and urban
- Recreational viewers
  - Visitors to parks and wildlife refuges
  - Tourists visiting towns and cities
- Special interest viewers
  - Native American tribes
  - Local historical societies
  - Local chapters of conservation societies (e.g., Audubon Society)
  - Park commissions
  - Regulatory agencies (e.g., USFWS, THC)
- Intermittent viewers (view primarily from transportation corridors)
  - Commuters
  - Commercial (e.g., truck drivers, railroad operators, ferry operator).

Within each of these categories, viewer response will also vary depending on the typical duration of exposure to visual resources and the typical distance from which they view those resources. For example, a residential viewer who currently has an unobstructed view of a high-quality resource from their backyard will be impacted differently than a residential viewer who lives several streets away and already has an obstructed view of those resources. Similarly, a viewer that only views a resource such as the LRGVNWR from the highway as they pass through the region will have a different viewer response relative to that resource than a viewer that regularly hikes the trails within the LRGVNWR.

9.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Project Characteristics. The primary introduced visual elements associated with the Project are the single line of fencing, gates, patrol roads, access roads, and construction clutter (stockpiles of supplies and heavy equipment during construction). The Project will also remove existing visual elements, such as buildings, vegetation, and subtle landforms (through grading or filling) that occur within the 60-foot permanent impact corridor. Finally, the tactical infrastructure will act as a physical barrier between viewers and those views that can only be viewed from vantage points on the other side of the fence (e.g., views from the tops of levees).

Of these, addition of the line of fencing and the associated patrol road, removal of existing elements from the impact corridor, and the loss of access to specific visual resources due to the fact that the fence is a barrier will have long-term impacts on visual resources, while the remaining elements will have temporary or short-term impacts limited to the period of construction. The nature (adverse or beneficial) and degree (minor to major) of the long-term impacts can be affected by the appearance of the fencing (i.e., width, height, materials, color), the patrol road (i.e., paved or unpaved, width), and the access roads (i.e., number, paved or unpaved, width).

Removal of existing visual elements will also constitute a long-term impact. Where the existing element adds to the visual character and quality of the resource, the impact of its removal will be adverse. Where the existing element detracts from the visual character and quality of the resource (e.g., rusted equipment or dead trees), the impact of removal could be beneficial. In all cases, removal of existing elements will have the net result of exposing more of the fence, patrol road, and other tactical infrastructure; in settings where the addition of the fence is considered to have a major adverse impact on visual resources, any benefit accruing from removal of existing elements will be outweighed by the more dominant adverse visual impact of the fence.

The impacts associated with the loss of access to specific visual resources can be affected primarily by the placement of the fence relative to those resources and inclusion of gates that allow access to those resources. USBP has already included provisions for a number of gates to allow access to agricultural fields, businesses, and cemeteries. These gates also allow access to some of the visual resources that will otherwise be blocked.

Visual Resource Concerns. In **Chapter 9.2**, **Tables 9-1** and **9-2** provided a summary of the character and quality of visual resources currently present within the impact corridor. **Tables 9-3** and **9-4** show how implementation of the Project will likely alter the character and quality of existing visual resources within each land unit. **Figures 9-6** through **9-9** provide examples of typical impacts; these images show the impacts associated with the addition of a fence constructed using a type of pedestrian fence currently being constructed in other USBP sectors. These photographs provide approximations of the degree of alteration that will result from introduction of the fence and patrol road to these viewsheds.

In general, within park/refuge land units, the introduction of the fence and removal of vegetation from the impact corridor will likely constitute an adverse impact on the character and quality of visual resources. The degree of the

Table 9-3. Impact on the Character of Visual Resources within Typical Rio Grande Valley Land Units

Land Units	Line	Color	Form	Texture
Park/Refuge	The fence and patrol road also represent horizontal lines, but might disrupt existing layers and gentle curves, particularly where the fence will be taller than surrounding vegetation. Clearing and grading will introduce a visual break in the vegetation pattern.	The fences will be made from nonreflective steel. No painting will be required.	The fence and patrol road are rectilinear in form and will contrast with existing forms in this land unit.	As man-made, synthetic elements, the fence and patrol road will contrast with the dominant texture of this land unit.
Rural	At short distances the fence will introduce a primarily horizontal line that will blend with other dominant horizontal lines like the levee and field breaks. The patrol road and access roads should also blend, both at short and longer distances. With greater distance, the mesh of the fence will “disappear,” making the vertical bollards of the fence the dominant line. These vertical lines might blend where other vertical elements are present (utility poles, silos, remote video surveillance system) depending on the height of those elements in each area. The regularity of the lines could contrast with less regular lines.	The fences will be made from nonreflective steel. No painting will be required.	The fence and patrol road are rectilinear in form and might result in greater domination of rectilinear forms compared to organic forms when viewed at a distance.	As a man-made, synthetic element, the fence will contrast with the dominant textures of this land unit. The patrol and access roads will not significantly alter the viewshed for most rural landscapes, as a number of roads and field breaks are already present in this land unit.

Land Units	Line	Color	Form	Texture
Town/Suburban Development	Because this land unit already includes a mixture of horizontal and vertical lines, the introduction of additional vertical lines will be consistent with the existing landscape from a distance. In closer proximity, however, the height and regularity of the fence line will likely contrast with existing lines.	The fences will be made from nonreflective steel. No painting will be required.	Because this land unit contains a larger number of rectilinear forms than the previous land units, the rectilinear forms of the fence and associated roads are more likely to blend with the forms of this land unit. The massing of the fence (height and length) will likely contrast with most other rectilinear forms, however.	Because this land unit contains a variety of textures, the textures of the fence and associated roads are more likely to blend with the textures of this land unit at least at a distance. Up close, the fence will contrast against natural textures and be more prone to blend with man-made elements.
Urban/Industrial	Because this land unit already includes a mixture of horizontal and vertical lines, the introduction of additional vertical lines will be consistent with the existing landscape from a distance. In closer proximity, however, the height and regularity of the fence line will likely contrast with existing lines.	The fences will be made from nonreflective steel. No painting will be required.	Because this land unit contains a larger number of rectilinear forms than the previous land units, the rectilinear forms of the fence and associated roads are more likely to blend with the forms of this land unit. Depending on the forms in the immediate area, though, the massing of the fence (height and length) could blend or contrast with existing forms.	Because this land unit contains a variety of textures, the textures of the fence and associated roads are more likely to blend with the textures of this land unit at least at a distance. Up close, the fence will contrast against natural textures and be more prone to blend with man-made elements.

Table 9-4. Quality of Visual Resources within Typical Rio Grande Valley Land Units After Construction

Land Units	Vividness	Intactness	Unity	Rating
Park/Refuge	Moderate	Moderate	Moderate	Moderate
Rural	Moderate	Moderate/High	Moderate	Moderate
Town/Suburban Development	Low/Moderate	Low/Moderate	Low/Moderate	Low/Moderate
Urban/Industrial	Low to High	Low/Moderate	Low to High	Moderate

impact will vary depending on the height of surrounding vegetation and the presence of any other visually intrusive elements. For example, where the fence is shorter than the levee and the view towards the levee is obscured by thick vegetation, the fence will have less of a visual impact than in those areas where clearings or shorter vegetation make the fence more visible. In those sections where the park/refuge land unit is visually intruded upon by other land units (i.e., this land unit is concentrated into a small area, as in Sections O-4, O-5, O-6, O-7, O-8, O-10, O-13, and O-16), impacts on visual resources associated with this land unit will be less compared to those in sections that are dominated by the park/refuge unit.

In rural land units, the fence might blend with other linear features (e.g., levee, field breaks) to the point where the impact is neutral. The degree to which the fence contrasts with its surroundings will vary by season, as mature crops will provide a greater variety of forms and textures, and screening of the fence compared to fallow fields. Inclusion of a larger number of other intrusive elements (visual clutter), such as utility poles or towers, water towers, and remote video surveillance system, can also reduce the overall impact on visual resources within this land unit. For this land unit, therefore, impacts will range from minor to major and neutral to adverse.

In Town/Suburban Development land units, there will likely be greater screening of the fence due to the greater variety of lines, colors, forms, and textures present; however, an 18-foot-tall fence will likely be one of the tallest man-made visual elements in this setting, reducing its ability to blend. As with the visual resources in other land units, the impact of the Project will vary depending on its immediate setting; the more exposed the fence is and the greater the contrast between it and surrounding elements, the greater the visual impact. For this land unit, therefore, impacts could range from minor to major, but will typically be adverse.

In Urban/Industrial land units, there will likely be greater screening of the fence due to the greater variety of lines, colors, forms, and textures present, and an increase in the use of other fences and more common occurrence of tall or

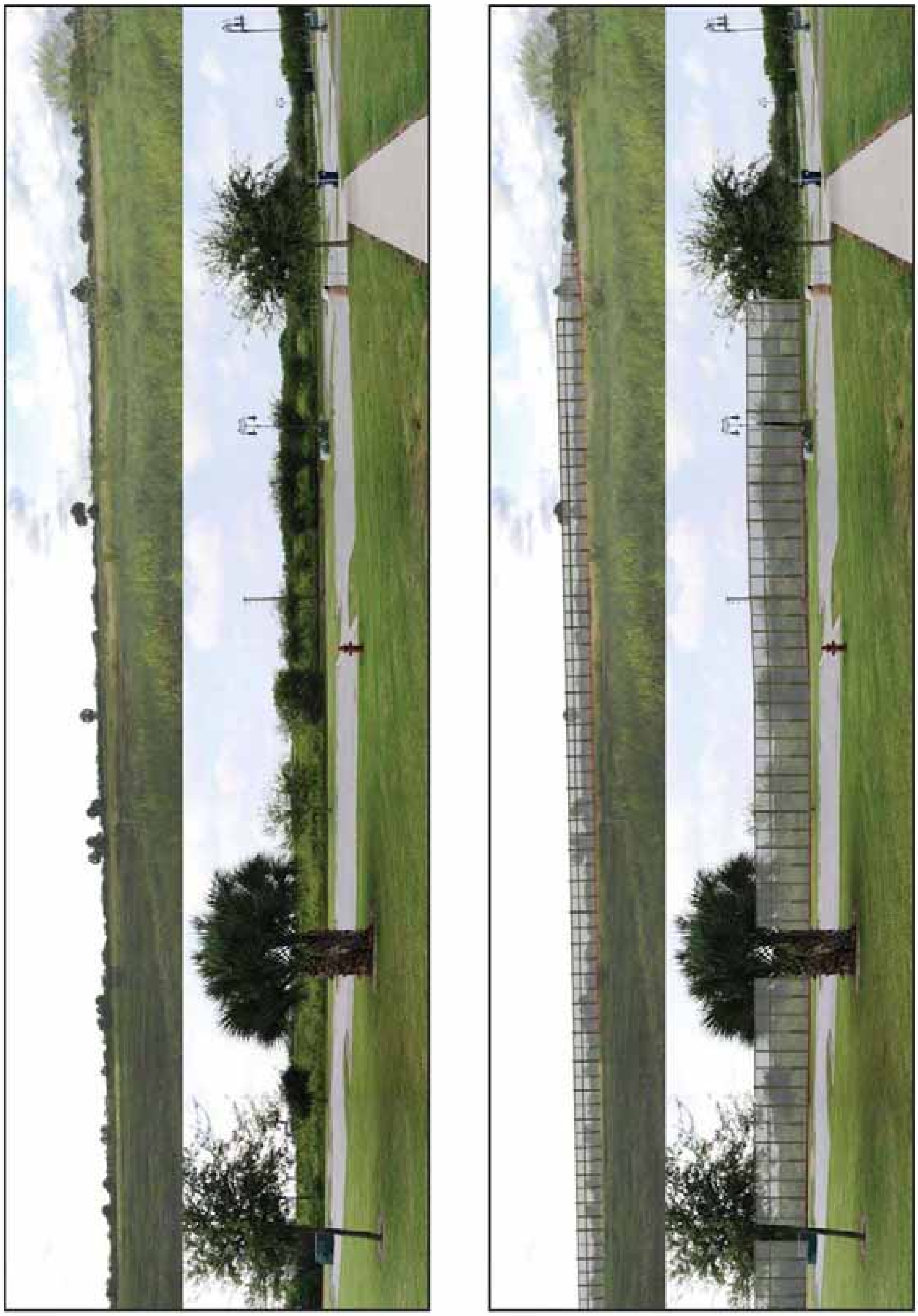

Figure 9-6. Typical Views Towards Impact Corridor, Showing How the Park/Refuge Land Unit Will Appear with a Fence and Patrol Road

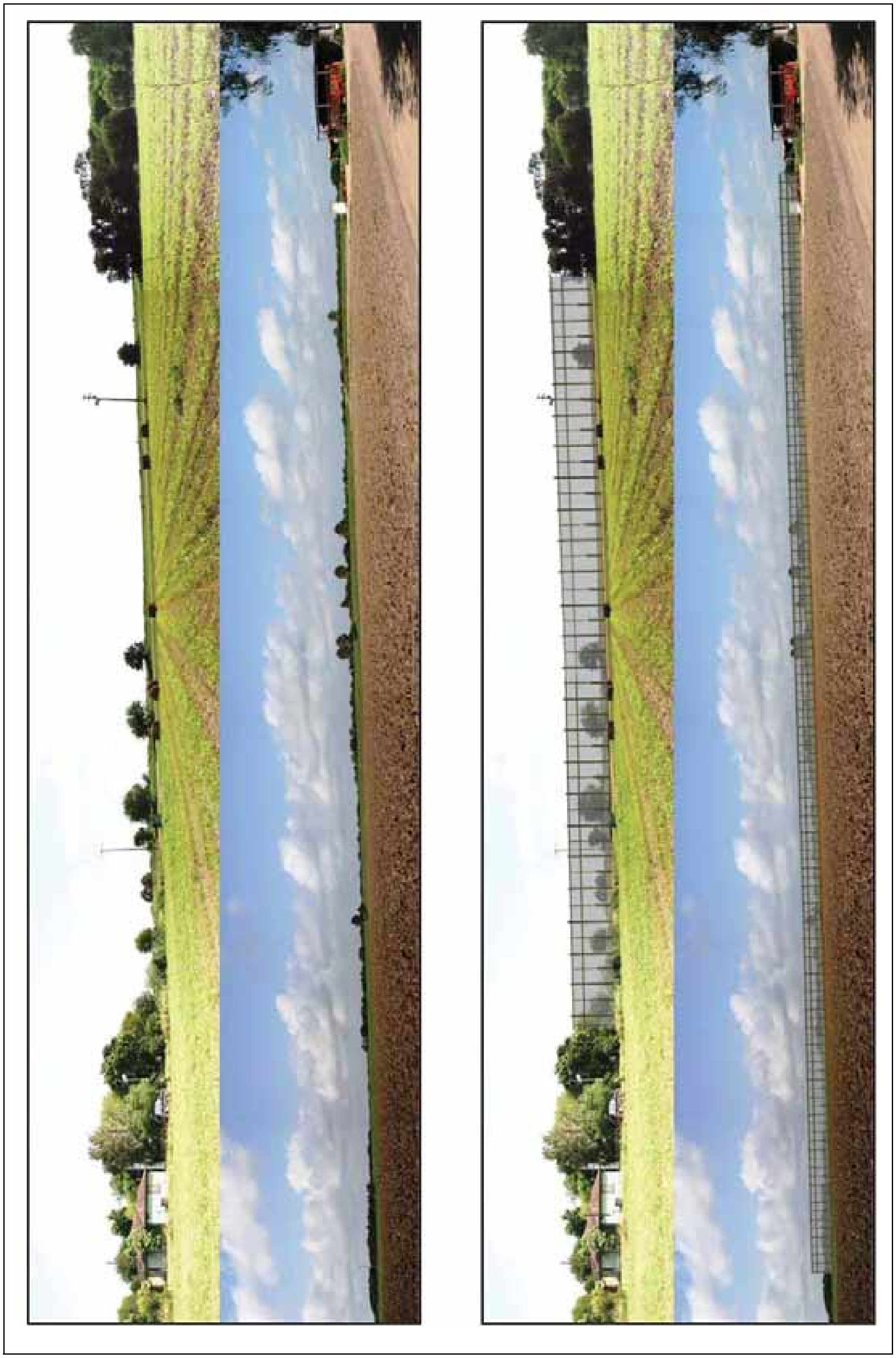

Figure 9-7. Typical Views Towards Impact Corridor, Showing How the Rural Land Unit Will Appear with a Fence and Patrol Road

Figure 9-8. Typical Views Towards Impact Corridor, Showing How the Town/Suburban Land Unit Will Appear with a Fence and Patrol Road

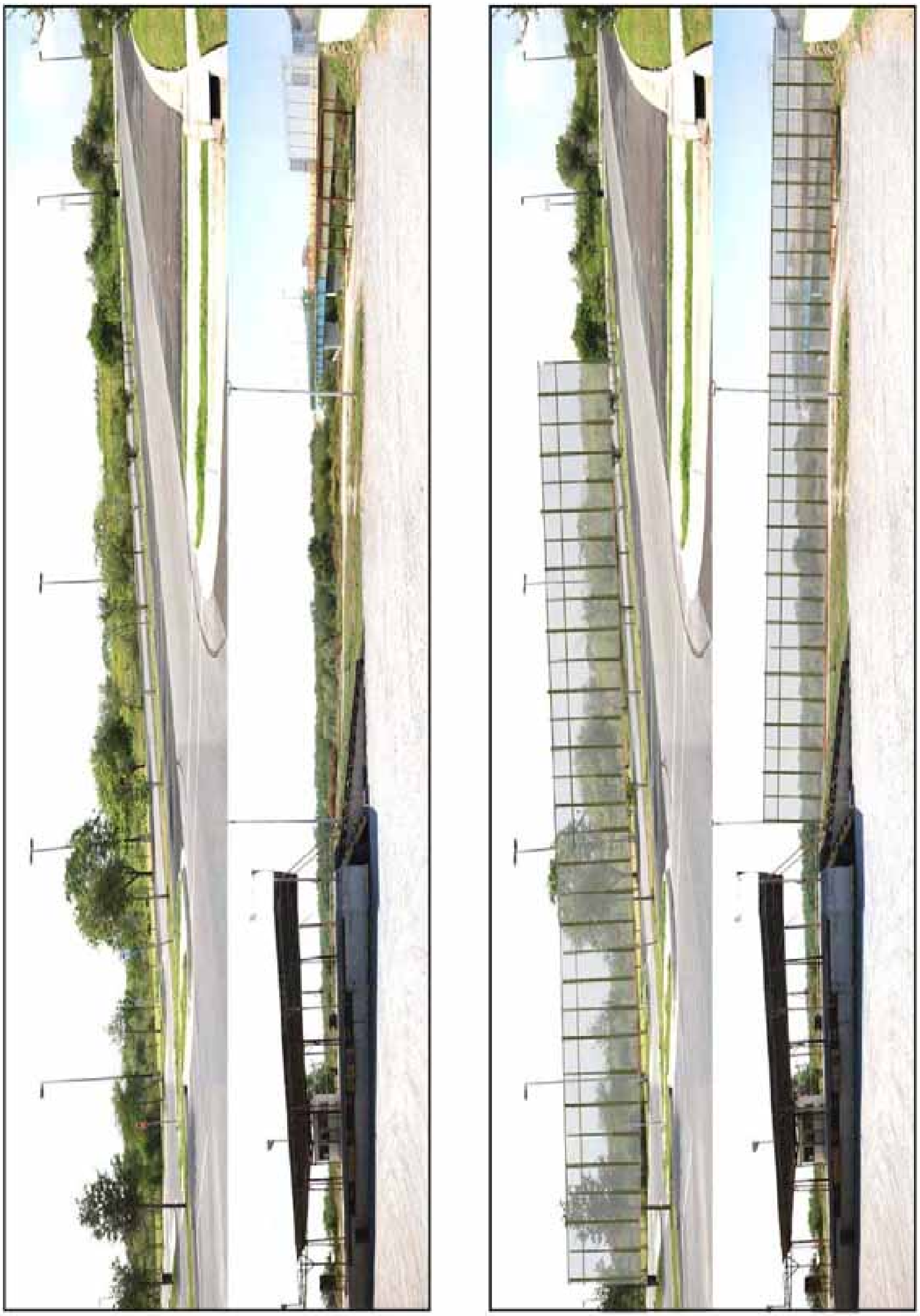

Figure 9-9. Typical Views Towards Impact Corridor, Showing How the Urban/Industrial Land Unit Will Appear with a Fence and Patrol Road

massive forms will increase the ability of the fence to blend with its surroundings. As with the visual resources in other land units, the impact of the Project will vary depending on its immediate setting; the more exposed the fence is and the greater the contrast between it and surrounding elements, the greater the visual impact. For this land unit, therefore, impacts will range from minor to major, and neutral to adverse. The FHWA guidance (USDOT undated) cites examples where the addition of a consistent aesthetic element to an urban setting helps create greater unity to the views within the land unit, thus resulting in a beneficial impact. Although this outcome is possible within this land unit type, a review of the settings along the impact corridor suggests that the best-case scenario will be a neutral or minor adverse impact.

Finally, with respect to the impacts on the specific visual resources listed in **Chapter 9.2**, implementation of the Project will have short- or long-term adverse impacts on the settings of those resources. The greater the distance between the resource and the intrusive visual elements (primarily the fence), and the more intervening visual elements between them, the less the degree of the impact. For example, construction of the fence at a distance of 60 feet from a historic building will typically constitute a major adverse impact, while construction of the fence several hundred feet from the resource with intervening vegetation or buildings will reduce the impact to moderate or minor. Placement of the fence within the boundaries of an NHL or historic district, particularly where there is a high degree of visual continuity between resources (few noncontributing elements) will also be considered a major adverse impact on that resource. A more detailed discussion of the impacts on the settings or viewsheds of specific cultural resources is provided in **Chapter 8.3**.

Viewer Response Concerns. In **Chapter 9.2**, the pool of potential viewers was grouped into several general categories. As noted in that discussion, any single viewer will have some responses to the alteration to the visual resources in each land unit that are based on their own personal experiences and ties to those resources, and other responses tied to more common experiences (group sentiment). Specific comments received from viewers identified concerns about visual impacts throughout the impact corridor and with some of the specific natural or cultural resources noted above, but did not identify any new visual resources of concern. It should be noted that no explicit poll of viewer responses with respect to impacts on visual resources has been conducted for this Project.

In many respects, the principle of “not in my backyard” has a strong correlation with the responses of viewers for whom view of the fence will be regular or constant (i.e., residential, commercial, or industrial viewers). Where the fence will directly impact private property, the viewer response from the landowner is likely to be that the Project will represent a major adverse impact on visual resources visible from their property. There is also a possibility that the viewer response in this instance could be beneficial, based on a feeling of increased safety or security (e.g., fence as protection). Responses from viewers located a greater distance from the fence, particularly if their view of the fence is obstructed by other elements or is simply part of the overall visual clutter, will typically be less intense (minor) and more likely neutral, unless the fence will obstruct a visual resource considered to be of high quality or cultural importance. In general, the closer the proximity of the viewer to the fence, the more likely the response is to be major and adverse.

For viewers likely to view the fence on a less regular basis (e.g., recreational viewers, special interest viewers, intermittent viewers), viewer responses will be tied to perception of how the tactical infrastructure has altered their access (impedes existing views or impedes physical access to views) to valued visual resources. Although any of these groups could object on principle to any type of alteration or feel a beneficial response due to a sense of increased security, responses will be more intense and adverse where alterations downgrade the quality or character of existing visual resources. Based on the comments received for this Project, viewer responses appear to range from minor to major and neutral to adverse.

As a final point, for viewers accustomed to accessing views available from the levees or from settings other than parks or refuges, the construction of the tactical infrastructure will place a permanent barrier between the viewer and the visual resources in those locales. By presumption, any visual resource regularly sought out by a viewer will constitute a moderate- or high-quality visual resource, and restricting physical access to those resources will thus constitute a long-term major adverse impact for those viewers.

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10. SOCIOECONOMIC RESOURCES AND SAFETY

10.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts on socioeconomic and safety resources.

Socioeconomic Resources. Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly characteristics of population and economic activity.

Socioeconomic data in this section are presented at the community and county levels to characterize baseline socioeconomic conditions in the context of regional and state trends. Data have been collected from previously published documents issued by Federal, state, and local agencies; and from state and national databases (e.g., U.S. Census Bureau).

Environmental Justice, Protection of Children, and Safety.

There are no Federal regulations specifically addressing socioeconomics; however, there is one EO that pertains to environmental justice issues. Although the Secretary's waiver means that CBP no longer has any specific obligation under Executive Order (EO) 12898, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with EO 12898 as the basis for evaluating potential environmental impacts and developing appropriate mitigations for environmental justice, protection of children, and safety.

EO 12898 is included in the socioeconomic resources section because it relates to various socioeconomic groups and the health effects that could be imposed on them. On February 11, 1994, President Clinton issued EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This EO requires that Federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. The purpose of the EO is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal, and local programs and policies.

Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a project. Databases were searched in an attempt to identify potential sources of environmental hazards near the Project. Such information aids in evaluating whether a project will render vulnerable any of the groups targeted for protection in the EO.

EO 13045, *Protection of Children From Environmental Health Risks and Safety Risks,* addresses the Federal policy of protection of children from exposure to disproportionate environmental health and safety risks. This EO established that each agency has a responsibility to ensure that its policies, programs, activities, and standards address risk to children that result from environmental health risks or safety risks.

10.2 AFFECTED ENVIRONMENT

CBP plans to construct, operate, and maintain tactical infrastructure in the southernmost portions of Starr, Hidalgo, and Cameron counties in Texas. Therefore, these counties constitute the study area for the Region of Influence (ROI). The impact corridor will cross multiple land use types, including rural, urban, suburban, and agricultural.

Population Growth and Characteristics. Cameron, Hidalgo, and Starr counties, Texas, have a total population of 1.15 million. According to the U.S. Census Bureau, Cameron County has a population of 387,717, and is home to Brownsville, the city with the largest population in the three-county area (U.S. Census Bureau 2007b). Hidalgo County has the largest county population of 700,634 in 2006. Starr County at the western end of the ROI is the least populated of the three counties, with an estimated population of 61,780 in 2006 (U.S. Census Bureau 2007b).

The population in the three-county area has grown rapidly since 1980, increasing by 31 percent in the 1980s and 39 percent in the 1990s (BEA 2007). Over the past 6 years, some portions of the three-county area have been among the fastest growing areas in the United States. Both Hidalgo County and Brownsville in Cameron County had a 23 percent increase in population between 2000 and 2006 (U.S. Census Bureau 2007b). Brownsville has had the 24th highest growth rate of any city with more than 100,000 residents in the United States. **Table 10–1** compares population trends in the ROI with the state of Texas between 1980 and 2006. **Table 10-2** extrapolates continued trends in the ROI as compared to the rest of Texas through the year 2020.

Table 10-1. State and County Population Trends Comparison in the ROI 1980 to 2006

Year	State of Texas	Cameron County	Hidalgo County	Starr County
1980	14,338,208	211,944	286,540	27,666
1985	16,272,722	245,894	341,145	34,274
1990	17,056,755	261,728	387,200	40,805
1995	18,958,751	304,928	487,593	49,598
2000	20,851,820	335,227	569,463	53,597
2006	23,507,783	387,717	700,634	61,780
Change 1980 to 1990	19.0 percent	23.5 percent	35.1 percent	47.5 percent
Change 1990 to 2000	22.2 percent	28.1 percent	47.1 percent	31.3 percent
Change 2000 to 2006	12.7 percent	15.7 percent	23.0 percent	15.3 percent

Source: BEA 2007

Table 10-2. County Population Trends, 2000 to 2020

Year	State of Texas	Cameron County	Hidalgo County	Starr County
2000	20,851,820	335,227	569,463	53,597
2005	22,928,508	378,905	678,652	60,479
2010	24,330,612	415,307	752,909	67,528
2015	26,156,715	457,255	854,936	74,905
2020	28,005,788	499,380	959,669	82,205
Projected Change 2000 to 2010	16.7%	23.9%	32.2%	26.0%
Projected Change 2010 to 2020	15.1%	20.2%	27.5%	21.7%

Sources: BEA 2007, U.S. Census Bureau 2006b and 2007a, BEA 2007, TSDC 2006

Cameron County has more than 40 miles of beaches along its eastern side, including the southernmost section of Padre Island. Brownsville, with a 2006 population of 172,437, is the southernmost city in Texas, and is across the Rio Grande from the City of Matamoros, Mexico (U.S. Census Bureau 2007b). Other large cities in the county include Harlingen and San Benito; however, these cities are farther away from the impact corridor. Together these three cities account for 68 percent of the county's population. Cameron County also comprises the Brownsville-Harlingen-San Benito Metropolitan Statistical Area (MSA). Five other cities and nine towns, including La Feria, South Padre Island, and Bayview, account for another 10 percent of the county population. The remaining county population (22 percent) lives outside of these cities and towns. The county is home to the University of Texas at Brownsville and Texas Southmost College (U.S. Census Bureau 2007b).

In Hidalgo County, the McAllen-Edinburg-Mission MSA includes the entire county area and is made up of the three principal cities of McAllen, Edinburg, and Mission. McAllen and Mission do not border Mexico, but are less than 10 miles from the Mexican city of Reynosa. Other larger cities in the county include Pharr, San Juan, and Weslaco. Sixteen other cities have populations ranging from 311 (Granjeno) to 16,287 (Alamo) and make up 15 percent of the county population. The remaining county population lives in outlying rural areas or unincorporated communities and makes up 31 percent of the county's population (U.S. Census Bureau 2007b). The bulk of the county's population is in the southern half of the county within 20 miles of the Mexican border. The county is home to the University of Texas - Pan American (U.S. Census Bureau 2007b).

The largest cities in Starr County are Rio Grande City and Roma. These cities, plus the smaller La Grulla, are at or near the Mexican border, with the Mexican cities of Camargo and Miguel Aleman just a short distance away. Outside of these three cities, the population of 34,945 represents 57 percent of the county population (U.S. Census Bureau 2007b). The largest employer in the county is Starr Produce with 1,500 to 2,000 employees, followed by the county, school districts, and Wal-Mart. Rio Grande City is home to the South Texas Community College, and the University of Texas – Pan American has a campus there.

Population projections through 2010 from the Texas state demography office show a 29 percent growth rate and continued growth of 25 percent through the following decade (TSDC 2006). Key factors contributing to the rapid growth include both domestic and international migration related to the expanding availability of job opportunities, an influx of retirees, and an increasing number of children related to the many younger households that have migrated into the area, particularly in Hidalgo County.

While the area's population growth has more than doubled since 1980, the area's racial and ethnic characteristic remains predominantly Hispanic (U.S. Census Bureau 2007a) (see **Table 10-3**). While the non-Hispanic population has increased 8 percent in the past 6 years, the Hispanic population has grown by more than 20 percent over the same period (U.S. Census Bureau 2007a). The proportion of Hispanics in the three-county area is 88.7 percent, about 2.5 times the proportion of Hispanics in the State of Texas. Estimates for 2006 indicate that the three-county area is 9.9 percent non-Hispanic whites, and only 1.3 percent other races (U.S. Census Bureau 2007a).

Table 10-3. Racial and Ethnic Characteristics in the ROI, 2000 to 2006

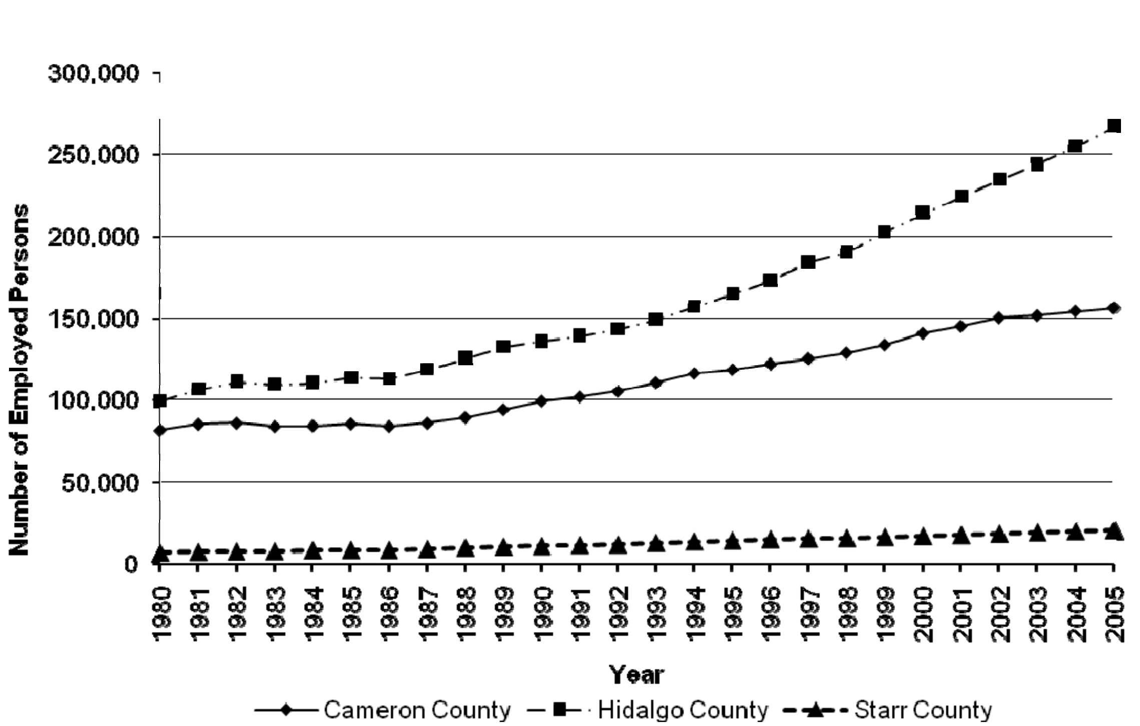
	2000 Census*	2006 Estimate	Change 2000 to 2006	Portion of Total Population: 2006 Estimate
State of Texas	**20,851,820**	**23,507,783**	**12.7%**	**100.0%**
Hispanic	6,669,666	8,385,139	25.7%	35.7%
Non-Hispanic Population by Race:				
White Alone	10,986,965	11,351,060	3.3%	48.3%
Black Alone	2,378,444	2,687,401	13.0%	11.4%
Asian	567,528	763,381	34.5%	3.2%
Other Races	249,217	320,802	28.7%	1.4%
Cameron County	**335,227**	**387,717**	**15.7%**	**100.0%**
Hispanic	282,736	333,733	18.0%	86.1%
Non-Hispanic Population by Race:				
White Alone	49,133	49,460	0.7%	12.8%
Black Alone	923	1,311	42.0%	0.3%
Asian	1,568	1,996	27.3%	0.5%
Other Races	867	1,217	40.4%	0.3%
Hidalgo County	**569,463**	**700,634**	**23.0%**	**100.0%**
Hispanic	503,100	626,742	24.6%	89.5%
Non-Hispanic Population by Race:				
White Alone	60,033	63,641	6.0%	9.1%
Black Alone	1,976	3,133	58.6%	0.4%
Asian	3,261	5,126	57.2%	0.7%
Other Races	1,093	1,992	82.3%	0.3%
Starr County	**53,597**	**61,780**	**15.3%**	**100.0%**
Hispanic	52,278	60,193	15.1%	97.4%
Non-Hispanic Population by Race:				
White Alone	1,111	1,294	16.5%	2.1%
Black Alone	8	26	225.0%	0.0%
Asian	141	202	43.3%	0.3%
Other Races	59	65	10.2%	0.1%

Source: U.S. Census Bureau 2007a.

Census 2000 population differs slightly in the estimates file as compared to the Census 2000 data.

Employment and Income. Starr, Hidalgo, and Cameron counties have seen great improvement in the local economy in the past two decades. The total number of jobs in the ROI has increased by 236 percent since 1980 (BEA 2007).

As a result, the unemployment rate has dropped more than 20 percent, to 7.3 percent (BLS 2007). Per capita income (adjusted for inflation) has increased 18 percent in Starr County, 19 percent in Hidalgo County, and 18 percent in Cameron County. **Figure 10-1** shows county employment trends between 1980 and 2005.



Source: BEA 2007

Figure 10-1. Total County Employment, 1980 to 2005

Several industries have seen substantial growth, thus creating local jobs in the ROI. The biggest employers include the private industry, health care, retail and tourism, and local manufacturing. **Table 10-4** details employment by industrial sector.

Private employment has increased by 17 percent across the three-county area from 2001 to 2005 (as compared to 6 percent for the State of Texas) (BEA 2007).

The health care industry has been a key economic driver in terms of job growth. With the population 65 years and older increasing by 17 percent from 2000 to 2006 and other increases in demands for health services, this sector has grown by nearly 40 percent in the three-county area and now makes up 18 percent of the area’s jobs (BEA 2007).

Table 10-4. Employment by Industrial Sector in the ROI, 2005

Sector or Summary Level	Texas	Percent of Texas Total	Cameron County	Hidalgo County	Starr County	Three-County Total	Percent of Three-County Total 2005
TOTAL EMPLOYMENT	**13,088,946**	**100.0**	**156,193**	**267,366**	**20,365**	**403,194**	**100**
Wage and salary employment	***10,269,066***	**78**	***127,700***	***215,817***	***13,768***	**329,749**	**82**
Proprietors employment	***2,819,880***	**22**	***28,493***	***51,549***	***6,597***	**73,445**	**18**
Farm employment	***281,727***	**2**	***1,714***	***3,057***	***1,217***	**3,554**	**1**
Nonfarm employment	***12,807,219***	**98**	***154,479***	***264,309***	***19,148***	**399,640**	**99**
Private employment	**10,979,216**	**84**	**126,595**	**215,653**	**13,832**	**328,416**	**81**
Forestry, fishing, related activities, and other	68,253	1	2,897	6,925	(A)	(A)	n/a
Mining	244,837	2	216	2,282	114	2,384	1
Utilities	51,045	0	322	783	45	1,060	0
Construction	899,172	7	8,748	18,234	1,777	25,205	6
Manufacturing	951,778	7	7,808	9,355	211	16,952	4
Wholesale trade	530,192	4	4,167	8,417	239	12,345	3
Retail Trade	1,417,748	11	19,205	35,027	2,217	52,015	13
Transportation and warehousing	469,746	4	5,628	8,638	491	13,775	3
Information	262,195	2	1,489	3,252	46	4,695	1
Finance and insurance	631,849	5	4,204	8,171	284	12,091	3
Real estate, rental, leasing	524,931	4	4,958	6,574	199	11,333	3

Sector or Summary Level	Texas	Percent of Texas Total	Cameron County	Hidalgo County	Starr County	Three-County Total	Percent of Three-County Total 2005
Professional and technical services	828,786	6	4,601	7,678	346	11,933	3
Management of companies and enterprises	69,896	1	323	472	40	755	0
Administrative and waste services	843,486	6	8,327	13,823	626	21,524	5
Educational services	178,321	1	1,479	1,946	103	3,322	1
Health care and social assistance	1,168,205	9	28,803	46,870	4,243	71,430	18
Arts, entertainment, and recreation	200,551	2	1,895	2,225	(D)	(D)	n/a
Accommodation and food services	879,593	7	11,406	17,687	(A)	(A)	n/a
Other services, except public administration	758,632	6	10,119	17,294	1,733	25,680	6
Government and government enterprises	**1,828,003**	**14**	**27,884**	**48,656**	**5,316**	**71,224**	**18**
Federal, civilian	181,107	1	2,352	2,710	396	4,666	1
Military	161,205	1	984	1,530	136	2,378	1
State government	337,769	3	4,021	5,265	132	9,154	2
Local government	1,147,922	9	20,527	39,151	4,652	55,026	14

Source: BEA 2007

Note: A= Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

Retail trade accounts for 13 percent of the area's jobs in 2005, a 12 percent increase since 2001. This expansion has also been important to the regional economy and is due in part to retirees coming into the area in the winter and shopping in the border areas. Mexican nationals also cross the border legally to have access to the broad selection of products at retail outlets in the three-county area (BEA 2007, FRDB 2005).

The local manufacturing sector has declined by nearly 30 percent from 2001 to 2005 in terms of employment (BEA 2007). Manufacturing jobs now make up 4 percent of the area's economy. However, the border economy benefits from maquiladoras, manufacturing and assembly establishments in Mexico that use U.S. inputs, and then import finished products and subassemblies via POE crossings in these counties for further distribution. Related to this are jobs in the wholesale trade, transportation, and warehousing industries, which make up another 6 percent of the area's jobs and that have increased by 9 percent since 2001 (BEA 2007).

Other growth sectors are related to the general boom in housing and population. Construction jobs make up 7 percent of the jobs in the 2005 economy in the three-county area, increasing in number by 9 percent since 2001 (BEA 2007). Large increases have also been seen in finance and insurance (22 percent growth) and real estate (28 percent growth) (BEA 2007).

Tourism in the region is also important. Cameron County is the home of South Padre Island, which attracts many tourists over the winter and early spring. Besides vacationers at the beach, the area is home to nine World Birding Centers (developed by the TPWD to boost tourism in the area), two of which are in the corridor and potentially affected by the tactical infrastructure and the National Audubon Society's (Audubon Texas) Sabal Palms Sanctuary in Brownsville, which could also be affected. Tourism-related businesses have experienced an expansion in the past 5 years with growth in the arts, entertainment, and recreation industries at 9 percent and growth in accommodations and food services at 11 percent. These industries now make up about 7 percent of the area's jobs (BEA 2007).

Total travel and tourism in the three-county ROI generated a total of $1.673 billion in expenditures in 2006 (exclusive of air transportation expenditures) (BEA 2007). Survey data available only for Cameron County, when expanded to the three-county ROI, indicate a total of 4.67 million visitors annually, of which 8.1 percent cited "Nature/Culture: Observe & Conserve/Eco-Travel" as an activity they engaged in. Applying this percentage to the total regional travel expenditures results in an estimated impact of $135.5 million due to ecotourism. This supports the impacts reported by local sources of $125–150 million.

Large increases in jobs have also been seen in information industry, professional and technical services, management companies and enterprises, and administrative and waste services. These four industries have had growth rates of more than 20 percent and together make up 9 percent of the jobs in the area (BEA 2007).

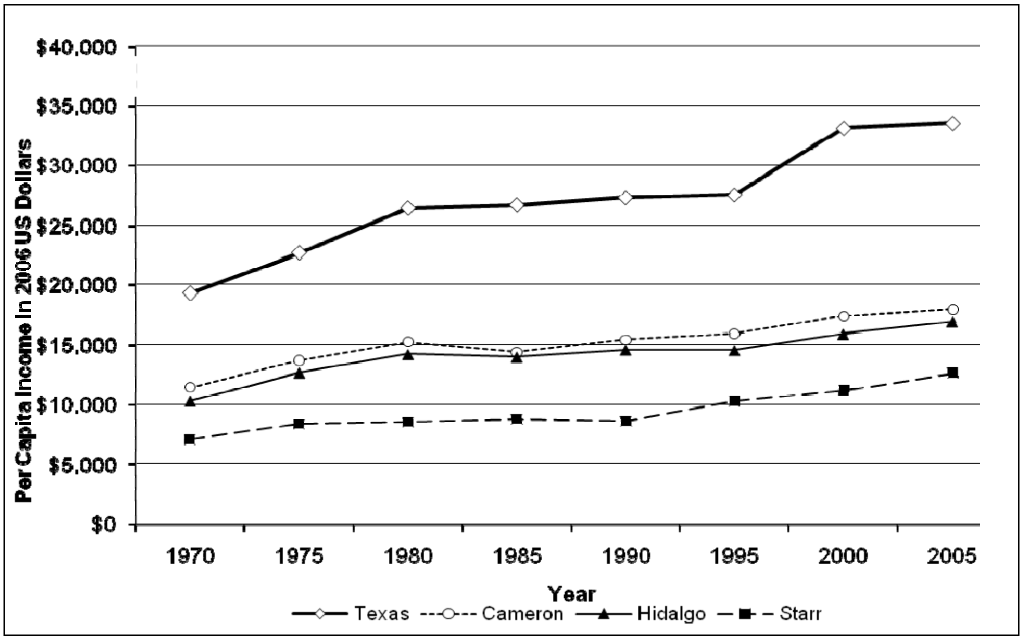
Government employment has increased by 8 percent in the three-county area. Federal civilian employment has increased by 7 percent, and these jobs now make up 1 percent of the area's employment (BEA 2007). State employment over the period has increased by only 1 percent while local government employment has seen the largest increase by 10 percent (BEA 2007). As a portion of total jobs, local government makes up 14 percent of the total economy, and local school districts and other local government entities are among the biggest employers in these counties (BEA 2007).

Although the economy has improved in the ROI, the area remains relatively poor. The unemployment rate in the ROI is high (7.3 percent) when compared to the Texas unemployment rate of 4.9 percent (BLS 2007). **Table 10-5** shows how the unemployment rate in the ROI compares with the state. As shown in **Figure 10–2**, the 2005 per capita income of $16,490 for the three-county area is about half of the per capita income of the rest of the State of Texas ($32,460) (BEA 2007).

Table 10-5. State and ROI Labor Force and Unemployment Rate Averages

	2000	**2003**	**2004**	**2005**	**2006**
State of Texas					
Labor Force	10,347,847	10,999,132	11,127,293	11,282,845	11,487,496
Unemployment Rate	4.4%	6.7%	6.0%	5.4%	4.9%
Cameron County					
Labor Force	127,011	143,231	143,439	142,204	144,709
Unemployment Rate	7.0%	9.6%	8.8%	7.6%	6.6%
Hidalgo County					
Labor Force	210,984	247,486	257,511	264,251	269,586
Unemployment Rate	9.2%	10.4%	9.1%	7.9%	7.4%
Starr County					
Labor Force	17,722	21,308	21,625	21,471	21,758
Unemployment Rate	16.8%	15.9%	14.5%	13.0%	11.7%

Source: BLS 2007



Source: BEA 2007

Figure 10-2. Per Capita Income, 1970 to 2005 (Real $2006)

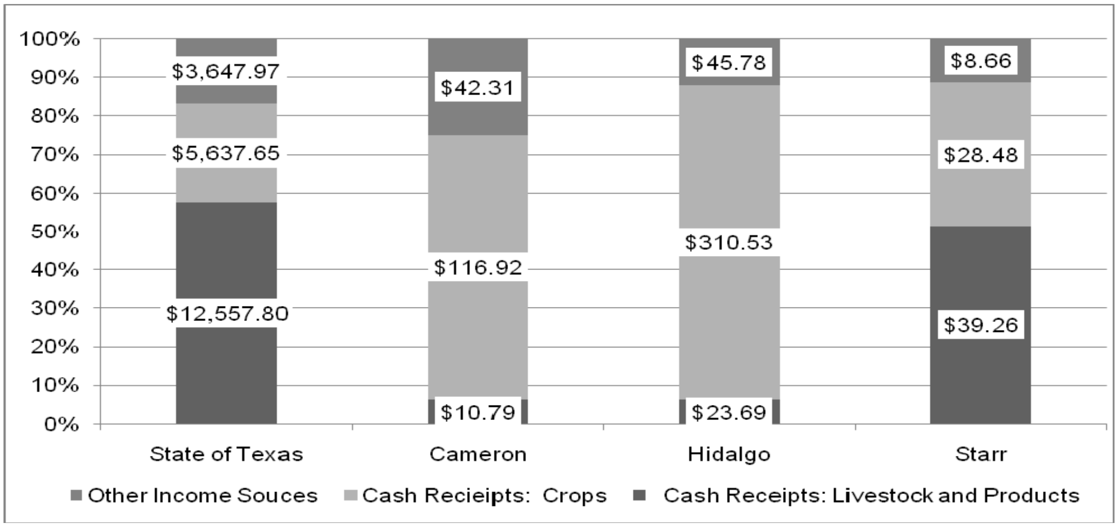
According to the U.S. Census Bureau's Small Area Income and Poverty Estimates program, the poverty rate among all individuals has dropped in the area from 44.8 percent in 1989 to 30.3 percent in 2004. However, **Table 10-6** shows the area's poverty rate is still almost twice the 16.2 percent poverty rate for the State of Texas (U.S. Census Bureau 2006a).

Table 10-6. Poverty Rates and Median Income

Geographic Area	Overall Poverty Rate	Child Poverty Rate (Under 18)	Median Income (2004 dollars)
State of Texas	16.2 percent	22.7 percent	$41,645
Cameron County	29.4 percent	40.4 percent	$26,719
Hidalgo County	30.5 percent	41.2 percent	$26,375
Starr County	34.8 percent	46.6 percent	$19,775

Source: U.S. Census Bureau 2006a

Agriculture. Higher poverty rates in the area are attributed in part to the agriculture industry. Moreover, the counties in the project area have a very low median income when compared to the State of Texas. Although nonfarm private sector employment has increased by nearly 17 percent, farm employment has declined by 12 percent from 2001 to 2005 across these three counties, now accounting for slightly more than 1 percent of the area's 2005 jobs (BEA 2007). Though Texas is known for cattle, farm income from crops far outweighs income from livestock in Cameron and Hidalgo counties. In the three-county area, crops made up 73 percent of the 2005 farm income as compared to 12 percent for livestock and related products (BEA 2007). In the 2002 Agricultural Census, 41 percent of the farms raised cattle in the three-county area, and 56 percent of the land was identified as cropland. Sugar cane is a major crop in the impact corridor (USDA 2004). **Figure 10-3** compares local distribution of agricultural income with the state. **Table 10-7** characterizes local farms.



Source: USDA 2004

Figure 10-3. Distribution of Farm Income by Type, 2005

Selected Public Services

- Public Education. School enrollment and the demographics of school enrollment generally match those of the population of the three counties. In Cameron County, 10 school districts provide educational services to 98,010 students in 130 schools in school year 2007 (TEA 2006a). In Hidalgo County, 20 school districts, including five charter school districts, provide educational services to 190,501 students in school year 2007. In Starr County, three school districts provide educational services to 16,645 students in 23 schools in school year 2007 (TEA 2006a). Similar to demographics of the area, the demographic characteristics of the students enrolled in these schools are predominantly Hispanic and predominantly low income (TEA 2006b). **Table 10-8** provides detailed ethnic information by county and school district in the ROI.

- Law Enforcement. Law enforcement and other community services are provided by 40 law enforcement agencies in the three-county area. Cameron County is served by 16 different agencies with 628 commissioned officers. Hidalgo County is served by 21 different agencies with 1,052 commissioned officers. Starr County is served by 3 different agencies with 77 commissioned officers (TDPS 2006). **Table 10-9** shows the breakdown of non-Federal law enforcement by county and agency.

Table 10-7. Characteristics of Local Agriculture in 2002

Description	Texas Counties			Total for Three Counties
	Cameron	Hidalgo	Starr	
Number of Farms	1,120	2,104	870	4,094
Acres in Farms	350,437	593,158	570,430	1,514,025
Total Cropland (acres)	253,571	405,094	193,688	852,353
Harvested Cropland (acres)	151,923	277,406	41,759	471,088
Farms by Size, 2002				
1 to 9 Acres	191	393	5	589
10 to 49 Acres	470	866	50	1,386
50 to 179 Acres	184	401	281	866
180 Acres or more	275	444	534	1253
Farms by Value of Sales, 2002				
Less than $5,000	603	958	573	2,134
$5,000 to $49,999	294	814	263	1,371
$50,000 or more	223	332	34	589
Principal Occupation, 2002				
Farming	666	1,115	492	2,273
Other	454	989	378	1,821
Hired Farm Labor				
Farms with hired workers	337	671	341	1,349
Farms with 1 worker	201	295	103	599
Farms with 2 or more workers	136	376	238	750
Select Livestock for 2002				
Farms with Cattle/Calves	402	614	671	1,687

Source: USDA 2004

Environmental Justice. The CEQ oversees the Federal government's compliance with EO 12898. CBP does not have procedures for implementing EO 12898. Therefore, guidance from USEPA's Office of Environmental Justice was followed (USEPA Toolkit). This Report uses the following three-step methodology to evaluate potential environmental justice impacts:

- Identify potential environmental justice populations located in the project area or that will otherwise be affected by the Project
- Identify potential environmental hazards and the potential human health and environmental effects near the Project
- Assess whether there are potential adverse environmental and human health effects on minority and low-income populations that will be disproportionately high and adverse.

Table 10-8. Ethnic and Racial Distribution by County and Independent School District (ISD) in the ROI

School District	School Year 2007 Enrollment	Total Schools	Percent Hispanic 2004	Percent White 2004	Percent Other Races 2004	Percent Economically Disadvantaged 2004
Cameron County						
Brownsville ISD	48,334	49	98.0%	2.0%	0.0%	93.1%
Harlingen CISD	17,684	24	88.0%	11.0%	1.0%	71.8%
La Feria ISD	3,186	8	91.0%	9.0%	0.0%	79.2%
Los Fresnos CISD	8,935	10	93.0%	6.0%	1.0%	85.5%
Point Isabel ISD	2,597	4	85.0%	15.0%	0.0%	88.3%
Rio Hondo ISD	2,292	5	95.0%	5.0%	0.0%	81.9%
San Benito CISD	10,694	18	98.0%	2.0%	0.0%	83.9%
Santa Maria ISD	633	5	100.0%	0.0%	0.0%	97.8%
Santa Rosa ISD	1,195	3	97.0%	3.0%	0.0%	96.8%
South Texas ISD	2,460	4	76.0%	16.0%	8.0%	53.1%
Hidalgo County						
Donna ISD	13,363	17	99.0%	1.0%	0.0%	91.3%
Edcouch-Elsa ISD	5,598	9	99.0%	0.0%	1.0%	90.6%
Edinburg CISD	28,772	36	97.0%	3.0%	0.0%	85.2%
Hidalgo ISD	3,331	6	100.0%	0.0%	0.0%	92.2%
Idea Academy	2,073	1	94.0%	6.0%	0.0%	82.2%
La Joya ISD	25,130	27	100.0%	0.0%	0.0%	90.5%
La Villa ISD	615	4	100.0%	0.0%	0.0%	89.8%
McAllen ISD	24,570	32	89.0%	8.0%	3.0%	69.5%
Mercedes ISD	5,279	10	99.0%	1.0%	0.0%	92.1%
Mid-Valley Academy	252	2	94.0%	6.0%	0.0%	84.2%
Mission CISD	15,462	20	98.0%	2.0%	0.0%	84.3%
Monte Alto ISD	603	2	96.0%	3.0%	1.0%	88.6%
One Stop Multiservice Charter School	5,536	3	97.0%	3.0%	0.0%	92.8%
Pharr-San Juan-Alamo ISD	28,868	36	99.0%	1.0%	0.0%	90.0%
Progreso ISD	1,989	5	100.0%	0.0%	0.0%	94.2%
Sharyland ISD	8,208	9	85.0%	13.0%	2.0%	52.6%
Technology Education Charter High	451	1	97.0%	3.0%	0.0%	85.8%
Valley View ISD	4,099	5	100.0%	0.0%	0.0%	94.1%
Vanguard Academy	369	1	93.0%	7.0%	0.0%	87.4%
Weslaco ISD	15,933	20	97.0%	2.0%	1.0%	86.5%
Starr County						
Rio Grande City CISD	9,969	11	100.0%	0.0%	0.0%	84.5%
Roma ISD	6,417	10	100.0%	0.0%	0.0%	89.2%
San Isidro ISD	259	2	95.0%	5.0%	0.0%	81.1%

Source: TEA 2006a, TEA 2006b

Table 10-9. Law Enforcement Agencies and Personnel in the ROI *

	Commissioned	Civilian	Total
Cameron County			
Cameron County Sheriff's Office	94	258	352
Local Police Departments (15)	534	234	768
Total	**628**	**492**	**1,120**
Hidalgo County			
Hidalgo County Sheriff's Office	217	435	652
Local Police Departments (20)	835	346	1,181
Total	**1,052**	**781**	**1,833**
Starr County			
Starr County Sheriff's Office	33	57	90
Local Police Departments (2)	34	14	58
Total	**77**	**71**	**148**

Source: TDPS 2006
Note: * Does not include Federal law enforcement.

A demographic analysis was used to assess the presence of a potential environmental justice prescribed population living near the Project Area. Census 2000 information is available for racial, ethnic, and economic characteristics at the census tract level. The census tracts in which the portions of the Project will be located were identified. All are just north of the Rio Grande. Some of these census tracts have a substantial amount of land and population away from the project area; however, these census tracts have demographic characteristics similar to those of the persons living at or near project construction activity. In some cases, the population in the census tract closest to the project area appears to be lower in income than the population in the same census tract farther away from the river. **Table 10-10** identifies the minority populations associated with the project area and its associated composition.

As shown in **Table 10-11**, each census tract has a potential environmental justice community based upon its racial and ethnic characteristic of being more than 50 percent minority and also a substantially higher percentage than the general population in both Texas and the United States. Each census tract has a potential environmental justice community based upon the presence of a large proportion of persons with incomes at or below the poverty level and based upon this proportion being meaningfully greater than the proportion of persons with incomes at or below the poverty rate for the general populations in both the State of Texas and the United States. Based upon Census 2000 information, the population living in each of these census tracts meets these two criteria as a potential environmental justice population.

Table 10-10. Racial and Ethnic Population Composition in Geographic Comparison Areas

Geographic Area by Census Tract	Percentage of Total Population						
	White and not Hispanic or Latino (A)	Asian and not Hispanic or Latino (B)	Black or African American and not Hispanic or Latino (C)	Other Races, Two or More Races, and not Hispanic or Latino (D)	Hispanic or Latino Ethnicity (E)	Total Racial and Ethnic Minorities (B) + (C) + (D) + (E)	Difference in Percent Minority Population Above/Below the State Average
United States	69.1%	3.6%	12.0%	2.8%	12.5%	30.9%	-16.7%
Texas	52.4%	2.6%	11.3%	1.7%	32.0%	47.6%	--
Cameron County	14.5%	0.4%	0.3%	0.3%	84.5%	85.5%	37.9%
Census Tracts Included in Project Area	**7.6%**	**0.0%**	**0.0%**	**0.1%**	**92.2%**	**92.3%**	**44.8%**
Census Tracts Not Included in Project Area	15.3%	0.5%	0.4%	0.3%	83.5%	84.7%	37.1%
Hidalgo County	10.4%	0.5%	0.4%	0.3%	88.4%	89.6%	42.0%
Census Tracts Included in Project Area	**6.3%**	**0.0%**	**0.1%**	**0.1%**	**93.5%**	**93.7%**	**46.1%**
Census Tracts Not Included in Project Area	10.7%	0.6%	0.4%	0.3%	88.1%	89.3%	41.8%

Geographic Area by Census Tract	Percentage of Total Population						
	White and not Hispanic or Latino (A)	Asian and not Hispanic or Latino (B)	Black or African American and not Hispanic or Latino (C)	Other Races, Two or More Races, and not Hispanic or Latino (D)	Hispanic or Latino Ethnicity (E)	Total Racial and Ethnic Minorities (B) + (C) + (D) + (E)	Difference in Percent Minority Population Above/Below the State Average
Starr County	1.6%	0.3%	0.0%	0.0%	98.1%	98.4%	50.8%
Census Tracts Included in Project Area	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**98.0%**	**98.0%**	**50.4%**
Census Tracts Not Included in Project Area	1.4%	0.4%	0.0%	0.0%	98.2%	98.6%	51.0%
Three-County Area	11.3%	0.5%	0.3%	0.3%	87.6%	88.7%	41.1%

Source: U.S. Census Bureau 2002b

Table 10-11. Census Tract Detail of Demographic Characteristics Relevant to Environmental Justice

Geographic Area	Proportion of Total Population: Racial and Ethnic Minorities	Difference in Proportion of Minority Population above the State Proportion	Proportion of Total Population Below Poverty Level	Difference in the Proportion of Low Income Population above the State Proportion
Cameron County Census Tracts Included in Project Area				
119.03	98.0%	50.4%	46.5%	31.2%
121	79.1%	31.5%	35.4%	20.1%
125.05	95.4%	47.8%	34.5%	19.2%
125.07	96.4%	48.8%	42.0%	26.6%
125.08	89.3%	41.7%	29.8%	14.4%
128	97.4%	49.8%	33.5%	18.2%
133.07	100.0%	52.4%	55.2%	39.8%
140.01	93.4%	45.8%	57.6%	42.2%
141	96.9%	49.3%	32.4%	17.1%
Hidalgo County Census Tracts Included in Project Area				
213.01	98.1%	50.5%	43.8%	28.4%
228	96.2%	48.6%	45.6%	30.2%
242.01	98.6%	51.0%	52.1%	36.7%
242.02	87.3%	39.7%	37.1%	21.7%
Starr County Census Tracts Included in Project Area				
9501.02	97.8%	50.2%	42.3%	26.9%
9501.03	97.9%	50.3%	53.9%	38.6%
9502.02	98.4%	50.8%	45.7%	30.4%

Source: U.S. Census Bureau 2002a and 2002b

CBP reviewed data on landfills or regulated facilities that might use or emit hazardous materials or wastes, including USEPA's Toxic Release Inventory (TRI) database, but found no facilities that might be producing an environmental hazard or stress on residents near the Project. Only small automotive service stations were found within 0.5 miles of the Project. No facilities recognized as emitting hazardous substances were found.

10.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Socioeconomics**.** Construction of tactical infrastructure associated with the Project will have minor beneficial direct and indirect impacts on socioeconomics through increased employment and the purchase of goods and services. Project impacts related to employment, temporary housing, public services, and material supplies will be minor, temporary, and easily absorbed within the existing USBP Rio Grande Valley Sector regional resource and socioeconomics infrastructure. Construction will occur over approximately 8 months in 2008, with a construction workforce peaking at about 200 workers. There could be a long-term increase in the permanent workforce from maintenance personnel that would have beneficial direct and indirect effects on socioeconomic resources.

Because much of the construction cost is in the fabrication of infrastructure components elsewhere in the United States to be shipped in, this will represent a short-term, moderate impact on the local economy.

Changes in economic factors can also impact the social fabric of a community. For example, increases in permanent employment could stimulate the need for new housing units, and, as a result, increase demand for community and social services such as primary and secondary education, fire and police protection, and health care. Because there will be only a short-term increase in local employment, there will be no change in population size as a result of the Project. Therefore, demand for new housing units and other social services is not expected.

Population Growth and Characteristics. Negligible short-term adverse and beneficial impacts on population growth and characteristics will be expected. Short-term moderate increases to populations will be expected in construction areas. Due to the large size of the regional construction trades industry, construction is expected to be drawn primarily from the regional workforce, with some project managers and specialized skilled workers brought in by the selected contractor. The temporary need for approximately 200 construction workers can be easily supplied by the three-county construction workforce of more than 25,000. Given the short timeframe for construction, it is unlikely that any nonlocal workers will be accompanied by their families. Therefore, the short-term nature and scale of the construction project will not induce secondary population growth in the region.

Construction of the project will require some acquisition of private property. The acquisition will mostly be narrow strips of ROW for the fence and patrol roads. The construction, operation, and maintenance of tactical infrastructure is not anticipated to require the purchase of any residences by the Government.

Employment and Income. Minor short-term beneficial impacts on employment and income will be expected. Each job created by implementation of the Project will generate additional jobs within companies that supply goods and services for the project. Direct and secondary jobs created will be temporary and short-term in nature. The project will not create any long-term employment in the region.

Some primary pedestrian fence sections will be located on or near recreational lands and parks. Indirect socioeconomic impacts on ecotourism will occur if the impacts on wildlife populations or access restrictions are so severe that the resource will be irreparably impaired. The Old Hidalgo Pumphouse Nature Park and the Roma World Birding Center will be north of the impact corridor and access to these areas will not be impacted. The Sabal Palms Sanctuary will be south of the impact corridor and ecotourism will be adversely impacted due to restricted access. Access to the Bentsen-Rio Grande Valley State Park, the Santa Ana NWR and the International Butterfly Park will not be directly affected by the tactical infrastructure. Thus, impacts on ecotourism within the USBP Rio Grande Valley Sector, while long-term in nature, are likely to be minor and adverse depending on restrictions to access.

However, the Project will help to deter cross-border violators in the immediate area, which will make the area safer for recreational users, ecotourists, and USBP agents. Overall, the impacts on ecotourism are expected to be minor.

As for retail trade, research indicates cross-border trade is estimated to contribute at least $1.2 billion per year in retail trade in McAllen and Brownsville alone (Coronado and Phillips 2005). The Project will not affect the operations of established border crossings and bridges, nor alter procedures affecting the ability of individuals from either the United States or Mexico to continue to travel back and forth as they now do because there is nothing inherent in the design or location of the pedestrian fence sections that will hinder or restrict normal, legal cross-border interaction. As a consequence, no long-term effects on legitimate regional income or economic structure are anticipated.

No permanent or long-term effects on employment, population, personal income, or poverty levels; or other demographic or employment indicators are expected from construction. Since the Project will not measurably affect the local economy or workforce, no social effects are expected. There will be a net short-term increase in income to the region, as the funding for the project will come from outside the area, and, as a Federal project, construction workers will be paid the "prevailing wage" under the Davis-Bacon Act, which might be higher than the average wage in the construction industry locally (DOL undated).

***Agriculture*.** Overall the impact on agriculture, agricultural landowners, and other commercial establishments south of the impact corridor will be adverse, moderate, and long-term. The tactical infrastructure will impact agricultural lands in two ways. First, there will be some loss of cropland from the 60-foot-wide corridor for the construction and operation of tactical infrastructure. Second, although the Project includes gates at various locations to provide landowners access to their property, it is anticipated that longer travel distances and times will be required to reach a given field depending on the location of the controlled access gates. Installation of a pedestrian fence with gates could have moderate adverse effects on landowner's access, the movement of machinery and equipment, planting and harvesting, potential problems of access for agricultural service firms (as opposed to owners/lessees), and a resulting increase in costs and corresponding decrease in land value.

Select Public Services. Minor short-term and long-term beneficial impacts on public services are expected. Generally, workers spend approximately 25 to 30 percent of their wages locally for food, shelter, and entertainment, which will have an indirect beneficial impact on the local economy. Other indirect impacts will be noticed through the taxes generated by purchases, as well as payroll deductions. However, based on the large size of the ROI the impacts will be minor and dispersed throughout the ROI. The objective of the pedestrian fence is to reduce illegal activity along the border. This could ease the burden of local law enforcement agencies.

Private Property and Residential Ownership. The construction, operation, and maintenance of tactical infrastructure is not anticipated to require the purchase of any residences by the Government. Minor to moderate adverse impacts are expected from the acquisition of private property. Some non-residential structures such as sheds will be removed, and some residential and nonresidential properties will be visually impaired by the primary pedestrian fence and adjacent patrol roads. The social aspects of dislocation could be disruptive. Many families in the corridor have lived there for decades, some even centuries, and have strong emotional ties to the family land and homes. Established patterns of use and enjoyment could be adversely affected by noise and visual effects of the tactical infrastructure.

These impacts will be mitigated by fair compensation for the acquisition or impairment of properties. However, a major adverse impact will occur on those property owners that do not wish to sell their property regardless of the level of compensation.

Environmental Justice, Protection of Children, and Safety. As discussed in **Chapter 10.2**, including **Tables 10-3**, **10-6**, **10-10**, and **10-11**, the census tracts near the Project contain a high proportion of minority and low-income residents. Also as discussed in **Chapter 10.2**, no facilities that might produce an environmental hazard or stress on residents near the Project were identified. Only small automotive service stations were found within 0.5 miles of the Project. As discussed in **Chapter 2.3**, air emissions from the Project will be low and will have no adverse impacts on local or regional air quality. The Project will have no other emissions that might produce adverse human health and environmental effects. Therefore, there will be no disproportionate adverse impacts on minority and low-income residents.

Direct beneficial effects on safety and the protection of children are expected from the projected deterrence of cross-border violators, from entering the United States, and therefore provide for safer communities.

The tactical infrastructure adjacent to many rural settlements, small towns, and neighborhoods within larger cities. Property owners and residents will be affected by restricted access, visual intrusion, noise and disruption during construction, and, in some cases, compensated loss of property. In such communities as Los Ebanos (Section O-3), Granjeno (Section O-5), Peñitas (Section O-4), and others, the tactical infrastructure traverses residential properties. These communities, and the neighborhoods affected in the larger communities such as Brownsville (Section O-19) and Roma (Section O-1), are of lower income than the census tract of which they are a part and are clearly subject to issues of environmental justice. The Government will compensate property owners by paying a fair market value for property.

The project will have short- to long-term direct beneficial effects on children and safety in the ROI and surrounding areas. The addition of tactical infrastructure is expected to increase the safety of USBP agents in the UBSP Rio Grande Valley Sector by allowing them to work more efficiently in the pursuit of cross-border violators. The Project will help to deter cross-border violators from entering the surrounding area.

11. UTILITIES AND INFRASTRUCTURE

11.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts on utilities and infrastructure.

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. Below is a brief overview of each infrastructure component that could be affected by the project.

11.2 AFFECTED ENVIRONMENT

Water Supply Systems. The principal source of water for irrigation and municipal water in the impact corridor is the Rio Grande. Approximately 74,000 acres of agricultural lands are irrigated in the Rio Grande Valley (Fipps and Pope 1998). The irrigation system is characterized by approximately 642 miles of canals, 10 miles of pipelines, and 45 miles of resacas (i.e., former channels or oxbows of the Rio Grande) (Fipps and Pope 1998). Pumps and pumphouses are also part of the irrigation system.

Municipal water systems in the Rio Grande Valley take raw water from the water distribution networks of irrigation districts. In Hidalgo and Cameron counties, 39 municipal treatment plants take raw water from 14 irrigation districts. These municipal supply networks consist of 92 miles of lined canals, 168 miles of unlined canals, 25 miles of pipelines, 377 acres of resacas, and 3,845 acres of reservoirs (Fipps 2004). Known water supply infrastructure that occurs in the impact corridor is presented in **Table 11-1**.

Drainage Systems. Agricultural irrigation return and storm water runoff in the area of the impact corridor in Hidalgo and Cameron counties drain into the Arroyo Colorado and eventually into the Laguna Madre (TSSWCB undated). Irrigation and storm water runoff is collected in drainage ditches and resacas (USFWS 1991). Numerous agricultural and storm water drainages occur within the impact corridor. Known drainage infrastructure that occurs in the impact corridor is presented in **Table 11-1**.

Table 11-1. Known Water Supply, Drainage, and Sanitary Sewer Infrastructure Within the Impact Corridor

Tactical Infrastructure Section	Infrastructure
O-1	Roma intake pipes Roma sewer outfall pipes 1 private water pump
O-2	7 private water pumps
O-4	Peñitas pumphouse
O-6	Runs along Pharr San Juan Main Canal Old Hidalgo pumphouse intakes Mac Pump intakes McAllen pumphouse intakes
O-7	Runs along Donna Canal Pipelines
O-9	8 irrigation stand pipes Donna pump station 2 irrigation pumps Pipelines Section will end before the settling basin
O-11	Section will start at Santa Maria canal La Feria pumphouse La Feria Canal Irrigation pump and stand pipe Pipelines
O-12	Harlingen Canal
O-13	San Benito Canal
O-14	IBWC pump
O-16	Cameron County irrigation pump Private irrigation pumps
O-17	Irrigation stand pipes Irrigation pumps
O-18	Section will start at Los Fresnos Canal
O-19	Pumphouses Pumps
O-21	El Jardin Canal El Jardin water pump for Brownsville

Municipal Sanitary Sewer Systems. Some municipal sanitary sewer systems in the impact corridor discharge into the Rio Grande. Known municipal sanitary sewer infrastructure within the impact corridor includes outfall pipes (see **Table 11-1**).

Solid Waste Management. Solid waste management primarily relates to the availability of landfills to support a population's residential, commercial, and industrial needs. Alternative means of waste disposal might involve waste–to–energy programs or incineration. In some localities, landfills are designed specifically for, and limited to, disposal of construction and demolition debris. Recycling programs for various waste categories (e.g., glass, metals, papers, asphalt, and concrete) reduce reliance on landfills for disposal.

As of 2005, there were three active municipal landfills in Starr County, three active municipal landfills in Hidalgo County, and one active municipal landfill in Cameron County. The remaining capacity in terms of years for these landfills was determined in 2005, based on compaction rate and the amount disposed in 2005 (TCEQ 2006). The remaining capacity of these landfills as of 2005 is reported in **Table 11-2**.

Table 11-2. Remaining Capacity of Local Municipal Landfills as of 2005

Landfill Name	County	Remaining Capacity (Years)
City of Roma	Starr	30
City of La Grulla	Starr	109.67
Starr County Landfill	Starr	0.70
Edinburg Regional Sanitary Landfill	Hidalgo	21.70
Peñitas Landfill	Hidalgo	3.58
BFI Rio Grande Landfill	Hidalgo	5.30
Brownsville	Cameron	80.20

Source: TCEQ 2006

Note: Remaining capacity based on rate of compaction and amount disposed of in 2005.

Transportation Systems. The Texas Department of Transportation (TDOT), in cooperation with local and regional officials, is responsible for planning, designing, building, operating, and maintaining the state's transportation system. Highway systems in the vicinity of the impact corridor include SR 83, State Highway 374, U.S. Highway 281, State Highway 415, SR 77, State Highway 48, and State Highway 4. In addition, there are numerous municipal city roads, farm roads, county roads, levee roads, and unpaved roads.

Electrical and Natural Gas Systems. Electrical transmission lines and natural gas distribution lines that are part of the electrical and natural gas systems for the Rio Grande Valley are in the vicinity of the impact corridor. The tactical infrastructure sections in which utilities infrastructure occur are presented in **Table 11-3**.

Table 11-3. Location of Utility Infrastructure Located Within the Impact Corridor

Fence Section	Infrastructure
O-4	1 Electric Transmission Line; 1 Gas Distribution Line
O-6	1 Electric Transmission Line; 3 Gas Distribution Lines
O-8	1 Electric Transmission Line; 2 Gas Distribution Lines
O-18	1 Electric Transmission Line; Overhead Electrical Power Line

11.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Water Supply Systems. Short-term negligible adverse impacts on the Rio Grande Valley irrigation and municipal water supply systems are expected as a result of construction of the tactical infrastructure sections near irrigation and municipal water supply infrastructure. Irrigation districts have Rio Grande water rights, enforced through the TCEQ's Rio Grande Watermaster, and provide water not only to farmers, but to municipal customers as well. Known infrastructure is presented in **Table 11-1**. All water supply infrastructure will be identified prior to construction, and impacts on these systems will be avoided to the maximum extent practical. Canals will be avoided to the maximum extent practicable. Pipelines that could not be avoided will be moved. All changes to water supply system infrastructure will be coordinated with the TCEQ and irrigation districts, to ensure that cities and water supply corporations continue to provide water to their customers

Drainage Systems. Short-term negligible adverse impacts on Rio Grande Valley irrigation and storm water drainage systems will be expected. Known infrastructure is presented in **Table 11-1**. All drainages will be identified prior to construction and impacts on these systems will be avoided to the maximum extent practical. Adherence to proper engineering practices and applicable codes and ordinances will reduce storm water runoff-related impacts to a level of insignificance. In addition, erosion and sedimentation controls will be in place during construction to reduce and control siltation or erosion impacts on areas outside of the construction site. For example, SWPPPs will be required and will contain sediment and erosion control BMPs. All relevant Federal, state, and local regulations will be used as guidelines in developing SWPPP BMPs. All storm water drainages will be identified prior to construction and impacts on these systems will be minimal.

Municipal Sanitary Sewer Systems. Short-term minor adverse impacts on municipal sanitary systems are expected. Known infrastructure that could be impacted is presented in **Table 11-1**. All sanitary sewer infrastructure will be identified prior to construction and impacts on these systems will be avoided to the maximum extent practical. Any outfall pipes that will be affected by the construction will be moved. No long-term impacts are expected.

Solid Waste Management. Short-term minor adverse impacts on solid waste management are expected. Solid waste generated from the construction activities consists of building materials such as concrete and metals (conduit and piping). The contractor will recycle construction materials to the greatest extent practical. Nonrecyclable construction debris will be taken to one or more of the Starr, Hidalgo, or Cameron county landfills permitted to take this type of waste. While some of the landfills in the Rio Grande Valley area might be at or near capacity, the remaining landfills have sufficient capacity. Solid waste associated with the Project is expected to be negligible compared to the solid waste currently generated in Starr, Hidalgo, and Cameron counties, and will not exceed the capacity of any landfill.

Transportation Systems. No adverse impacts on transportation systems are expected. The construction will require delivery of materials to, and removal of debris from, the construction sites. Construction traffic will compose a small percentage of the total existing traffic and many of the vehicles will be driven to and kept onsite for the duration of construction activities, resulting in relatively few additional trips. Furthermore, potential increases in traffic volume associated with construction activities will be temporary. Heavy vehicles are frequently driven on local transportation systems. Therefore, the vehicles necessary for construction are not expected to have a heavy impact on local transportation systems. No road or lane closures are anticipated. However, if roadways or lanes are required to be closed, USBP will coordinate with TxDOT and local municipalities.

Electrical and Natural Gas Systems. Short-term, minor, adverse impacts on the Rio Grande Valley electrical and natural gas systems are expected. All electrical and natural gas infrastructure will be identified prior to construction and impacts on these systems will be avoided to the maximum extent practical. Any electrical transmission or natural gas distribution lines impacted by construction will be moved. Temporary interruptions in electrical power transmission and natural gas distribution could be experienced when this infrastructure is moved. No long-term impacts will be expected.

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12. HAZARDOUS MATERIALS AND WASTE

12.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), the Toxic Substances Control Act (TSCA), and the Superfund Amendments and Reauthorization Act (SARA) Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with CERCLA, RCRA, TSCA, and SARA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for hazardous materials and wastes.

In general, hazardous materials, hazardous substances, and hazardous wastes include elements, compounds, mixtures, solutions, and substances which, when released into the environment or otherwise improperly managed, could present substantial danger to the public health, welfare, or the environment.

Evaluation of hazardous materials and wastes focuses on underground storage tanks (USTs); aboveground storage tanks (ASTs); and the storage, transport, handling, and use of pesticides, herbicides, fuels, solvents, oils, lubricants, asbestos containing material (ACM), and lead-based paint (LBP). Evaluation might also extend to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project area. In addition to being a threat to humans, the improper release of hazardous materials and wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of hazardous materials or wastes, the extent of contamination varies based on the type of soil, topography, and water resources.

12.2 AFFECTED ENVIRONMENT

As discussed in **Chapter 4**, the area surrounding the impact corridor is predominantly used for agriculture. Therefore, pesticides and herbicides are currently used. It is assumed that all such substances are applied according to Federal, state, and local standards and regulations. There are no known waste storage or disposal sites within the impact corridor (DTSC 2007). ASTs have been observed in Section O-2. There are also private buildings within the impact corridor. Depending on the construction date, these buildings could contain ACM or LBP. A Phase I Environmental Site Assessment will be conducted in conjunction with any real estate transactions to determine and quantify amounts of ACM or LBP.

12.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short-term negligible adverse impacts will be expected. Products containing hazardous materials (e.g., fuels, oils, lubricants, pesticides, and herbicides) will be procured and used during construction. It is anticipated that the quantity of products containing hazardous materials used will be minimal and their use will be of short duration. Herbicides may be used along the fence to control herbaceous vegetation. Commercially available products whose mode of action is through translocation in plant tissue and that are neutralized on contact with soil will be utilized. Such products are effective without residual impact. Therefore, no long-term impacts on humans, wildlife, soils, or water are expected.

Accidental spills could occur during construction. Spills could result from such activities as refueling of heavy equipment, loss of hydraulic oil through ruptured or leaking hoses, and possible gasoline or diesel fuel spills resulting from the unlikely event of a ruptured fuel tank. A spill could potentially result in adverse impacts on wildlife, soils, water, and vegetation. However, only small amounts of hazardous materials are expected. Contractors will be responsible for the management of hazardous materials and wastes. CBP will also require that the contractor keep any necessary materials and equipment onsite to quickly contain any spill or leak. The management of hazardous materials and wastes will include the use of BMPs and adherence to a pollution prevention plan, an SPCC Plan, and a storm water management plan. CBP will require the construction contractor to manage all hazardous materials and wastes in accordance with applicable Federal, state, and local regulations.

ASTs have been observed within the impact corridor. A Phase I Environmental Site Assessment will be conducted in conjunction with any real estate transactions associated with the Project. If ACM and LBP are identified in buildings that need to be removed, removal and disposal will be conducted in accordance with all applicable Federal, state, and local regulations. Therefore, no impacts on humans, wildlife, soils, water, and vegetation are expected as a result of hazardous materials and wastes. Additionally, the Project will not have an impact on Federal, state, or local hazardous wastes management or pollution prevention programs.

13. RELATED PROJECTS AND POTENTIAL EFFECTS

The following analysis summarizes expected environmental effects from the Project when added to other past, current, and reasonably foreseeable future actions. The geographic scope of the analysis varies by resource area. For example, the geographic scope of cumulative impacts on resources such as noise, visual resources, soils, and vegetation is very narrow and focused on the location of the resource. The geographic scope of air quality, wildlife and sensitive species, and socioeconomics is much broader and considers more county- or region-wide activities. Projects that were considered for this analysis were identified by reviewing USBP documents, news releases, and published media reports, and through consultation with planning and engineering departments of local governments, and state and Federal agencies. Projects that do not occur in close proximity (i.e., within several miles) of the fence will not contribute to a cumulative impact and are generally not evaluated further.

Cumulative Fencing, Southern Border. There are currently 62 miles of landing mat fence at various locations along the U.S./Mexico international border (CRS 2006); 14 miles of single, double, and triple fence in San Diego, California; 70 miles of new pedestrian fence constructed at various locations along the U.S./Mexico international border; and fences at POE facilities throughout the southern border. In addition, 225 miles of fence are planned (including the 70 miles in the USBP Rio Grande Valley Sector). New fence sections are also being studied for other areas of Texas, New Mexico, Arizona, and California.

Past Actions**.** Past actions are those that have occurred prior to the development of this ESP. Past actions have shaped the current environmental conditions; therefore, the impacts of these past actions are generally included in the affected environment described in the individual resource chapters. For example, most of the tactical infrastructure will follow the IBWC levee ROW or existing USBP patrol roads in the southernmost portions of Starr, Hidalgo, and Cameron counties in Texas. Consequently, some of the fence sections will be on private lands and cross multiple land use types, including rural, urban, suburban, and agriculture that have undergone changes as the result of commercial and residential development. These past actions are now part of the existing environment. Some recent past actions of note are as follows:

- USBP Operation Rio Grande. This operation was recently implemented on the border to increase operational control of the border along the Rio Grande corridor of the USBP McAllen Sector (renamed the Rio Grande Valley Sector), which includes USBP Rio Grande City, McAllen, Mercedes, Harlingen, Brownsville, and Port Isabel stations. USBP Operation Rio Grande included installation of lighting (permanent and portable), road improvement, fencing (5.4 miles of chain-link fencing near POEs in parts of Brownsville and Port Isabel stations), boat ramps, and maintenance mowing (DHS 2004).

- Private Residential Developments. For the past several years the Rio Grande Valley has experienced high demand for single-family homes. One example of a private residential development near the U.S./Mexico international border and the Rio Grande is Sharyland Plantation, a 6,000–acre master-planned multi-use community started in 1998 in Mission, Texas, near Fence Section O-5. A former citrus plantation, Sharyland Plantation is currently a residential, industrial, and commercial development of more than 1,400 newly constructed homes in 19 neighborhoods ranging in price from $160,000 to more than a $1 million (Sharyland 2007). South of Sharyland Plantation is the community of Granjeno.

***Present Actions*.** Present actions include current or funded construction projects, USBP or other agency operations in close proximity to the tactical infrastructure, and current resource management programs and land use activities within the affected areas. The following ongoing actions are considered in the cumulative impacts analysis:

- Anzalduas POE. The Anzalduas POE is currently under construction in the Granjeno/Mission area. This POE is adjacent to a NWR parcel west of Granjeno and will become an extension of Stuart Road, which intersects farm to market (FM) 494. When completed, Anzalduas POE will contain elevated north- and southbound lanes. This bridge will provide access across two levees and a floodway just below Anzalduas Dam and Anzalduas County Park. Fence Section O-5 will intersect this new roadway by crossing underneath the new Anzalduas POE bridge.
- University of Texas at Brownsville and Texas Southmost College Bond Program Projects. In November 2004, the City of Brownsville approved a $68 million bond package that will provide facilities necessary for growing enrollment. The bond is providing the financial resources to build seven projects.
- Texas Department of Transportation. TxDOT has several ongoing road improvement projects scheduled for Cameron, Hidalgo, and Starr counties. However, the area of impacts will likely be minor, as the majority of the construction will be within existing ROWs. Projects include the widening of SR 83 in Mercedes to a six-lane expressway with a median concrete barrier, and construction of bridges over the floodway and Mercedes Main Canal. The SR 83 Weslaco Project consists of reconstructing the expressway to six lanes from FM 1423 to FM 1015 and the construction of new overpasses.
- Road Construction San Benito. Construction for North Sam Houston Boulevard (FM 345) will expand and overlay the road, at a cost of $7.7 million. Completion is expected in 2009.

***Reasonably Foreseeable Future Actions*.** Reasonably foreseeable future actions consist of activities that have been proposed or approved and can be evaluated with respect to their effects. The following are reasonably foreseeable future actions that are related to securing the U.S./Mexico international border:

- Secure Border Initiative (SBI). The SBI is a comprehensive multi-year plan established by the DHS to secure America's borders and reduce illegal immigration. DHS's comprehensive plan to gain effective control of our Nation's borders includes substantial investments in technology, infrastructure, and enforcement personnel. SBI supports CBP frontline agents and officers by deploying an optimal, integrated solution that develops, installs, and integrates technology and tactical infrastructure solutions. Examples of planned tactical infrastructure could consist of, but not limited to, roads, pedestrian and vehicle fence, and lights .
- Future Pedestrian Fence. Secretary Chertoff has committed that CBP will have constructed 370 miles of pedestrian fence along the southwest border by the end of CY 2008. By the end of FY 2007, CBP had more than 145 miles of pedestrian fencing completed along the southwest border. Construction will occur in two phases. The first phase of construction occured in areas that have already been developed (e.g., currently contains permanent vehicle barriers or temporary vehicle barriers) where required environmental studies and consultation with appropriate regulatory agencies were already underway. The second phase of construction will occur in other areas, generally not already studied, and will include all necessary surveys, studies, and consultation with regulatory agencies.
- Temporary or Permanent Lighting. USBP frequently uses temporary (portable) or permanent lighting in conjunction with fences and patrol roads in urban areas near POEs. Lighting acts as a deterrent to cross-border violators and as an aid to USBP agents. Lighting locations are determined by USBP agents based on projected operational needs of the specific area. While specific future operational requirements are not currently known and are not reasonably certain to occur, areas that might be suitable for lighting can be identified for the purposes of the cumulative effects analysis. Approximately 450 lights could be required at fence Section O-1 adjacent to the Roma POE, Section O-2 adjacent to the Rio Grande City POE, Section O-3 adjacent to the Los Ebanos Ferry POE, Section O-6 adjacent to the Hidalgo POE, Sections O-9 and O-10 adjacent to the Progreso POE, Section O-10 adjacent to the Pharr POE, Sections O-13 and O-14 adjacent to the Los Indios Bridge POE, Section O-19 adjacent to the Brownsville/Matamoros POE, Section O-19 adjacent to the Gateway POE, and Sections O-20 and O-21 adjacent to the Veterans POE. Standard design for temporary or permanent lights is further discussed in **Appendix B**.

- USIBWC Levee Improvements. The USIBWC has proposed several flood control projects affecting levees within the Lower Rio Grande Valley. These projects include raising the 4.5-mile Hidalgo Protective Levee System (USIBWC 2005a), raising approximately 76 miles of the main and north floodway levee systems (USIBWC 2007a), and alternative vegetation maintenance activities in Hidalgo, Cameron, and Willacy counties, Texas (USIBWC 2003). In addition, the USIBWC published a draft Programmatic EIS (PEIS) in July 2007 on improvements to the USIBWC Rio Grande flood control projects along the Texas-Mexico border (USIBWC 2007a). That PEIS evaluates alternatives to future improvement projects which could be undertaken over the next 20 years. These alternatives are (1) an Enhanced Operation and Maintenance (EOM) Alternative, (2) and Integrated Water Resources Management (IWR) Alternative, and (3) a Multipurpose Project Management (MPM) Alternative.

Table 13-1 presents the reasonably foreseeable future actions by section of tactical infrastructure.

Cumulative Analysis by Resource Area. This section presents the resource-specific impacts related to the past, present, and reasonably foreseeable actions discussed above. Only those actions that are additive to the potential impacts associated with the Project are considered. **Table 13-2** presents the cumulative impacts by resource area that might occur from implementation of the Project when combined with other past, present, and future activities that are discussed in more detail below.

13.1 AIR QUALITY

Minor, short-term, adverse cumulative impacts on air quality are expected from the construction of tactical infrastructure in combination with other reasonably foreseeable future actions. As discussed in **Chapter 2**, construction equipment will temporarily increase fugitive dust and operation emissions from combustion fuel sources. Since there will be no substantive change in USBP operations, emissions from vehicles will remain constant and there will be no cumulative impact on air quality.

13.2 NOISE

Minor cumulative impacts on ambient noise are expected from the additive impacts of construction, operation, and maintenance of tactical infrastructure and anticipated residential and commercial development activities and infrastructure improvement projects that routinely occur throughout the project area. Noise intensity and duration from construction, maintenance, and operation of tactical infrastructure will be similar to construction activities from residential or commercial development, or road construction and maintenance. Because noise

Table 13-1. Reasonably Foreseeable Future Actions by Tactical Infrastructure Sections for the USBP Rio Grande Valley Sector

Tactical Infrastructure Section Number	Border Patrol Station	Description of Future Action
O-3	McAllen	Plans are likely to be developed sometime in 2008 for a new POE facility. This plan is only for the POE facility itself. There are no plans to construct a bridge. The plan involves keeping the ferry operational.
O-4	McAllen	Proposed levee upgrades. According to a recently released document from IBWC, the design phase of this project is scheduled through February 2008. Construction is scheduled from March 2008 through September 2009. Work will be completed by Hidalgo County Drainage District No. 1.
O-5	McAllen	Proposed levee upgrades. Preliminary plans indicate the IBWC will rehabilitate the south floodway levee from the Anzalduas Dam area to the Hidalgo area. Construction is projected to occur from March 2008 through September 2009. Work will be completed by Hidalgo County Drainage District No. 1.
O-6	McAllen	(1) According to the Chairman of the Hidalgo County Water District No. 3, there are plans to build a reservoir just northeast of the McAllen Pump on land currently owned by the district. The plans are to integrate the reservoir into the upgraded levee in this area. Exact timeframes for this project are unknown. (2) IBWC, in conjunction with the City of Hidalgo, is planning on relocating the current levee southward toward the river in the area just east of the Hidalgo POE. These plans have recently become available and indicate the rerouting of the levee from an area near or under the Hidalgo POE Bridge to a point near the Old Hidalgo Pumphouse. The length of this relocation project is approximately 0.65 miles. (3) Additional levee rehabilitation. Construction for Phase 1 of the levee rehabilitation is anticipated to begin in April 2008 from the Common Levee (south floodway levee) to the Hidalgo POE. Construction for Phase 2 is anticipated to commence during December 2008. Phase 2 begins at the Hidalgo POE and runs downriver for approximately 1.5 miles along the levee to the 2nd street canal. Construction for the levee in the Hidalgo area will be performed by IBWC.
O-8	Weslaco	The Donna POE facility will be south of FM 493. Construction is to start in early November 2008.

Tactical Infrastructure Section Number	Border Patrol Station	Description of Future Action
O-14	Harlingen	A 40-acre parcel is proposed by TxDOT for construction of a state-of-the-art Department of Public Safety inspection station for commercial truck traffic.
O-15	Harlingen	In La Paloma near FM 732 TxDOT will begin construction within the next few years of the expansion of U.S. 281 from La Paloma to Brownsville. The highway will be expanded to a four-lane highway to accommodate international commercial truck traffic. Dates of construction are not known.
O-16	Harlingen	Construction of a residential subdivision is proposed adjacent to the impact corridor in El Ranchito, Texas. Dates of construction are unknown at this time.
O-17	Brownsville	(1) The Brownsville/Matamoros railroad bridge (Union Pacific) is being relocated just west of River Bend Resort within the next 2 years. (2) ANCLA Design and Construction is considering subdividing land and developing a new neighborhood in the project area. (3) Expansion of US 281 to five lanes. Stakes in the field indicate an expansion of the hardtop of about 21–30 feet. (4) USBP is proposing to improve the Russell/Barreda Canal, frequently used by smugglers and aliens to hide. USBP proposes to have it buried (install a pipe underground rather than open canal).
O-18	Brownsville	(1) Expansion of US 281 from Pharr, Texas, to FM 3248 Alton Gloor. This will be a five-lane highway. (2) New proposed commercial POE Bridge west of City of Brownsville Public Utilities Board Water Treatment Plant. (3) USFWS and the City of Brownsville are proposing and planning a Nature Trail Park in this area.
O-19	Brownsville	(1) A residential subdivision is currently under construction adjacent to the levee/fence area. (2) Brownsville waterfront redevelopment project near Hope Park, on private property. No additional information about this proposal is available at this time.

Tactical Infrastructure Section Number	Border Patrol Station	Description of Future Action
O-21	Fort Brown	(1) Proposed East Loop, Phase II Project, will begin at US 77/83 and end at FM 1419. The project is a part of the Trans Texas Corridor I-69 that will link the Rio Grande Valley to Denison, Texas. It is slated for construction in 2010 and is being funded by the City of Brownsville and the TxDOT. The levee will be redirected and will be placed further south of its current location. The existing levee will become a four-lane highway which will be used to redirect commercial traffic around Brownsville. The City of Brownsville is in the process of finalizing negotiations to purchase land from private landowners in the area. The city has already acquired a majority of the land with the exception of four land parcels. (2) The Mayor of Brownsville and the Brownsville Public Utility Board (PUB) are proposing the construction of a weir and reservoir approximately 6 miles downriver of the Gateway International Bridge. The weir proposal will impound a water reservoir approximately 42 river-miles long, extending from river-mile 48 to river-mile 90. The reservoir will be within the existing riverbanks and inside the levees that parallel the banks of the river. The USACE has prepared an Environmental Assessment, concluding that the proposal will have no significant impact on the quality of the human environment. The project will impact approximately 65 acres of jurisdictional riverine habitat and wetlands on the U.S. side of the Rio Grande, and 65 acres on the Mexico side of the Rio Grande. The proponent proposes to mitigate this loss through the creation or enhancement of 130 acres of wetlands downstream of the project area. The proponent also proposes to mitigate any impacts by purchasing and protecting a 280-acre tract of land that will form a corridor between the Laguna Atascosa NWR and the Boca Chica NWR that will allow wildlife to travel between the two refuges (BPUB 2004).

Table 13-2. Summary of Potential Cumulative Effects

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Air Quality	Attainment criteria for all criteria pollutants.	Emissions from vehicles and agricultural areas.	Fugitive dust and combustion emissions generation during construction.	Fugitive dust and increased equipment operation during construction.	Continued attainment.
Noise	None.	Current background noise from development.	Short-term noise from construction equipment and increased traffic.	Short-term noise from construction equipment and increased traffic.	Short-term adverse impacts from construction equipment and increased traffic.
Land Use	Agricultural lands impacted by development.	Development of open and agricultural lands.	USBP purchase of land or easements to construct tactical infrastructure. Natural areas developed for tactical infrastructure.	Residential and commercial development permanently alters natural areas and agricultural lands.	Moderate adverse impacts on recreational and agricultural lands.
Geology and Soils	Installation of pipelines and other features.	Installation of pipelines and other features.	Installation of fence posts and other structures.	Installation of pipelines, fencing, and other infrastructure.	Minor long-term impact from additional infrastructure.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Water Resources					
Hydrology and Groundwater	Degradation of aquifers to historical pollution.	Continued degradation of aquifers from pollution.	None.	Minor to moderate short- and long-term impacts.	Minor to moderate short- and long-term impacts.
Surface Waters and Waters of the United States	Point and nonpoint discharges including wastewater treatment effluent, agricultural runoff, and storm water have impacted water quality. Removal of wetland vegetation and fill of waters of the United States, including wetlands.	Point and nonpoint discharges including wastewater treatment effluent, agricultural runoff, and storm water have impacted water quality.	Construction erosion and sediment runoff, potential oil spills and leaks. Removal of wetland vegetation and fill of waters of the United States, including wetlands, and temporary degradation of water quality.	Construction erosion and sediment runoff, potential oil spills and leaks. Removal of wetland vegetation and fill of waters of the United States, including wetlands, and temporary degradation of water quality.	Moderate short-term impacts from construction activities, including removal of wetland vegetation and fill of waters of the United States, and temporary degradation of water quality. Minor long-term erosion impacts from infrastructure.
Floodplains	Permanently altered by development and safety features such as levees and dams.	None.	Adverse impacts in Sections O-1 through O-3. No other impacts.	None.	Adverse impacts in Sections O-1 through O-3. No other impacts.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Biological Resources					
Vegetation	Degraded historic habitat of sensitive and common wildlife species.	Continued urbanization results in loss of native species.	Minor to moderate loss of native species and habitat.	Minor to moderate loss of native species and habitat.	Moderate adverse impacts on native habitats and vegetation.
Wildlife and Aquatic Resources	Urbanization and loss of green corridors impacted habitat and food sources.	Minor to moderate loss of green corridor for wildlife.	Minor to moderate loss of green corridor and water access for wildlife.	Loss of green corridor for wildlife.	Moderate loss of green corridor and water access for wildlife.
Special Status Species	Degraded water quality and urbanization impacted sensitive species.	Urbanization and agricultural development degraded habitat for sensitive species.	Minor to moderate loss of green corridor and water access for wildlife.	Loss of habitat for sensitive species and water quality degradation.	Current and future activities will continue to delete green corridor and water access for wildlife.
Cultural Resources	Development and infrastructure improvements adversely affected cultural resources; some preservation such as Old Hidalgo Pumphouse and in Roma Historic District.	Development and infrastructure improvements to be adversely affected by cultural resources; some preservation.	Moderate to major long-term adverse impacts on cultural resources.	Continued development and infrastructure improvements to adversely affect cultural resources; continued preservation efforts.	Moderate to major long-term adverse impacts on cultural resources.

Resource	Past Actions	Current Background Activities	Project Impacts	Known Future Actions	Cumulative Effects
Aesthetic and Visual Resources	Historical development of undeveloped lands.	Development of natural areas for community and industry infrastructure.	Constant static visual interruption at fixed points. Loss of recreational area.	Constant static visual interruption at fixed points.	Minor to moderate long-term impacts from permanent infrastructure.
Socioeconomic Resources, Environmental Justice, and Safety	Urban development throughout counties.	Strong local economy and high land values.	Minor to moderate short-term and long-term beneficial impacts on local construction.	Continued strong local economy, high land values, and expansion in counties.	Minor stimulation of local economies from construction activities. Minor adverse impact on environmental justice or protection of children or human health and safety.
Utilities and Infrastructure	Historical development and maintenance of utilities, infrastructure, and roadways in area.	Utilities, infrastructure, and roadways have been upgraded as necessary.	Minor to moderate short-term adverse impacts on local utilities, infrastructure, and roadways during construction.	Continued development and maintenance of utilities, infrastructure, and roadways in area.	None.
Hazardous Materials and Wastes	Use of hazardous substances in vehicles. Possible illegal dumping.	Use of hazardous substances in vehicles. Possible illegal dumping.	Minor use of hazardous materials during construction.	Minor use of hazardous materials during construction.	None.

attenuates over distance, a gradual decrease in noise levels occurs the further a receptor is away from the source of noise. Construction, operation, and maintenance of tactical infrastructure will be distant from other substantial noise-generating activities except in suburban and urban areas. Increased noise from construction of tactical infrastructure could combine with existing noise sources or other construction activities to produce a temporary cumulative impact on sensitive noise receptors. Construction noise will not be louder, but might be heard over a greater distance or over a longer time period.

13.3 LAND USE

Construction of tactical infrastructure will result in minor changes to land use. Recent activities that have most affected land use near the tactical infrastructure are increased commercial and residential development of agricultural and open lands. Moderate cumulative impacts on land use are expected from the additive effects of the past, present, and reasonably foreseeable future actions, but changes in local land use will continue to be dominated by development. For example, the conversion of 508 acres to support tactical infrastructure is minimal when compared to multiple large developments such as Sharyland Plantation, which converted 6,000 acres of agricultural land to residential and commercial use (Sharyland 2007). Recreational lands, residential areas, and agricultural lands will be displaced by the Project. Future development of residential areas will further alter the current land use.

13.4 GEOLOGY AND SOILS

Additive effects include minor changes in topography due to grading, contouring, and trenching; minor soil disturbance; a minor increase in erosion; and a loss of prime farmland. Construction of the tactical infrastructure will not be in close proximity to residential and commercial development and will not interact to cumulatively affect geological resources, including soils. However, each present or reasonably foreseeable future action identified has the potential for temporary erosion from construction activities.

13.5 WATER RESOURCES

Hydrology and Groundwater. Moderate impacts on hydrology and groundwater will occur from the construction of tactical infrastructure when combined with other past, present, and reasonably foreseeable future actions due to increased erosion and stream sedimentation.

Surface Water and Waters of the United States. Moderate impacts on surface water and waters of the United States could occur from increased erosion and stream sedimentation. Disturbance from construction and operation of the tactical infrastructure along with residential and commercial development have the potential for additional erosion and stream sedimentation and adverse cumulative effects. Past actions, including historic and current fishing, vessel traffic, sewage, agricultural runoff, and industrial discharges have generally degraded the quality of water in the lower Rio Grande and have resulted in long-term direct moderate impacts on water quality.

Wetland losses in the United States have resulted from draining, dredging, filling, leveling, and flooding for urban, agricultural, and residential development. An estimated 4.1 million acres of wetlands existed on the Texas coast in the mid–1950s. By the early 1990s, wetlands had decreased to less than 3.9 million acres including 3.3 million acres of freshwater wetlands and 567,000 acres of saltwater wetlands. About 1.7 million acres (52 percent) of the 3.3 million acres of freshwater wetlands were classified as farmed wetlands. The total net loss of wetlands for the region was approximately 210,600 acres, making the average annual net loss of wetlands about 5,700 acres. The greatest losses were of freshwater emergent and forested wetlands (USFWS 1997). Impacts on wetlands will be avoided to the maximum extent practicable. Approximately 8 acres of wetlands will be impacted by construction of the tactical infrastructure. The cumulative impacts on wetlands will be long-term and adverse.

Floodplains. Floodplain resources can be adversely impacted by development, increases in impervious areas, loss of vegetation, changes in hydrology, and soil compaction. Construction, operation, and maintenance of tactical infrastructure has the potential for negligible to minor impacts on floodplains from further loss of vegetation, soil compaction on access roads and patrol roads, and the placement of structures in the floodplains. Floodplains were previously impacted by the construction of the levee system that controls the flow of water over low-lying areas. When added to other past, present, and reasonably foreseeable future actions, impacts from the new tactical infrastructure will be minor due to the relatively small impact within floodplains.

13.6 VEGETATION

Moderate impacts on native species vegetation and habitat are expected from the additive effects of past, present and reasonably foreseeable future actions. Urbanization of the area has directly reduced habitat for sensitive flora species. Indirect impacts from urbanization include changes in floodways, water quality, and the introduction of nonnative species.

Development of land for urban use will continue at an unknown pace resulting in loss of farmland and of wildlife habitat. Construction of new POEs and other border facilities will contribute to this development issue. Conversion of native upland thornscrub to grazing land by using root-plowing and other methods will continue at an unknown pace. One such tract of land was observed. Purchase of land for management as wildlife habitat and for preservation will continue. Lands already purchased are undergoing restoration at various levels of success and some of these are being affected by fence construction. Water rights issues could become important and affect agricultural and urban acreages and planning efforts.

13.7 WILDLIFE AND AQUATIC RESOURCES

Minor to moderate impacts on wildlife and species are expected from the additive effects of the past, present, and reasonably foreseeable future actions. Urbanization of the area has effectively reduced green corridor and water access for wildlife. Cumulative impacts will mainly result from loss of habitat as described in **Chapter 7.2**, habitat disturbance and degradation, construction traffic, and permanent loss of green corridors. Displaced wildlife will move to adjacent habitat if sufficient habitat exists. Since the Rio Grande Valley has experienced substantial residential and commercial development, and such development is projected to continue, the amount of potentially suitable habitat could continue to decrease, producing a long-term, minor to major adverse cumulative effect. Wildlife could also be adversely impacted by noise during construction, operational lighting, and loss of potential prey species. Species will also be impacted by equipment spills and leaks.

13.8 SPECIAL STATUS SPECIES

Potential effects of fence construction, operation, and maintenance of tactical infrastructure on special status species are analyzed in the Biological Resources Plan in **Appendix E**. Potential direct and indirect impacts on federally listed species are based on currently available data.

Special status species are commonly protected because their historic range and habitat has been reduced and will only support a small number of individuals. Construction, operation, and maintenance of tactical infrastructure, when combined with past, present, and future residential and commercial development has the potential to result in minor to major adverse cumulative impacts on these species. Potential threats to federally listed species within the impact corridor include trampling (for plants), habitat conversion, and noise.

Approximately 508 acres of vegetation will be cleared along the impact corridor. The impact corridor approaches known locations of individuals of Texas ayenia, Walker's manioc, and Zapata bladderpod. Implementation of the Project has the potential for short-term major adverse impacts on these species due to trampling or mortality during fence construction. The impact corridor will cut across the lower portions of Los Velas and Los Velas West annexes of the LRGVNWR (Section O-2), it will entirely avoid the potentially more species-rich Arroyo Ramirez unit (Section O-1), the Culebron Banco unit (Section O-13), and the Tahuachal Banco unit (Section O-16). In addition, the impact corridor borders instead of intersects the southern boundary of the Phillips Banco unit of the LRGVNWR. The fence alignment was selected to avoid several known locations of Zapata bladderpod and Walker's manioc. Cumulative impacts on federally listed plants are anticipated to be short-term, moderate, and adverse.

The loss of approximately 125 acres of disturbed thornscrub shrubland and woodland habitat, predominantly honey mesquite and retama, and of approximately 50 acres of disturbed floodplain shrubland, woodland, and forest habitat, predominantly honey mesquite and sugarberry and to a lesser extent sabal palm, represents a loss of approximately 150 acres of potential ocelot and jaguarundi habitat. The long-term, cumulative adverse impact from the loss of potential habitat for these species will be moderate to major.

Habitat loss of state-listed species in Sections O-1, O-2, O-8, and O-10 (i.e., Mexican treefrog, Mexican burrowing toad, Texas horned lizard, and white–lipped lizard) will affect a small area and will be a minor, adverse cumulative effect on these species. BMPs to avoid and minimize impacts, such as pre-construction clearance surveys, will reduce potential adverse impacts.

Cumulative, adverse impacts on migratory birds could be substantial due to the potential timing of fence construction. Implementation of BMPs presented in **Appendix E** could reduce their intensity. However, past loss of habitat combined with potential construction has the potential for long-term, major, adverse cumulative impacts.

13.9 CULTURAL RESOURCES

Moderate to major adverse, long-term impacts on cultural resources are expected from the additive effects of past, present, and reasonably foreseeable future actions. Past, current, and future commercial and residential development, improvements to infrastructure such as highway and irrigation projects, and the clearing of land for agriculture have had an impact on cultural resources and can be expected to continue to do so. At the same time, some past and present efforts have resulted in the preservation of some historic properties such as the Old Hidalgo Pumphouse and some properties in the Roma Historic District. Similar preservation efforts can be expected to continue. Cumulative effects on historic properties are expected to be moderate to major, adverse, and long-term.

Consultation with Commanche Nation and Kiowa Tribe of Oklahoma will ensure that properties of religious and cultural significance to the tribes are addressed. Known historic properties will also be affected.

Impacts on cultural resources will be avoided, minimized, or mitigated through careful planning, siting, and design of the tactical infrastructure and development of special measures. For example, by locating Section O-1 below the bluff, impacts on the Roma Historic District will be substantially reduced. In other cases, special designs could be developed to reduce effects on historic properties. The integrity of areas that might have significant archaeological resources and be potentially affected by the infrastructure will be studied, such as Fort Ringgold, Fort Brown, and Roma Historic District. Additional archaeological resources are expected to be identified.

13.10 AESTHETICS AND VISUAL RESOURCES

Minor to moderate impacts on aesthetics and visual resources are expected from the cumulative effects of past, present, and reasonably foreseeable future actions. The presence of the Project's construction equipment will produce a short-term adverse impact on visual resources. Once installed, the fence will create a permanent and fixed visual interruption at fixed points. Adverse cumulative effects could include temporary construction impacts and the introduction of light poles and increased night illumination during construction. Other planned commercial and residential developments could introduce night illumination into previously open or agricultural lands. Recreational activities such as star-gazing could be adversely affected by this cumulative impact in night illumination depending on where the viewer is located.

13.11 SOCIOECONOMIC RESOURCES AND SAFETY

Short-term beneficial impacts on local and regional socioeconomic resources are expected from the additive effects of past, present, and reasonably foreseeable future actions. Economic benefits will be realized by construction companies; their employers and suppliers; and by Cameron, Hidalgo, and Starr counties through a minor increase in tax receipts for the purchase of goods and services. Construction of tactical infrastructure has the potential for minor beneficial effects from temporary increases in construction jobs and the purchase of goods and services in Cameron, Hidalgo, and Starr counties. Approximately 25,000 workers are employed in the construction industry in the three counties. An increase of 200 construction jobs will represent only about 1 percent of total construction jobs, so the cumulative effect will be minimal. Since the construction jobs will be temporary, negligible cumulative effects on population growth, income, or other services are expected.

The Rio Grande Valley has experienced growth including residential and commercial development. The conversion of 508 acres to support tactical infrastructure is a minimal cumulative impact compared to other development. For example, a single development, Sharyland Plantation, converted 6,000 acres of agricultural land to residential and commercial development.

Some residents might be adversely impacted by the construction and Government purchase of their property. The potential exists that some residents might have been impacted by a previous USBP action to install lights or patrol roads under Operation Rio Grande. Although no residents have been identified as being impacted this way, this might be an adverse cumulative effect.

The cumulative impacts of USBP activities to reduce the flow of illegal drugs, terrorists, and terrorist weapons into the United States and the concomitant effects upon the Nation's health and economy, drug-related crimes, community cohesion, property values, and traditional family values will be long-term and beneficial, both nationally and locally. Residents of the border towns will benefit from increased security, a reduction in illegal cross-border activity and the number of violent crimes, less damage to and loss of personal property, and less financial burden for entitlement programs. This will be accompanied by the concomitant benefits of reduced enforcement and insurance costs. In addition residents of the United States will benefit from increased security and a lessened potential for entry of terrorists and possible terrorist attacks in the United States. Operation and maintenance of the tactical infrastructure has little potential for cumulative impacts on socioeconomics.

As discussed in **Chapter 10**, some tactical infrastructure will be constructed on or adjacent to residential properties. Of the 21 fence sections, 11 will be within census bureau tracts in which a portion of the tracts have a higher proportion of minority or low-income residents. Of the 70 miles of tactical infrastructure, substantially less than half will be within census bureau tracts that have a higher proportion of minority or low-income residents—therefore the overall impacts of the tactical infrastructure will not fall disproportionately on minority or low-income populations. Of the 16 census tracts identified in **Table 10-11** that have a higher proportion of minority or low-income residents, 6 of the sections will have populations near fence sections that might be adversely impacted by construction or operation of the tactical infrastructure. These are Sections O-4 (census tract 242.02), O-5 (census tract 213.01), O-13 (census tract 121), O-15 (census tract 125.05), O-19 (census tracts 128, 133.07, and 140.01), and O-21 (census tract 141).

13.12 UTILITIES AND INFRASTRUCTURE

Residential and commercial development in Cameron, Hidalgo, and Starr counties has increased demand for utilities such as drinking water, wastewater treatment, natural gas and electric power distribution, and transportation. The construction, operation, and maintenance of tactical infrastructure will have minimal demand for utilities and infrastructure, combining to produce a minimal adverse cumulative impact. Minor impacts on roadways and traffic are expected from the additive effects of past, present, and reasonably foreseeable future actions.

13.13 HAZARDOUS MATERIALS AND WASTE

Construction, operation, and maintenance of tactical infrastructure will require minimal quantities of hazardous materials and generate small quantities of hazardous wastes. Therefore, minimal cumulative impacts on hazardous materials and wastes will occur.

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15. ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
°F	degrees Fahrenheit
ACM	asbestos-containing material
ADNL	A-weighted Day Night Average Sound Level
APE	Area of Potential Effect
AQCR	air quality control region
AST	aboveground storage tank
BLIAQCR	Brownsville-Laredo Intrastate Air Quality Control Region
BLM	Bureau of Land Management
BMP	Best Management Practice
CAA	Clean Air Act
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
CMP	Coastal Management Program
CO	carbon monoxide
CO_2	carbon dioxide
CR	County Route
CWA	Clean Water Act
CY	calendar year
dBA	A-weighted decibels
dBC	C-weighted decibels
DHS	U.S. Department of Homeland Security
DOI	Department of the Interior
EIS	Environmental Impact Statement
EO	Executive Order
EOM	Enhanced Operation and Management
ESA	Endangered Species Act
ESP	Environmental Stewardship Plan
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FM	farm to market
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	fiscal year
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HCDD No. 1	Hidalgo County Drainage District No. 1
hp	horsepower
IBWC	International Boundary and Water Commission
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as amended
ISD	Independent School District
IWR	Integrated Water Resources Management
JD	Jurisdictional Determination
LBP	Lead-based paint
LRGFCP	Lower Rio Grande Flood Control Project
LRGVNWR	Lower Rio Grande Valley National Wildlife Refuge
MOA	Memorandum of Agreement
MBTA	Migratory Bird Treaty Act
mg/m^3	milligrams per cubic meter

MMTCE	million metric tons of carbon equivalent
Mph	miles per hour
MPM	Multipurpose Project Management
MSA	Metropolitan Statistical Area
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NHL	National Historic Landmark
NLCD	National Land Cover Dataset
NO_2	nitrogen dioxide
NOA	Notice of Availability
NO_x	nitrogen oxide
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
O_3	ozone
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
Pb	lead
PEIS	Programmatic Environmental Impact Statement
PM_{10}	particle matter equal to or less than 10 microns in diameter
$PM_{2.5}$	particle matter equal to or less than 2.5 microns in diameter
POE	Port of Entry
ppm	parts per million
PSD	Prevention of Significant Deterioration
PUB	Public Utility Board
ROE	rights of entry
ROI	Region of Influence
RTHL	Recorded Texas Historic Landmarks
ROW	right-of-way
SBI	Secure Border Initiative
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SR	State Route
SWPPP	Storm Water Pollution Prevention Plan
TAAQS	Texas Ambient Air Quality Standards
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TCP	traditional cultural property
TxDOT	Texas Department of Transportation
THC	Texas Historical Commission
TPWD	Texas Parks and Wildlife Department
TRI	Toxic Release Inventory
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USIBWC	U.S. International Boundary and Water Commission
UST	underground storage tank
VOC	volatile organic compound
WMA	Wildlife Management Area

APPENDIX A

Secretary of Homeland Security, Determination Pursuant to Section 102 of IIRIRA of 1996, as Amended

Vascular Diseases Research; 93.838, Lung Diseases Research; 93.839, Blood Diseases and Resources Research, National Institutes of Health, HHS)

Dated: March 26, 2008.

Jennifer Spaeth,

Director, Office of Federal Advisory Committee Policy.

[FR Doc. E8–6702 Filed 4–2–08; 8:45 am]

BILLING CODE 4140–01–M

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: I have a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, § 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided me with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (''IIRIRA''). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, § 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of IIRIRA.

I determine that the areas in the vicinity of the United States border described on the attached document, which is incorporated and made a part hereof, are areas of high illegal entry (collectively ''Project Areas''). These Project Areas are located in the States of California, Arizona, New Mexico, and Texas. In order to deter illegal crossings in the Project Areas, there is presently a need to construct fixed and mobile barriers (such as fencing, vehicle barriers, towers, sensors, cameras, and other surveillance, communication, and detection equipment) and roads in the vicinity of the border of the United States. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Areas, which are areas of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended.

Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Areas, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884 (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*)), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Wild and Scenic Rivers Act (Pub. L. 90–542, 16 U.S.C. 1281 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Wilderness Act (Pub. L. 88–577, 16 U.S.C. 1131 *et seq.*), the Federal Land Policy and Management Act (Pub. L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Otay Mountain Wilderness Act of 1999 (Pub. L. 106–145), Sections 102(29) and 103 of Title I of the California Desert Protection Act (Pub. L. 103–433), 50 Stat. 1827, the National Park Service Organic Act (Pub. L. 64–235, 16 U.S.C. 1, 2–4), the National Park Service General Authorities Act (Pub. L. 91–383, 16 U.S.C. 1a–1 *et seq.*), Sections 401(7), 403, and 404 of the National Parks and Recreation Act of 1978 (Pub. L. 95–625), Sections 301(a)–(f) of the Arizona Desert Wilderness Act (Pub. L. 101–628), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), the National Forest Management Act of 1976 (16 U.S.C. 1600 *et seq.*), and the Multiple Use and Sustained Yield Act of 1960 (16 U.S.C. 528–531).

This waiver does not supersede, supplement, or in any way modify the previous waivers published in the **Federal Register** on September 22, 2005 (70 FR 55622), January 19, 2007 (72 FR

2535), and October 26, 2007 (72 FR 60870).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1095 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: The Department of Homeland Security has a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, Section 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided the Secretary of Homeland Security with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (''IIRIRA''). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, Section 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of the IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of the IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December of 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of the IIRIRA.

I determine that the area in the vicinity of the United States border as described in the attached document, hereinafter the Project Area, which is incorporated and made a part hereof, is an area of high illegal entry. In order to deter illegal crossings in the Project Area, there is presently a need to construct fixed and mobile barriers and roads in conjunction with improvements to an existing levee system in the vicinity of the border of the United States as a joint effort with Hidalgo County, Texas. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Area, which is an area of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended. Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Area, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884) (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Federal Land Policy and Management Act (Pub L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), and the Federal Grant and Cooperative Agreement Act of 1977 (31 U.S.C. 6303–05).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1096 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

APPENDIX B

Standard Design for Tactical Infrastructure

APPENDIX B

STANDARD DESIGN FOR TACTICAL INFRASTRUCTURE

A properly designed tactical infrastructure system is an indispensable tool in deterring those attempting to illegally cross the U.S. border. Tactical infrastructure is also integral to maintaining USBP's flexibility in deploying agents and enforcement operations. A formidable infrastructure acts as a force multiplier by slowing down illegal entrants and increasing the window of time that agents have to respond. Strategically developed tactical infrastructure should enable USBP managers to better utilize existing manpower when addressing the dynamic nature of terrorists, illegal aliens, and narcotics trafficking (INS 2002).

USBP apprehension statistics remain the most reliable way to codify trends in illegal migration along the border. Based on apprehension statistics, in a 2006 report on border security, the Congressional Research Service concluded that "the installation of border fencing, in combination with an increase in agent manpower and technological assets, has had a significant effect on the apprehensions made in the San Diego sector" (CRS 2006).

Since effective border enforcement requires adequate scope, depth, and variety in enforcement activity, any single border enforcement function that significantly depletes USBP's ability to satisfactorily address any other enforcement action creates exploitable opportunities for criminal elements. For example, the intense deployment of personnel resources necessary to monitor urban border areas without tactical infrastructure adversely affects the number of agents available for boat patrol, transportation check points, patrolling remote border areas, and other tasks. Tactical infrastructure reduces this effect by reinforcing critical areas, allowing the agents to be assigned to other equally important border enforcement roles (INS 2002).

Fencing

The five fence types that will be constructed for the USBP Rio Grande Valley Sector include two styles of primary pedestrian fence, floating primary pedestrian fence, concrete retaining wall, and concrete flood protection structures/concrete fence. The two styles of primary pedestrian fence consist of steel bollards or pickets and bollards anchored into concrete footings (see **Figure 1-1**). Floating primary pedestrian fence consist of prefabricated floating fence panels placed on the levee (see **Figure 1-2**). Floating fences are generally concrete barriers with pickets anchored on top. Concrete retaining walls consist of prefabricated concrete wall panels sheet-piled into an existing embankment. The concrete flood protection structures/concrete fence consists of a concrete retaining wall built on the south side of the levee and includes a road within the current footprint of the levee ROW (see **Figure 1-3**). Wildlife openings cannot be placed into floating fence, concrete retaining walls, or concrete flood protection structures/concrete fence.

Construction of the proposed tactical infrastructure will begin in Spring 2008 and continue through December 2008. Because each discrete tactical infrastructure section represents an individual project that could proceed independently, multiple sections will be under construction simultaneously.

Figure 1-1. Photograph of a Typical Primary Pedestrian Fence

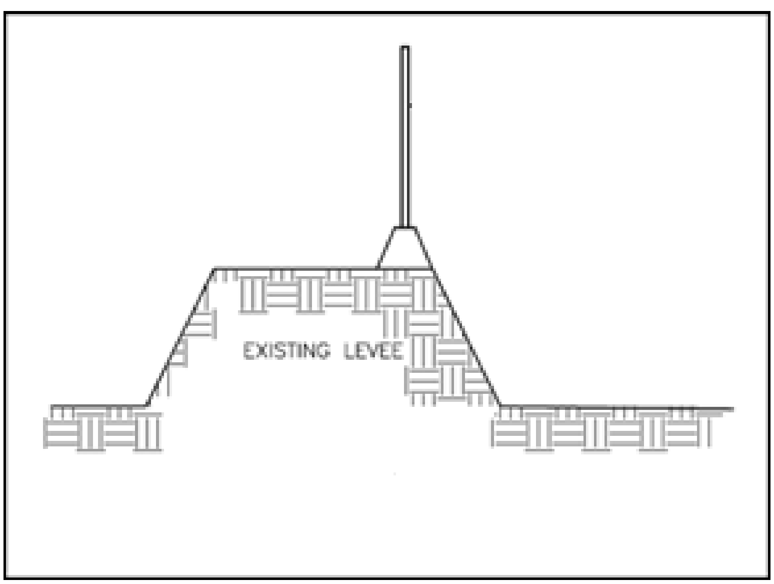


Figure 1-2. Cross Section of Typical Floating Fence

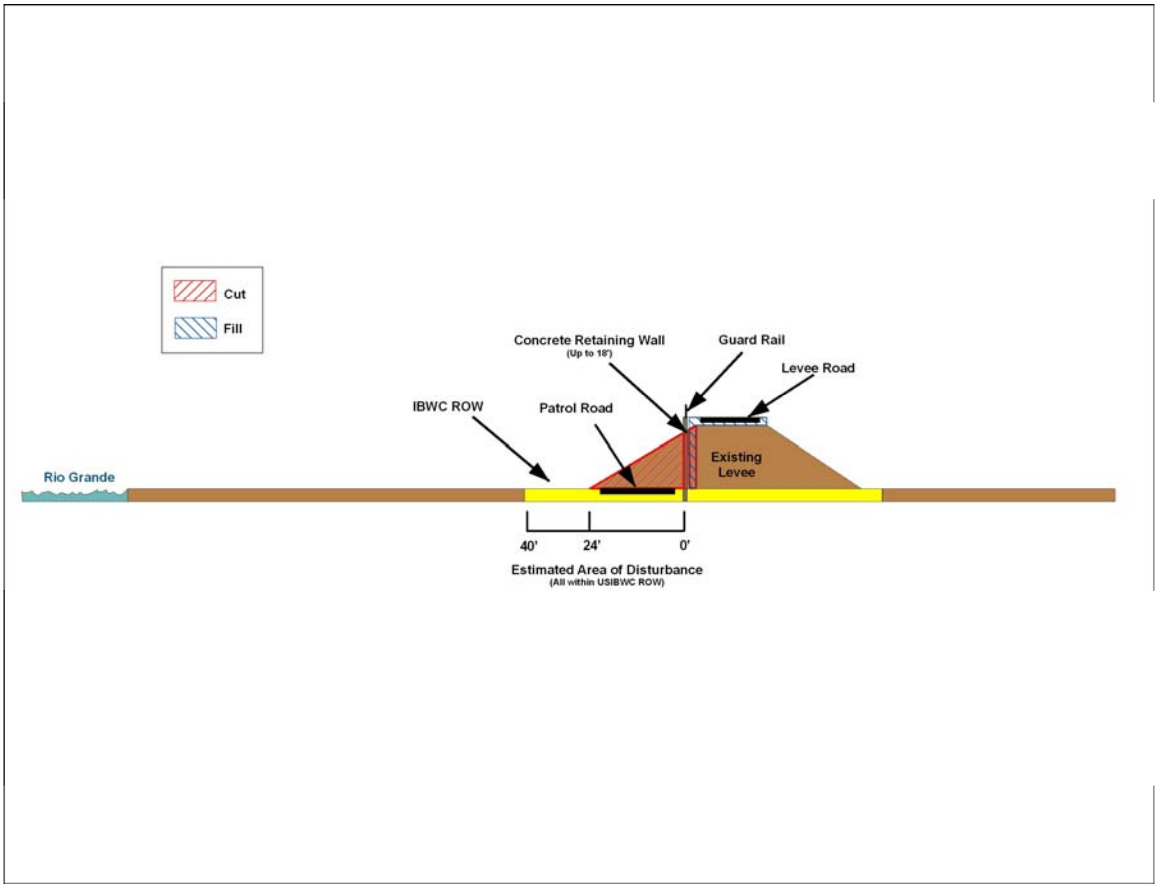


Figure 1-3. Cross-Section of Concrete Levee Retaining Wall

Patrol Roads

Patrol roads provide USBP agents with quick and direct access to anyone conducting illegal activity along the border, and allow agents access to the various components of the tactical infrastructure system. Patrol roads typically run parallel to and a few feet north of the primary pedestrian fence. Patrol roads are typically unpaved, but in some cases "all-weather" roads are necessary to ensure continual USBP access (INS 2002).

References

CRS 2006 — Congressional Research Service (CRS). 2006. "Report For Congress." *Border Security: Barriers Along the U.S. International Border*. 12 December 2006.

INS 2002 — Immigration and Naturalization Service (INS). 2002. Draft Environmental Impact Statement for the Completion of the 14-Mile Border Infrastructure System, San Diego, CA. Immigration and naturalization Service. January 2002

APPENDIX C

Air Quality Information

APPENDIX C

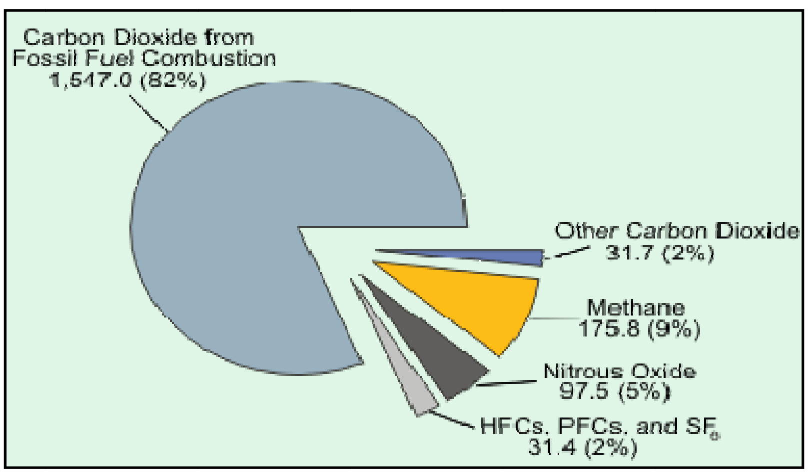
AIR QUALITY EMISSIONS CALCULATIONS

Greenhouse Gases

In April 2007, the U.S. Supreme Court declared that carbon dioxide (CO_2) and other greenhouse gases are air pollutants under the Clean Air Act (CAA). The Court declared that the U.S. Environmental Protection Agency (USEPA) has the authority to regulate emissions from new cars and trucks under the landmark environment law.

Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, the trapped heat results in the phenomenon of global warming.

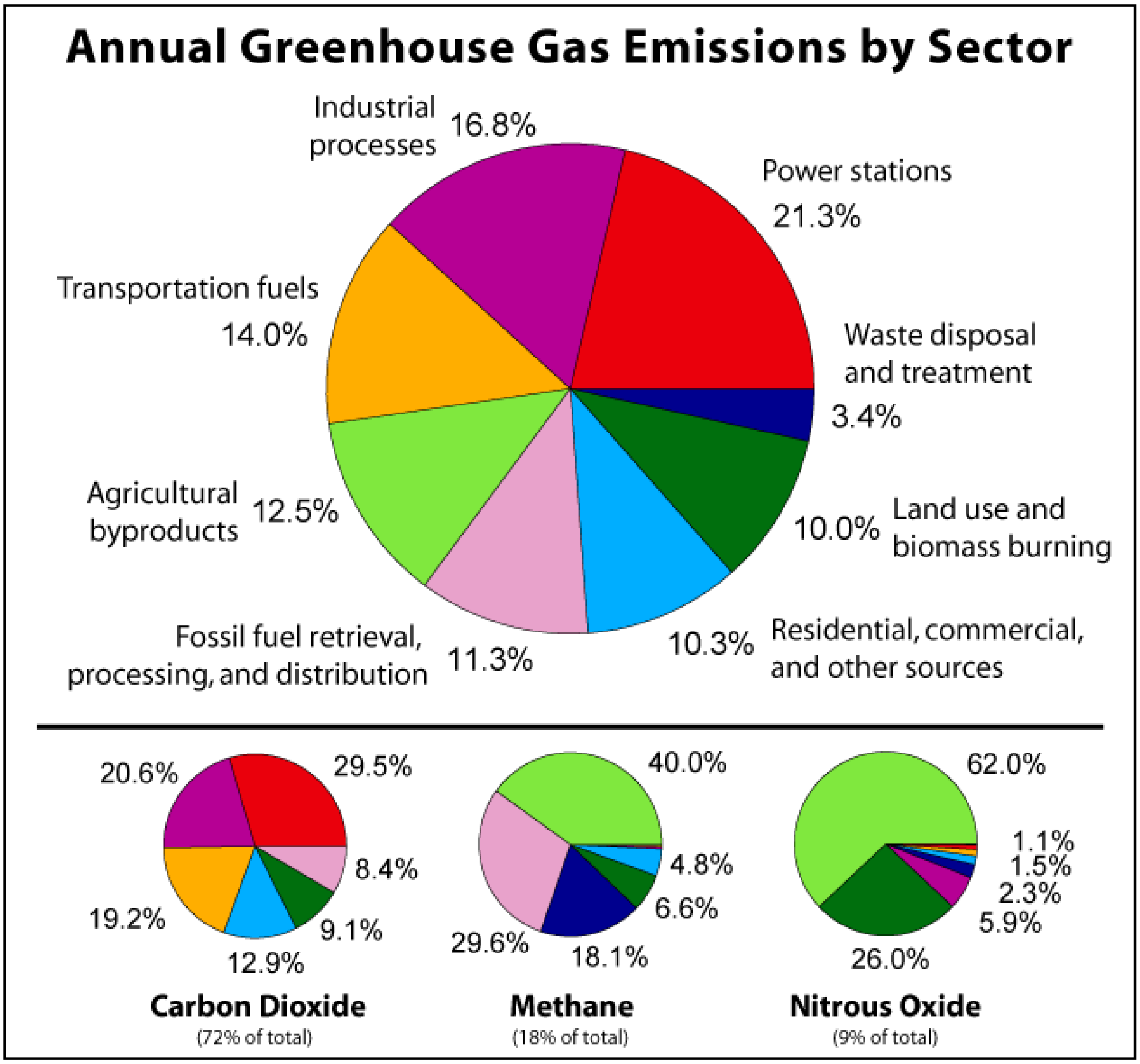
Many gases exhibit these "greenhouse" properties. The sources of the majority of greenhouse gases come mostly from natural sources but are also contributed to by human activity and are shown in **Figure C-1**. It is not possible to state that a specific gas causes a certain percentage of the greenhouse effect because the influences of the various gases are not additive.



Source: Energy Information Administration 2003

Figure C-1. Greenhouse Gas Emissions From Burning of Gas (Million Metric Tons of Carbon Equivalent)

Figure C-2 displays the annual greenhouse gas emissions by sector in the United States. Most government agencies and military installations are just beginning to establish a baseline for their operations and their impact on the greenhouse effect. Since the USEPA has not promulgated an ambient standard or *de minimis* level for CO_2 emissions for Federal actions, there is no standard value to compare an action against in terms of meeting or violating the standard.



Source: Rosmarino 2006

Figure C-2. Annual Greenhouse Gas Emissions by Sector

References

Energy Information Administration. 2003. “Greenhouse Gases, Climate Change, and Energy.” EIA Brochure. 2003. Available online: <*http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html*>. Last updated April 2, 2004. Accessed November 4, 2007.

Tanyalynnette Rosmarino, Director of Field Engineering, Northeast, BigFix, Inc. 2006. “A Self-Funding Enterprise Solution to Reduce Power Consumption and Carbon Emissions.” Slide presentation for the NYS Forum’s May Executive Committee Meeting Building an Energy Smart IT Environment. 2006. Available online: <*http://www.nysforum.org/documents/html/2007/execcommittee/may/enterprisepowerconsumptionreduction_files/800x600/slide1.html*>. Accessed November 4, 2007.

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Summary	Summarizes total emissions by calendar year.
Combustion	Estimates emissions from non-road equipment exhaust as well as painting.
Fugitive	Estimates fine particulate emissions from earthmoving, vehicle traffic, and windblown dust
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions
Maintenance Emissions	Estimates the total emissions from future maintenance of fencelines and patrol roads from mowers.
Generator Emissions	Estimates the total emissions from emergency generators to power construction equipment.
AQCR Tier Report	Summarizes total emissions for the Brownsville-Laredo Intrastate AQCR Tier Reports for 2001, to be used to compare project to regional emissions.

Air Quality Emissions from the Project

		NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	
CY2008	Construction Combustion	470.443	70.127	549.588	9.409	15.782	
	Construction Fugitive Dust	-	-	-	-	646.336	662.118
	Maintenance Emissions	0.042	0.005	0.021	0.010	0.005	
	Generator Emissions	22.777	1.859	4.907	1.498	1.601	
	TOTAL CY2008	493.263	71.992	554.516	10.917	663.724	

Since future year budgets were not readily available, actual 2001 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the Project is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Brownsville-Laredo Intrastate AQCR

	Point and Area Sources Combined				
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)
2001	44,137	73,577	317,422	2,940	132,788

Source: USEPA-AirData NET Tier Report (http://www.epa.gov/air/data/geosel.html). Site visited on 15 October 2007.

Determination Significance (Significance Threshold = 10%) for Construction Activities

	Point and Area Sources Combined				
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)
Minimum - 2001	44,137	73,577	317,422	2,940	132,788
2008 Emissions	493.263	71.992	554.516	10.917	663.724
Project A %	**1.118%**	**0.098%**	**0.175%**	**0.371%**	**0.500%**

Construction Combustion Emissions for CY 2008

Combustion Emissions of VOC, NO_x, SO_2, CO and PM_{10} Due to Construction

Includes:

100% of Construct Pedestrian Fence and Patrol Road	22,134,816	ft^2

Assumptions:

Total ground disturbance for pedestrian fence and patrol road would be 69.87 miles long by 60 feet wide (22,134,816 ft^2).
No grading would be required in construction staging areas.
Patrol road would be graded and lined with gravel. No paving would be included in the Project,
Construction would occur between March and December 2008 for a total of 190 working days.

Total Building Construction Area:	0	ft^2	(none)
Total Demolished Area:	0	ft^2	(none)
Total Paved Area:	0	ft^2	(none)
Total Disturbed Area:	22,134,816	ft^2	
Construction Duration:	1.0	year(s)	
Annual Construction Activity:	190	days/yr	

Emissions Factors Used for Construction Equipment

Reference: Guide to Air Quality Assessment, SMAQMD, 2004

Emissions factors are taken from Table 3-2. Assumptions regarding the type and number of equipment are from Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Bulldozer	1	29.40	3.66	25.09	0.59	1.17
Motor Grader	1	10.22	1.76	14.98	0.20	0.28
Water Truck	1	20.89	3.60	30.62	0.42	0.58
Total per 10 acres of activity	3	60.51	9.02	70.69	1.21	2.03

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Paver	1	7.93	1.37	11.62	0.16	0.22
Roller	1	5.01	0.86	7.34	0.10	0.14
Total per 10 acres of activity	2	12.94	2.23	18.96	0.26	0.36

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Loader	1	7.86	1.35	11.52	0.16	0.22
Haul Truck	1	20.89	3.60	30.62	0.42	0.58
Total per 10 acres of activity	2	28.75	4.95	42.14	0.58	0.80

Building Construction

Equipment[d]	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Stationary						
Generator Set	1	11.83	1.47	10.09	0.24	0.47
Industrial Saw	1	17.02	2.12	14.52	0.34	0.68
Welder	1	4.48	0.56	3.83	0.09	0.18
Mobile (non-road)						
Truck	1	20.89	3.60	30.62	0.84	0.58
Forklift	1	4.57	0.79	6.70	0.18	0.13
Crane	1	8.37	1.44	12.27	0.33	0.23
Total per 10 acres of activity	6	67.16	9.98	78.03	2.02	2.27

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Air Compressor	1	6.83	0.85	5.82	0.14	0.27
Total per 10 acres of activity	1	6.83	0.85	5.82	0.14	0.27

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activitiy, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emissions factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC.

c) The SMAQMD 2004 reference does not provide SO_2 emissions factors. For this worksheet, SO_2 emissions have been estimated based on approximate fuel use rate for diesel equipment and the assumption of 500 ppm sulfur diesel fuel. For the average of the equipment fleet, the resulting SO_2 factor was found to be approximately 0.04 times the NOx emissions factor for the mobile equipment (based upon 2002 USAF IERA "Air Emissions Inventory Guidance") and 0.02 times the NOx emissions factor for all other equipment (based on AP-42, Table 3.4-1)

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSIONS FACTOR SUMMARY

Source	Equipment Multiplier*	SMAQMD Emissions Factors (lb/day)				
		NO_x	VOC	CO	SO_2**	PM_{10}
Grading Equipment	51	156814.195	23375.707	183196.091	3136.284	5260.830
Paving Equipment	1	0.000	0.000	0.000	0.000	0.000
Demolition Equipment	1	0.000	0.000	0.000	0.000	0.000
Building Construction	1	0.000	0.000	0.000	0.000	0.000
Air Compressor for Architectural Coating	1	0.000	0.000	0.000	0.000	0.000
Architectural Coating**			0.000			

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project

**Emissions factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emissions Factor for Grading Equipment NOx = (Total Grading NOx per 10 ac*((total disturbed area/43560)/10))*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	22,134,816	508.15	6	(from "CY2008 Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per the SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition.
The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}
Grading Equipment	940,885.17	140,254.24	1,099,176.55	18,817.70	31,564.98
Paving	-	-	-	-	-
Demolition	-	-	-	-	-
Building Construction	-	-	-	-	-
Architectural Coatings	-	-	-	-	-
Total Emissions (lbs):	**940,885.17**	**140,254.24**	**1,099,176.55**	**18,817.70**	**31,564.98**

Results: Total Project Annual Emissions Rates

	NO_x	VOC	CO	SO_2	PM_{10}
Total Project Emissions (lbs)	940,885.17	140,254.24	1,099,176.55	18,817.70	31,564.98
Total Project Emissions (tons)	470.44	70.13	549.59	9.41	15.78

CO2 Emissions

It is assumed that 30 vehicles consisting of bulldozer, grader, forklift, cranes, rollers, and light duty trucks would be usefor this project.

It is further assumed that the total approximate average miles per day per vehicle would be 10 miles

It is assumed that the average vehicle will produce 19.5 pounds of CO2 per gallon of gas used. (www.eia.doe.gov/oiaf/1605/coefficients)

30 vehicles x 10 miles/day/vehicle x 190 days working x 1 gal/10 miles x 19.5 lb co2/gal x ton/2000lb = 55 tons CO2

Estimate emissions of CO2 for BLIAQCR region is 995,000 tons per year

Construction Fugitive Dust Emissions for CY 2008

Calculation of PM_{10} Emissions Due to Site Preparation (Uncontrolled).

User Input Parameters / Assumptions

Acres graded per year:	508.15	acres/yr	(From "CY2008 Combustion" worksheet)
Grading days/yr:	5.59	days/yr	(From "CY2008 Grading worksheet)
Exposed days/yr:	90	assumed days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil piles area fraction:	0.10	(assumed fraction of site area covered by soil piles)	
Soil percent silt, s:	8.5	%	(mean silt content; expected range: 0.56 to 23, AP-42 Table 13.2.2-1)
Soil percent moisture, M:	85	%	(http://www.cpc.noaa.gov/products/soilmst/w.shtml)
Annual rainfall days, p:	70	days/yr rainfall exceeds 0.01 inch/day (AP-42 Fig 13.2.2-1)	
Wind speed > 12 mph %, I:	39.5	%	Ave. of wind speed at Brownsville, TX (ftp://ftp.wcc.nrcs.usda.gov/downloads/climate/windrose/texas/brownsville/)
Fraction of TSP, J:	0.5	per California Environmental Quality Act (CEQA) Air Quality Handbook, SCAQMD, 1993, p. A9-99	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	8	ft	
Qty construction vehicles:	152.44	vehicles	(From "CY2008 Grading worksheet)
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)
PM_{10} Adjustment Factor k	1.5	lb/VMT	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
PM_{10} Adjustment Factor a	0.9	(dimensionless)	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
PM_{10} Adjustment Factor b	0.45	(dimensionless)	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
Mean Vehicle Weight W	40	tons	assumed for aggregate trucks

TSP - Total Suspended Particulate
VMT - Vehicle Miles Traveled

Emissions Due to Soil Disturbance Activities

Operation Parameters (Calculated from User Inputs)

Grading duration per acre	0.1	hr/acre	
Bulldozer mileage per acre	1	VMT/acre	(Miles traveled by bulldozer during grading)
Construction VMT per day	762	VMT/day	
Construction VMT per acre	8.4	VMT/acre	(Travel on unpaved surfaces within site)

Equations Used (Corrected for PM_{10})

Operation	Empirical Equation	Units	AP-42 Section (5th Edition)
Bulldozing	$0.75(s^{1.5})/(M^{1.4})$	lbs/hr	Table 11.9-1, Overburden
Grading	$(0.60)(0.051)s^{2.0}$	lbs/VMT	Table 11.9-1,
Vehicle Traffic (unpaved roads)	$[(k(s/12)^{a}(W/3)^{b})]\ [(365-P)/365]$	lbs/VMT	Section 13.2.2

Source: Compilation of Air Pollutant Emissions Factors, Vol. I, USEPA AP-42, Section 11.9 dated 10/98 and Section 13.2 dated 12/03

Calculation of PM_{10} Emissions Factors for Each Operation

Operation	Emissions Factor (mass/ unit)		Operation Parameter		Emissions Factor (lbs/ acre)	
Bulldozing	0.04	lbs/hr	0.1	hr/acre	0.00	lbs/acre
Grading	0.77	lbs/VMT	1	VMT/acre	0.80	lbs/acre
Vehicle Traffic (unpaved roads)	2.85	lbs/VMT	8.4	VMT/acre	24.00	lbs/acre

Emissions Due to Wind Erosion of Soil Piles and Exposed Graded Surface

Reference: California Environmental Quality Act (CEQA) Air Quality Handbook, SCAQMD, 1993.

Soil Piles EF = 1.7(s/1.5)[(365 - p)/235](I/15)(J) = (s)(365 - p)(I)(J)/(3110.2941), p. A9-99.

Soil Piles EF = 15.9 lbs/day/acre covered by soil piles

Consider soil piles area fraction so that EF applies to graded area

Soil piles area fraction: 0.10 (Fraction of site area covered by soil piles)
Soil Piles EF = 1.59 lbs/day/acres graded

Graded Surface EF = 26.4 lbs/day/acre (recommended in CEQA Manual, p. A9-93).

Calculation of Annual PM_{10} Emissions

Source	Emissions Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing	0.00	lbs/acre	508.15	NA	0	0.000
Grading	0.80	lbs/acre	508.15	NA	407	0.203
Vehicle Traffic	24.00	lbs/acre	508.15	NA	12,195	6.098
Erosion of Soil Piles	1.59	lbs/acre/day	508.15	90	72,716	36.358
Erosion of Graded Surface	26.40	lbs/acre/day	508.15	90	1,207,354	603.677
TOTAL					1,292,671	646.34

Soil Disturbance EF: 24.80 lbs/acre
Wind Erosion EF: 27.99 lbs/acre/day

Back calculate to get EF: 455.46 lbs/acre/grading day

Construction (Grading) Schedule for CY 2008

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 508.15 acres/yr (from "CY2008 Combustion" Worksheet)
Qty Equipment: 152.44 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.
Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	508.15	63.52
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	508.15	248.43
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	254.07	256.19
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	254.07	105.10
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	508.15	178.22
TOTAL								851.46

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 851.46
Qty Equipment: 152.44
Grading days/yr: 5.59

Maintenance Activities Emissions for CY 2008

Combustion Emissions of VOC, NO_x, SO_2, CO and PM_{10} Due to Maintenance Activities

The pedestrian fenceline and patrol road would require mowing approximately two times per year to maintain vegetation height and allow enhanced visibility and security.

Assumptions:
Approximately 508.15 acres of land would be mowed twice per year.
Two agricultural mowers (40 horsepower) would operate for approximately 14 days.
Each working day would be 8 hours.
Agricultural mowers operate at 43% load capacity (17.2 horsepower).

Emissions Factors Used for Maintenance Equipment

Reference: USAF IERA "Air Emissions Inventory Guidance", July 2001, Table 7-6. Criteria Pollutant Emissions Factors for Nonroad Diesel Engines.

Emissions Factors

Equipment	Rated Power (hp)	Loading Factor (% of Max Power)	Operating Time (hr/yr)	BSFC (lb/hp-hr)	NO_x (g/hp-hr)	VOC (g/hp-hr)	CO (g/hp-hr)	SO_2 (g/hp-hr)	PM_{10} (g/hp-hr)
Agricultural Mower (Diesel)	40	43	224	0.408	5.0	0.6	2.5	1.19	0.6

BSFC = Brake Specific Fuel Consumption

Results: Total Maintenance Annual Emissions Rates

	NO_x	VOC	CO	SO_2	PM_{10}
Total Maintenance Emissions (lbs)	84.954	10.195	42.477	20.219	10.195
Total Maintenance Emissions (tons)	0.042	0.005	0.021	0.010	0.005

Example:
Total Maintenance Emissions (lbs of NO_x) =
(Rated power output of equipment engine)*(Loading Factor/100)*(Operating Time)*(Number of Equipment)*(Emissions Factor)*(Conversion factor)

Total Maintenance Emissions (lbs of NO_x) = (40 hp)*(43/100)*(224 hr/yr)*(2 Equipment)*(5.0 g/hp-hr)*(0.002205 lb/g) = 84.95 lbs/yr

Emissions from Diesel Powered Generators for Construction Equipment

The Project would require six diesel powered generators to power construction equipment. These generators would operate approximately 8 hours per day for 190 working days.

Number of Generators	6	
Maximum Hours of Operation	8	hrs/day
Number of Construction Days	190	

Total Generator Capacity	75	hp
Hourly Rate	0.5262	MMBtu/hr
Annual Use	4,799	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (75 Hp/0.363)*(0.002546699 MMBtu/hr) =0.5262 MMBtu/hr
Annual Use (MMBtu) = (Number of Generator * Hours Operation/Day * Number of Construction Days) = (6*8*190*0.5262) = 4,799 MMBtu/yr

Note: Generators horsepower output capacity is only 0.363 percent efficient (AP-42 Chapter 3.3).
Source: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Generator Emissions Factors (Diesel)

NO_x	4.41	lb/MMBtu
VOC	0.36	lb/MMBtu
CO	0.95	lb/MMBtu
SO_x	0.29	lb/MMBtu
PM_{10}	0.31	lb/MMBtu

Emissions (Diesel)

NO_x	10.581	tpy
VOC	0.864	tpy
CO	2.279	tpy
SO_x	0.696	tpy
PM_{10}	0.744	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (4,799*4.41)/2000 = 10.581 tpy

Source: Emissions Factors: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Emissions from Diesel Powered Generators for Portable Lights

To be conservative, it was assumed that up to 30 portable light units would be needed for construction. These portable lights are powered by 6-kilowatt self-contained diesel generators. Portable lights would generally operate continuously every night (approximately 12 hours) 365 days per year.

Number of Generators	30	
Maximum Hours of Operation	12	hrs/day
Number of Construction Days	365	

Total Generator Capacity	6	hp
Hourly Rate	0.0421	MMBtu/hr
Annual Use	5,531	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (75 Hp/0.363)*(0.002546699 MMBtu/hr) =0.5262 MMBtu/hr
Annual Use (MMBtu) = (Number of Generator * Hours Operation/Day * Number of Construction Days) = (6*8*190*0.5262) = 4,799 MMBtu/yr

Note: Generators horsepower output capacity is only 0.363 percent efficient (AP-42 Chapter 3.3).
Source: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Generator Emissions Factors (Diesel)

NO_x	4.41	lb/MMBtu
VOC	0.36	lb/MMBtu
CO	0.95	lb/MMBtu
SO_x	0.29	lb/MMBtu
PM_{10}	0.31	lb/MMBtu

Emissions (Diesel)

NO_x	12.196	tpy
VOC	0.996	tpy
CO	2.627	tpy
SO_x	0.802	tpy
PM_{10}	0.857	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (5,531*4.41)/2000 = 12.196 tpy

Source: Emissions Factors: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Brownsville-Laredo Intrastate Air Quality Control Region

			Area Source Emissions						Point Source Emissions					
Row # SORT	State	County	CO	NOx	PM10	PM2.5	SO2	VOC	CO	NOx	PM10	PM2.5	SO2	VOC
1	TX	Cameron Co	84,539	10,659	36,197	6,679	849	15,988	386	1,169	149	111	136	516
2	TX	Hidalgo Co	145,505	17,041	61,198	11,285	1,161	27,056	4,064	2,697	319	313	41	773
3	TX	Jim Hogg Co	1,621	110	1,229	291	18.5	763	77.3	293	3.32	3.32	0.08	50
4	TX	Starr Co	17,040	2,251	12,645	2,259	141	4,287	433	1,144	0.47	0.42	30.4	215
5	TX	Webb Co	47,946	5,122	9,943	2,380	376	13,764	755	1,128	36.7	35.6	25.2	124
6	TX	Willacy Co	9,021	1,371	9,238	1,777	121	2,753	144	253	1.61	1.61	0.02	49.6
7	TX	Zapata Co	5,466	396	1,828	477	40.1	7,134	425	503	0.18	0.17	0.21	104
Grand Total			311,138	36,950	132,278	25,148	2,707	71,745	6,284	7,187	510	465	233	1,832

SOURCE:
http://www.epa.gov/air/data/geosel.html
USEPA - AirData NET Tier Report
*Net Air pollution sources (area and point) in tons per year (2001)
Site visited on 15 October 2007.

Brownsville-Laredo Intrastate AQCR (40 CFR 81.135):
In the State of Texas: Cameron County, Hidalgo County, Jim Hogg County, Starr County, Webb County, Willacy County, Zapata County

APPENDIX D

Biological Survey Report

BIOLOGICAL SURVEY REPORT

SUPPORTING THE

CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE USBP RIO GRANDE VALLEY SECTOR, TEXAS

Prepared for

U.S. Customs and Border Protection

Prepared by

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e²M Project No.: 4100-989

MAY 2008

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
BMP	Best Management Practice
BSR	Biological Survey Report
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
cm	centimeter(s)
CWA	Clean Water Act of 1977
e²M	engineering-environmental Management, Inc.
EOR	Element Occurrence Record
ESA	Endangered Species Act
FE	Federally Endangered
GIS	Geographic Information SystemGPS
GPs	Global Positioning System
LA	license agreement
LRGV	Lower Rio Grande Valley
LRGVNWR	Lower Rio Grande Valley National Wildlife Refuge
MBTA	Migratory Bird Treaty Act of 1918, as amended
m	meter(s)
m^2	square meters
MJD	Multi-Jurisdictional Dataset
mph	miles per hour
NVCS	National Vegetation Classification Standard
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
ROE	right of entry
ROW	right-of-way
SE	State Endangered
TPWD	Texas Parks and Wildlife Department
TXNDD	Texas Natural Diversity Database
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USIBWC	U.S. International Boundary and Water Commission
UTM	Universal Transverse Mercator
WMA	Wildlife Management Area

BIOLOGICAL SURVEY REPORT
FOR
CONSTRUCTION AND OPERATION OF TACTICAL INFRASTRUCTURE
USBP RIO GRANDE VALLEY SECTORS

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1. INTRODUCTION

This Biological Survey Report (BSR) synthesizes information collected from a variety of literature sources and field surveys to describe the biological resources within the project corridor, provides supporting information from the project region, allows evaluation of the potential impacts of the project on biological resources, and provides the basis of recommendations for avoidance or reduction of those impacts using mitigation, including best management practices (BMP). Information was gathered from publicly available literature, data provided by relevant land management agencies, reviews of aerial photography and U.S. Geological Survey (USGS) topographic maps, data from the State of Texas, data from NatureServe, field surveys of the project corridor conducted in October and December 2007, and a a reconnaissance survey for plant communities and land use types in the Hidalgo County sections in March 2008. A 150-foot-wide corridor was surveyed over the approximate 70-mile project corridor. The project will occur within a 60-foot corridor inside the 150-foot survey corridor in Sections O-1 through O-3 and O-11 through O-21 and a 40-foot corridor south of the levee in Sections O-4 through O-10. The construction corridor encompasses approximately 70 miles in length, with approximately 461 acres within the disturbed area. In total, approximately 323 acres of nonnative and native vegetation providing wildlife habitat occurs in the project corridor. The remaining area, 137 acres, supports land use in the form of fallow and irrigated agriculture, urban and residential development, roads, and open water.

Herbaceous vegetation (e.g., grasslands, forblands, emergent wetlands) composes approximately 65% of the impact corridor for a vegetation cover total of approximately 242 acres. Shrublands (dwarf, short, and tall) compose approximately 5% of the impact corridor for a vegetation cover total of 17 acres. Forests and woodlands compose approximately 17% of the impact corridor or 64 acres vegetation cover total. The vegetation represents a combination of mostly nonnative grasses that have become established in dense stands on levee banks, in hay fields, and as forest and woodland understory; shrublands that are invading herbaceous vegetation stands or occur on gravelly upland substrates; and a combination of remnant and planted riparian woodlands and forests.

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2. PROJECT DESCRIPTION

U.S. Customs and Border Protection (CBP) will construct, maintain, and operate tactical infrastructure consisting of pedestrian fence and associated access roads, patrol roads, and lights along the U.S./Mexico international border in the U.S. Border Patrol (USBP), Rio Grande Valley Sector, Texas. The locations of tactical infrastructure are based on a USBP Rio Grande Valley Sector assessment of local operational requirements where it will assist USBP agents in reducing cross-border violator activities. Tactical infrastructure will be constructed in 21 discrete sections along the international border in Starr, Hidalgo, and Cameron counties, Texas (see **Table 2-1**). The individual tactical infrastructure sections range from approximately 1 mile in length to approximately 13 miles in length.

Table 2-1. Tactical Infrastructure Sections, Rio Grande Valley Sector

Fence Section No.	Border Patrol Station	General Location	Approximate Mileage (mi)
O-1	Rio Grande City	Near Roma Port of Entry	3.75
O-2	Rio Grande City	Near Rio Grande City Port of Entry	8.74
O-3	McAllen	Los Ebanos Port of Entry	1.9
O-4	McAllen	From Peñitas to Abram	4.35
O-5	McAllen	Future Anzalduas Port of Entry	1.76
O-6	McAllen	Hidalgo Port of Entry	3.85
O-7	Weslaco	Proposed Donna Port of Entry	0.90
O-8	Weslaco	Retamal Dam	3.25
O-9	Weslaco	West Progreso Port of Entry	3.87
O-10	Weslaco	East Progreso Port of Entry	2.33
O-11	Harlingen	Joe’s Bar-Nemo Road	2.31
O-12	Harlingen	Weaver’s Mountain	0.92
O-13	Harlingen	West Los Indios Port of Entry	1.58
O-14	Harlingen	East Los Indios Port of Entry	3.59
O-15	Harlingen	Triangle - La Paloma	1.93
O-16	Harlingen	Ho Chi Minh - Estero	3.0
O-17	Brownsville	Proposed Carmen Road Freight Train Bridge	1.61
O-18	Brownsville	Proposed Flor De Mayo Port of Entry to Garden Park	3.58
O-19	Brownsville	B&M Port of Entry to Los Tomates	3.37
O-20	Brownsville	Los Tomates to Veterans International Bridge	0.93
O-21	Fort Brown	Veterans International Bridge to Sea Shell Inn	12.99
Total			**71.44**

3. SURVEY METHODS

To provide flexibility in placement of tactical infrastructure within the project corridor, and to ensure consideration of impacts due to construction, patrol, and maintenance, surveys were conducted in an area extending 150 feet on the north side (i.e., side away from the Rio Grande) of the 21 individual tactical infrastructure sections and extending at least 0.5 miles past the ends of each section (a total of 1,541 acres). Additionally, a reconnaissance survey was conducted in Hidalgo County on March 6–7, 2008, to determine plant communities and land use types on and south of the USIBWC levee including the levee shoulder, embankment, toe slope, right-of-way (ROW), and adjacent public and private land. The areas thus defined are referred to hereafter as the "survey corridor."

Intuitive controlled investigations of the survey corridor were conducted by biologists of engineering-environmental Management, Inc. (e²M): Jim Von Loh (senior ecologist), Karen Stackpole (staff biologist), Brent Eastty (staff botanist), Dusty Janeke (staff biologist), Valerie Whalon (staff biologist), Tom Hayes (senior ecologist), and Nancy Hays (senior ecologist). Also participating were Gena Janssen, Dr. Tom Patterson, Dr. Sue Sill, and Dr. Carol Bush (subcontractors to e²M and U.S. Fish and Wildlife Service [USFWS], approved botanists for the Rio Grande Valley). The October and December 2007 surveys examined the project corridor beginning on 2 October and on 10 December 2007. The 2008 surveys were conducted during mid-March. In order to conduct surveys and access properties, rights-of-entry (ROE) approvals and CBP escorts were required.

e²M assigned senior ecologists and biologists familiar with vegetation and wildlife habitat classification, mapping protocols, and field sampling methods to intuitively examine the landscape and project corridor for the approximately 70-mile length. Further, senior e²M natural resources staff teamed with USFWS-approved and experienced South Texas botanists to ensure accurate identification of plant species and competent surveys for rare plants and potential habitat. The surveys were controlled, in that ROEs were approved for a 150-foot corridor width, and survey crews were required to be accompanied by USBP agents who served as guides, shared knowledge of wildlife sightings and other pertinent information, contacted landowners, if necessary, and ensured surveyor safety while in the field. Investigations included observed plant and wildlife species that were individually listed by fence segment, an assessment of habitat and surveys for rare plant and wildlife species, landscape photography points, observation points recording dominant species/location/cover/ environmental conditions/photodocumentation, determination of potential wetlands for future research, and general note-taking of natural resources.

Biologists walked the project corridor for each tactical infrastructure section where approved ROE or a special use permit was obtained. They conducted reconnaissance-level surveys on areas of land use (e.g., agricultural fields and urban areas) and examined in detail areas containing unique species compositions or habitat that might be conducive to sensitive species (e.g., grasslands, shrublands, woodlands, forests, wetlands, water bodies). Observation data (Universal Transverse Mercator [UTM] coordinates, photographs, field notes, environmental information, vegetation structure, and plant community composition) were recorded at regular intervals along the corridor where vegetation occurred as homogenous stands and also where plant communities presented substantial shifts in species composition. These data were used to generate a vegetation classification and map to facilitate delineation of habitat types, analyses of potential sensitive species occurrences, and analyses of potential project impacts on biological resources (Attachment A). Vegetation type and land use maps were provided as a digital file for this report. Although no protocol surveys were conducted, botanists and wildlife biologists specifically examined habitats to determine the presence of state- and Federal-listed species (see **Tables 3-1 and 3-2**). Descriptions of the federally listed species are provided in Attachment B.

Texas Department of Wildlife and Parks; Texas Natural Diversity Database

The Texas Natural Diversity Database (TXNDD) was established in 1983 and is the Texas Parks and Wildlife Department's (TPWD) most comprehensive source of information related to rare, threatened, and endangered animals, plants, exemplary natural communities, and other significant features. While these data are continually updated, there are gaps in coverage and species information due to lack of access to land for inventory, data from many sources, and a lack of staff and resources to collect and process data for all rare and significant resources. To request information from the TXNDD the following link can be accessed: http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species.phtml.

For the project corridor, TXNDD was used to assist with the evaluation of environmental impacts of the sections under consideration. The interpretation and extrapolation of the data included consideration of (1) data gaps that occur because of lack of access to private land, (2) the restriction of data extraction from only public information sources, (3) species and geographic coverage focused on the most-rare species and ecosystems, and (4) the lack of precise locality data in many secondary sources. Because of the small proportion of public land versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. However, it is based on the best data available to TPWD in terms of rare species locations and distributions and the use of qualified biologists to provide onsite inventory and evaluation. The element occurrence records (EORs) for Starr, Hidalgo, Cameron, and Starr counties are summarized by tracked species or plant community in Table 3-1.

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
Awaous banana (River Goby)	H	G5S1; TXT	(1) Southwest of Mission 6 km in the Rio Grande mainstem	(1) Occurred in pool lined with slabby boulders, moderate to swift current, little detritus or sand (EOID 7286)
Hybognathus amarus (Rio Grande Silvery Minnow)	C, S	G1G2SX; FLE; TXE	(1) Rio Grande at Brownsville; (2) Rio Grande downstream of Falcon Dam	(1) Captured in the 1920s, type locality (EOID 2794); (2) Observed in 1961, represents the last collection of the Rio Grande Silvery Minnow (EOID 7508)
Hypopachus variolosus (Sheep Frog)	C, H, S	G5S2; TXT	(1) West of Raymondville, LRGVNWR; (2) Near Brownsville, LRGVNWR; (3) Brownsville; (4) Edinburg; (5) Northwest of Edinburg; (6) West of McAllen; (7) Harlingen; (8) Northeast of Rio Grande City; (9) Near El Sauz; (10) Near Santa Catarina and Santa Anna; (11) East of Bayview; (12) North of Mission; (13) Southwest of Mission	(1) C ollected in 1965 (EOID 3099); (2) Observed in 1923 (EOID 3536); (3) Collected in 1955 (EOID 3742); (4) Observed in 1933, collected 22 specimens in 1936 (EOID 4303); (5) Observed in 1934, collected 25 specimens in 1935 (EOID 5122); (6) Collected one specimen in 1949 (EOID 7429); (7) Observed in 2006 in Brush Country vegetation with introduced grasses (EOID 8803); (8) Large chorus heard in 2002 (EOID 8812); (9) Two choruses heard in 2002 and 2006 (EOID 8813); (10) Large choruses were heard in 2002 (EOID 8814); (11) Choruses were heard in 2002 and 2003 (EOID 8815); (12) Choruses heard in 2004 (EOID 8816); (13) Chorus heard in 2004 (EOID 8817)
Leptodactylus fragilis (White-lipped Frog)	H, S	G5S1; TXT	(1) Southeast of Rio Grande City; (2) West of Mission; (3) Southeast of Rio Grande City; (4) Northwest of Rio Grande City; (5) North of Roma and Los Saenz; (6) Near El Sauz	(1) Observed in 1932 (EOID 379); (2) Collected in 1935 (EOID 3108); (3) Collected in 1932 (EOID 4735); (4) Choruses heard and observation made in 2002 (EOID 8821); (5) Choruses heard at two locations in 2002 (EOID 8822); (6) Choruses heard at three locations in 2002 (EOID 8823)
Notophthalmus meridonalis (Black-spotted Newt)	C, H	G1S1; TXT	(1) Near Harlingen; (2) Near Brownsville and Los Fresnos; (3) Brownsville; (4) Southeast of McAllen; (5) East of Harlingen; (6) North of Sal del Ray; (7) Near Brownsville ; (8) Near Harlingen; (9) Bentsen State Park; 10) South of Raymondville; (11) La Joya Lake near Mission; (12) North of Brownsville; (13) Laguna Atascosa NWR; (14) Willacy – Cameron County Line; (15) Sabal Palm Grove Sanctuary	(1) Collected in 1946 (EOID 151); (2) Observations in 1948 and 1949 (EOID 567); (3) N/A (EOID 1378); (4) Two collections in 1962 (EOID 1757); (5) N/A (EOID 2042); (6) Collection in 1966 (EOID 2504); (7) Collection in 1923, topotype (EOID 2616); (8) Collection in 1952 (EOID 2627); (9) Collection of two specimens in 1967 (EOID 3661); (10) N/A (EOID 5489); (11) Collections made in 1939, 1940, 1941, and 1945 (EOID 5794); (12) Collection in 1947 (EOID 6392); (13) Collection of two specimens 1976, observation in 1987, best known meta-population (EOID 6494); (14) Collection in 1977 (EOID 7802); (15) Collection in 1970 (EOID 8166)

[1] Source: TDWP-NDD 2007

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
Rhinophrynus dorsalis (Mexican Burrowing Toad)	S	G5S2; TXT	(1) 8 miles west of Roma; (2) 2 miles west of Rio Grande City; (3) Near Rio Grande City; (4) Twelve miles north of Roma; (5) Northeast of U.S. 83 and FR 2098; (6) South of El Sauz; (7) Six-eight miles north of Rio Grande City; (8) Roma – Los Saenz; (9) Santa Catarina – Santa Ana; (10) Ten miles west of La Gloria; (11) Eleven miles south of El Sauz	(1) Observed in 1966 (EOID 363); (2) Observed in 1966 (EOID 2199); (3) Heard calls on both banks of the Rio Grande in 1966 (EOID 4060); (4) Young toads from stock tank in 1966 (EOID 5982); (5) Weed-filled pond in arroyo in 1966 (EOID 7093); (6) Tadpoles collected and choruses heard at four sites between 1967–2002 (EOID 8217); (7) Choruses heard at four sites in 2002 (EOID 8824); (8) Choruses heard at one site and two adults observed in 2002 (EOID 8825); (9) Choruses heard at one site in 2002 following 11 inches of rain (EOID 8827); (10) One chorus heard at one site in 2002 (EOID 8828); (11) One chorus heard at one site in 2006 (EOID 8824)
Siren sp. 1 (South Texas Siren, Large Form)	C, H, S	GNRQSNR; TXT	(1) Edinberg; (2) South of Mercedes; (3) Sabal Palm Grove Sanctuary; (4) West of La Joya; (5) Southwest of McAllen; (6) Laguna Atascosa NWR; (7) South of San Juan; (8) Near Brownsville; (9) South of Harlingen; (10) Near Sullivan City; (11) Santa Ana NWR; (12) Near Brownsville; (13) South of Harlingen; (14) South of Pharr; (15) Bentsen-Rio Grande Valley State Park; (16) South of Harlingen	(1) Collected specimen from roadside ditch in 1966 (EOID 1591); (2) Observed in 1983 (EOID 1669); (3) Collected specimen in 1960 (EOID 1752); (4) Observed in 1941, specimens collected in 1958 (EOID 1753); (5) Specimens collected in 1960 and 1961 from a salty drainage ditch (EOID 1997); (6) Observation in 1983 (EOID 2018); (7) Observation in 1936 (EOID 2584); (8) Specimens collected, including paratypes in 1950, 1952, and 1960 (EOID 3355); (9) Specimen collected in 1946 (EOID 3471); (10) Specimen collected, paratype in 1951 (EOID 3530); (11) Collections made in 1970 and 1977 (EOID 4856); (12) Specimens collected in 1951 (may contain the type), 1953, 1958, 1964, and 1972 (EOID 5392); (13) Paratype locality (EOID 6353); (14) Specimen collected in 1972 (EOID 7085); (15) Observation made in 1970, specimens collected in 1983 (EOID 7293); (16) Specimens collected from borrow pit in 1946 (EOID 7774)
Smilisca baudinii (Mexican Treefrog)	C	G5S3; TXT	(1) Palo Alto Battlefield National Historic Site; (2) Brownsville; (3) Southmost Ranch Preserve; (4) Near San Benito; (5) East of Bayview; (6) Northeast of San Benito; (7) TPWD Coastal Fisheries Field Station; (8) Near Russelltown	(1) One chorus heard and one specimen collected in 2003, the site was first observed in 1976 (EOID 284); (2) Collection in 1920, observation in 1972 (EOID 3594); (3) Observation in 1976 (EOID 6149); (4) Specimen collected in 1968 (EOID 6940); (5) Choruses were heard at multiple locations in 2002, 2003, and 2004 (EOID 8818); (6) Chorus heard in 2002 (EOID 8819); (7) Large choruses heard in 2002 (EOID 8820); (8) Chorus heard in 2002 (EOID 8826)
Coniophanes imperialis (Black-striped Snake)	C, H	G4G5S2; TXT	(1) North of Brownsville; (2) Fort Brown; (3) East of Brownsville, LRGVNWR; (4) Southmost Ranch Preserve; (5) Near Carricitos; (6)	(1) N/A (EOID 142); (2) Specimen collected in 1954 (EOID 1311); (3) N/A (EOID 2830); (4) Specimen collected in 1980 (EOID 4311); (5) Specimen observed in 1989 (EOID 5000); (6)

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			Brownsville; (7) Norteast of Brownsville; (8) Southeast of Sebastian; (9) West of McAllen	Specimens collected in 1932 and 1952 (EOID 6261); (7) N/A (EOID 6262); (8) One specimen (EOID 7570); (9) One specimen collected in 1949 (EOID 8189)
Crotaphytus reticulatus (Reticulate Collared Lizard)	H, S	G3S2; TXT	(1) Falcon State Park; (2) West of La Joya; (3) Northwest of Roma; (4) Falcon State Park; (5) Near Cuevitas; (6) Falcon State Park; (7) Casas Blancas; (8) North of La Joya	(1) Specimen collected in 1958 (EOID 613); (2) Specimen collected in 1976 (EOID 2336); (3) Specimen collected in 1933 (EOID 3022); (4) Observations recorded in 1965 and 2002, population drought-affected in 2002 (EOID 3666); (5) Specimens collected in 1932 and 1948 in honey mesquite chaparral (EOID 3892); (5) Observed in 1983 (EOID 5240); (6) Observations in 2001 and 2002 (EOID 5482); (7) Observed in 1975 (EOID 5624); (8) Observed in 1977, under rock in chaparral
Drymarchon corais (Indigo Snake)	C, H	G4S3; TXT	(1) Hidalgo; (2) Sabal Palm Grove Sanctuary; (3) Southmost Ranch Preserve; (4) Near Brownsville Ship Channel, LRGVNWR; (5) Near Linn Siding	(1) Observed in 1968 (EOID 3445); (2) Observed in 1998 on dirt road (EOID 4511); (3) Observed in 1998, 1999, 2001, and 2002 in herbaceous and brush habitats (EOID 7547); (4) Descriptions of 18 observations from 1998–2002, several habitats and road sightings (EOID 7926); (5) Observed in 2002 in wetland (EOID 8327)
Drymobius margaritiferus (Speckled Racer)	C, H	G5S1; TXT	(1) Sabal Palm Grove Sanctuary; (2) Southmost Ranch Preserve; (3) Southeast of Brownsville; (4) Southmost Ranch Preserve; (5) East of Brownsville; (6) Southeast of Mercedes	(1) Observed in 2000 in leaf litter (EOID 823); (2) Observed in 1999 in leaf litter of sabal palm woodland (EOID 1626); (3) Collected in 1982 (EOID 3087); (4) Observed in 1998 in deep leaf litter of sabal palm woodland (EOID 5630); (5) Collected in 1935 (EOID 5937); (6) N/A (EOID 6820)
Gopherus berlandieri (Texas Tortoise)	C, H, S	G4S3; TXT	(1) La Reforma Training Site; (2) Southmost Ranch Preserve; (3) East of Pinitas; (4) South of Brownsville Ship Channel; (5) Northwest of Brownsville Fishing Harbor; (6) South of Randado; (7) Southmost Ranch Preserve; (8) Near Loma de la Montuosa, LRGVNWR; (9) Near San Martin Lake; (10) Near Palmito Hill Battlefield and Tulosa Tract, LRGVNWR; (11) Near Loma de la Estrella, LRGVNWR; (12) Near Mercedes	(1) Observed in 1994 within cenizo – honey mesquite – granjeno disturbed mixed brush community (EOID 1136); (2) Observed in 1999 on dirt road in sabal palm woodland (EOID 1716); (3) Observed in the 1990s in a go-back pasture (EOID 2644); (4) Observed in 1998 and 2001 on loma in thornscrub (EOID 3544); (5) Observed in 1999 in coastal prairie with scattered Spanish dagger and honey mesquite (EOID 4711); (6) Observed in 1978 (EOID 4734); (7) Observed in 2001 on dirt road in sabal palm grove (EOID 5070); (8) Eight different observations from 1998–2001 on edge of thornscrub loma surrounded by coastal prairie (EOID 5998); (9) Observations in 1998 and 2001 (EOID 8278); (10) Four observations between 1998 and 2001 on edge of thornscrub loma within coastal prairie (EOID 8279); (11) Observed in 2000 in Thornscrub on loma (EOID 8281); (12) Observed in 2006 in mixed non-native grasses and scattered shrubs (EOID 8805)

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
Leptodeira septentrionalis septentrionalis (Northern Cat-eyed Snake)	C	G5T5S2; TXT	(1) North of Edinburg; (2) Near Brownsville	(1) Observed in 1971 (EOID 1708); (2) Observed in 1927 (EOID 4888)
Phrynosoma cornutum (Texas Horned Lizard)	C, H	G4G5S4; TXT	(1) West of Monte Christo; (2) Sabal Palm Grove Sanctuary; (3) South of Loma del Divisadero; (4) Near Loma de la Montuosa, LRGVNWR; (5) Vista del Mar and Tulosa Ranch, LRGVNWR; (6) Vista del Mar, LRGVNWR; (7) Near Loma del Cenizal; (8) Near Los Ebanos	(1) Observed in 2002 in chaparral (EOID 1333); (2) Observed in 2001 on levee road (EOID 1608); (3) Observed in 1998 on dirt road in coastal prairie; (4) Observations in 1998 and 2001 on dirt road through coastal prairie (EOID 8285); (5) Two observations in 1998 and 1999 on roads through coastal prairie (EOID 8286); (6) Two observations in 1998 on road through coastal prairie and agricultural field (EOID 8287); (7) Two observations in 2001 on dirt road through coastal prairie (EOID 8288); (8) Observation in 1993 in unimproved pasture in farmland (EOID 8307)
Asturina nitida (Gray Hawk)	H	G4G5S2B; TXT	(1) Anzalduas County Park	(1) Observed in 1999, pair fledged one young from a nest in a large cedar elm (EOID 5022)
Buteo albicaudatus (White-tailed Hawk)	C	G4G5S4B; TXT	(1) Brownsville Ship Channel	(1) Observed between 2000–2002, six nests constructed in honey mesquite and Spanish dagger, less than 7 feet tall, several young fledged (EOID 8274)
Charadrius melodus (Piping Plover)	C	G3S2; FLT; TXT	(1) South Bay LRGVNWR; (2) South Padre Island	(1) Observed in 1991 on sand and silt with algal mat (EOID 1152); (2) Observed in 1991 on sand and silt with algal mat (EOID 6545)
Falco femoralis septentrionalis (Northern Aplomado Falcon)	C	G4T2S1; FLE; TXE	(1) Brownsville Ship Channel	(1) Observed from 1995–2002 with five nests constructed on power pole, Spanish dagger, and honey mesquite, several young fledged, some lost to predation (EOID 5542)
Falco peregrinus (Peregrine Falcon)	C	G4S3; TXE,T	(1) South Padre Island; (2) Padre Island; 3) South Bay; 4) Padre Island	(1) Observed in 1991 on bay side flats (EOID 1908); (2) Observed in 1991 on bayside flats (EOID 5425); (3) Observed in 1991 (EOID 6384); (4) Observed in 1991 on bayside flats (EOID 7490);
Pachyramphus aglaiae (Rose-throated Becard)	H	G4G5SNA; TXT	(1) Santa Ana NWR; (2) Anzalduas County Park	(1) Nest building activity by unpaired female, observed in 2003 (EOID 235); (2) Pair nesting in cedar elm, abandoned a nest in a Mexican ash tree, observed in 1999 (EOID 4390)
Rookery (Colonial Nesting Birds)	C	GNRSNR	(1) Intracoastal Waterway near Arroyo Colorado; (2) South of Port Isabel; (3) South Padre Island; (4) Near Laguna Atascosa NWR; (5) Green Island; (6) Near Laguna Atascosa	(1) Nesting for 13 species of shore and water birds (EOID 154); (2) Nesting for one species of water bird (EOID 579); (3) Nesting for one species of water bird (EOID 2057); (4) Nesting for one species of shorebird (EOID 4009); (5) Nesting for 11

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			NWR; (7) Near Arroyo Colorado	species of shore and water birds (EOID 5491); (6) Nesting for 13 species of shore and water birds (EOID 5886); (7) Nesting for 10 species of shore and water birds (EOID 7151)
Choeronycteris mexicana (Mexican long-tongued bat)	C	G4S1	(1) Laguna Atascosa NWR	(1) Observed in 1998, dead male occurred under granjeno and thick thornscrub (EOID 3211)
Herpailurus yaguarondi (Jaguarundi)	C, H, S	G4S1; FLE; TXE	(1) La Coma tract, LRGVNWR; (2) El Negro Ranch Road; (3) Falcon State Recreation Area; (4) Five miles north of Los Fresnos; (5) Santa Ana NWR Complex; (6) Boca Chica; (7) Rangerville Tract, LRGVNWR and Resaca del Rancho Viejo; (8) Brownsville, two miles east of Keller's Corner; (9) Yturria Tract, LRGVNWR, two miles northeast of Sullivan City; (10) Resaca de la Palma WMA – World Birding Center and Olmito State Fish Hatchery; (11) Eight miles southeast of Brownsville on the Rio Grande in the Sabal Palm Grove Sanctuary; (12) Gabrielson Unit, LRGVNWR, near Anzalduas Dam, 2 miles south of Madero, Bentsen Rio Grande Valley SP; (13) Laguna Atascosa NWR	(1) One "cat in hand" observation between 1988–1989 (EOID 1005); (2) One reliable observation in 1992 (EOID 2074); (3) Six reliable observations between 1992–1993 (EOID 2286); (4) One reliable observation in 1992 (EOID 2415); (5) 23 reliable observations between 1987–1993 (EIOD 2582); (6) One reliable observation in 1990 (EOID 3204); (7) Three reliable observations between 1988–1989 (EOID 3205); (8) One road-killed individual near a brushy fringe along the Boca Chica Highway that leads to Rio Grande (EOID 3768); (9) One reliable observation between 1987–1988 (EOID 6401); (10) Three reliable observations between 1991–1992 (EOID 6920); (11) Two reliable observations between 1989–1990 (EOID 7020); (12) Ten reliable observations between 1988–1993 (EOID 7202); (13) Thirty-two reliable observations between 1987–1993, in Tamaulipan Thornscrub of dense honey mesquite, Texas ebony, and huisache (EOID 8139)
Lasiurus ega (Southern Yellow Bat)	C	G5S1; TXT	(1) Near Southmost Ranch Preserve; (2) National Audubon Society, Sabal Palm Grove Sanctuary; (3) Southeast of Brownsville	(1) Captured two males in an ornamental palm grove near the Rio Grande; (2) Occur in sabal palm grove adjacent to the Rio Grande (EOID 4572); (3) N/A (EOID 6796)
Leopardis pardalis (Ocelot)	C, H	G4S1; FLE; TXE	(1) Eight miles southeast of Brownsville; (2) South of Brownsville; (3) Port of Brownsville to Loma de los Ebanitos, Brownsville Ship Channel, and Holly Beach; (4) Santa Ana NWR Complex; (5) Two miles southwest of Sebastian; (6) Near Hargill; (7) Bentsen Rio Grande Valley SP; (8) Laguna Atascosa NWR and vicinity	(1) Sabal Palm Grove Sanctuary between 1988–1991 (EOID 697); (2) LRGVNWR between 1989–1991 (EIOD 726); (3) Radio-collared male monitored between 1990–1991 (EIOD 881); (4) Seven reliable observations between 1989–1991 (EOID 2142); (5) Longoria Unit of Las Palomas WMA in 1989 (EOID 3608); (6) Two individuals were live-trapped between 1980–1984, occupying Tamaulipan Thornscrub of dense honey mesquite, huisache, and Texas ebony (EOID 5801); (7) Seven reliable observations between 1991–1992 (EOID 6239); (8) Nine individuals were live-trapped in 1984, 36 observations were recorded between 1989–1993, 16 individuals were live-trapped between 1996–1997, and three observations were recorded in 1991, occupying Thornscrub of dense honey

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
				mesquite, huisache, and Texas ebony (EOID 6268)
Nasua narica (White-nosed Coati)	H, S	G5S2?; TXT	(1) 25 miles north of Edinburg; (2) Five miles east of Roma on the Rio Grande	(1) One coati observed in 1985 (EOID 3096); (2) One coati observed in 1991 (EOID 6009)
Panthera onca (Jaguar)	C	G3SH; FLE; TXE	(1) Near San Benito	(1) Jaguar kill reported in 1946 (EOID 2848).
Adelia vaseyi (Vasey's Adelia)	C, H, S	G2G3S2S3	(1) Brownsville; (2) Near Brownsville; (3) Vela Woods Tract, LRGVNWR; (4) Near Harlingen; (5) Santa Ana NWR Complex; (6) Ranchito Tract, LRGVNWR, (7) Las Palomas WMA; (8) Harlingen; (9) Near Brownsville; (10) Near Santa Rosa; (11) La Puerta Tract, LRGVNWR; (12) Santa Ana NWR Complex; (13) Las Palomas WMA, Noriega Tract LRGVNWR, Resaca de la Palma SP – World Birding Center; (14) Harlingen; (15) Southmost Ranch Preserve; (16) La Coma Tract, LRGVNWR; (17) Near Olmita; (18) Near Mission; (19) Near Progreso; (20) La Puerta Tract, LRGVNWR; (21) Las Palomas WMA; (22) Ranchito Tract, LRGVNWR; (23) Near Rio Hondo; (24) Las Palomas WMA; (25) Near McCook	(1) Observed on one acre in 1938 and 1943 (EOID 327); (2) Observed individual shrub in 2002 (EOID 603); (3) Up to 10 shrubs observed in 1994 (EOID 879); (4) Moderate population in mixed thorn shrubland observed in 2001 (EOID 1335); (5) Observed in blackbrush – cenizo shrubland in 1989 (EOID 1483); (6) Few plants observed in 1993 with Texas ebony woodland (EOID 1688); (7) Observed in 1988 with Texas ebony – anacua woodlands (EOID 1922); (8) Large population in thornscrub, observed in 2002 (EOID 2219); (9) Observed in chaparral thickets in 1942 (EOID 2740); (10) Shrub encountered in mature thornscrub forest, observed in 1989 and 1994 (EOID 3270); (11) Few shrubs observed in 1995 on dry slope of Goliad Formation conglomerate (EOID 3548); (12) Observation on one acre site in 1965 (EOID 4109); (13) Occurrences determined in thornscrub habitats in 1987 and 1994 (EOID 4516); (14) Large stand observed in 1956, 1959, 1964, and 2002 (EOID 4553); (15) Observed on one acre in 1963 (EOID 4915); (16) Few shrubs observed in 1994 with granjeno, Texas ebony, and anacua (EOID 5390); (17) Uncommon on black dry soil in 1926 (EOID 5594); (18) Two populations on sandy hills observed in 1933 and 1937 (EOID 6460); (19) Few shrubs along roadside, observed in 1986 (EOID 6830); (20) Few shrubs on sandy soil, observed in 1994 (EOID 7091); (21) Few shrubs in honey mesquite – granjeno woodland, observed in 1994 (EOID 7281); (22) Populations associated with dense woodland thicket, observed in 1957 and 1994 (EOID 7886);(23) Few shrubs in small disturbed patches of Thornscrub, observed in 2002 (EOID 8301); (24) Small populations in dense Thornscrub and woodland, observed in 2001 (EOID 8302); (25) Small populations in old mixed brush underlain by the Goliad Formation, observed in 1998 and 2003 (EOID 8310)
Ambrosia cheiranthifolia	C	G2S2; FLE;	(1) Near Barreda	(1) Open plain, soil remains dry for long periods, observed in

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
(South Texas Ambrosia)		TXE		1932 through 1938 (EOID 7388)
Ascleoias prostrata (Prostrate Milkweed)	S	G1G2S1S2	(1) Near Falcon State Recreation Area; (2) LRGVNWR, Arroyo Ramirez Tract; (3) North of Roma; (4) North of Roma; (5) West of Rio Grande City; (6) Near Roma	(1) Observed between 1987–1994 on well-drained calcareous sandy loam of the Copita Series overlaying the Yegua Formation (EOID 1572); (2) Observed in 2003 on dirt road (EOID 5533); (3) Observed in 1957, healthy population in 1986, no individuals in 1991 on 5-acre site, disturbed, bladed roadside site dominated by buffelgrass (EOID 6223); (4) Observed from 1966–1993 on one-acre site (EOID 6491); (5) Observed in 2004 in Copita fine sandy loam overlaying Catahoula and Frio formations (EOID 8325); (6) N/A (EOID 8798)
Astrophytum asterias (Star Cactus)	S	G1S1; FLE; TXE	(1) North of Rio Grande City; (2) Near Rio Grande City	(1) Sandy loam on south-facing slope, one acre observed between 1931–1968 (EOID 3563); (2) Gravelly loam, northeast facing slope, scattered brush with past clearing of brush, 30 acres observed in 1959 through 2003 (EOID 4575)
Atriplex klebergorum (Kleberg Saltbush)	S	G2S2S3	(1) Near El Sauz	(1) Observed in saline soil in 1979 (EOID 2898)
Ayenia limitaris (Texas Ayenia)	C, H	G2S1; FLE; TXE	(1) Near Barreda Station; (2) Near Los Fresnos; (3) Harlingen; (4) Near Olmito; (5) Near Progreso; (6) LRGVNWR, Teniente (Rudman) Tract; (7) Brownsville	(1) Observed on one acre from 1932–1939 on dry alluvial soils in thickets (EOID 137); (2) Observed on one acre in 1924 (EOID 1002); (3) Observed in 2001 and 2002 on Mercedes clay of the Rio Grande alluvium, tall thornscrub woodland with litter covered soil (EOID 1992); (4) Observed from 1941–1943 on clay soil of dry chaparral thickets; (5) Observed on one acre from 1977–1988 in deep shade of Texas Ebony – Anacua Woodland (EOID 3631); (6) Observed in 1999 on Willacy fine sandy loam with honey mesquite and granjeno (EOID 7113); (7) Observed under cultivation from 1945–1963 (EOID 7196)
Cardiospermum dissectum (Chihuahua Balloon-vine)	H, S	G2S2	(1) Near Falcon SRA; (2) La Puerta Tract, LRGVNWR; (3) Near Roma; (4) North of Roma; (5) North of Roma; (6) North of Rio Grande City; (7) La Puerta Tract, LRGVNWR; (8) Arroyo Ramirez Tract, LRGVNWR; (9) Chicharra Banco Tract, LRGVNWR; (10) La Reforma Training Area; (11) Near Alto Bonito; (12) Falcon SRA; (13) Los Olmos Tract, LRGVNWR; (14) Near Santa Margarita; (15) Falcon State Park; (16) LRGVNWR; (17) Yturria Brush Tract, LRGVNWR; (18) East of Rio Grande City; (19) Falcon SRA; (20) La	(1) Population observed in 1994 and 2002 in calcareous sandy loam, blackbrush thornscrub possibly in adjacent woodland (EOID 147); (2) Population observed in 1994 on calcareous sandstone and in blackbrush Thornscrub (EOID 581); (3) Observed in 1966 on hills and rocky slopes among shrubs (EOID 989); (4) Small colony in gravelly, Copita soils, observed in 1957 and 2002 (EOID 1173); (5) Observed in 1940 (EOID 1939); (6) Observed in 1951 (EOID 2189); (7) Few individuals in cenizo – blackbrush Thornscrub, observed in 1994 (EOID 2230); (8) Population on sandstone outcrop with blackbrush thornscrub, observed in 2003 (EOID 2596); (9) Uncommon occurrence on plowed upland, observed in 1994 (EOID 3011);

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			Puerta Tract, LRGVNWR; (21) North of La Joya; (22) Near La Joya (23) Near Rio Grande City; (24) Near Rio Grande City	(10) Common in honey mesquite – blackbrush – cenizo stand, observed in 1993 (EOID 3070); (11) Occasional plants in disturbed hillcut, observed in 1992 (EOID 5626); (12) Survey of blackbrush Thornscrub in 1990 (EOID 5658); (13) Common on level areas between gravel hills, observed in 1994 (EOID 5938); (14) Few plants on gravel terrace and slope, observed in 1975 (EOID 6004); (15) Observed in 1974 (EOID 6435); (16) Observations made in 1926 (EOID 6631); (17) A few plants observed in upland chaparral in 1994 (EOID 7554); (18) Few plants in arroyo, observed in 2002 (EOID 7555); (19) Blackbrush thornscrub occurs, observed in 1990 (EOID 7609); (20) Plants frequent in open honey mesquite – palo verde woodland, observed in 1994 (EOID 8226); (21) Small population in dense, medium-stature Thornscrub of blackbrush and cenizo, observed in 2003 (EOID 8308): (22) Plants abundant under moderately tall honey mesquite thornscrub, observed in 2003 (EOID 8312); (23) Common in medium-stature thornscrub, observed in 2002 (EOID 8322); (24) Many plants in medium-stature thornscrub, observed in 2002 (EOID 8323)

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
Coryphantha macromeris var. *runyonii* (Runyon's Cory Cactus)	C, S	G5T2T3S2S3	(1) North of Rio Grande City; (2) Near Junction of Highway 83 and FM 2098; (3) Near Junction of Highway 83 and FM 2098; (4) North of Roma; (5) Near El Sauz; (6) La Puerta Tract, LRGVNWR; (7) Northeast of Rio Grande City; (8) Rio Grande City; (9) Chapeno Tract, LRGVNWR; (10) La Puerta Tract, LRGVNWR; (11) Near Falcon Dam; (12) Brownsville; (13) Near Rio Grande City; (14) Los Olmos Tract, LRGVNWR; (15) Near Roma; (16) Near La Grulla; (17) Near Rio Grande City; (18) Near Rio Grande City	(1) Observed in 1933 (EOID 204); (2) One plant on gravelly eroding slope, observed in 1987 (EOID 311); (3) Several individuals on gravelly gentle slopes, observed in 1987 (EOID 312); (4) Few plants within Thornscrub on gravelly soils, observed in 2002 (EOID 969); (5) An individual on gravelly loam, observed in 1988 (EOID 1559); (6) Several plants in dense shrubland on gravelly soils, observed in 1988 (EOID 2184); (7) Rio Grande plains, observed in 1958 (EOID 3060); (8) Abundant on gravel and sandy hills, type locality, observed in 1918 and 1921 (EOID 3293); (9) Habitat of thorny shrubs on gravelly slope, observed in 1994 (EOID 3490); (10) Habitat of honey mesquite – palo verde woodland observed in 1994 (EOID 4821); (11) Observed in 1963 (EOID 4944); (12) Observed in 1924 (EOID 5304); (13) Few plants on gravelly loam with scattered brush, observed in 1987 (EOID 5673); (14) Several plants on gravelly slopes and drainages with mixed shrubland, observed in 1988 and 1994 (EOID 6370); (15) Habitat of sandy soil observed in 1965 (EOID 7069); (16) Habitat of deep soil supporting honey mesquite and junco observed in 1963 (EOID 7308); (17) Four populations on gravelly soil in native thornscrub, observed in 2002 (EOID 8313); (18) Seven clumps on gravelly soil in native thornscrub, observed in 2002 (EOID 8314)
Echeandra chandleri (Lila de los Llanos)	C	G3S2S3	(1) Playa del Rio, LRGVNWR; (2) Playa del Rio; (3) Near Highway 510 and 100 junction; (4) Playa del Rio, LRGVNWR; (5) Tulosa Ranch Tract, LRGVNWR; (6) Laguna Atascosa NWR; (7) Playa del Rio, LRGVNWR; (8) Near Rio Hondo; (9) Playa del Rio, LRGVNWR; (10) Loma de Estrella, LRGVNWR; (11) Playa del Rio, LRGVNWR; (12) Playa del Rio, LRGVNWR; (13) Playa del Rio, LRGVNWR; (14) Playa del Rio, LRGVNWR; (15) West of Port Isabel; (16) Playa del Rio, LRGVNWR; (17) Loma Preserve, LRGVNWR; (18) Northeast of Brownsville	(1) Large populations in open areas with honey mesquite and trecul yucca, observed in 1987 (EOID 395); (2) Large population in central portion of loma, observed in 1987 (EOID 462); (3) Large population along roadside and adjacent old field, observed in 1972 and 1984 (EOID 891); (4) Moderate population in open grassy areas, observed in 1987 (EOID 1020); (5) Observation of one plant in 1994 (EOID 1835); (6) Present on roadsides (EOID 2093); (7) A small colony observed in 1987 (EOID 2736); (8) Holotype collection in 1913 (EOID 3724); (9) Moderate population in thorn brush grassland, observed in 1987 (EOID 3961); (10) Moderate population on clay dunes, observed in 1973 and 1984 (EOID 4310); (11) Moderate population observed in 1987 and 1994, growing in open grassland (EOID 5582); (12) Eleven small populations in tall grasslands, observed in 1987 (EOID 5583); (13) Three moderate populations in open grassy areas, observed in 1987 (EOID 6669); (14) Ten small to moderate populations in open

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
				disturbed areas observed in 1987 (EOID 7039); (15) One-acre site observed in 1967 (EOID 7046); (16) Four small populations in open grassy areas, observed in 1987 (EOID 7181); (17) Small population on top of bluff and on flats, observed in 1994 (EOID 7600); (18) Small population on clay dunes in pasture, observed in 1923 and 1984 (EOID 7880)
Echeandia texensis (Green Island Echeandia)	C	G1S1	(1) Green Island; (2) Laguna Atascosa NWR; (3) Brownsville	(1) Holotypes and isotypes collected in 1922 (EOID 1011); (2) Observed in 1913 and 1975 on a one-acre tract of clay dunes with chaparral and prairies (EOID 4143); (3) Observed in 1935 and 1967 on clay loam soil (EOID 4505)
Eriogonum greggii (Gregg's Wild-buckwheat)	H, S	G2S1	(1) La Puerta Tract, LRGVNWR; (2) Near Highway 83 and FM 2098; (3) La Joya; (4) La Puerta Tract, LRGVNWR	(1) Few plants observed in 1995 in nearly barren sandy loam deposited over the Goliad Formation (EOID 1896); (2) Population observed in 1975, census in 1987, and observed in 2001 on gravelly, brushy, eroding slopes (EOID 2572); (3) Observed in 1942 (EOID 5710); (4) Observed in 1994 and considered locally common (EOID 6941)
Frankenia johnstonii (Johnston's Frankenia)	S	G3S3; FLE-PDL; TXE	(1) Near Roma; (2) Near Salineno; (3) Chapeno Tract, LRGVNWR; (4) Near El Sauz; (5) Near Roma; (6) Near Rio Grande City; (7) Near El Sauz; (8) Near El Sauz; (9) Near El Sauz; (10) Near El Sauz; (11) North of Roma; (12) N/A; (13) N/A; (14) N/A; (15) N/A	(1) Habitat of open areas with saline soils, observed in 1968 (EOID 842); (2) Population on 25 acres with rocky hill covered with fossil oyster shells, observed in 1974 and 1999 (EOID 1898); (3) Population of gravelly slopes and saline soils, observed in 1986, 1994, and 2000 (EOID 4843); (4) Population on bare ground with severe grazing pressure, soils are clay to clay loam and alkaline, observed in 1966 and 1999 (EOID 6402); (5) Population on 15 acres with Catarina soils, observed in 1999 (EOID 7468); (6) Population on 10 acres with Catarina soils that are strongly alkaline, observed in 1994 and 1999 (EOID 8324); (7) Population on 30 acres with Catarina soils, observed in 1999 (EOID 8329); (8) Population on two acres of Copita soils growing with saladillo, observed in 1994 and 1999 (EOID 8330); (9) Population on 20 acres of Catarina soils observed in 1999 (EOID 8331); (10) Population on 4 acres of Ramadero loam, previously disturbed site supports saladillo, observed in 1994 and 1999 (EOID 8332); (11) Population on 11 acres of Catarina soils observed in 1999 (EOID 8333); (12) Population on 15 acres of Montell clay soils, with saladillo, observed in 1994 and 1999 (EOID 8338); (13) Population of 23 acres with Copita sandy loam soils, observed in 1999 (EOID 8339); (14) Populations on 70 acres of Maverick soils, eroded and Catarina soils, observed in 1999 (EOID 8340);

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
				(15) Populations on 20 acres with Catarina soils, observed in 1997 and 2000 (EOID 8342)
Grindelia oolepis (Plains Gumweed)	C	G2S2	(1) South of Russeltown; (2) Brownsville; (3) Brownsville; (4) Brownsville; (5) Brownsville; (6) Near Los Fresnos	(1) Collected in 1939 on black clay soil in low spots (EOID 797); (2) Observed in 1941 and 1980 not located in 2001 and 2002 (EOID 1352); (3) Three populations observed in 1940, two relocated in 1979, none located in 2001 and 2002 (EOID 3838); (4) Observed as abundant in 2001, occurred in roadside ditch in 2002 (EOID 4326); (5) Type locality sampled in 1923, Harlingen clay soil, gumbo (EOID 4681); (6) Sampled in thicket in 1930 (EOID 6335)
Heteranthera mexicana (Mexican Mud-plantain)	C, H	G2G3S1	(1) Mission; (2) Near Alamo; (3) South of Mercedes; (4) North of Brownsville	(1) Collected in 1936 (EOID 1383); (2) Collected in 1942; (3) Collected in muddy soil of a resaca in 1932 and 1941; (4) Collected in 1928 in black clay soil in low moist places (EOID 7720)
Justicia runyonii (Runyon's Water-willow)	C, H	G2S2	(1) North of Brownsville; (2) Near Lozono; (3) Sabal Palm Grove Sanctuary; (4) Near Santa Rosa; (5) Near Barreda; (6) Santa Ana NWR Complex; (7) Las Palomas WMA; (8) La Paloma Tract, LRGVNWR; (9) Brownsville; (10) West of Harlingen; (11) N/A; (12) Arroyo Colorado Unit, Las Palomas WMA; (13) East of Brownsville; (14) Near Olmito; (15) South of Weslaco; (16) Las Palomas WMA and Resaca de la Palma SP – World Birding Center	(1) Observed in black soil in 1923 (EOID 105); (2) Observed on sandy loam of levee in swales with tall brush, documented in 1955 and 1984 (EOID 401); (3) Occurs in shade under sabal palms, observed in 1984 and 1992 (EOID 1331); (4) Large population on sandy clay loam on edge of honey mesquite – mule's fat woodland, observed in 1991 (EOID 1763); (5) Habitat on edge of thicket in clay soil, observed in 1933, 1936, and 1984 (EOID 1813); (6) Observation in 1959 and 1985 (EOID 2801); (7) Population occurs on resaca bank with Texas ebony and cedar elm, observed in 1994 (EOID 3129); (8) Habitat is edge of dense thicket, observed in 1957 (EOID 4023); (9) Observed in 1942 and 1947 (EOID 4130); (10) Observed in 1984 (EOID 4321); (11) Habitat is ephemeral pond margin, observed in 1991 (EOID 4389); (12) Populations in mesic sites and shade of tall subtropical thorn woodlands, observed in 2001 (EOID 4730); (13) Population on resaca banks at edge of thickets, observed in 1922 (EOID 5105); (14) Observed in 1927 (EOID 5720); (15) Habitat of heavy clay with honey mesquite, observed in 1983 (EOID 5890); (16) Populations at resaca edges associated with Texas ebony, snake-eyes, and granjeno woodlands, observed in 1984 and 1987 (EOID 6686)
Manfreda longiflora (St. Joseph's Staff)	C, H, S	G2S2	(1) Near Falcon Village; (2) Cuellar Tract, LRGVNWR; (3) Near Roma; (4) Near Sullivan City; (5) Near La Joya; (6) Near Rio Grande City; (7) Near Brownsville; (8) Sam Fordyce	(1) Small population in sandy loam soil adjacent to blackbrush thornscrub, observed in 2002 (EOID 104); (2) Several plants on eroded saline clay soils of slopes observed in 1994 (EOID 304); (3) A single plant on sandy loam observed in 1991 (EOID 489);

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			North Tract, LRGVNWR; (9) La Puerta Tract, LRGVNWR; (10) Los Olmos Tract, LRGVNWR; (11) East of Rio Grande City; (12) Near El Sauz; (13) Near El Sauz; (14) Arroyo Ramirez Tract, LRGVNWR; (15) Near Rio Grande City; (16) North of Roma; (17) Chapeno Tract, LRGVNWR; (18) Near Rio Grande City	(4) Possible occurrence on clay slopes and gravel hills (E)ID 1137); (5) Population in honey mesquite woodland, observed in 1987 (EOID 2499); (6) Populations of gravelly loamy soils with honey mesquite shrubland, observed in 1987 and 2003 (EOID 2863); (7) Observed in 1921 (EOID 3160); (8) Population on shallow calcareous soil in area of old gravel pit, observed in 1994 (EOID 4097); (9) Population on caliche bluffs in blackbrush and cenizo, observed in 1994 (EOID 4098); (10) Population on caliche bluff edge with conglomerate, observed in 1994 (EOID 4263); (11) Observation on gravelly ridge in 1954 (EOID 5796); (12) Population on gravelly loam over calcareous sandstone in honey mesquite shrubland, observed in 1985 and 1988 (EOID 6229); (13) Population of overgrazed and eroding pasture in honey mesquite – grassland habitat, observed in 1985 and 1988 (EOID 6870); (14) Population on ridgeslope, observed in 2003 (EOID 7149); (15) Population on deep clay soils and scattered in grasslands, observed in 1988 (EOID 7818); (16) Population on sandy, clayey loam observed in 2002 (EOID 8095); (17) Population in calcareous clay between gravelly slopes observed in 1994 (EOID 8203); (18) Individual under honey mesquite shrub observed in 2002 (EOID 8321)
Manihot walkerae (Walker's Manioc)	H, S	G1S1; FLE; TXE	(1) Near La Joya; (2) Near La Joya; (3) LRGVNWR, Chicharra Banco Tract; (4) Northeast of Peñitas; (5) LRGVNWR, La Puerta Tract; (6) LRGNWR, Yturria Brush Tract; (7) South of Mission; (8) North of Rio Grande City; (9) Near Peñitas; (10) East of Rio Grande City	(1) Observed between 1997–2001 on knoll of Jimenez-Quemado Complex soils, gravelly (EOID 163); (2) N/A, observed in 1940–1941 (EOID 369); (3) Observed in 1995–1996 (EOID 2674); (4) Observed on one acre from 1990–1992 on fine sandy loam in partial shade of dense native brush (EOID 3041); (5) Observed 1993–1995 in mixed shrubland on McAllen fine sandy loam over Goliad Formation with caliche flat at edge of slope (EOID 3956); (6) Observed from 1995–2002 (EOID 5302); (7) Observed in 1940, holotype (EOID 5411); (8) Observed in 2000 in Zapata soil near native brush rangeland (EOID 6219); (8) Observed from 1997–2002 on Zapata Series calcareous gravelly loam, in medium stature thornscrub (EOID 6220); (9) Observed from 1997–2002 in native brush along a fenceline (EOID 6569); (10) Observed in 1940 (EOID 8235)
Matelea radiata (Falfurrias Milkvine)	H	GHSH	(1) North of La Joya	(1) Observed in 1941 on dry gravel hills, clay soil, 45 meters (EOID 1793)
Physaria thamnophila (Zapata bladderpod)	S	G1S1; FLE; TXE	(1) North of Roma; (2) North of Roma; (3) Cuellar Tract, LRGVNWR; (4) Roma;	(1) Observed in 1994 (EOID 196); (2) Observed on Maverick soil series, Jackson group geology, in 1996, 2000, and 2001

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			(5) Arroyo Ramirez Tract, LRGVNWR; (6) North of Roma	(EOID 1206); (3) Observed on Catarina Clay, Yegua formation geology, in open thorn shrubland on eroded soil in full sun, in 1994, 1997, 2001, and 2002 (EOID 2223); (4) No plants observed in 1985 and 1986 (EOID 5562); (5) Observed on sandstone outcrop on ridge in blackbrush shrubland in 2002 and 2003 with two additional rare species (EOID 7381): (6) Observed on gravelly slopes of grassy, flat plain of huisache, blackbrush, honey mesquite, and cenizo in 1987, 1996, and 2001 (EOID 7965)
Thelocactus bicolor var. *flavidispinus* (Straw-spine Glory-of-Texas)	S	G4T2S2	(1) Near Rio Grande City	(1) Misidentified specimen (EOID 645)
Thymophylla tephroleuca (Ashy Dogweed)	S	G2S2; FLE; TXE	(1) North of Rio Grande City	(1) Observed in 1932 (EOID 7995)
Tillandsia baileyi (Bailey's Ballmoss)	C, H	G2G3S2	(1) Near La Joya; (2) South of Weslaco; (3) Noriega Tract, LRGVNWR; (4) Near Los Fresnos; (5) Harlingen; (6) Harlingen; (7) Near Rio Hondo; (8) West of La Paloma; (9) Near Olmito; (10) Laguna Atascosa NWR; (11) South of Weslaco; (12) Resaca del Rancho Viejo, LRGVNWR; (13) Ranchito Tract, LRGVNWR; (14) Santa Ana NWR Complex; (15) LRGVNWR	(1) Specimens collected from two populations in 1940 (EOID 124); (2) Observation of a Texas ebony host tree in 1941 (EOID 1180); (3) Observation area of 1 acre with extremely dense Texas ebony – snake-eyes thicket and mature subtropical evergreen woodland (EOID 2480); (4) Population observed in remnant tall subtropical brush in 2001 (EOID 3064); (5) Population observed in Texas ebony and other trees and shrubs in 2002 (EOID 3494); (6) Observed in 1964 and mapped in 2002; (7) Small population in Texas ebony tall shrubs (EOID 4598); (8) Growing on honey mesquite tree in a thicket, observed in 1940 (EOID 5170); (9) Individuals growing on introduced trees and shrubs observed in 1927 and 1988 (EOID 6438); (10) Observed in 1990 on granjeno shrubs in chaparral (EOID 7080); (11) Observed in 1988 (EOID 7548); (12) observed in 1984 and 1987 in a densely wooded strip (EOID 7549); (13) Observed in 1994 in honey mesquite – granjeno woodlands (EOID 6010); (14) Observed in1992, plants growing on Texas ebony trees (EOID 8129); (15) Observed in 1952 on clay dunes growing near ground
Acacia rigidula Series (Blackbrush Series)	S	G5S5	(1) North of Roma; (2) Falcon SRA; (3) Falcon SRA; (4) North of Rio Grande City; (5) North of Rio Grande City	(1) Observed 7,040 acres in 1986, soils are gypsiferous or saline, diverse ridge with honey mesquite, blackbrush, guajillo, kidneywood, some root plowing (EOID 1126); (2) Observed in 1990, diverse Thornscrub shrubland (EOID 4918); (3) Observed

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
				in 1990, diverse Thornscrub shrubland (EOID 4919); (4) Observed 25 acres in 1985, Barreta Thornscrub (EOID 4999); (5) Observed 25 acres in 1985, Barreta Thornscrub (EOID 7919)
Pithecellobium ebano – Ehretia anacua Series (Texas Ebony – Anacua Series)	C, H, S	G2S1	(1) Las Palomas WMA; (2) Las Palomas WMA, LRGVNWR; (3) Las Palomas WMA, LRGVNWR, Resaca de la Palma SP – World Birding Center; (4) Near Garceno; (5) Near Madero, LRGVNWR; (6) Las Palomas NWR; (7) Laguna Atascosa NWR; (8) South of Brownsville, LRGNWR; (9) Bentsen – Rio Grande Valley SP; (10) Las Palomas WMA; (11) North of Progreso; (12) South of Abram, LRGVNWR; (13) LRGVNWR	(1) Observed 50 acres in 1985, Texas ebony, sugarberry, anacua, elm, a few sabal palms, growing near a resaca (EOID 1281); (2) Observed 40 acres in 1985, Texas ebony - anaqua, honey mesquite - anacua, low brush with patchy distribution (EOID 1283); (3) Observed 440 acres in 1985, diverse, little true Texas ebony - anaqua, more Texas ebony - mixed brush with snake-eyes, lotebush, granjeno, excellent brush tract (EOID 2575); (4) Observed 110 acres in 1985, sugarberry, Texas ebony, anaqua, honey mesquite, fairly good quality (EOID 3271); (5) Observed 730 acres in 1985, potential Texas ebony - anaqua, most is potential sugarberry – elm, now elm - anacua – hackberry – Texas bluewood, some Texas ebony on dry sites (EOID 3506); (6) Observed 45 acres in 1985, parts are typical Texas ebony – anaqua pygmy forest, small area of mixed quality (EOID 4272); (7) Observed 45,000 acres in 1986, diverse area of scrub and low woodland scattered among wetlands matrix with Texas ebony, snake-eyes, honey mesquite, Colima, etc. (EOID 5148); (8) 17 acres of go-back brush, not visited, potential is subtropical woodland or shrubland (EOID 5571); (9) Observed in 1985 and 1990, mostly sugarberry, Texas ebony, anacua, bluewood, honey mesquite, elm with much Texas ebony – Anacua, very good site (EOID 5935); (10) Observed 165 acres in 1985, patches of old-growth Texas ebony – anaqua – bluewood – spiny hackberry mixed with planted areas and old fields (EOID 6712); (11) Observed 30 acres in 1985, honey mesquite - Texas ebony - anaqua, catclaw, good patches of Thornscrub and woodland (EOID 6892); (12) Observed 30 acres in 1985, sugarberry - anaqua, huisache go-back fields (EOID 7263); (13) Observed 80 acres in 1985, confusing sugarberry – honey mesquite - Texas ebony with no anaqua (EOID 7948)
Pithecellobium ebano – Phaulothamnus spinescens Series (Texas Ebony – Snake-eyes Series)	C, H	G2S2	(1) East of Loma del Burro, LRGVNWR; (2) Four miles south of San Benito; (3) North of Rio Hondo and adjacent to Arroyo Colorado; (4) LRGVNWR, south of Brownsville Ship Channel; (5) LRGVNWR, South Bay; (6) Loma	(1) Observed in 1956, 63 acres dominated by low tropical shrubs (EOID 377); (2) Observed in 1985, 65 acres dominated by Texas ebony and mixed brush in active cemetery where one acre is cleared each year (EOID 894); (3) Observed in 1985, 65 acres dominated by Texas ebony, blackbrush, snake-eyes, and

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			Preserve, LRGVNWR; (7) Near Combes; (8) LRGVNWR, South Bay; (9) Las Palomas WMA; (10) LRGVNWR, south of Brownsville Ship Channel; (11) LRGVNWR, Santa Ana; (12) Las Palomas NMA; (13) Near Combes; (14) Laguna Madre, LRGVNWR; (15) Southeast of Highway 281 and 186, LRGVNWR; (16) South of Brownsville Ship Channel, LRGVNWR	lotebush, patchy distribution (EOID 1800); (4) Observed in 1952, 60 acres (EOID 2741); (5) Observed in 1952, 73 acres dominated by low subtropical shrubs (EOID 2742); (6) Observed in 1952, 50 acres dominated by low subtropical shrubs (EOID 2741); (7) Observed from road in 1985, 25 acres of confusing honey mesquite, sugarberry, mixed brush, possible Texas ebony – anacua (EOID 3593); (8) Observed in 1952, 73 acres dominated by low subtropical shrubs (EOID 4673); (9) Observed in 1985, 70 acres of go-back field dominated by honey mesquite and granjeno (EOID 5145); (10) Observed in 1952, 29 acres dominated by low subtropical shrubs (EOID 5561); (11) Probably a go-back pasture, 20 acres (EOID 5751); (12) Observed in 1988, mixed shrubland with emergent Texas ebony, a portion may be the Cenizo Series and a portion Texas ebony – Anacua Series (EOID 5893); (13) Observed in 1985, 65 acres surveyed from the road, Texas ebony – honey mesquite mixed brush with Texas Ebony – Anacua potential (EOID 6379); (14) Observed in 1952, 68 acres dominated by low subtropical shrubs (EOID 7026); (15) Observed in 1984 and 1985, 1,800 acres dominated by honey mesquite – brush with some huisache – palo verde sites (EOID 8053); (16) Observed in 1952, 13 acres dominated by low subtropical shrubs (EOID 8181);
Pithecellobium ebano – Phaulothamnus spinescens – Citharexylum berlandieri Series (Texas Ebony – Snake-eyes – Berlandier Fiddlewood Series)	C	G2S2	(1) Seven miles inland from Boca Chica Beach	(1) Clay loam hill, associates include running mesquite, cross-thorn, maytenas, brasil, and a variety of subtropical shrubs, observed in 1984 (EOID 895)
Prosopis glandulosa – Acacia smallii Series (Honey Mesquite – Huisache Series)	C, H, S	G5S5	(1) Falcon Reservoir shoreline; (2) Las Palomas WMA, Arroyo Colorado SRA; (3) Bentsen-Rio Grande Valley SP, Rio Grande hiking trail	(1) Recent growth woodland in seasonally flooded saline soils in narrow band on shoreline, observed in 1990 (EOID 1520); (2) Disturbance type in grazed area, not surveyed intensively in 1988 (EOID 3036); (3) Disturbance type with dense herbaceous cover of weedy species, observed in 1990 (EOID 5940)
Sabal texana Series (Texas Palmetto Series)	C	G2S1	(1) Sabal Palm Grove Sanctuary, East of Palm Grove School on Southmost Road; (2) Southmost Ranch Preserve, four miles southeast of Palm Grove School; (3) LRGVNWR, one mile south of Palm Grove	(1) Thirty acres observed in 1984 and managed as a nature preserve: sabal palm, Texas ebony, Anacua, Sugarberry, Bluewood subtropical forest, some sites a former tropical plant nursery (EOID 2505); (2) Thirty acres observed in 1986, small, fair quality Texas Palmetto Forest with Texas ebony,

Table 3-1. Summary of Element Occurrence Records for Cameron, Hidalgo, and Starr Counties.[1]

Species	County Record	Rank and Status	General Location	Comments
			School	sugarberry, anacua, brasil, tenaza, and diverse shrubs and vines; home to many subtropical birds at the northern edge of their range (EOID 5955; (3) Three-hundred sixty-five acres observed in 1985, mostly cropland with restoration in progress (EOID 7189)
Ulmus americana – *Celtis* spp. Series (American Elm – Hackberry Series)	C, H	G4S4	(1) Near FM2556 and Highway 281 junction, LRGVNWR	(1) Observed in 1985, fairly good floodplain forest of diverse sugarberry, Mexican ash, elm, and willow, patchy distribution (EOID 2148)
Ulmus crassifolia – *Celtis laevigata* Series (Cedar Elm – Sugarberry Series)	H, S	G4S4	(1) East of Runn, LRGVNWR; (2) South of Santa Margarita; (3) South of La Joya, LRGVNWR; (4) Bentsen – Rio Grande Valley SP; (5) Las Palomas WMA	(1) Observed 20 acres in 1985, good patches of elm, hackberry, Texas ebony, honey mesquite, and Mexican ash (EOID 2494); (2) Observed 25 acres in 1985, good sugarberry, Mexican ash, willow gallery forest with no elm, intermittent stands to Falcon Dam (EOID 3601); (3) Observed 70 acres in 1985, highly disturbed sugarberry, honey mesquite, granjeno, cedar elm, and Texas bluewood, bank of Rio Grande eroding at this site (EOID 5968); (4) Observed in 1990 (EOID 6515); (5) Observed 45 acres in 1985, internally drained stand of sugarberry, honey mesquite, cedar elm, huisache, and Mexican ash (EOID 7054)
Uniola paniculata – *Panicum amarum* Series (Sea Oats – Bitter Panicum Series)	C	G4S3	(1) Brazos Island SRA	(1) Dunes elevated to 10–12 feet tall, casual visit in 1991 (EOID 7656)

County lists of rare species were acquired from TPWD and these were consolidated into **Table 3-2**. The county lists include species of conservation concern in Texas. In general, species that appear on county lists do not all share the same probability of occurrence within a county (e.g., some species are migrants or wintering residents and a few species might be historic or considered extirpated within a county). The following are species for which data were available in the TXNDD:

- **Fish:** river goby, Rio Grande silvery minnow.
- **Amphibians:** sheep frog, white-lipped frog, black-spotted newt, Mexican burrowing toad, south Texas siren (large form), Mexican treefrog.
- **Reptiles:** black-striped snake, reticulate collared lizard, indigo snake, speckled racer, Texas tortoise, Texas horned lizard, northern cat-eyed snake.
- **Birds:** gray hawk, white-tailed hawk, piping plover, northern aplomado falcon, peregrine falcon, rose-throated becard, rookery.
- **Mammals:** Mexican long-tongued bat, jaguarundi, southern yellow bat, ocelot, white-nosed coati, jaguar.
- **Plants:** Vasey's adelia, south Texas ambrosia, prostrate milkweed, star cactus, Kleberg saltbush, Texas ayenia, Chihuahua balloon-vine, Runyon's cory cactus, lila de los llanos, Green Island echeandia, Gregg's wild buckwheat, Johnston's frankenia, plains gumweed, Mexican mud-plantain, Runyon's water-willow, St. Joseph's staff, Walker's manioc, Falfurrias milkvine, Zapata bladderpod, ashy dogweed, Bailey's ballmoss.
- **Vegetation Types:** Blackbrush Series, Texas Ebony – Anacua Series, Texas Ebony – Snake-eyes Series, Texas Ebony – Snake-eyes – Berlandier Fiddlewood Series, Mesquite – Huisache Series, Texas Palmetto Series, American Elm – Hackberry Series, Cedar Elm – Sugarberry Series, Sea Oats – Bitter Panicum Series.

Table 3-2. Federal- and State-Threatened and Endangered Species in Texas

Common Name	Scientific Name	County	Federal Status	State Status
Fish				
Blackfin goby	*Gobionellus atripinnis*	C		**T**
Opossum pipefish	*Microphis brachyurus*	C		**T**
Rio Grande silvery minnow	*Hybognathus amarus*	S, H, C		**E**
River goby	*Awaous banana*	H, C		**T**

Common Name	Scientific Name	County	Federal Status	State Status
Amphibians				
Black spotted newt	*Notophthalmus meridionalis*	S, H, C		**T**
Mexican burrowing toad	*Rhinophrynus dorsalis*	S		**T**
Mexican treefrog	*Smilisca baudinii*	S, H, C		**T**
Sheep frog	*Hypopachus variolosus*	S, H, C		**T**
South Texas siren (large form)	*Siren sp 1*	S, H, C		**T**
White-lipped frog	*Leptodactylus fragilis*	S, H, C		**T**
Reptiles				
Black-striped snake	*Coniophanes imperialis*	H, C		**T**
Green sea turtle	*Chelonia mydas*	C	**E**	**T**
Hawksbill sea turtle	*Eretmochelys imbricata*	C	**E**	**E**
Kemp’s Ridley sea turtle	*Lepidochelys kempii*	C	**E**	**E**
Leatherback sea turtle	*Dermochelys coriacea*	C	**E**	**E**
Loggerhead sea turtle	*Caretta caretta*	C	**T**	**T**
Indigo snake	*Drymarchon corais*	S, H, C		**T**
Northern cat-eyed snake	*Leptodeira septentrionalis septentrionalis*	S, H, C		**T**
Reticulate collared lizard	*Crotaphytus reticulatus*	S, H		**T**
Speckled racer	*Drymobius margaritiferus*	H, C		**T**
Texas horned lizard	*Phrynosoma cornutum*	S, H, C		**T**
Texas scarlet snake	*Cemophora coccinea lineri*	C		**T**
Texas tortoise	*Gopherus berlandieri*	S, H		**T**
Birds				
American peregrine falcon	*Falco peregrinus anatum*	S, H, C		**E**
Arctic peregrine falcon	*Falco peregrinus tundrius*	S, H, C		**T**
Brown pelican	*Pelecanus occidentalis*	C	**E**	**E**
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	S, H, C		**T**
Common black-hawk	*Buteogallus anthracinus*	S, H, C		**T**
Eskimo curlew	*Numenius borealis*	C		**E**
Gray hawk	*Asturina nitida*	S, H, C		**T**
Least tern	*Sterna antillarum*	S, H, C	**E**	**E**
Mexican hooded oriole	*Icterus cucullatus cucullatus*	S		**T**
Northern Aplomado falcon	*Falco femoralis septentrionalis*	H, C	**E**	**E**

Common Name	Scientific Name	County	Federal Status	State Status
Northern beardless-tyrannulet	*Camptostoma imberbe*	S, H, C		**T**
Peregrine falcon	*Falco peregrinus*	S, H, C		**E, T**
Piping plover	*Charadrius melodus*	H, C	**T**	**T**
Reddish egret	*Egretta rufescens*	H, C		**T**
Rose-throated becard	*Pachyramphus aglaiae*	S, H, C		**T**
Sooty tern	*Sterna fuscata*	C		**T**
Texas Botteri's sparrow	*Aimophila botterii texana*	H, C		**T**
Birds (continued)				
Tropical parula	*Parula pitiayumi*	S, H, C		**T**
White-faced ibis	*Plegadis chihi*	H, C		**T**
White-tailed hawk	*Buteo albicaudatus*	S, H, C		**T**
Whooping crane	*Grus Americana*	S, H, C	**E**	**E**
Wood stork	*Mycteria americana*	S, C		**T**
Zone-tailed hawk	*Buteo albonotatus*	S, C		**T**
Mammals				
Coues' rice rat	*Oryzomys couesi*	S, H, C		**T**
Gulf Coast jaguarundi	*Herpailurus (=Felis) yaguarondi*	S, H, C	**E**	**E**
Ocelot	*Leopardus (=Felis) pardalis*	S, H, C	**E**	**E**
Southern yellow bat	*Lasiurus ega*	H, C		**T**
White-nosed coati	*Nasua narica*	S, H, C		**T**
Plants				
Ashy dogweed	*Thymophylla tephroleuca*	S	**E**	**E**
Johnston's frankenia	*Frankenia johnstonii*	S	**E**	**E**
South Texas ambrosia	*Ambrosia cheiranthifolia*	C	**E**	**E**
Star cactus	*Astrophytum asterias*	S, H,C	**E**	**E**
Texas ayenia	*Ayenia limitaris*	H,C	**E**	**E**
Walker's manioc	*Manihot walkerae*	S, H	**E**	**E**
Zapata bladderpod	*Lesquerella thamnophila*	S	**E**	**E**

Sources: TPWD 2007, USFWS 2007
Notes:
S: Starr County, Texas
H: Hidalgo County, Texas
C: Cameron County, Texas
E = Endangered; T = Threatened

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4. ENVIRONMENTAL SETTING

The project area climate is semiarid-subtropical/subhumid within the Modified Marine climatic type with summers that are long and hot and winters that are short, dry, and mild (Larkin and Bomar 1983, Bailey 1995). The marine climate results from the predominant onshore flow of tropical maritime air from the Gulf of Mexico. Onshore air flow is modified by a decrease in moisture content from east to west and by intermittent seasonal intrusions of continental air.

Average temperatures in Brownsville/McAllen range from a low of 48 degrees Fahrenheit (°F) in January to a low of 75 °F in July, and a high of 69 °F in December to a high of 97 °F in August. Annual low and high temperatures for Brownsville range from 12 °F to 63 °F and 93 °F to 107 °F, respectively. The average annual precipitation of the Rio Grande Delta recorded in Brownsville ranges from 22 to 30 inches (Brownsville recorded 21.68 inches and McAllen 22.6 inches for 2006), and the distribution of rainfall is irregular. Wind speeds are stable ranging from 10.4 miles per hour (mph) to 17.3 mph during the year. A long growing season is experienced for the project region, from 314 to 341 days. The evaporation rate during the summer season is high, about twice the amount of precipitation.

The vegetation of the Rio Grande Delta of southern Texas has generally been classified under the Dry Domain, Tropical/Subtropical Steppe Division of Bailey (1995). The project area is more finely classified as the Southwestern Plateau and Plains Dry Steppe and Shrub Province. (TPWD 2007) provides discussion and describes vegetation geography to biotic provinces and natural regions using topographic features, climate, vegetation types, and terrestrial vertebrates. This system places the project area in the Tamaulipan Biotic Province, South Texas Brush Country (Rio Grande Basin) Natural Region, and the Level III Ecoregions of the Southern Texas Plains and Western Gulf Coastal Plain.

Occurring within the Lower Rio Grande Valley (LRGV) (technically a delta) of southern Texas and northern Mexico, Tamaulipan Brushland represents a unique ecosystem (USFWS 1988). The characteristic natural vegetation is dense and thorny, and plant species distribution can be correlated with geologic formations. The Rio Grande floodplain supports tall, dense riparian forest, woodland, shrubland, and herbaceous vegetation while the xeric upland areas support mostly spiny shrubs, short-stature trees, and dense nonnative grasslands. Between the 1920s and 1980s more than 95% of the native brushland (includes woodlands and forests) and 90% of the riparian vegetation had been converted to agriculture and urban land use (USFWS 1988). In 1988, it was estimated that 98% of the lush, subtropical region of the Rio Grande Delta had been cleared of native vegetation in the United States and a large, but unknown percentage cleared in Mexico.

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5. BIOLOGICAL RESOURCES

5.1 Vegetation Classification for the 150-foot Survey Corridor on the North Side of the Levee

The USFWS (1988) recognized 11 biotic communities in the LRGV using a combination of plant species dominance, wildlife use, topography, hydrology, and geology. There are eight biotic communities that could be associated with the project region: (1) Chihuahuan Thorn Forest, (2) Upper Valley Flood Forest, (3) Barretal, (4) Upland Thornscrub, (5) Mid-Valley Riparian Woodland, (6) Sabal Palm Forest, (7) Mid-Delta Thorn Forest, and (8) Ramadero. Chihuahuan Thorn Forest could occur near the western terminus of Section O-1. Sections O-1 and O-2 lie within the Upper Valley Flood Forest biotic community and adjacent to the Barretal. Sections O-3 and O-4 occur within the Upper Valley Flood Forest and Upland Thornscrub biotic communities. Sections O-4 through O-20 occur primarily within the Mid-Valley Riparian Woodland biotic community, with some vegetative influence from the Mid-Delta Thorn Forest, which occurs to the north. The Sabal Palm Forest biotic community occurs within Section O-21. Ramaderos occur where ridges and slopes are in proximity to the Rio Grande, mostly along Section O-1.

Chihuahuan Thorn Forest is a desert shrub community characterized by upland and riparian components, e.g., sotol, catclaw mimosa, and blackbrush acacia shrublands and black willow, Montezuma baldcypress, Texas ebony, and honey mesquite riparian woodlands and forests. Upper Valley Flood Forest is characterized by honey mesquite and granjeno stands that have become established in the small forested valleys of the Rio Grande between Falcon and Mission. Barretal or thicket is characterized by the native citrus tree, chaparro prieto, Tamaulipan palo verde, chaparro amargosa, and junco that have become established on a narrow band of gravel and caliche ridges that are elevated above the Rio Grande floodplain. Upland Thornscrub, the most widespread of the Tamaulipan Biotic Province communities regionally, has become established on hills, ridges, and slopes at higher elevations than the Rio Grande floodplain terraces and is characterized by anacuahuita and cenizo shrubs. Mid-Valley Riparian Woodland is a bottomland hardwood forest of the Rio Grande floodplain that is characterized by cedar elm, Berlandier ash, and sugarberry trees, often intermixed with honey mesquite and granjeno in the understory. Sabal Palm Forest represents remnant stands of Mexican palmettos or sabal palms associated with tepeguaje, anacua, and Texas ebony trees. Mid-Delta Thorn Forest is located on the Rio Grande delta and is characterized by honey mesquite and granjeno, often in association with Texas ebony, anacua, and brasil. Ramaderos are isolated strips of dense shrubs lining arroyos that have eroded into slopes, are periodically flooded, and are characterized by granjeno, huisache, retama, brasil, and honey mesquite shrubs and small trees.

NatureServe (2007a) has defined ecological systems to represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes such as fire or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. The ensuing vegetation description for the project area was prepared in the framework of ecological systems that include (1) Tamaulipan Calcareous Thornscrub (CES301.986), (2) Tamaulipan Mesquite Upland Scrub (CES301.984); (3) Tamaulipan Mixed Deciduous Thornscrub (CES301.983), (4) Tamaulipan Savanna Grassland (CES301.985), (5) Tamaulipan Arroyo Shrubland (CES301.992), (6) Tamaulipan Floodplain (CES301.990), (7) Tamaulipan Palm Grove Riparian Forest (CES 301.991), and (8) North American Arid West Emergent Marsh (CES300.729). **Table 5-1** provides a crosswalk between the biotic communities described by the USFWS (1988) and the ecological systems of NatureServe (2008).

Classification of existing vegetation within this corridor was achieved by accessing the project corridor and staging areas as proposed, sampling observation points, and relating them to the NatureServe (2007a) Explorer classification database. At the coarsest level, the eight above-named ecological systems were determined and local vegetation types described using the national system. A finer level of classification equaling or approximating the vegetation alliance level of the National Vegetation Classification System (NatureServe 2007a) was used to prepare the plant community discussions under each ecological system. Vegetation stands and patches that are generally unclassified in the current system and sampled within the corridor typically consisted of nonnative species including Chinaberry (*Koelreuteria* sp.) Woodland, Athel Tamarisk (*Tamarix aphylla*) Woodland, Castor Bean (*Ricinus communis*) / Buffelgrass (*Pennisetum ciliare*) Shrubland, Mediterranean Lovegrass (*Eragrostis* sp.) – Rough Pigweed (*Amaranthus retroflexus*) Herbaceous Vegetation, Johnsongrass (*Sorghum halapense*) Herbaceous Vegetation; Windmill Grass (*Chloris* spp.) Herbaceous Vegetation, Silver Bluestem (*Bothriochloa laguroides*) – Buffelgrass (*Pennisetum ciliare*) Herbaceous Vegetation, Streambed Bristlegrass Herbaceous Vegetation, Kleberg's Bluestem Herbaceous Vegetation, Quelite Cenizo (*Atriplex matamorensis*) – Buffelgrass (*Pennisetum ciliare*) Herbaceous Vegetation, Prairie Aster (*Aster subulatus*) Herbaceous Vegetation, and False Ragweed (*Parthenium confertum*) – Johnsongrass (*Sorghum halepense*) – Windmillgrass (*Chloris cucullata*) Herbaceous Vegetation.

Habitats observed, sampled, and photographed within the project corridor range from upland thornscrub on the western end of Section O-1, upper and mid-valley riparian forest and woodland communities throughout the middle sections, and sabal palm and mid-delta thorn forests within Section O-21. Much of the vegetation cover along the sections consists of nonnative grassland species that are themselves dominant or often support an overstory of honey mesquite, retama, tepeguaje, mule's fat or jara, or huisache shrubs or small trees.

Table 5-1. Crosswalk Relationship of USFWS Biotic Communities with National Vegetation Classification Standard (NVCS) Ecological Systems and Vegetation Alliances

Ecological System (NatureServe 2008) Vegetation Alliance	Biotic Community (USFWS 1988)
Tamaulipan Calcareous Thornscrub -Cenizo – Blackbrush Shrubland -Bristleleaf Dogweed – Woody Tiquilia Dwarf-shrubland	Barretal, Upland Thornscrub
Tamaulipan Mesquite Upland Scrub -Granjeno Woodland and Shrubland -Honey Mesquite Woodland	Chihuahuan Thorn Forest, Upper Valley Flood Forest, Mid-Delta Thorn Forest
Tamaulipan Mixed Deciduous Thornscrub -Huisache Woodland -Honey Mesquite Shrubland	Chihuahuan Thorn Forest, Upland Thornscrub
Tamaulipan Savanna Grassland -Retama Shrubland -Tepeguahe Woodland	Upper Valley Flood Forest, Mid-Valley Riparian Woodland
Tamaulipan Arroyo Shrubland	Ramadero
Tamaulipan Floodplain -Texas Ebony Riparian Forest and Woodland -Sugarberry Riparian Forest and Woodland -Mexican Ash Woodland -Honey Mesquite Riparian Forest, -Mule’s Fat Shrubland -Black Willow Woodland and Shrubland -Giant Reed Herbaceous Vegetation -Common Reed Herbaceous Vegetation	Upper Valley Flood Forest, Mid-Valley Riparian Woodland
Tamaulipan Palm Grove Riparian Forest -Sabal Palm Forest and Woodland	Sabal Palm Forest
North American Arid West Emergent Marsh -Alkali Sacaton Herbaceous Vegetation -Narrowleaf Cattail Herbaceous Vegetation, -Smartweed Herbaceous Vegetation -Duckweed Herbaceous Vegetation	Included among several Biotic Communities

Vegetation cover occupies approximately 63% of the corridor. Agricultural fields occur along much of the corridor and include sugarcane, sorghum, Johnsongrass, sunflowers, cotton, row crop vegetables (particularly onions, beans, tomatoes, broccoli, corn), citrus trees (grapefruit and orange), or fields that were fallow at the time of the site visit; fields occupy approximately 21% of the corridor. Urban development and private property with single homes occurs adjacent to several sections; along with roads, these land uses occupy approximately 15% of the corridor.

A brief description of each plant community observed within the sections (Sections O-1 through O-21) is provided herein; they are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation. To the extent possible, each community is illustrated and supported by representative ground photographs and foliar cover information for dominant species. Some vegetation patches and stands are introduced nonnative species and do not readily fit into a recognized vegetation alliance or ecological system predominantly designed for native vegetation; they are discussed at the end of this section.

5.1.1 Tamaulipan Floodplain Ecological System (CES301.990)

Texas Ebony Riparian Forest and Woodland

Texas ebony occurred within the project corridor as trees and shrubs typically providing sparse to low cover in other plant communities and as individual large trees. Woodland stands dominated by 5-meter (m) to 15-m-tall Texas ebony trees occurred within the Hidalgo Bend and Tahuachal Banco Units of the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) within Sections O-6 and O-16, respectively. Within these stands, sugarberry, tepeguahe, and huisache canopy trees together provided 15% cover and the understory was characterized by moderate to dense cover, up to 80% cover by switchgrass and buffelgrass. As an understory to tepeguaje woodlands in the Phillips Banco tract of the LRGVNWR (Section 0-18), Texas ebony trees to 6-m-tall provided up to 5% cover. Particularly large, mature Texas ebony trees that are approximately 20 m–25 m tall occur within floodplain habitat in Section O-2 where they occupy the outer edge (see **Figure 5-1**). The large trees have emerged from an understory of the nonnative perennial grass, buffelgrass, and can exceed 100 years of age (Patterson 2008).

Sugarberry Riparian Forest and Woodland

Sugarberry forest and woodland stands have become established on the outer floodplain and along oxbows of the Rio Grande and were sampled in Sections O-1, O-2, O-3, O-8, O-9, O-10, O-11, O-12, and O-14 (see **Figure 5-2**). Sugarberry stands cover approximately 6 acres within the project corridor and approximately 9.7 acres within the staging area and access road templates. Canopy cover for the mature sugarberry trees (10 m–30 m tall) ranges from 15% to 75%. Honey mesquite trees are commonly present in the canopy layer and provide 5% to 20% cover. A diverse stand occurred along a stream in the Arroyo Ramirez Unit of the LRGVNWR, which supported 6% cover by sugarberry and 8% cover

Figure 5-1. Representative Photographs of Mature Texas Ebony Tree and Woodland Stand

Figure 5-2. Representative Photographs of Sugarberry Habitat

combined for Mexican ash, anacua, honey mesquite, Texas persimmon, Texas ebony, cedar elm, and black willow trees. In one stand, a subcanopy layer of granjeno, huisache, and honey mesquite, from 5 m–10 m tall, provided approximately 20% cover. The herbaceous layer provides low to dense cover, from 5% to 75% cover and includes switchgrass, Bermuda grass, buffelgrass, or giant reed (carrizo). One regional biologist (Patterson 2008) considered the sugarberry riparian forest occurring at the Arroyo Ramirez confluence with the Rio Grande as the best example of riparian woodland that he has observed in Starr County.

Mexican Ash Woodland

Stands of Mexican ash occurred in Section O-12 on a construction staging area at Los Indios and a homestead site (see **Figure 5-3**). In these stands, mature Mexican ash canopy trees were planted in rows in parklike settings, ranged up to 20 m tall, and provided approximately 20% cover. Buffelgrass and Bermuda grass provided moderate herbaceous cover for these stands, up to 35% and were regularly maintained by mowing.

Figure 5-3. Representative Photographs of Mexican Ash Habitat

Honey Mesquite Riparian Forest

Honey mesquite forests characterized by large trees from 10 m–30 m tall occurred on the Rio Grande floodplain margins and were sampled in Sections O-1, O-2, O-6, O-8, O-13, and O-21. Honey mesquite stands cover approximately 44.3 acres within the project corridor and approximately 91.2 acres within the staging areas and access road templates. In the canopy layer, honey mesquite cover ranged from 20% to 60% (see **Figure 5-4**). Associated canopy tree species included sugarberry, retama, and granjeno that provided low cover, from 3% to 15% cover. A subcanopy layer was typically present, provided 10% to 25% cover, and included snake eyes, huisache, retama, granjeno, brasil, Texas ebony, and colima. The tall and short shrub layers (1 m–5 m tall) were occasionally present, provided from 5% to 55% cover, and included Texas prickly pear, snake eyes, cenizo, granjeno, and honey mesquite saplings. The herbaceous layer provided low to dense cover, from 15% to 85% cover, ranged from 0.5 m–2.0 m tall, and included buffelgrass, switchgrass, and a variety of forbs including vines.

Mule's Fat Shrubland

Mule's fat or jara occurred as stands and patches of riparian tall shrubs from 4 m–10 m tall where near-to-surface groundwater or occasional standing water

Figure 5-4. Representative Photographs of Honey Mesquite Forest Habitat

was present within the project region. Mule's fat stands cover approximately 1.6 acres within the project corridor and approximately 1.1 acres within the staging area and access road templates. The densest stands with mule's fat or jara tall shrub foliar cover of up to 55% were recorded in Section O-3 within the Los Ebanos Unit of the LRGVNWR, Section O-13, and Section O-18 within the Phillips Banco Unit (see **Figure 5-5**). Stands can be monotypic in the tall shrub layer, or low cover, less than 10% cover of granjeno, tepeguaje, sugarberry saplings, or black willow, can occur. The herbaceous layer provides moderate to high cover, from 30% to 90% cover, ranges from 0.5 m–2.0 m tall, and includes switchgrass, windmill grass, Johnsongrass, buffelgrass, and prairie aster. The typical succession of abandoned cropland within the Rio Grande floodplain proceeds from annual forbs (Russian-thistle and pigweed) to shrubs (mule's fat) to a final disclimax of honey mesquite and Texas prickly pear (Patterson 2008).

Black Willow Woodland and Shrubland

Black willow tall shrubs or small trees, from 5 m–10 m in height, form narrow bands or linear stands on saturated soil around permanent water bodies including the Rio Grande, canals, drainage ditches, and ponds (see **Figure 5-6**). Representative stands were sampled in Sections O-3, O-8, O-13, O-14, and O-20. Black willow typically provided from 10% to 60% cover in the canopy or tall shrub layer

Figure 5-5. Representative Photographs of Mule's Fat Habitat

Figure 5-6. Representative Photographs of Black Willow Habitat

along with low to moderate cover, less than 10% by granjeno, honey mesquite, mule's fat or jara, and retama. The herbaceous layer provided moderate to high cover, from 15% to 95% cover, ranged from 1 m–10 m tall, and included giant reed, switchgrass, narrowleaf cattail, smartweed, and buffelgrass.

Giant Reed Herbaceous Vegetation

Giant reed or carrizo forms 5 m–10 m tall, linear, dense stands (from 15%–95% cover) on saturated soils of ditch and canal banks, standing water in ditches, and other sites with near-to-surface groundwater. Some stands have apparently become established as a result of irrigation runoff draining from sugarcane and other irrigated agricultural fields. Giant reed stands cover approximately 0.3 acres within the project corridor and approximately 0.3 acres within the staging area and access road templates. The banks of the Rio Grande support dense stands that exceeded 8 m in height (see **Figure 5-7**). Switchgrass is a common associate in giant reed stands providing from 15% to 50% cover and black willow trees to 10 m tall provided approximately 25% cover in one stand. In one stand near Moon Lake in Section O-9, common reed provided cover equal to that of giant reed, e.g., 15% cover for each species of reed. In a recently mown stand in Section O-9, giant reed was dominant, but provided only 4% cover. Representative data were recorded from stands that occurred in Sections O-2, O-9, and O-14.

Figure 5-7. Representative Photographs of Giant Reed Habitat

Common Reed Herbaceous Vegetation

Common reed was rarely observed within the project region, persisting as narrow strips along canal banks that rarely exceeded 25 square meters (m^2) in area covered (see **Figure 5-8**). Larger stands were observed outside the project corridor and along the banks of the Rio Grande and its associated oxbows or resacas. One stand along the Rio Grande in the Arroyo Ramirez Unit of the LRGVNWR was associated with wetland forbs and grasses including delta arrowhead, erect burhead, fragrant flatsedge, wild cowpea, hachinal, gulf cockspur, Louisiana cupgrass, water smartweed, water pimpernel, and Mexican buttonbush.

Figure 5-8. Representative Photographs of Common Reed Habitat

5.1.2 Tamaulipan Palm Grove Riparian Forest Ecological System (CES301.991)

Sabal Palm Forest and Woodland

Sabal palms are distributed predominantly in Section O-21 as scattered individuals, small groups, or linear clumps, and patches and stands where they persist as seedlings, tall shrubs (palmettos), and as trees up to 20 m tall (see **Figure 5-9**). Only a few sabal palm trees were observed in other project sections, mostly as palmettos. The USFWS has established the Boscaje de la Palma Unit of the LRGVNWR in the southernmost bend of the Rio Grande near Brownsville to preserve sabal palm forest and woodland habitat (USFWS 1988). The sabal palm was common enough in this region, extending to near the Gulf of Mexico at the time of Spanish exploration, that the Rio Grande was first named the Rio de Las Palmas. Sabal palm stands cover approximately 8.3 acres within the project corridor and approximately 11.4 acres within the staging area and access road templates. In sampled stands, the sabal palm ranged from 4 m–10 m tall and provided from 8% to 30% cover. Low cover, less than 10%, was also provided by honey mesquite, tepeguaje, anacua, huisache, sugarberry, and Texas ebony trees and tall shrubs. In the herbaceous layer, the liana ivy treebine or hierba del buey provides up to 50% cover and switchgrass provides from 20%–55% cover. The sabal palm woodland stand located within the Bascaje de la Palma Unit was aggressively treated to eradicate nonnative grasses and shrubs and therefore presented a disturbed understory (see **Figure 5-9**).

Figure 5-9. Representative Photographs of Sabal Palm Forest and Woodland Habitat

5.1.3 Tamaulipan Mesquite Upland Scrub Ecological System (CES301.984)

Granjeno Woodland and Shrubland

Granjeno or spiny hackberry forms stands of moderate-stature trees to 15 m tall or is a dominant understory component in the subcanopy or tall shrub layers, ranging from 3 m–5 m tall. Granjeno stands occupy approximately 2.4 acres within the project corridor and approximately 1.4 acres within staging area and access road templates. Representative stands were sampled in Sections O-1, O-5, O-10, O-13, and O-17 where granjeno cover ranged from 30% to 75% (see **Figure 5–10**). Associated canopy trees provided low cover, up to 20%, and included honey mesquite, huisache, sugarberry, and retama. The herbaceous layer provided low to dense cover, from 5% to 50%, and included the 2 m–8 m tall switchgrass, giant reed, and Johnsongrass. On some small hilltops within the Arroyo Ramirez Unit of the LRGVNWR within Section O-1, granjeno tall shrubs provided 10% cover and buffelgrass provided 70% cover; associated short shrubs that together provided 14% cover at this site included Texas prickly-pear, snake eyes, lotebush, colema, and Mexican persimmon.


Figure 5-10. Representative Photographs of Granjeno Habitat

Honey Mesquite Woodland

Honey mesquite woodlands with small trees from 5 m–10 m tall were sampled in Sections O-1, O-2, O-3, O-4, O-5, O-7, O-8, O-9, O-10, O-15, and O-18. Honey mesquite woodland and tall shrub stands (combined herein) cover approximately 5.8 acres within the project corridor and approximately 3.7 acres within the access road template. In the canopy layer, honey mesquite cover ranged from 5% to 55% (see **Figure 5-11**). Associated canopy tree species, when present, included snake eyes, granjeno, retama, huisache, sugarberry, and Texas ebony that provided low to moderately dense cover, from 5% to 40%. The tall and short shrub layers provided low cover, up to 15%, and included snake eyes, Texas prickly pear, blackbrush, cenizo, kidney wood, mule's fat or jara, junco, goatbrush, granjeno, tasajillo, lotebush, bluewood condalia, colima, brasil, and honey mesquite saplings. The herbaceous layer contributed low to high cover, from 5% to 90%, and is dominated by buffelgrass and switchgrass. The vine or liana old man's beard can provide low to moderate cover in this plant community. Revegetation efforts at the Los Ebanos Unit of the LRGVNWR were represented by this type following 5 to 6 years of growth. The typical succession of abandoned cropland within the Rio Grande floodplain proceeds from annual forbs (Russian-thistle and pigweed) to shrubs (mule's fat) to a final disclimax of honey mesquite and Texas prickly pear (Patterson 2008).

Figure 5-11. Representative Photographs of Honey Mesquite Woodland Habitat

5.1.4 Tamaulipan Mixed Deciduous Thornscrub Ecological System (CES301.983)

Huisache Woodland

Huisache typically occurs in the canopy, subcanopy, or as tall shrubs as a component of other plant communities (see **Figure 5-12**). Short-stature huisache woodlands were sampled within Sections O-1, O-2, and O-7 and two short-stature huisache woodland stands were observed in Section O-21. Huisache woodland and tall shrub stands (combined herein) cover approximately 0.1 acre within the project corridor. In the canopy layer, huisache trees from 5 m–10 m tall ranged in cover from 8% to 10%. Additional canopy trees included retama and honey mesquite, which together provided from 5% to 8% cover. The shrub layer was moderately diverse and included Texas prickly-pear, bluewood condalia, cenizo, lotebush, colima, anaqua, and palo verde that together provided up to 6% cover. The understory was characterized by moderately dense to dense stands of the nonnative buffelgrass and switchgrass, which together provided 50% to 80% cover.

Figure 5-12. Representative Photographs of Huisache Woodland Habitat

Honey Mesquite Shrubland

Honey mesquite is distributed throughout the approximately 70-mile corridor and occurs as tall shrubs becoming recently reestablished in nonnative grasslands, as short-stature woodlands where reestablishment in nonnative grasslands has occurred over several years, and as tall forests of mature trees at the edge of the Rio Grande floodplain. The approximate acreage covered by honey mesquite tall shrubs is combined with the woodlands discussion (see above) to provide a more accurate area. Honey mesquite tall shrubs sampled in Section O-1 occur along the high bluffs adjacent to Los Negros Creek and the ridgetops between side arroyos, range from 2 m–5 m in height, and typically provide from 5% to 25% cover (see **Figure 5-13**). Associated tall and short shrubs include Texas prickly pear, tasajillo, blackbrush, cenizo, lotebush, coyotillo, snake-eyes, granjeno, Colima, guayacan, Spanish dagger, coma, Mission fiddlewood, leatherstem, and brasil, which together provide up to 10% cover. The herbaceous layer is typically dominated by buffelgrass, which provides up to 60% cover.

5.1.5 Tamaulipan Arroyo Shrubland Ecological System (CES301.992)

Several arroyos or deep drainages that are intermittently flooded occur primarily within Sections O-1 and O-2 (see **Figure 5-14**). Shrubland stands within arroyos cover approximately 0.9 acres within the project corridor and approximately 0.7 acres within the staging area and access road templates. Characterized primarily by short shrubs that provide up to 20% cover, the arroyos are floristically diverse and each is somewhat unique in terms of species composition. The more common shrubs include blackbrush or chaparro, lotebush, coma, coyotillo, leatherstem, brasil, colima, cenizo, Mexican persimmon, kidney wood, jointfir, snake-eyes, granjeno, Wherry mimosa, oregano, Texas prickly pear, and Texas palo verde. Rarely, tall shrubs of honey mesquite or Spanish dagger can also occur, providing sparse cover. In arroyos associated with Los Negros Creek, large barrel cacti occur on the steep slopes. The herbaceous layer is often sparse and can include the endangered Zapata bladderpod on sandstone

Figure 5-13. Representative Photographs of Honey Mesquite Shrubland Habitat

outcrops or it can provide up to 20% cover by the nonnative buffelgrass. Arroyo habitats have fine clay and sand substrates that are highly erodible and arroyos are subject to disturbance because of steep slopes. The bottom of Los Negros Creek contains a massive, unvegetated fossil reef composed of oyster shells, possibly the largest such reef in Starr County (Patterson 2008).

Figure 5-14. Representative Photographs of Arroyos in Sections O-1 and O-2

5.1.6 Tamaulipan Calcareous Thornscrub Ecological System (CES301.986)

Cenizo – Blackbrush Shrubland

The western portion of Section O-1 and eastern portion of Section O-2 traverse gravel-covered ridges, sandstone bluffs, and hill slopes that support this species rich, predominantly shrub and succulent community. The gravel is small, to 10 centimeters (cm) in diameter, is glazed with desert varnish, and provides nearly 100% armoring of the soil surface. Additional soil armoring is provided by clam shells in some locations and a few bedrock outcrops occur immediately south of Section O-1. Shrublands of this type cover approximately 7.9 acres within the project corridor and approximately 9.7 acres within the staging area and access road templates. One stand of cenizo—blackbrush shrubland approximately 200 m long—is just north of the corridor, at the terminus of Section O-1 and has been recently root-plowed, leaving less than 20% cover by native shrub species while resulting in approximately 50% to 70% cover by the nonnative buffelgrass (see **Figure 5-15**). The short and tall shrub layers provide from 20% to 30% cover in this community, and are characterized by cenizo, blackbrush, honey mesquite, Wherry mimosa, Texas paloverde, Texas prickly pear, tasajillo, kidney wood, coyotillo, junco, oregano, leatherstem, dog cholla, and Spanish dagger.

The herbaceous layer contributes sparse cover, less than 5% cover, in this vegetation type.

Figure 5-15. Representative Photographs of Cenizo – Blackbrush Habitat (Lower two photos represent area that has been root-plowed - fenceline contrast and buffelgrass invasion)

Bristleleaf Dogweed – Woody Tiquilia Dwarf-shrubland

The western portion of Section O-1 and its associated staging areas occur on areas of gravel-covered ridges and hill slopes that support this short-stature, species-rich vegetation stand (see **Figure 5-16**). This stand is small, less than one acre in size under both corridor widths. The substrate consists of bare soil, primarily, and small gravel. A few bedrock outcrops occur in the stand vicinity. A few honey mesquite tall shrubs provide sparse cover while Spanish dagger and blackbrush provide low cover within this stand. The short shrub layer ranges from 2 m–5 m in height, provides up to 10% cover, and is characterized by amargosa, cenizo, lotebush, Texas prickly pear, coyotillo, and tenaza. The dwarf-shrub layer, less than 0.5 m tall, provides low to moderate cover, up to 20%, and is dominated by bristleleaf dogweed (Tiny Tim dogweed) and woody tiquilia (oreja de perro), in addition to sparse cover by pencil cactus. The herbaceous layer contributes sparse to low cover, less than 10%, and includes the nonnative Mediterranean lovegrass and buffelgrass.

Figure 5-16. Representative Photographs of Bristleleaf Dogweed – Woody Tiquilia Habitat

5.1.7 Tamaulipan Savanna Grassland Ecological System (CES301.985)

Retama Shrubland

Retama has reinvaded nonnative grassland habitat to form shrublands and short-stature woodlands with low to moderately dense cover, from 10% to 40% cover as recorded for Sections O-4, O-6, O-13, O-18, and O-21 (see **Figure 5-17**). Retama stands cover approximately 0.9 acres within the project corridor and approximately 2.8 acres within the staging area and access road templates. Granjeno and honey mesquite tall shrubs can provide up to 10% cover and mule's fat or jara and lotebush can provide up to 8% cover. The herbaceous layer was usually monotypic and could be characterized by buffelgrass, windmill grass, or switchgrass, which provide low to dense cover from 15% to 100%.

Tepeguahe Woodland

A single stand of tepeguahe woodland from 10 m–15 m tall was documented in the Phillips Banco Unit of the LRGVNWR within Section O-18 (see **Figure 5-18**). Tepeguahe stands cover approximately 0.01 acre within the project corridor and approximately 10.6 acres within the staging area and access road templates. Tepeguahe trees occurred on the flat plain beyond the fenceline and provided from 30% to 35% cover with low cover, less than 10%, provided by Texas ebony, sugarberry, and Mexican sabal palm in the subcanopy layer. Near the adjacent levee, on the toeslope, tepeguahe trees and tall shrubs provided 30% cover, while the herbaceous layer was characterized by 1 m–2 m tall switchgrass, which provided approximately 60% cover.

Figure 5-17. Representative Photographs of Retama Habitat

Figure 5-18. Representative Photographs of Tepeguahe Habitat

5.1.8 North American Arid West Emergent Marsh Ecological System (CES300.729)

Alkali Sacaton Herbaceous Vegetation

Two relatively large stands of alkali sacaton were observed and a representative stand sampled in Section O-4 (see **Figure 5-19**). Although the hydrology

Figure 5-19. Representative Photographs of Alkali Sacaton Habitat

supporting this herbaceous wetland type is unknown, the stands occupy shallow depressions that likely capture runoff from the surrounding landscape during precipitation events. Alkali sacaton stands cover approximately 0.6 acres within the access road template. The stands are nearly monotypic with 0.5 m–1.0 m tall alkali sacaton bunchgrass providing up to 75% cover and Bermuda grass, a nonnative, providing sparse cover, less than 5%.

Narrowleaf Cattail Herbaceous Vegetation

Patches and small linear stands of narrowleaf cattail occur along perennial water bodies, particularly on pond shorelines, where the soils are saturated most of the year or where shallow water to 1.0 m deep persists (see **Figure 5-20**). Narrowleaf cattail stands cover 1.2 acres within the project corridor and approximately 1.9 acres within the staging areas and access road templates. Where established, as in Section O-8, narrowleaf cattail stands are monotypic, range from 2 m–4 m tall, form bands approximately 10 m wide, and provide from 60% to 90% cover. The largest ponded area had been excavated historically for gravel extraction to below the groundwater table.


Figure 5-20. Representative Photographs of Narrowleaf Cattail Habitat

Smartweed Herbaceous Vegetation

Smartweed is rare within the corridor and dominates the bottom of one canal or large irrigation ditch within Section O-14 (see **Figure 5-21**). The smartweed stand covers approximately 0.1 acre within the access road template. The stand is narrow and linear, up to 5 m wide and smartweed forbs provide approximately 20% cover. The canal bottom is saturated with occasional pools of standing water. Adjacent banks support 1 m–3 m tall Johnsongrass and switchgrass, primarily. In some locations along the canal or irrigation ditch, an overstory canopy of black willow provides up to 60% cover, which is described more fully under the black willow woodland discussion.

Figure 5-21. Representative Photograph of Smartweed Habitat

Duckweed Herbaceous Vegetation

One small pond in Section O-9, less than 0.1 acre in size, supported approximately 90% cover by the floating aquatic plant species duckweed (see

Figure 5-22). This pond also supported a band of narrowleaf cattail on saturated soil around its margin in addition to black willow tall shrubs.

Figure 5-22. Representative Photograph of Duckweed Habitat

5.1.9 Nonnative Woodland, Shrubland, and Herbaceous Vegetation Alliances and Associations

Athel Tamarisk Woodland

A small stand, less than 0.5 acres in size, of six very large and old Athel tamarisk trees occurs within Section O-2 amid a broader honey mesquite forest and woodland stand (see **Figure 5-23**). These trees are approximately 20 m tall, are multiple branched from low on the trunk, and have very large basal diameters. A few scattered, large Athel tamarisk trees occur elsewhere in this stand and several were observed on the banks of the Rio Grande associated with other sections. This vegetation type occurs within the Tamaulipan Floodplain ecological system of NatureServe (2007a).

Chinaberry Woodland

One stand of Chinaberry, a nonnative ornamental tall shrub or small tree, was documented in Section O-16 (see **Figure 5-24**). In this small stand, which covers approximately 0.3 acres within the project corridor, Chinaberry canopy trees ranged from 6 m–8 m tall and provided approximately 60% cover. Other canopy trees provided 40% cover: honey mesquite (5%), huisache (5%), and retama (15%). Buffelgrass and switchgrass provide moderate to high herbaceous cover for this stand, 50% and 5% cover, respectively.

Figure 5-23. Representative Photographs of Athel Tamarisk Stand

Figure 5-24. Representative Photograph of Chinaberry Habitat

Castor Bean / Buffelgrass Shrubland

One abandoned homestead in Section O-9 supported a tall shrubland, up to 5 m tall, of castor bean, honey mesquite, and mule's fat or jara, which together provide 22% cover (see **Figure 5-25**). The commonly occurring, nonnative buffelgrass contributed 20% cover within this stand. This stand covered less than 0.1 acre within the project corridor.

Buffelgrass Semi-Natural Herbaceous Vegetation

Buffelgrass, a nonnative forage and erosion-control grass introduced from Africa, is the most common vegetation type and ground cover in the project region (see

Figure 5-25. Representative Photograph of Castor Bean / Buffelgrass Habitat

Figure 5-26). Buffelgrass stands cover approximately 135.7 acres within the project corridor and an additional 103.7 acres on staging areas and access roads. Buffelgrass ranges from 0.5 m–1.5 m tall and provides from 25% to 100% cover on levee banks, canal banks, toe slopes, flats, old fields, and pastures to the exclusion of other species. Where native shrubs and trees have been introduced or have otherwise become established (e.g., honey mesquite, granjeno, huisache), buffelgrass characterizes the understory often providing 90% to 100% cover. In some herbaceous stands within the Project region, bufflegrass shares dominance with switchgrass, Johnsongrass, or windmill grass forming mixed stands or a type of ecotone. This vegetation type occurs within all the Tamaulipan ecological systems described by NatureServe (2007) for this region.

Figure 5-26. Representative Photographs of Buffelgrass Habitat

Switchgrass – (Guinea Grass) Herbaceous Vegetation

Panicum spp. (switchgrass and Guinea grass) are common throughout the project corridor on sites that are more mesic (see **Figure 5-27**). Switch and Guinea grasses are bunchgrasses likely introduced to the project region for livestock forage and erosion control. Switchgrass stands cover approximately 35.7 acres within the project corridor and approximately 19.5 acres within the staging area and access road templates. Switchgrass often forms mixed stands with buffelgrass. Switch and Guinea grasses range from 1 m–2 m tall and provide from 40% to 95% cover on levee banks, canal banks, toe slopes, flats, and pastures, sometimes to the exclusion of other species. Where native shrubs and trees have been introduced (as on units of LRGVNWR) or have otherwise become established, switch and Guinea grasses can compose the understory providing 25% to 75% cover. In some herbaceous stands within the Project region, switch and Guinea grasses share dominance with buffelgrass, primarily forming mixed stands or a type of ecotone. This vegetation type occurs within all the Tamaulipan ecological systems described by NatureServe (2007) for this region.

Figure 5-27. Representative Photographs of Switchgrass (Guinea Grass) Habitat

Silver Bluestem – Buffelgrass Herbaceous Vegetation

A large patch of silver bluestem and bufflegrass, covering less than 0.3 acres, was sampled on the levee embankment within Section O-5 (see **Figure 5-28**). Silver bluestem provided 50% cover and buffelgrass provided 15% cover. A few shrubs of *Acacia* sp. provide low cover, up to 4%.

Figure 5-28. Representative Photographs of Silver Bluestem – Buffelgrass Habitat

Johnsongrass Semi-Natural Herbaceous Vegetation

Johnsongrass is grown as a pasture grass and to produce cured grass hay for livestock forage. Individual plants and small patches are scattered within most of the sections and a few larger stands were observed, possibly as remnant stands from past farming efforts. Johnsongrass stands cover approximately 1.0 acre within the project corridor. Nearly monotypic stands occur in Sections O-11, O-13, and O-14, with Johnsongrass up to 2 m tall providing 80% to 90% cover (see **Figure 5-29**). In one stand, switchgrass provides up to 5% cover and a few castor bean shrubs provide approximately 2% cover. These large stands are irrigated during the growing season or receive sufficient runoff following precipitation events to survive.

Figure 5-29. Representative Photographs of Johnsongrass Habitat

Bermuda Grass Semi-Natural Herbaceous Vegetation

Small patches and larger stands of Bermuda grass have become established on levee banks, in ditches adjacent to canal banks, and in agricultural fields that have been allowed to go fallow for more than one year (see **Figure 5-30**). Bermuda grass stands cover approximately 2.1 acres within the project corridor and an additional 11.6 acres on staging areas and access roads. Typical stands of this nonnative rhizomatous grass were sampled within Sections O-3, O-6, O-8, and O-15 where Bermuda grass ranged in cover from 15% to 80%. Along Section O-15, heavy and apparently continual grazing by cattle drives the dominance of Bermuda grass. Associated herbaceous species that individually provide 10% cover or less include buffelgrass, switchgrass, windmill grass, sandbur, and morning-glory. In one stand the tall shrub huisache provided 5% cover.

Figure 5-30. Representative Photographs of Bermuda Grass Habitat

Windmill Grass Herbaceous Vegetation

Representative patches and stands of windmill grass were sampled in Sections O-12, O-13, O-19, O-20, and O-21 (see **Figure 5-31**). In some places windmill grass has become the dominant grass forming nearly pure stands on levee banks; however, extensive, monotypic stands occupy fields that were historically cultivated. Windmill grass stands cover approximately 6.4 acres within the project corridor and approximately 1.3 acres within the staging and access road templates. Windmill grass is dense and typically provides 90% to 95% cover. Associated tall shrubs, from 2 m–5 m tall, include mule's fat or jara, huisache, and retama that together provide from 1% to 25% cover in windmill grass stands and result in a shrub herbaceous classification. Two large stands were mowed annually to acquire grass hay.


Figure 5-31. Representative Photographs of Windmill Grass Habitat

Streambed Bristlegrass Herbaceous Vegetation

A single patch or small stand of streambed bristlegrass, covering less than 5.0 acres, was sampled in Section O-10 (see **Figure 5-32**). The stand occurs at a staging area and had been introduced into a field that is used for overflow parking. In the herbaceous layer, streambed bristlegrass provides up to 80% cover, while windmill grass and false ragweed contribute sparse cover. This stand is maintained by mowing.

Kleberg's Bluestem Herbaceous Vegetation

Representative stands of Kleberg's bluestem were sampled in Sections O-7 and O-9 (see **Figure 5-33**). Kleberg's bluestem provides dense cover, up to 70%, characterizing the herbaceous layer. Other herbaceous species provide low to moderate cover, up to 25% and include Bermuda grass, windmill grass, Guinea grass, buffelgrass, snap-pea, silverleaf nightshade (trompillo), and old man's beard. Associated tall shrubs, from 2 m–5 m tall, include honey mesquite, sugarberry, lotebush, granjeno, and retama that together provide up to 10% cover.

Figure 5-32. Representative Photograph of Streambed Bristlegrass Habitat

Figure 5-33. Representative Photographs of Kleberg's Bluestem Habitat

Mediterranean Lovegrass – Rough Pigweed Semi-Natural Herbaceous Vegetation

A fallow agricultural field in Section O-2 and a pasture in the Peñitas Unit of the LRGVNWR in Section O-4 supported stands of Mediterranean lovegrass and the tall, coarse forb, rough pigweed (see **Figure 5-34**). These annual stands cover approximately 1.5 acres within the project corridor and approximately 14.2 acres within the staging area and access road templates. The nonnative grasses Mediterranean lovegrass, Bermuda grass, and buffelgrass provided approximately 35% to 45%, 8%, and 3% cover, respectively, and the forbs rough pigweed and annual sunflower provided approximately 15% and 2% cover, respectively, in one stand. This vegetation type would be removed by plowing or tilling if the fields are prepared for future planting. The typical succession of abandoned cropland within the Rio Grande floodplain proceeds from annual forbs (Russian-thistle and pigweed) to shrubs (mule's fat) to a final disclimax of honey mesquite and Texas prickly pear (Patterson 2008).

Figure 5-34. Representative Photograph of Mediterranean Lovegrass, Rough Pigweed Habitat

Quelite Cenizo – Buffelgrass Semi-Natural Herbaceous Vegetation

One large patch of quelite cenizo forbs, less than 0.1 acre in area, has become established within a buffelgrass matrix on the embankment between the levee road and the adjacent paved highway of Section O-4 near Peñitas. Quelite cenizo, providing up to 65% cover, dominates a short reach of this section and extends from the levee road to the pavement edge (see **Figure 5-35**). This stand occupies approximately 1 acre, supports the nonnative grasses buffelgrass (10% cover) and Johnsongrass (2% cover), and includes a few shrubs of honey mesquite that provide sparse cover, up to 5%.

Figure 5-35. Representative Photograph of Quelite Cenizo - Buffelgrass Habitat

Prairie Aster - (Crucita) Semi-Natural Herbaceous Vegetation

One stand and one large patch of prairie aster forbs have become established on a fallow agricultural field and in a shallow depression that occupy less than 5.0 acres in area. The agricultural field, which was formerly planted to sorghum, will serve as a construction staging area of 2 to 5 acres within Section O-17. The shallow depression occurs within the Phillips Banco Unit of the LRGVNWR in Section O-18 and covers approximately 0.1 acre. Prairie aster, providing up to 45% cover, dominates this type, in addition to low cover up to 7% cover provided by buffelgrass and switchgrass in the herbaceous layer (see **Figure 5-36**). The tall shrub mule's fat or jara provides low cover, from 1% to 5% cover, in the sampled stands of prairie aster herbaceous vegetation. Another small stand of herbaceous vegetation within the Tahuachal Banco Unit of the LRGVNWR in Section O-16 was dominated by crucita (15% cover) with low cover of prairie aster (3% cover). This stand has become established in an abandoned agricultural field where the rows are still obvious.


Figure 5-36. Representative Photographs of Prairie Aster Habitat

False Ragweed – Johnsongrass – Windmill Grass Semi-Natural Herbaceous Vegetation

One stand of false ragweed forbs and the associated nonnative grasses Johnsongrass and windmill grass has become established on an abandoned agriculture field that is partially in use as a parking lot and staging area for a private business. The site would potentially serve as a construction staging area of 2 to 5 acres within Section O-13. False ragweed, providing up to 25% cover, characterizes this type, in addition to moderate cover, up to 25% cover, provided by Johnsongrass, windmill grass, and Bermuda grass in the herbaceous layer (see **Figure 5-37**). This stand is maintained annually by mowing, nearly eliminating cover by shrub species.

Figure 5-37. Representative Photograph of False Ragweed Habitat

5.2 Vegetation Classification for the South of the Levee Project in Sections O-4 through O-10

A reconnaissance survey was conducted in Hidalgo County on March 6–7, 2008, to determine plant communities and land use types on and south of the USIBWC levee including the levee shoulder, embankment, toe slope, ROW, and adjacent public and private land. Plant community observations are summarized by section in Table 5-2 and each community/habitat is further described and illustrated herein. A vegetation and land use map was prepared following this survey to inform document users. An in-depth survey was conducted in late March and early April 2008 to inventory for rare plants and conduct wetland analyses.

Table 5-2. LRGV Resources Summary for Sections O-4 through O-10, South of the Levee Road

Section	Plant Communities Observed – General Location	Comments and Notes
O-4	-Seepweed – Buffelgrass Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary -Buffelgrass Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary -Honey Mesquite – Huisache / Texas Prickly pear / Buffelgrass Woodland – LRGVNWR Peñitas, La Pesquera, Chihuahua Woods, Abrams West, Abrams, and TP&WD -Narrowleaf Cattail – Common Reed – Bermuda Grass Herbaceous Vegetation –	-Ponds occur near west end and in the middle of section at the edge of the wall construction footprint -Ditch occurs near west end at edge of proposed limits of construction and is proposed to remain undisturbed by using Bollard fence here instead of retaining wall; supports wetland vegetation to approximately 5 m wide

Table 5-2. LRGV Resources Summary for Sections O-4 through O-10, South of the Levee Road

Section	Plant Communities Observed – General Location	Comments and Notes
	Ponds Abutting Boundary Fence, Ditch, and Canal Banks	-Canal occurs with pump station on western end, is proposed to remain undisturbed until some future project unrelated to this one is approved, and would not be disturbed; banks support wetland vegetation to approximately 4 m wide -Wall installation would require tree removal and branch trimming in the middle to eastern one-half
O-5	-Buffelgrass Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary - Buffelgrass /Honey Mesquite Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary - Bermuda Grass – Common Reed – Narrowleaf Cattail Herbaceous Vegetation - Canal and Overflow Channel Banks	-Canal occurs on western terminus along one-third of the section, located north of levee road and would not be disturbed; banks support wetland vegetation to approximately 2 m wide -Overflow channel occurs on western terminus at edge of proposed limits of construction and could be disturbed; banks support wetland vegetation to approximately 8 m wide
O-6	-Buffelgrass Herbaceous Vegetation - Levee Bank and Toe Slope -Honey Mesquite – Huisache / Buffelgrass Woodland – LRGVNWR Pate Bend and Hidalgo Bend -Giant Reed Herbaceous Vegetation – Near Middle on Levee Bank and Toe -Black Willow / Narrowleaf Cattail Wooded Herbaceous Vegetation – Canal Banks at Toe of Levee	-Canal crosses about half way, the concrete box culvert would be extended to accommodate retaining wall; banks support wetland vegetation to approximately 2 m wide -Ditch supports stand of giant reed near the bridge; occurs adjacent to retaining wall footprint -Canal occurs on eastern end at toe of levee fill; banks support wetland vegetation to approximately 4 m wide -Wall installation would require tree removal and branch trimming in the middle to eastern one-half
O-7	-Buffelgrass Herbaceous Vegetation -	-Wall installation would require

Table 5-2. LRGV Resources Summary for Sections O-4 through O-10, South of the Levee Road

Section	Plant Communities Observed – General Location	Comments and Notes
	Levee Bank and Toe Slope - LRGVNWR Monterrey Banco -Honey Mesquite – Huisache – Granjeno / Buffelgrass Woodland – LRGVNWR Monterrey Banco -Tepeguahe – Honey Mesquite – Huisache / Buffelgrass Woodland – LRGVNWR Monterrey Banco -Bermuda Grass Herbaceous Vegetation - Canal Banks and Roadside -Common Reed – Giant Reed – Castor Bean Herbaceous Vegetation - Canal Banks	limited branch trimming (eastern one-third), possible removal of a few small trees -Wetlands have become established on canal banks, approximately 2 m wide on each bank
O-8	-Buffelgrass Herbaceous Vegetation - Levee Bank and Toe Slope -Honey Mesquite – Huisache / Buffelgrass Woodland – LRGVNWR La Coma -Bermuda Grass – Narrowleaf Cattail – Annual Sunflower Herbaceous Vegetation -Ditch in Middle Portion	-Ditch occurs near middle at edge of proposed limits of construction and could be disturbed; supports wetland vegetation to approximately 4 m wide -Wall installation would require tree removal and branch trimming at the eastern terminus
O-9	-Buffelgrass – Windmillgrass Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary -Huisache – Honey Mesquite / Buffelgrass Woodland – LRGVNWR Llano Grande Banco -Common Reed – Narrowleaf Cattail Herbaceous Vegetation – Halfway, Ditch Adjacent to Ag Field -Giant Reed – Bermuda Grass Herbaceous Vegetation – Canal Banks on Eastern One-Fourth	-Ditch occurs near middle at edge of proposed limits of construction and could be disturbed; supports wetland vegetation to approximately 3 m wide -Ponds occur near middle and would require sheet piling and fill to support wall construction -Canal occurs on eastern one-fourth at toe of levee fill; banks support wetland vegetation to approximately 10 m wide -Wall installation would require tree removal and branch trimming in the eastern one-third
O-10	-Buffelgrass – Windmillgrass Herbaceous Vegetation – Levee Bank and Toe Slope to Boundary -Black Willow / Narrowleaf Cattail –	-Ditch occurs near middle at edge of limits of construction and could be disturbed; supports wetland vegetation to approximately 10 m

Table 5-2. LRGV Resources Summary for Sections O-4 through O-10, South of the Levee Road

Section	Plant Communities Observed – General Location	Comments and Notes
	Bulrush Wooded Herbaceous Vegetation – Wide Ditch -Granjeno – Honey Mesquite – Black Willow / Narrowleaf Cattail Woodland – Shallow Ponds of LRGVNWR Rosario Banco	wide -Ponds occur near east end at the edge of the wall construction footprint -Wall installation will require tree removal and branch trimming in the eastern one-third

Plant Community Descriptions

Ten provisional plant communities were observed during the reconnaissance survey and their photosignatures were identified and labeled on enlarged, true color aerial photography while in the field. This section provides a brief description of each community and one or more characteristic ground photographs. One very large cypress tree known as the whiskey tree occurs within Section O-10 and is located within the project corridor; it has several trunks from a base stump that is in excess of 5 feet in diameter (Figure 5-38).

Figure 5-38. Photograph of the whiskey tree.

Honey Mesquite Woodland (Figure 5-39): most common woodland cover occurs on levee toeslopes to floodplain terraces; typically is associated with other diagnostic woodland species as a dominant; dominates stands in all Sections O-4 through O-10; honey mesquite trees are typically 5-10 m tall and provide cover ranging from 15 to 50%. Associated canopy trees include huisache, granjeno, and retama. The succulent, Texas prickly pear is common along fencelines; the herbaceous layer is characterized by buffelgrass that provides moderate cover. One honey mesquite woodland stand near the east end of Section O-8 had burned with the fire contained in the herbaceous layer.

Figure 5-39. Characteristic photographs of honey mesquite woodland habitat.

Huisache Woodland (Figure 5-40): occurs on floodplain terraces; typically is associated with other diagnostic woodland species and is rarely dominant; dominates stand in Section O-9; huisache are typically 5–8 m tall and provide cover ranging from 5 to 25%. Associated canopy trees include honey mesquite and the succulent Texas prickly pear occurs in the understory. The herbaceous layer is characterized by buffelgrass that provides moderate cover.

Figure 5-40. Characteristic photograph of huisache woodland habitat.

Tepeguahe Woodland (Figure 5-41): occurs on floodplain terraces; typically is associated with other diagnostic woodland species and is rarely dominant; dominates stand in Section O-7; tepeguahe are typically 5–10 m tall and provide cover ranging from 5 to 15%. Associated canopy trees are honey mesquite and huisache and the herbaceous layer is characterized by buffelgrass that provides moderate cover.

Figure 5-41. Characteristic photograph of tepeguahe woodland habitat.

Granjeno Woodland (Figure 5-42): occurs on floodplain terraces and along fencelines; typically is associated with other diagnostic woodland species and is rarely dominant; dominates stand in Section O-10; granjeno are typically 5–8 m tall and provide cover ranging from 20 to 50%. Associated canopy trees are honey mesquite and huisache and the herbaceous layer is characterized by buffelgrass that provides moderate cover.

Figure 5-42. Characteristic photograph of granjeno woodland habitat.

Black Willow Woodland and Shrubland (Figure 5-43): occurs on canal, ditch, pond, lake, and river banks; typically is associated with other diagnostic wetland species as a dominant; dominates stands in Sections O-6 and O-10; black willow canopy trees or tall shrubs are typically 3–8 m tall and provide from 5 to 15% cover. Commonly associated wetland graminoids occurring in shallow water bodies are narrowleaf cattail and bulrush.

Figure 5-43. Characteristic photograph of black willow woodland and shrubland habitat.

Buffelgrass Semi-natural Herbaceous Vegetation (Figure 5-44): most common herbaceous cover occurs on levee shoulders and slopes, toeslopes, ROWs, and as understory in woodland communities; can form monotypes or is associated with other diagnostic species; dominates herbaceous stands in Sections O-4 through O-10; buffelgrass is typically less than 0.5 m tall and provides cover ranging from 5 to 40%. On the western end of Section O-4, buffelgrass is sparse in terms of cover (approximately 5%) and seepweed provides up to 10% cover on the levee slope. In Sections O-9 and O-10, windmillgrass provides low cover within the buffelgrass matrix or is codominant. Buffelgrass is considered a nonnative, invasive species under Texas weed laws.

Figure 5-44. Characteristic photographs of buffelgrass habitat.

Bermuda Grass Semi-natural Herbaceous Vegetation (Figure 5-45): occurs on canal and lake banks primarily; typically forms monotypes of carpetlike grass; dominates stands in Sections O-5, O-7, and O-8; Bermuda grass forms a low sod on canal banks and along some roadways and provides cover ranging from 20 to 60%. Associated species include the castor bean, annual sunflower, common reed, and narrowleaf cattail, which range in height from 1–2 m and provide low cover. Bermuda grass and castor beans are considered nonnative, invasive species under Texas weed laws.

Figure 5-45. Characteristic photograph of Bermuda grass habitat.

Giant Reed Semi-natural Herbaceous Vegetation (Figure 5-46): occurs on seeps and canal, ditch, pond, and lake margins; typically forms monotypes of up to 10 m tall; dominates stands in Sections O-6 and O-9; giant reed provides cover ranging from 50 to 90%. Giant reed stands often support Bermuda grass in the understory, at least along the stand margin. Giant reed is considered a noxious, nonnative, and invasive species under Texas weed laws.

Figure 5-46. Characteristic photograph of giant reed habitat.

Common Reed Herbaceous Vegetation (Figure 5-47): occurs on canal, ditch, pond, and lake margins; typically is associated with other diagnostic wetland species as a dominant; dominates stands in Sections O-7 and O-9; common reed is typically intermixed with other wetland species but can occur as small monotypic patches providing cover from 10 to 25%. Common reed was often codominant with narrowleaf cattail, bulrush, giant reed, and Bermuda grass and occasionally black willow.

Figure 5-47. Common reed habitat.

Narrowleaf Cattail Herbaceous Vegetation (Figure 5-48): occurs in shallow ponds, on pond and lake margins, and along ditches and canals; typically is associated with other diagnostic wetland species as a codominant; dominates one stand in Section O-4; narrowleaf cattail is typically intermixed with or understory to other wetland species but can occur as small monotypic patches providing cover from 15 to 50%. Narrowleaf cattail was understory to black willow tall shrubs and codominated with common reed, Bermuda grass, and bulrush.

Figure 5-48. Narrowleaf cattail habitat.

Land Use Types

Several land use types were identified, photographed, and delineated for this portion of the project corridor (Figure 5-49). They can provide some habitat value for wildlife and include fallow agricultural fields; cropped agricultural fields (e.g., sugar cane, onions, carrots, cabbage); open water (e.g., ditches, canals, ponds, lakes); highways, roads, and trails; residential and urban development; and miscellaneous other land uses.

5-49a. Pond

5-49b. Canal

5-49c. Ditch

5-49d. Structure and river

5-49e. Agricultural field and power line

5-49f. Town, road, canal

5-49g. Levee road

5-49h. Bike path

5-49i. Other/dump site

Figure 5-49. Characteristic land use types.

5.3 Plant Species Identified

A list of plant species prepared during the field surveys including wetlands indicator status and the tactical infrastructure section in which each species was identified is provided in **Table 5-3**. The number of taxa identified during late summer and fall surveys was 317 with four species occurring in all fence sections. The most diverse of the fence sections was O-1 where 189 plant species were recorded in upland, riparian, and wetlands habitats.

Table 5-3. List of Plant Species Identified During Section Surveys

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Abutilon abutiloides / Berlandier Abutilon	---	X	X																				**2**
Abutilon fruticosum / Pelotazo	---						X	X			X		X	X		X	X						**7**
Abutilon trisulcatum / Amantillo	---	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X					**15**
Acacia berlandieri / Guajillo	---			X				X															**2**
Acacia farnesiana / Huisache	---	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**21**
Acacia rigidula / Chaparro Prieto	---	X	X	X	X														X				**5**
Acacia schaffneri / Huisachillo, Twisted Acacia	---	X				X																	**2**
Acacia wrightii / Catclaw	---	X	X	X																			**3**
Acalypha monostachya / Round Copperleaf	---		X																				**1**
Acleisanthes obtusa / Berlandier Trumpets	---	X				X	X		X		X												**5**
Adelia vaseyi / Vasey Adelia	---			X																			**1**
Agave americana / Century Plant	---	X																					**1**
Allionia incarnata / Trailing Allionia	---	X																					**1**
Allowissadula lozanii / Pseudoabutilon	---							X															**1**
Aloysia gratissima / Whitebrush	---	X	X																				**2**
Aloysia macrostachya / Sweet Stem	---	X																					**1**

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Amaranthus sp. / Amaranth	---				X	X	X	X	X	X	X			X									8
Amaranthus palmeri / Palmer Pigweed	FACU	X	X																				2
Amaranthus retroflexus / Rough Pigweed	FACU-		X																				1
Ambrosia sp. / Ragweed	---					X																	1
Ambrosia psilostachya / Western Ragweed	FACU-	X	X																				2
Ampelopsis arborea / Peppervine	FAC						X		X	X	X	X		X	X		X						8
Ancistrocactus sheeri / Fish-hook Cactus	---	X																					1
Andropogon glomeratus / Bushy Bluestem	FACW+																		X				1
Anredera vesicaria / Maderia Vine	---	X																					1
Antigonon leptopus / Queen's Wreath	---	X																					1
Aristida adscencionis / Sixweeks Threeawn	---	X																					1
Aristida purpurea / Purple Threeawn	---	X																					1
Aristolochia pentandra / Dutchman's Pipe	---	X																					1
Arundo donax / Giant Reed, Carrizo	FAC+		X	X		X	X		X	X	X		X	X	X			X	X		X	X	14
Aster spinosus (Leucosyris spinosa, Chloracantha spinosa) / Mexican Devil-weed, Spiny Aster	FACW-	X	X		X	X		X						X	X	X			X				9
Aster subulatus / Prairie Aster	OBL	X	X		X			X						X			X	X	X				8

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Atriplex matamorensis / Quelite Cenizo, Matamoros Saltbush	---				X																		1
Baccharis neglecta / Jara Dulce, Roosevelt Weed	FAC		X	X						X	X	X		X									6
Baccharis salicifolia / Jara, Mule's Fat	FACW			X			X		X	X	X	X		X			X	X	X				10
Baccharis texana / Baccharis	---																		X			X	2
Baccharis sp. / Seep Willow	---			X				X			X												3
Bahia absinthifolia / Hairy Seed Bahia	---	X																					1
Bauhinia variegata / Purple Orchid Tree	---											X											1
Bastardia viscosa / Mexican Bastardia	---	X	X		X						X			X								X	6
Billieturnera helleri / Copper Sida	---	X																					1
Boerhavia sp. / Boerhavia	---	X				X																	2
Borrichia frutescens / Sea Ox Eye	FACW+				X	X																X	3
Bothriochloa ischamaium / King Ranch Bluestem	---				X	X		X	X		X												5
Bothriochloa laguroides / Silver Bluestem	---					X																	1
Buddleja sessiliflora / Butterfly-bush, Tepozan	---		X																				1
Caesalpinia mexicana / Mexican Caesalpinia	---										X												1
Calyptocarpus vialis / Straggler Daisy	FAC	X				X						X										X	4

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Campsis radicans / Trumpet Creeper	FAC																					**X**	**1**
Capsicum annuum / Chilipiquin	---	**X**	**X**				**X**	**X**									**X**						**5**
Cardiospermum dissectum / Balloon Vine	---	**X**	**X**																				**2**
Cassia sp. / Cassia	---									**X**													**1**
Castela erecta (*Castela texana*) / Amargosa, Goatbush	---	**X**	**X**	**X**																			**3**
Celosia nitida / Albahaca	---	**X**																					**1**
Celtis laevigata / Palo blanco, Texas Sugarberry	FAC	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**			**X**	**18**
Celtis pallida / Granjeno, Spiny Hackberry	---	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**19**
Cenchrus ciliaris / Buffelgrass	---	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**21**
Cenchrus spinifex (Cenchrus insertus) / Common Sandbur	---		**X**																				**1**
Cephalanthus salicifolius / Mexican Buttonbush	---	**X**																					**1**
Cercidium texanum var. *macrum (Parkinsonia texana)* / Paloverde	---	**X**	**X**																				**2**
Cestrum sp. / Jessamine	---	**X**																					**1**
Cevallia sinuata / Stinging Stickleaf	---	**X**																					**1**
Chamaesyce sp. / Mat Spurge	---					**X**			**X**			**X**		**X**	**X**	**X**	**X**						**7**
Chenopodium berlandieri / Pitseed Goosefoot	---	**X**	**X**																				**2**

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Chloris cucullata / Hooded Windmill grass	---	X	X																				**2**
Chloris sp. / Windmill Grass	---													X	X		X			X			**4**
Chromolaena odorata / Crucita	---	X	X																				**2**
Cirsium texanum / Texas Thistle	---				X					X													**2**
Cissus incisa (Cissus trifoliata) / Hierba del Buey, Ivy Treebine, Possum Grape	FACU-	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X			X	**17**
Citharexylum berlandieri / Berlandier's Fiddlewood	---		X																		X		**2**
Citharexylum brachyanthum / Mission Fiddlewood	---	X																					**1**
Clematis drummondii / Barbas de Chivato, Old Man's Beard	---	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X			**18**
Cocculus diversifolius / Snail Vine, Correhuela	---	X			X	X	X		X	X	X			X					X			X	**10**
Colubrina texensis / Hog Plum	---	X																					**1**
Commelina erecta / Day Flower	---	X	X																			X	**3**
Condalia hookeri / Brasil, Bluewood Condalia	---	X	X	X	X	X	X	X	X		X						X		X			X	**12**
Convolvulus equitans / Texas Bindweed	---		X							X	X										X		**4**
Conyza canadensis / Horsetail, Horse Weed	UPL	X	X																				**2**
Cordia boissieri / Anacahuita, Mexican Olive	---	X	X	X	X							X							X				**6**

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Coryphantha macromeris / Dumpling Cactus	---	X																					1
Coryphantha robertii / Runyon's Escobaria	---	X																					1
Croton humilis / Berlandier Croton	---	X																					1
Croton incanus / Vara Blanca	---	X																					1
Croton leucophyllus / Two-color Croton	---		X																				1
Croton lindheimerianus / Three-seed Croton	---	X																					1
Croton sp. / Croton	---	X		X	X				X														4
Cucurbita foetidissima / Coyote Melon	---				X																		1
Cynanchum angustifolium / Climbing Milkweed	OBL				X	X					X												3
Cynanchum barbigerum / Milkweed Vine	---	X	X								X												3
Cynanchum sp. / Milkweed Vine	---					X																	1
Cynodon dactylon / Pato de Gallo, Bermuda Grass	FACU+	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	19
Cyperus odoratus / Fragrant Flat Sedge	FACW	X																					1
Cyperus tenuis / Flat Sedge	FACW					X			X					X									3
Dactyloctenium aegyptium / Durban Crowfootgrass	---	X																					1
Dalea pogonathera / Bearded Dalea	---	X																					1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Datura inoxia / Indian Apple	---	X																					1
Desmanthus obtusus / Bluntpod Bundleflower	---	X																					1
Desmanthus virgatus / Bundleflower	---							X		X													2
Dichanthium annulatum / Kleberg's Bluestem	---							X		X													2
Dicanthium aristatum / Angleton Bluestem	---	X																					1
Digitaria cognata / Fall Witchgrass	---	X																					1
Diospyros texana / Texas Persimmon	---	X										X											2
Ditaxis humilis / Low Wild Mercury	---	X																					1
Dyssodia tenuiloba / Tiny Tim Dogweed	---	X																					1
Echinocactus texensis / Manca Caballo, Horse Crippler	---			X																			1
Echinocereus berlandieri / Berlandier's Alicoche	---			X																			1
Echinocereus enneacanthus / Pitaya, Strawberry Cactus	---	X		X	X																		3
Echinocereus reichenbachii / Rainbow Cactus	---	X																					1
Echinochloa colona / Junglerice	---	X																					1
Echinochloa crusgalli / Barnyardgrass	---	X																					1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Echinochloa crus-pavonis / Gulf Cockspur	---	X																					1
Echinodorus berteroi / Erect Burhead	OBL	X																					1
Ehretia anacua / Anacua	---	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	20
Ephedra antisyphilitica / Clapweed	---	X																					1
Eragrostis barrelieri / Mediterranean Lovegrass	---	X	X									X		X	X	X	X						7
Eriochloa punctata / Louisiana Cupgrass	---	X																					1
Erioneuron pilosum / Hairy tridens	---	X																					1
Erythrina herbacea / Coral Bean	---																X		X				2
Eupatorium odoratum (Chromolaena odorata) / Crucita, Christmas Bush	---			X			X	X	X		X	X		X			X		X				9
Euphorbia albomarginata / Whitemargin Euphorbia	---	X																					1
Euphorbia glyptosperma / Ridge-seed Euphorbia	---	X																					1
Euphorbia laredana / Laredo Euphorbia	---	X																					1
Euphorbia serpens / Hierba de la Golondrina	---		X																				1
Evolvulus alsinoides / Ojo de Vibora	---	X																					1
Eysenhardtia texana / Vara Dulce, Texas Kidneywood	---	X		X																			2

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Ferocactus hamatacanthus / Rio Grande Valley Barrel Cactus	---	X																					1
Florestina tripteris / Sticky Palafoxia	---	X	X											X					X				4
Forestiera angustifolia / Elbow Bush	---	X	X																				2
Fraxinus berlandieriana / Mexican Ash	FAC	X	X	X	X					X		X	X						X				8
Gaura brachycarpa / Lizard Tail	---						X				X												3
Gaura drummondii / Sweet Gaura	---				X		X	X		X	X												5
Gaura parviflora / Lizard Tail	NI																		X				1
Gaura sp. / Gaura	---														X								1
Glandularia bipinnatifida / Dakota Vervain	---								X														1
Guajacum angustifolium / Guayacan, Soap-bush, Ironwood	---	X	X	X	X			X															5
Gutierrezia texana var. *glutinosa* / Broomweed	---	X	X																				2
Havardia pallens / Tenaza	---																				X	X	2
Heimia salicifolius / Hachinal	FACW+	X	X																				2
Helenium microcephalum / Smallhead Sneezeweed	---	X																					1
Helianthus annuus / Annual Sunflower	FAC	X	X		X		X	X	X	X	X			X	X		X	X	X		X		14

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Heliotropium angiospermum / Heliotrope	UPL	X	X						X		X				X		X	X	X			X	9
Heliotropium confertifolium / Crowded Heliotrope	---	X																					1
Heliotropium currassavicum / Seaside Heliotrope	FACW				X	X				X													3
Herissantia crispa / Netveined Herissantia	---	X																					1
Heterotheca subaxillaris / Camphor Weed	---	X	X																				2
Hibiscus maritanus / Tulipan del Monte	---	X																					1
Ibervillea lindheimeri / Globe Berry	---			X							X												2
Ipomoea amnicola / Morning Glory	FACW-	X	X										X										3
Ipomoea carnea / Tree Morning Glory	---																			X	X		2
Ipomoea rupicola / Cliff Morning Glory	---		X																				1
Ipomoea sinuata (Merremia dissecta) / Alamo Vine	---				X	X	X	X	X	X	X	X		X	X	X	X	X	X		X		15
Ipomoea trichocarpa / Sharppod Morning Glory	FAC														X								1
Ipomoea sp. / Morning Glory	---										X												1
Isocoma coronopifolia / Common Goldenweed	---	X																					1
Jatropha dioica / Leather Stem	---	X																					1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Jefea brevifolia / Shorthorn Zexmenia	---	X																					1
Justicia pilosella / Hairy Tubetongue	---	X																					1
Kallstroemia californica / Texas Tack	---	X																					1
Karwinskia humboldtiana / Coyotillo	---	X	X	X				X	X														5
Koeberlinia spinosa / Junco, Allthorn	---	X		X																			2
Krameria ramosissima / Calderona	---	X																					1
Lantana achyranthifolia / Desert Lantana	---		X																				1
Lantana camara / West Indian Lantana, Afrombrilla	FACU											X		X	X		X	X					5
Lantana urticoides / Texas Lantana	---	X	X																X	X			4
Lemna minuata / Small Duckweed	OBL				X																		1
Lemna sp. / Duckweed	OBL									X													1
Lepidium austrinum / Peppergrass	---								X	X													2
Lesquerella thamnophila / Zapata Bladderpod	---	X																					1
Leucaena leucocephala / Poponac	FACU	X																					1
Leucaena pulverulenta / Tepeguaje, Lead Tree	---		X	X	X	X	X	X		X		X		X	X		X	X	X			X	14
Leucaena sp. / Lead Tree	---					X																	1
Leucophyllum frutescens / Cenizo, Purple Sage	---	X	X	X			X																4

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Leucosyris spinosa / Spiny Aster	FACW-		X																		X		2
Lippia alba / Brushy Lippia	FAC*						X	X	X		X								X				5
Lippia graveolens / Mexican Oregano	---	X																					1
Lycium berlandieri / Berlandier Wolfberry	---	X	X																				2
Malvastrum americanum / Malva Loca	---							X															1
Malvastrum coromandelianum / Three-lobed False Mallow	---	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X					16
Malvaviscus arboreus var. *drummondii* / Turk's Cap	---							X				X		X								X	4
Mammillaria heyderi / Bizniga de Chilitos, Nipple Cactus, Little Chilis	---	X		X	X																		3
Manfreda sileri / Manfreda	---			X																			1
Marsilea macropoda / Water-clover	OBL																	X					1
Maurandya antirrhiniflora / Snapdragon Vine	---		X																				1
Melampodium cinereum / Blackfoot Daisy	---	X																					1
Melia azedarach / Paraiso, Chinaberry-tree	---	X					X		X	X	X	X	X	X	X		X	X	X	X			13
Melilotus alba / White Sweet Clover	FACU					X																	1
Melochia pyramidata / Pyramid Flower	FAC-	X	X					X	X								X		X				6

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Mentzelia lindheimeri / Lindheimer Mentzelia	---	X																					1
Mikania scandens / Climbing Hempweed	FACW+								X		X												2
Mimosa malacophylla / Raspilla	---	X																					1
Mimosa pigra var. *berlandieri* / Zarza	FAC										X				X								2
Mimosa stringillosa / Powderpuff	---				X	X	X	X	X	X						X	X					X	9
Mimosa texana / Wherry Mimosa	---	X																				X	2
Mimosa sp. / Mimosa	---									X	X												2
Mirabilis jalapa / Four-o'clock	---	X	X																				2
Monarda citridora / Lemon Beebalm	---								X														1
Morus alba / Mulberry	FACU*	X	X									X									X		4
Nerium oleander / Oleander	---											X											1
Nicotiana glauca / Tree Tobacco	FAC	X	X	X																			3
Nyctaginia capitata / Nyctaginia	---	X																					1
Oenothera speciosa / Evening Primrose	---					X			X	X													3
Opuntia engelmannii / Nopal, Texas Prickly Pear	---	X	X	X	X	X	X	X	X	X	X	X		X		X	X		X			X	16
Opuntia leptocaulis / Tasajillo, Christmas Cactus	---	X	X	X	X																		4
Opuntia schottii / Clavellina, Dog Cholla	---	X		X	X																		3

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Oxalis dichondrifolia / Agrito	---	X																					**1**
Oxalis drummondii / Wood Sorrel	---														X	X							**2**
Palafoxia texana var. *texana* / Texas Palafoxia	---	X	X																				**2**
Palafoxia texana var. *ambigua* / Palafoxia	---		X			X								X				X					**4**
Panicum maximum (Urochloa maxima) / Guinea Grass	FAC-	X	X											X		X	X	X	X	X		X	**9**
Panicum virgatum / Switchgrass	FACW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**21**
Pappophoram vaginatum / Whiplash Pappusgrass	---	X																					**1**
Parkinsonia aculeata / Retama	FACW-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**21**
Parkinsonia texana (Cercidium texanum) / Paloverde, Texas Paloverde	---			X	X														X				**3**
Parthenium confertum / False Ragweed	---	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	**18**
Parthenium hysterophorus / False Ragweed	---					X																	**1**
Parthenium incanum / Mariola	---	X																					**1**
Passiflora foetida / Passion Flower	NI	X	X																				**2**
Passiflora tenuiloba / Spread-lobe Passion Flower	---	X																					**1**

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Pennisetum ciliare (Cenchrus ciliaris) / Buffelgrass	---	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	21
Phaulothamnus spinesecens / Snake Eyes	---	X	X	X		X																	4
Phoenix sp. / Date Palm	---									X													1
Phoradendron tomentosum / Mistletoe	---	X	X	X				X															4
Phragmites australis / Common Reed	FACW	X				X				X	X								X				5
Phyla nodiflora / Frog Fruit	FACW				X											X							2
Phyla strigulosa / Frog Fruit	---							X															1
Phyllanthus polygonoides / Knotweed	---	X																					1
Physalis cinerascens / Ground Cherry	---	X	X							X	X		X	X	X			X	X			X	10
Physalis sp. / Ground Cherry	---					X																	1
Pithecellobium ebano (Chloroleucon ebano, Ebanopsis ebano) / Ebano, Texas Ebony	---	X	X	X	X	X	X	X	X	X			X		X		X	X	X		X	X	16
Pithecellobium pallens / Tenaza	---		X																				1
Plumbago scandens / Leadwort	---					X	X																2
Polanisia dodecandra ssp. *riograndensis* / Clammyweed	FACU	X	X																				2
Polygala glandulosa / Glandular Milkwort	---	X																					1

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Polygonum pensylvanicum / Smartweed	FACW-								X					X	X								3
Polygonum punctatum / Water Smartweed	OBL	X																					1
Populus deltoides / Eastern Cottonwood	FAC													X									1
Portulaca pilosa / Chisme	---	X																					1
Portulaca oleracea / Common Purslane	---					X																	1
Privet ligustrum / Ligustrum	---											X											1
Prosopis glandulosa / Mesquite, Honey Mesquite	---	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	21
Prosopis reptans / Tornillo, Screw-bean Mesquite	FAC+	X			X	X	X	X															5
Ratibida columnaris / Mexican Hat	---					X		X		X												X	4
Rhynchosia minima / Least Snoutbean	---								X	X	X	X						X	X	X		X	8
Ricinus communis / Castor Bean	FACU	X	X	X			X	X	X	X	X	X		X	X	X	X	X			X	X	16
Rivina humilis / Coralito, Pigeonberry	---	X				X			X														3
Rubus trivialis / Dewberry	FAC										X	X						X	X			X	5
Ruellia runyonii / Wild Petunia	---														X								1
Ruellia spp. / Ruellia	---	X			X																		2
Sabal sp. / Palmetto	---										X												1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Sabal mexicana / Mexican Palmetto, Sabal Palm	---							X			X						X		X	X		X	6
Sagittaria platyphylla / Delta Arrowhead	OBL	X																					1
Salix nigra / Sauz, Black Willow	FACW+	X		X			X		X	X	X			X	X			X	X			X	11
Salsola australis / Russian-thistle	FACU	X	X		X		X	X	X	X	X												8
Salvia coccinea / Tropical Sage	---	X																	X				2
Samolus ebracteatus / Beach Pimpernel	---					X																	1
Samolus parviflorus / Water Pimpernel	OBL	X																					1
Sanvitalia ocymoides / Sanvitalia	---														X		X						2
Sarcostemma cynanchoides / Climbing Milkweed	---	X	X																X				3
Schaefferia cuneifolia / Desert Yaupon	---	X																					1
Schinus terebinthifolius / Brazilian Pepper	---									X										X			2
Scirpus validus / Softstem Bulrush	OBL				X																		1
Senna bauhinioides / Two-leaved Senna	---	X																					1
Senna sp. / Senna	---										X												1
Serjania brachycarpa / Serjania	---	X		X			X			X	X			X			X		X			X	9
Sesuvium sessile / Cenicilla	---				X																		1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Setaria ramiseta / Bristlegrass	---		X																				**1**
Setaria scheelei / Southwest Bristlegrass	---		X																				**1**
Setaria texana / Texas Bristlegrass	---		X																				**1**
Sibara runcinata / Sibara	---	X																					**1**
Sida abutifolia / Spreading Sida	---		X									X											**2**
Sida spinosa / Prickly Sida	UPL				X	X	X	X	X	X	X	X	X	X	X		X						**12**
Sideroxylon celastrinum / Coma	---	X		X	X		X		X													X	**6**
Smilax bona-nox / Common Greenbriar	FAC								X													X	**2**
Solanum elaeagnifolium / Trompillo, Silverleaf Nightshade	---	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	**18**
Solanum ptycanthum / West Indian Nightshade	---					X																	**1**
Solanum rostratum / Mala Mujer	---	X																					**1**
Solanum triquetrum / Texas Nightshade	---								X		X					X							**3**
Solidago canadensis / Tall Goldenrod	FACU+																				X		**1**
Sonchus oleraceous / Annual Sow Thistle	UPL*					X			X														**2**
Sorghum halepense / Johnsongrass	FACU			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	**18**
Sporobolus airoides / Alkali Sacaton	FAC				X																		**1**
Sporobolus pyramidatus / Whorled Dropseed	FAC	X			X	X																	**3**

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Sporobolus wrightii / Big Alkali Sacaton	---	X																					1
Sporobolus sp. / Dropseed	---				X																		1
Suaeda tampicencis / Sea Blite, Coastal Seepweed	---				X					X													2
Suaeda sp. / Suaeda	FACW				X			X															2
Talinum angustissimum / Flame Flower	---	X																					1
Tamarix aphylla / Athel Tamarisk, Saltcedar	FACW		X		X					X													3
Taxodium mucronatum / Montezuma Bald Cypress	OBL										X	X											2
Teucrium cubense / Small Coast Germander	FAC+	X	X				X			X	X												5
Tetraclea coulteri / Stink Weed	---	X																					1
Thamnosma texana / Dutchman’s Breeches, Ruda de Monte	---	X																					1
Theolocactus bicolor / Glory of Texas	---	X			X																		2
Thelocactus setispinus / Fishhook Cactus	---	X			X																		2
Thymophylla sp.(*Dyssodia* sp.) / Dogweed	---					X																	1
Tidestromia lanuginosa / Espanta Vaqueros	---	X	X																				2
Tiquilia canescens / Oreja de Perro	---	X																					1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Tribulus terrestris / Goathead	---		X																				1
Trichloris pluriflora / False Rhodegrass	---		X																				1
Tridens muticus / Slim Tridens	---	X																					1
Turnera diffusa / Damiana	---	X																					1
Typha domingensis / Tule, Narrow-leaf Cattail	OBL				X				X		X			X					X			X	6
Ulmus crassifolia / Cedar Elm	FAC	X																					1
Verbena canescens / Vervain	---	X																					1
Verbena halei / Slender Verbain	---	X	X		X	X			X	X													6
Verbesina encelioides / Cowpen Daisy	FAC		X							X	X						X	X					5
Verbesina microptera / Capitana, Frostweed	---														X						X	X	3
Vigna luteola / Wild Cowpea	FACW-	X																					1
Viguiera stenoloba var. *chihuahuensis* / Skeleton-leaf Goldeneye	---		X	X																			2
Vitis mustangus / Mustang Grape	---																					X	1
Waltheria indica / Hierba del Soldado	---		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	18
Washingtonia robusta / Washingtonia Palm	---									X													1
Wilcoxia poselgeri / Rat-tail Cactus	---	X																					1

Scientific Name / Common Name	Wetland Indictor Status	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total Number of Fence Sections in Which Species Occurs
Yucca treculeana / Palma Pita, Spanish Dagger	---	X													X								2
Zanthoxylum clavaherculis / Pepperbark	---										X												1
Zanthoxylum fagara / Colima	---	X	X				X	X	X	X	X	X	X						X			X	11
Ziziphus obtusifolia / Clepe, Lotebush	---	X	X	X	X	X	X	X	X		X											X	10
Total # of FACW- to OBL species per section		**14**	**8**	**4**	**12**	**7**	**3**	**5**	**7**	**8**	**9**	**4**	**3**	**9**	**5**	**4**	**4**	**6**	**9**	**2**	**3**	**4**	
Total # of taxa per fence section		**189**	**101**	**55**	**68**	**60**	**50**	**53**	**59**	**60**	**67**	**44**	**27**	**52**	**46**	**28**	**46**	**38**	**52**	**18**	**18**	**47**	

5.4 Fence Section Characteristics and Description of Habitat Quality

To ensure the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe 2007a). Additionally, rare species data were acquired from TPWD at the project inception. General descriptions of the habitat quality as it relates to rare plant species and the landscape characteristics of each section were provided by the USFWS approved botanists based on field observations and are provided below.

SECTION O-1

County: Starr
Potential Listed
Plant Occurrence: *Thymophylla tephroleuca* (Ashy dogweed) (federally endangered [FE], state endangered [SE])
Frankenia johnstonii (Johnston's frankenia) (FE, SE)
Astrophytum asterias (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Lesquerella thamnophila (Zapata bladderpod) (FE, SE)
Listed Plants Observed: None
Suitable Listed Plant Habitat Present: Possible for Johnston's frankenia, star cactus, and Zapata bladder pod.
If So, Habitat Quality: High for Zapata bladderpod; low for star cactus, low to medium for Johnston's frankenia.

Section Habitat Description: This section includes approximately 3.75 miles in the area of the Roma Port of Entry. The western portion of Section O-1 traverses a short distance of gravel-covered ridges and hill slopes that support cenizo – blackbrush shrubland, a species rich, predominantly shrub and succulent community. Several arroyos or deep drainages that are intermittently flooded occur within the Section O-1. Construction will not occur within deep arroyos therefore they were not rigorously sampled for classification but they were inspected closely for rare plant occurrence and potential habitat. Arroyos supported a mixture of tree and shrub species that consisted of honey locust, huisache, and granjeno in the tree canopy and subcanopy layers. The tall and short shrub layers are typified by blackbrush or chaparro, Texas prickly pear, brasil, tasajillo, cenizo, lotebush, and junco. Section O-1 lies within the Upper Valley Flood Forest and Ramaderos biotic communities and adjacent to the Barretal.

Ashy dogweed was sought in Section O-1, but was not observed. Ashy dogweed occurs in shallow to deep sand with a dominance of native grasses. The soils of the floodplain sections of Section O-1 are mostly silty clay loams.

Johnston's frankenia occurs in saline gypsum soils and in Starr County it is often associated with outcrops of fossil oyster shells. Fossil oyster shells outcropped adjacent to the sandstone bluffs and also in the eroded arroyos of Section O-1 in and near Roma. Johnston's frankenia was sought in the project corridor but was not observed.

Star cactus occurs in Starr County on gravel-covered saline soils in association with saladillo (*Varilla texana*; Asteraceae), *Billieturnera helleri* (Malvaceae), and with 12 or more species of cacti. In Section O-1, star cactus was sought on gravel-covered ridges. *Billieturnera helleri,* an indicator of saline soils was associated with a number of species of cacti at this site, but absent was saladillo. Star cactus was not observed in the project corridor.

Zapata bladderpod occupies sandy sites eroded from exposed geologic formations. Within Section O-1, slopes and ridges with exposed bedrock were evaluated. Zapata bladderpod was not observed in or near the sandstone outcrops, or anywhere within the survey corridor of Section O-1.

Walker's manioc occurs in Starr County in association with caliche in blackbrush - cenizo shrublands and barretal (*Helietta parvifolia*) associations. Caliche outcrops were not observed in the Section O-1 corridor.

SECTION O-2

County: Starr
Potential Listed
Plant Occurrence: *Thymophylla tephroleuca* (Ashy dogweed) (FE, SE)
Frankenia johnstonii (Johnston's frankenia) (FE, SE)
Astrophytum asterias (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Lesquerella thamnophila (Zapata bladderpod) (FE, SE)
Listed Plants Observed: None
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: This section includes approximately 8.74 miles near the Rio Grande City, Texas Port of Entry. Several arroyos or deep drainages that are intermittently flooded occur within Section O-2. Construction will not occur within deep arroyos; therefore, they were not rigorously sampled from a classification standpoint, but were examined for rare plant species and habitat. On inspection, they support a mixture of tree and shrub species that consists of honey locust, huisache, and granjeno in the tree canopy and subcanopy layers. The tall and short shrub layers are typified by blackbrush or chaparro, Texas prickly pear, brasil, tasajillo, cenizo, lotebush, and junco. Section O-2 lies within the Upper Valley Flood Forest biotic community and adjacent to the Barretal.

Ashy dogweed occurs in shallow to deep sand with a dominance of native grasses. A sandy area supports woodlands characterized by honey mesquite – Texas prickly pear cactus occurs in this section, probably a secondary succession woodland that has become established on abandoned crop and pastureland. Therefore, it is not suitable ashy dogweed habitat. Ashy dogweed was not observed in the project corridor; no rare species were observed in this section, and the habitats known for other rare plant species did not occur.

SECTION O-3

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Listed Plants Observed: None
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: This section includes approximately one mile and crosses two tracts of the LRGVNWR Los Ebanos Unit, an U.S. International Boundary and Water Commission (USIBWC) easement, residential sites surrounded by mesquite-buffelgrass pastures, and a very small (< 1 acre) brush tract owned by the Mennonite Brothers Church. Both refuge tracts were former agricultural fields that have been revegetated with native trees and shrubs between 2002 and 2003. The revegetation efforts were of limited success and the tracts are characterized by colonizing species including Roosevelt weed, seep willow, lead tree, and honey mesquite, with a dense herbaceous layer dominated by switchgrass and buffelgrass. The USIBWC easement was also previously disturbed and supported a similar plant species composition. The Mennonite Brothers Church tract was heavily browsed and grazed by goats, resulting in dense stands of tasajillo. An interesting assemblage of shrubs occurred including goat-bush, blackbrush, bluewood condalia, coyotillo, allthorn, guayacan, lotebush, seven species of cacti, and manfreda. This brush tract was considered relatively low quality and no rare or listed plant species were observed. Section O-3 occurs within the Upper Valley Flood Forest and Upland Thornscrub biotic communities.

SECTION O-4

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No (in both survey corridors north and south of the levee)

If So, Habitat Quality: NA

Section Habitat Description: This section includes approximately 4.35 miles and on the north side of the levee crosses a very small (~1-acre) portion of the TPWD Peñitas tracts, many agricultural fields (some plowed and fallow, some planted to corn and sugarcane), other disturbed tracts in various stages of re-growth, and residential sites. The TPWD tract supported fenceline woodland consisting mostly of honey mesquite and several species of cacti (fishhook, dog cholla, nipple cactus, tasajillo, and prickly pear) that had colonized soil at the base of the tree line. Just beyond the fenceline into the TPWD property was a cleared pipeline ROW. Remaining areas of the section consisted of agricultural fields or disturbed sites that were not considered representative of rare plant habitat. Section O-4 occurs within the Upper Valley Flood Forest, Upland Thornscrub, and Mid-Valley Riparian Woodland biotic communities.

On the southern side of the levee, the westernmost property is managed by TPWD. This area has been scraped and disturbed. The soils are somewhat saline, and there is approximately 30 to 40% bare ground. Scattered woody plants are honey mesquite, clepe, retama, and a few small salt cedar seedlings. Herbaceous species included suaeda, buffelgrass, seaside heliotrope, and sea ox-eye daisy. Also noted were Texas prickly pear, tasajillo, nipple cactus, fishhook cactus, and pitaya. The property is significantly different from most of the adjacent levy tracts given the abundant cacti occurrences. There was no appropriate endangered plant habitat.

Towards the LRGVNWR Peñitas tract, the same species assemblage occurs, becomes more dense (less disturbed), and the woody species created a dense stand along the fence line. Common species include honey mesquite, clepe, bluewood condalia, guayacan, spiny hackberry, and blackbrush. There was little to no herbaceous cover, except for the occasional buffelgrass clump from the toe of the levy to the fence line. There was no endangered plant habitat.

In the vicinity of the Hidalgo Pump House the area was scraped of vegetation cover and lay adjacent to active agricultural fields (including sugar cane). From the toe of the levy to the agricultural fields, the area is frequently mowed and maintained. Honey mesquite stump sprouts are prevalent within the buffelgrass and Bermuda grass dominated area. There is a small mesic zone with huisache, retama, cattails, and bulrush in this section. Other species recorded were suaeda, silverleaf nightshade, seaside heliotrope, King Ranch bluestem, and Johnson grass.

At the Texas Nature Conservancy Chihuahua Woods Preserve (no access), there is dense honey mesquite tree growth along the fence line along with clepe, Texas prickly pear, huisache, spiny hackberry, and snail vine. Adjacent to the fenceline is a large pond with large narrowleaf cattail stands. The levee toe to the fenceline is mowed (or bladed) and supports buffelgrass, Bermuda grass, and suaeda. There are large brush piles adjacent to the fenceline towards the eastern end of this section. Other species observed in the area were seaside heliotrope, sea ox-eye daisy, retama, salt cedar, and ivy treebine. There was no endangered plant habitat.

Near and within the LRGVNWR Abrams West tract, there are three large ponds surrounded by Bermuda grass, large stands of narrowleaf cattail with some duckweed, and a dense honey mesquite woodland. There are goats grazing throughout this area and species diversity is low. Additional species include retama, huisache, frog fruit, and climbing milkweed vine. There was no endangered plant habitat within this area.

The eastern portion of Section O-4 consists of a mowed/scraped levy toe area with honey mesquite stump sprouts, buffelgrass, Bermuda grass, suaeda, and powderpuff. The fence line woody species included honey mesquite, retama, and huisache, which were dominant, and the occasional spiny hackberry. There was no endangered plant habitat within this section.

SECTION O-5

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: Possible (only within the LRGVNWR Granjeno tract north of the levee); no (south of the levee)
If So, Habitat Quality: Low (within the Granjeno tract north of the levee)

Section Habitat Description: On the north side of the levee, this section includes approximately 1.76 miles and crosses the edge of the LRGVNWR Granjeno tract. The woodland species included honey mesquite, spiny hackberry, granjeno, sugarberry, anaqua, huisache, and lead tree, with Bermuda grass and switchgrass as the dominant herbaceous cover. The remainder of Section O-5 consisted of residential areas, some agricultural fields, and some small disturbed tracts. There was no potential rare plant habitat identified outside of the Granjeno tract. This section is located primarily within the Mid-Valley Riparian Woodland biotic community.

On the southern side of the levee, Section O-5 is called the Floodway and is characterized by a large flat area bounded by a levee on both sides. The levee sides are steep and portions are armored with large blocks of stone or concrete and vines. This area is frequently mowed and there are many honey mesquite stump sprouts. Other species recorded within the Flood Way were sweet gaura, silverleaf nightshade, Alamo vine, climbing milkvine, slender vervain, buffelgrass, old man's beard, ivy treebine, powderpuff, evening primrose, Bermuda grass, seaside heliotrope, sea ox-eye daisy, false ragweed, beach pimpernel, white sweet clover, and King Ranch bluestem. There was also a small mesic area with a small occurrence of common reed and giant reed. There is no endangered plant habitat within this section.

SECTION O-6

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No (north and south of the levee)
If So, Habitat Quality: NA

Section Habitat Description: Section O-6 includes approximately 3.85 miles. Within this section north of the levee is a predominantly urban environment that includes urban, industrial, and residential land use within the project corridor. Small acreages of fallow agricultural fields and highly disturbed parcels also occurred. There was no potential rare plant habitat identified. This section is located primarily within the Mid-Valley Riparian Woodland biotic community.

South of the levee, this segment consists primarily of LRGVNWR tracts (Pate Bend and Hidalgo Bend). Along the Pate Bend tract, the levee slope and toe area is mowed and supports buffelgrass, silverleaf nightshade, sweet gaura, and powderpuff. The fence line supports the woody species honey mesquite, clepe, bluewood condalia, huisache, ebony, lime prickly ash, retama, sugarberry, anacua, and spiny hackberry. The understory includes switchgrass and dried amantillo stalks. To the south, the woodland-like expanse opens to a savannah with the same basic species assemblage (with the addition of mule's fat shrubs). There are plow lines visible in this area and the area is notably trashy. At the edge of the Pate Bend tract there is a small mesic ditch supporting giant reed, honey mesquite, sugarberry, huisache, Chinaberry, anacua, castor bean, Johnsongrass, ivy treebine, and some bushy lippia. There is no endangered plant habitat within this area.

Near the eastern edge of the City of Hidalgo the LRGVNWR Hidalgo Bend tract begins and the levee is very close to the property boundary. Trees and tall shrubs within this woodland included honey mesquite, huisache, ebony, anacua, tepeguaje, sugarberry, retama, Chinaberry, and spiny hackberry. There is little to no understory, and abundant bare ground. Additional species observed were switchgrass, buffelgrass, old man's beard, dried amantillo stalks, ivy treebine, peppervine, sweet gaura, and some black willow and giant reed patches near the canals. There was no endangered plant habitat within this section.

SECTION O-7

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No (north and south of the levee)
If So, Habitat Quality: NA

Section Habitat Description: This section includes approximately 0.9 miles and north of the levee is entirely adjacent to agricultural land. The fields include plowed, fallow, and crops, e.g., sugarcane and sunflowers. There is no potential rare plant habitat within this section. This section occurs within the Mid-Valley Riparian Woodland biotic community and is adjacent to the Mid-Delta Thorn Forest.

South of the levee, Section 7 abuts the LRGVNWR Monterrey Banco tract. The levee slope and toe area is frequently mowed and maintained. This area was characterized by buffelgrass, King Ranch bluestem, switchgrass, sweet gaura, silverleaf nightshade, powderpuff, annual sunflower, Mexican hat, bushy lippia, and clumps of old man's beard. Along the common boundary the adjacent woodland is characterized by honey mesquite, huisache, retama, anacua, spiny hackberry, and scattered Texas prickly pear. There were some palmettos and Turk's cap that appeared to be planted within the tract as was one guajillo. There was no endangered plant habitat within this section or tract.

SECTION O-8

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No (north and south of the levee)
If So, Habitat Quality: NA

Section Habitat Description: This section is approximately 3.5 miles long and north of the levee includes agricultural fields (plowed, fallow, sugarcane, sunflowers), primarily. There is one disturbed brushy regrowth area, a small portion of the TPWD Las Palomas wildlife management area (WMA) tract, and a small portion of the LRGVNWR La Coma tract traversed by this alignment. The Las Palomas tract boundary supports dense trees and shrubs including retama, honey mesquite, spiny hackberry or granjeno, lime pricklyash, bluewood condalia, sugarberry, hackberry, anaqua, Texas ebony, and Chinaberry. The understory is predominantly leaf litter and woody debris, very dark (shaded), and has bare ground patches supporting sparse cover of pigeonberries. Where the sun can penetrate the canopy layer, switchgrass composes the herbaceous layer. Rare plant surveys were conducted within the Las Palomas tract with no success. The La Coma tract was disturbed historically by agricultural land use and has little to no rare plant potential. The understory is a dense, tall stand of buffelgrass and switchgrass with scattered shrubs of honey mesquite, huisache, retama, spiny hackberry or granjeno, coma, coyotillo, anaqua, lotebush, and Texas prickly pear. Targeted rare plant species were sought within the La Coma tract, but none were observed. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

To the south of the levee, the western half of Section O-8 parallels open or fallow agricultural fields and some active fields planted to sugar cane and onions. Commonly the levee slope and the toe area are scraped clean and devoid of vegetation. Occasionally the exposed soil supports sparse to low cover of annual sunflower, false ragweed, evening primrose, slender vervain, silverleaf nightshade, least snout bean, prickly sida, amantillo, hierba de Soldado, three-lobed false mallow, peppergrass, trumpets, Texas nightshade, annual sow thistle, Dakota vervain, powderpuff, pyramid flower, and lemon beebalm.

The eastern half of this section supports woodland tracts. The levee slope and mowed toe of this portion supports buffelgrass, Johnsongrass, Bermuda grass, annual sunflower, silverleaf nightshade, and powderpuff. Some areas of the tree line are honey mesquite dominated, while other areas (including the La Coma tract) also support sugarberry, retama, huisache, spiny hackberry, clepe, anacua, and few scattered Texas prickly pear. Additional species that occur in this area included bushy lippia, common greenbrier, old man's beard, amantillo, ivy treebine, and snail vine. There was no endangered plant habitat within this section.

SECTION O-9

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: Possible (only north of the levee)
If So, Habitat Quality: Medium (only north of the levee)

Section Habitat Description: Section O-9 includes approximately 3.87 miles that north of the levee is characterized by predominantly agricultural fields (plowed, fallow, corn, sugarcane). There is a small section of residential development and also resacas or cut-off oxbows near a huge, deep ravine lined with towering sugarberry trees located south of the alignment. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

To the south of the levee, the first half of Section O-9 parallels active agricultural fields (e.g., corn, cabbage, carrots). The levee slope and toe is typically scraped bare. Occasionally within the barren toe area there were ground cherry, annual sunflower, powderpuff, old man's beard, least snout bean, seaside heliotrope, germander, silverleaf nightshade, cowpen daisy, Dakota vervain, and Mexican hat.

This portion of the section includes the LRGVNWR Llano Grande Banco tract. It is characterized by an old canal adjacent to the levee. The canal supports giant reed and woody species including black willow, sugarberry, retama, and occasional ebony. The roadside area near the old canal was characterized by Bermuda grass with low cover of evening primrose, Texas thistle, least snout bean, false ragweed, castor bean, peppergrass, and sweet gaura.

The eastern quarter of Section O-9 is a large, flat, low area that is mowed and maintained to the Port of Entry boundary. This area is characterized by buffelgrass and Bermuda grass and the herbaceous flowering species noted above. There is no endangered plant habitat in Segment O-9.

SECTION O-10

County: Hidalgo
Potential Listed
Plant Occurrence: *Astrophytum asterias* (Star Cactus) (FE, SE)
Manihot walkerae (Walker's manioc) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: Possible (only north of the levee)
If So, Habitat Quality: Low (only north of the levee)

Section Habitat Description: Section O-10 includes approximately 2.33 miles that on the northern side of the levee crosses agricultural fields (sugarcane, fallow, plowed), primarily. Canals and stands of giant reed occur throughout the section. The LRGVNWR Rosario Banco tract is crossed by the alignment along this section. Rosario Banco is a previously disturbed site undergoing re-growth; on the easternmost portion of the tract, the buffelgrass and switchgrass stands are dense, tall, and difficult to navigate on foot. Scattered trees and shrubs characterizing this tract include honey mesquite, spiny hackberry or granjeno, retama, sugarberry, Chinaberry, lime pricklyash, and bluewood condalia. Near the western edge of this tract, the woodland stand provides dense cover resulting in bare ground in the understory. Although no rare plant species were observed, a Mexican tree frog occurred on a sugarberry leaf within the Rosario Banco tract. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

On the southern side of the levee in Section O-10, land use consists of mostly agricultural fields with the exception of the LRGVNWR Rosario Banco tract. The levee slope and toe area are mowed and supports buffelgrass, King Ranch bluestem, and powderpuff. The levee toe to the agricultural fields tends to alternate from a tree line to a mesic area (old canal). The tree lines support honey mesquite, huisache, retama, and some mule's fat. The more mesic sites support giant reed, common reed, black willow, huisache, and mule's fat. At the Rosario Banco tract, there is a large pond adjacent to the fence line and associated woodland. Trees occurring along the fence line were honey mesquite, huisache, anacua, sugarberry, spiny hackberry, pepperbark, zarza, and Mexican caesalpinia. South of the fenceline is a stand of common reed and narrowleaf cattail. Additional plant species that occur in this area were old man's beard, ivy treebine, hierba de Soldado, peppervine, germander, climbing milkvine, climbing hempvine, castor bean, Texas nightshade, and bushy lippia. There was no endangered plant habitat within this section.

SECTION O-11

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-11 includes approximately 2.31 miles and traverses a portion of the TPWD Anaqua WMA. The woodland stands are characterized by lead tree or tepeguahe, spiny hackberry or granjeno, sugarberry, huisache, Chinaberry, anaqua, and lime pricklyash. The understory is characterized by lantana species, Turk's cap, several species of vines or lianas, including the least snoutbean, dewberry, ivy treebine, and peppervine. There was no suitable habitat for listed plant species within this WMA, confirmed by on-the-ground surveys. The remainder of this section outside of the WMA consisted of fallow agricultural fields. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-12

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-12 includes approximately 0.92 miles and is characterized by a large sugarcane field, disturbed brush tract with little floristic diversity (mostly switchgrass and huisache), and the City of Harlingen Canal. The southern portion of the canal was lined with a thin band of tall trees, primarily anaqua, Chinaberry, spiny hackberry or granjeno, sugarberry, Texas ebony, honey mesquite, huisache, and retama. Rare plant surveys were conducted, but were unsuccessful within this section. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-13

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-13 includes approximately 1.58 miles that crosses agricultural fields (sorghum and fallow), primarily. The southern end of the section lies adjacent to LRGVNWR tract. There was no listed plant habitat within this section nor were rare plants observed in the on-the-ground survey. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-14

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-14 includes approximately 3.59 miles that lie adjacent to and parallels a canal for its entire length. The canal corridor was predominantly lined with Bermuda grass. No rare plant species were observed in this highly disturbed section, nor was suitable habitat observed. This section occurs within the Mid-Valley Riparian Woodland biotic community and is adjacent to the Mid-Delta Thorn Forest.

SECTION O-15

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-15 includes approximately 1.93 miles that are characterized largely by agricultural fields (fallow and sugarcane) and residential land use. There was no rare plant habitat within this section, nor were rare plant species observed during on-the-ground surveys. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-16

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-16 includes approximately 2.33 miles characterized by agricultural fields and residential neighborhoods. There was one very small woodland stand or patch, but it was highly disturbed and contained no listed plant species habitat. Surveys were conducted and no rare plant species were observed. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-17

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-17 includes approximately 1.61 miles and crosses agricultural fields, a canal edge, and nearby residential or commercial property containing abandoned vehicles. There was one small shrub herbaceous tract with low species diversity (mostly switchgrass, sparse honey mesquite, retama, spiny hackberry, or granjeno overstory). Within this tract there was an unusual and tiny mesic depression supporting water-clover along the saturated margin. All areas within this section have been disturbed, and there was no listed plant habitat or species observed. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-18

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-18 includes approximately 3.58 miles that cross agricultural land and parcels of revegetated habitat. A single stand of tepeguahe woodland from 10 m–15 m tall was examined, as was a retama shrubland, which has invaded nonnative grassland habitat to form herbaceous shrublands and short-stature woodlands in Section O-18. Suitable habitat for listed plant species does not occur in this section, nor were individual rare plants observed during on-the-ground surveys. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-19

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-19 includes approximately 3.37 miles characterized by extensive hay fields. In some segments of Section O-19, windmill grass has become established as the dominant grass, forming nearly pure stands on levee banks and extensive monotypic stands occupy grass hay pastures. There is no suitable habitat for rare plant species, nor were rare plants observed during on-the-ground surveys. This section occurs within the Mid-Valley Riparian Woodland biotic community and adjacent to the Mid-Delta Thorn Forest.

SECTION O-20

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) (FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: No
If So, Habitat Quality: NA

Section Habitat Description: Section O-20 includes approximately 0.93 miles characterized by pastures. In some segments of Section O-20, windmill grass has become established as the dominant grass, forming nearly pure stands on levee banks and extensive, monotypic stands occupy grass hay pastures. There is no suitable habitat for rare plant species, nor were rare plants observed during on-the-ground surveys. This section occurs within the Mid-Valley Riparian Woodland biotic community and marginally within the Sabal Palm Forest.

SECTION O-21

County: Cameron
Potential Listed
Plant Occurrence: *Ambrosia cheiranthifolia* (South Texas ambrosia) FE, SE)
Ayenia limitaris (Texas ayenia) (FE, SE)
Suitable Listed Plant Habitat Present: Yes
If So, Habitat Quality: Good

Section Habitat Description: Section O-21 includes approximately 12.99 miles through predominantly agricultural land. Sabal palms are common within Section O-21 as scattered individuals, linear clumps, and patches and stands where they persist as seedlings, tall shrubs, and as trees up to 20 m tall. Only a few sabal palm trees were observed in other project sections and those occurred as tall shrubs or palmettos. The LRGVNWR Boscaje de La Palma tract, located in the southernmost bend of the Rio Grande near Brownsville, was established to preserve sabal palm forest and woodland habitat. In addition, two short-stature huisache woodland stands were observed near the eastern end of Section O-21. The rare plant species listed for Cameron County were sought, but were not observed in the project corridor. The sabal palm is itself a species of limited distribution and stands have been mapped to more accurately describe potential project-related impacts. This section occurs within the Sabal Palm Forest and Mid-Valley Riparian Woodland biotic communities.

5.5 Wetlands and Waters of the United States

Wetlands and waters of the United States can be confusing terms and are defined here for the convenience of document users. The U.S. Corps of Engineers (USACE) has jurisdiction to protect wetlands under Section 404 of the Clean Water Act (CWA) using the following definition:

> *. . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 Code of Federal Regulations [CFR] 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.*

Wetlands have three diagnostic characteristics: (1) more than 50% of the dominant species present must be classified as obligate, facultative wetland, or facultative; (2) the soils must be classified as hydric; and (3) the area is either permanently or seasonally inundated (Environmental Laboratory 1987).

Waters of the United States are defined under 33 *United States Code* (U.S.C.) 1344, as follows:

a. The term “waters of the United States” means

    1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
    2. All interstate waters including interstate wetlands;
    3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
        i. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
        ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
        iii. Which are used or could be used for industrial purpose by industries in interstate commerce;
    4. All impoundments of waters otherwise defined as waters of the United States under the definition;
    5. Tributaries of waters identified in paragraphs (a)(1)-(4) of this section;
    6. The territorial seas;
    7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)-(6) of this section.

       Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (CWA) (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.
    8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the EPA.

b. The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

c. The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are "adjacent wetlands."

d. The term "high tide line" means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

e. The term "ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

The term “tidal waters” means those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.

5.5.1 Field Evaluation Summary

Observations and initial identification of potential wetlands and waters of the United States for the LRGV were recorded and reported daily to USACE wetlands ecologists during the October and December 2007 field inventories. Seventeen of the wetlands habitats located during these field inventory trips had been previously delineated and mapped under the National Wetlands Inventory (NWI) project (covering 7.3 acres in the NWI database); they included three freshwater ponds, nine freshwater emergent wetlands, one lake, two freshwater forested/shrub wetlands, and two riverine sites (USFWS 2007).

During December 2007, wetland ecology teams sampled 62 potential and known wetland sites to determine the wetlands classification, boundary, and jurisdictional status (jurisdictional determination form); record physical site data (wetland data observation form); and acquire on-the-ground photographs (**Table 5-4**). The teams assessed wetlands and waters of the United States within a 150-foot-wide corridor for the length of the project corridor with the exception of Sections O-17, O-18, and O-19 where access was granted for a narrower, 60-foot-wide corridor survey. Additionally, construction staging areas were assessed for wetlands and waters of the United States in conjunction with the corridor analyses. In general, wetlands of the project corridor have become established on seeps and springs, rivers and creeks, canals and ditches, ponds, and in arroyos and cover approximately 23.8 acres (Table 5-5). A Section 404 permit application was filed indicating approximately 2.77 acres of wetlands will be impacted by the project (**Table 5-5**).

5.5.2 Wetlands Vegetation Summary

Wetlands delineated within the Rio Grande Valley include forest, woodland, shrubland, and herbaceous types. The characteristic species for each wetlands type investigated, sampled, or delineated in the field are presented below by stand physiognomy.

Forest and Woodland

1. Black Willow/ Coyote Willow Riparian Woodland
2. Black Willow /Giant Reed Riparian Woodland
3. Black Willow/ Mexican Ash Riparian Woodland
4. Black Willow/ Narrowleaf Cattail Riparian Woodland
5. Black Willow–Retama/ Narrowleaf Cattail Riparian Woodland
6. Huisache Riparian Woodland
7. Retama Riparian Woodland
8. Retama–Black Willow/ Giant Reed Riparian Woodland
9. Retama/ Giant Reed Riparian Woodland
10. Retama/ Mule’s Fat Riparian Woodland
11. Retama–Sugarberry Riparian Woodland
12. Sugarberry–Mexican Ash Riparian Forest
13. Sugarberry–Mexican Sabal Palm Riparian Forest

Shrubland

1. Coyote Willow–Dewberry Shrubland
2. Coyote Willow/ Narrowleaf Cattail Shrubland
3. Roosevelt Weed– (Mule’s Fat) Shrubland
4. Roosevelt Weed– (Mule’s Fat)/Buffelgrass Shrubland
5. Roosevelt Weed–(Mule’s Fat)/Narrowleaf Cattail Shrubland

Table 5-4. Summary of Jurisdictional and Nonjurisdictional Wetlands within the LRGV

ID	NWI Type	Section	Boundary Flagged in Field	Boundary Determined from Aerial Photos and Ground Truthing	Jurisdictional Determination Form Completed	Routine Data Form Completed	Ground Photos Included	Map Included
*WL1	PEM/PSS	O-10	yes	—	yes	yes	yes	yes
*WL2	PEM	O-9	yes	—	yes	yes	yes	yes
WL3	PEM	O-9	no	yes	yes	no	yes	yes
*WL4	PEM/ Irrigation ditch	O-8	yes	—	yes	yes	yes	yes
WL5	Irrigation ditch	O-6	no	yes	yes	no	yes	yes
*WL6	PEM/POW	O-5	yes	—	yes	yes	yes	yes
WL7	Irrigation ditch	O-5	no	yes	yes	no	yes	yes
*WL8	Stream	O-1	yes	—	yes	no	yes	yes
WL9	Arroyo	O-1	yes	—	yes	no	yes	yes
WL10	Arroyo	O-1	yes	—	yes	no	yes	yes
*WL11	Arroyo	O-1	yes	—	yes	no	yes	yes
*WL12	Arroyo	O-1	no	yes	yes	no	yes	yes
WL13	Arroyo	O-1	yes	—	yes	no	yes	yes
*WL14	PFO/PEM	O-1	yes	—	yes	yes	yes	yes
*WL15	Arroyo	O-1	no	yes	yes	no	yes	yes
*WL16	PFO/PEM	O-2	yes	—	yes	yes	yes	yes

ID	NWI Type	Section	Boundary Flagged in Field	Boundary Determined from Aerial Photos and Ground Truthing	Jurisdictional Determination Form Completed	Routine Data Form Completed	Ground Photos Included	Map Included
WL17	Arroyo	O-19	no	yes	yes	no	yes	yes
*WL18	PSS/PEM	O-20	yes	—	yes	yes	yes	yes
*WL19	PEM/POW	O-17	yes	—	yes	yes	yes	yes
*WL20	PSS/PEM	O-17	yes	—	yes	yes	yes	yes
WL21	Irrigation canal	O-11	yes	—	yes	no	yes	yes
WL22	Irrigation canal	O-11	yes	—	yes	no	yes	yes
*WL23	PFO/ Irrigation ditch	O-11	yes	—	yes	yes	yes	yes
WL24	Irrigation canal	O-11	yes	—	yes	no	yes	yes
*WL25	POW/PFO/ PEM	O-12	yes	—	yes	yes	yes	yes
*WL26	PSS/POW/ PEM	O-13	yes	—	yes	yes	yes	yes
WL27	Irrigation ditch	O-12	yes	—	yes	no	yes	yes
WL28	Irrigation ditch	O-12	no	yes	yes	no	yes	yes
*WL29	PFO/PEM	O-13	yes	—	yes	yes	yes	yes
*WL30	PFO/PSS	O-13	yes	—	yes	yes	yes	yes
*WL31	PSS/PEM	O-13	yes	—	yes	yes	yes	yes

ID	NWI Type	Section	Boundary Flagged in Field	Boundary Determined from Aerial Photos and Ground Truthing	Jurisdictional Determination Form Completed	Routine Data Form Completed	Ground Photos Included	Map Included
*WL32	PEM	O-13	yes	—	yes	yes	yes	yes
*WL33	PEM	O-13	yes	—	yes	yes	yes	yes
WL34	Irrigation ditch	O-13	no	yes	yes	no	yes	yes
WL35	PFO	O-13	yes	—	yes	yes	yes	yes
*WL36	PFO	O-18	yes	—	yes	yes	yes	yes
*WL37	PEM/PSS	O-18	yes	—	yes	yes	yes	yes
*WL38	POW/PEM	O-18	yes	—	yes	yes	yes	yes
WL39	Irrigation ditch	O-18	no	yes	yes	no	no	yes
WL40	PSS/PEM	O-13	yes	—	yes	yes	yes	yes
WL41	Irrigation canal	O-14	no	yes	yes	no	yes	yes
WL42	Irrigation ditch	O-14	no	yes	yes	no	yes	yes
WL43	Irrigation ditch	O-14	no	yes	yes	no	yes	yes
WL44	Irrigation ditch	O-15	yes	—	yes	no	yes	yes
WL45	Irrigation ditch	O-21	yes	—	yes	no	yes	yes
*WL46	PFO/PEM	O-21	yes	—	yes	yes	yes	yes
*WL47	POW/PEM	O-21	yes	—	yes	yes	yes	yes

ID	NWI Type	Section	Boundary Flagged in Field	Boundary Determined from Aerial Photos and Ground Truthing	Jurisdictional Determination Form Completed	Routine Data Form Completed	Ground Photos Included	Map Included
WL48	Dry wash	O-1	no	yes	yes	no	no	yes
WL49	Dry wash	O-1	no	yes	yes	no	no	yes
WL50	Dry wash	O-1	no	yes	yes	no	no	yes
*WL51	PEM	O-2	no	yes	yes	no	no	yes
*WL52	PFO	O-2	no	yes	yes	no	no	yes
*WL53	PFO	O-2	no	yes	yes	no	no	yes
*WL54	PFO	O-2	no	yes	yes	no	no	yes
*WL55	Stream	O-2	no	yes	yes	no	no	yes
*WL56	PFO	O-2	no	yes	yes	no	no	yes
*WL57	PFO	O-20	no	yes	yes	no	no	yes
WL58	Irrigation ditch	O-21	no	yes	yes	no	no	yes
WL59	Irrigation ditch	O-21	no	yes	yes	no	no	yes
WL60	Irrigation ditch	O-21	no	yes	yes	no	no	yes
WL61	Irrigation ditch	O-21	no	yes	yes	no	no	yes
WL62	Irrigation ditch	O-21	no	yes	yes	no	no	yes

Note:
* = Jurisdictional, subject to permitting under Section 404 of the Clean Water Act
PEM = Palustrine Emergent, PFO=Palustrine Forested, POW=Palustrine Open Water, and PSS=Palustrine Scrub/Shrub

Table 5-5. Summary of Jurisdictional Wetlands within the LRGV

WL ID	WL Type	Section	Size (acres)	Impacts (acres)
WL1	PEM/PSS	O-10	0.42	0.02
WL2	PEM	O-9	2.62	0.24
WL4	PEM/ditch	O-8	0.11	0.03
WL6	PEM/POW	O-5	0.38	0
WL8	Stream	O-1	0.36	0.14
WL11	Arroyo	O-1	0.08	0
WL12	Arroyo	O-1	2.85	0
WL14	PFO/PEM	O-1	0.37	0.16
WL15	Arroyo	O-1	0.12	0.05
WL16	PFO/PEM	O-2	0.36	0
WL18	PSS/PEM	O-20	0.02	0
WL19	PEM/POW	O-17	0.5	0
WL20	PSS/PEM	O-17	2.65	0.21
WL23	PFO along ditch	O-11	3.25	0.96
WL25	POW/PFO/PEM	O-12	1.08	0
WL26	PSS/POW/PEM	O-13	0.79	0
WL29	PFO/PEM	O-13	0.09	0
WL30	PFO/PSS	O-13	0.18	0
WL31	PSS/PEM	O-13	0.14	0
WL32	PEM	O-13	0.14	0
WL33	PEM	O-13	0.44	0.08
WL36	PFO	O-18	0.04	0
WL37	PEM/PSS	O-18	0.17	0
WL38	POW/PEM	O-18	0.68	0
WL46	PFO/PEM	O-21	0.27	0
WL47	POW/PEM	O-21	1.82	0
WL51	PEM	O-2	1.6	0
WL52	PFO	O-2	0.25	0.09
WL53	PFO	O-2	0.22	0.13
WL54	PFO	O-2	0.22	0.09
WL55	Stream	O-2	0.04	0.04
WL56	PFO	O-2	1.13	0.53
WL57	PFO	O-20	0.4	0

Total wetland area in acres = 23.8; Total wetland impact area in acres = 2.77

Herbaceous

1. Common Reed Herbaceous Vegetation
2. Common Reed–Switchgrass Herbaceous Vegetation
3. Duckweed Floating Aquatic Herbaceous Vegetation
4. Giant Reed Herbaceous Vegetation
5. Giant Reed–Buffelgrass Herbaceous Vegetation
6. Giant Reed–Common Reed Herbaceous Vegetation
7. Narrowleaf Cattail–Sedge Herbaceous Vegetation
8. Narrowleaf Cattail–Smartweed Herbaceous Vegetation
9. Switchgrass–Bermuda Grass Herbaceous Vegetation

5.5.3 Wetlands Soil Summary

Soils supporting wetlands and waters of the United States within the LRGV included (1) Alluvial Land, (2) Camargo Silt Loam, (3) Camargo Silty Clay Loam, (4) Cameron Silty Clay, (5) Grulla Clay, (6) Laredo Silty Clay Loam, 0%–1% Slopes, (7) Matamoros Silty Clay, (8) Olmito Silty Clay, (9) Reynosa Silty Clay Loam, 0%–1% Slopes, (10) Rio Grande Silt Loam, and (11) Rio Grande Silty Clay Loam. The common soil textures of these Rio Grande floodplain sites are heavy silt loam and silty clay loam. However, one each of wetland stands was rooted in clay loam, silt loam, and mucky peat. The matrix color of the A horizon for LRGV wetland soils was consistently a brown hue (10YR) with the value ranging from 3 to 5 and the chroma ranging from 1 to 6. Wetland soils under long-term standing water or soils saturated by the groundwater table exhibited gleying and a few exhibited mottling. The mottles were typically a brown hue (10YR) or less commonly a yellow hue (2.5YR) and faint in terms of value and chroma.

5.6 Noxious Weeds and Invasive Nonnative Species

The State of Texas maintains a noxious weed definition, species list, and control districts under a legislative determination (TDA 2008). The legislature has determined that (1) noxious weeds are present in this state to a degree that poses a threat to agriculture and is deleterious to the proper use of soil and other natural resources, and (2) reclamation of land from noxious weeds is a public right and duty in the interest of conservation and development of the natural resources of the state (Chapter 388, Acts 1981, Sixty-seventh Legislature). Under Chapter 388 of this act “a weed or plant is considered to be a noxious weed if declared to be a noxious weed by: (1) a law of this state or (2) the department acting under the authority of Chapter 61 of this code or any other law of this state.” This Act is administered by the Texas Department of Agriculture under Title 4, Part 1, Chapter 19, Subchapter T: Noxious and Invasive Plants.

The Act and other legislation provide a list of noxious weed species present and managed within Texas (see **Table 5-6**). Additionally, TPWD has listed the

Brazilian peppertree, observed in Sections O-9 and O-19 in this survey, as a prohibited exotic species. The Web site, Texasinvasives.org, provides a list of 137 plant species considered to be nonnative invasives or noxious weeds within Texas, 14 of which occur within the project corridor and are listed in **Table 5-6**.

Table 5-6. Noxious Weed List for the Project Corridor

Common Name	Scientific Name	Fence Sections Observed
[1,2]Giant Reed; Carrizo	*Arundo donax*	O-2, O-3, O-9, O-10, O-12, O-13, O-14, O-17, O-18, O-20, O-21
[2]Bermuda Grass	*Cynodon dactylon*	O-1, O-2, O-3, O-4, O-5, O-6, O-7, O-8, O-9, O-10, O-11, O-12, O-13, O-14, O-15, O-16, O-17, O-19, O-21
[2]Angleton Bluestem	*Dicanthium aristatum*	O-1
[2]Poponac	*Leucaena leucocephala*	O-1
[2]Chinaberry Tree	*Melia azedarach*	O-1, O-6, O-8, O-9, O-10, O-11, O-12, O-13, O-14, O-16, O-17, O-18, O-19
[2]Tree Tobacco	*Nicotiana glauca*	O-1, O-2, O-3
[2]Buffelgrass	*Pennisetum ciliare*	O-1, O-2, O-3, O-4, O-5, O-6, O-7, O-8, O-9, O-10, O-11, O-12, O-13, O-14, O-15, O-16, O-17, O-18, O-19, O-20, O-21
[2]Castor Bean	*Ricinus communis*	O-1, O-2, O-3, O-6, O-7, O-8, O-9, O-11, O-13, O-14, O-15, O-16, O-17, O-20, O-21
[2]Russian-thistle	*Salsola tragus*	O-1, O-2, O-6, O-7, O-8, O-9, O-10
[1,2]Brazilian Peppertree	*Schinus terbinthifolius*	O-9, O-19
[2]Johnsongrass	*Sorghum halepense*	O-3, O-4, O-5, O-6, O-7, O-8, O-9, O-10, O-11, O-12, O-13, O-14, O-15, O-16, O-17, O-18, O-19, O-21
[1,2]Athel Tamarisk	*Tamarix aphylla*	O-2, O-9
[2]Goathead	*Tribulus terrestris*	O-2
[2]Guineagrass	*Urochloa maxima*	O-1, O-2, O-13, O-15, O-16, O-17, O-18, O-19, O-21

Source: TIO 2007
Notes: 1 = Noxious, 2 = Nonnative Invasive

In general, nonnative noxious and invasive plant species represent a serious management concern, and their inventory, monitoring, and control is expensive for land managers. Within the project corridor, 14 species of nonnative plants have been identified and 3 of these species (i.e., giant reed, Brazilian peppertree, athel tamarisk) are considered noxious in Texas. Nonnative species usually lower the value of wildlife habitat and compete with agricultural crops resulting in lower forage value and production. Once inventoried, methods commonly used to control nonnative species include biological, mechanical, and chemical. Controls must be ongoing to be effective in reducing, but only rarely eliminating, nonnative plant species.

5.7 Wildlife and Wildlife Habitat

5.7.1 Introduction

The Rio Grande Plain, also known as the South Texas brush country, encompasses about 20.5 million acres in an area extending from Del Rio to San Antonio, and southeast to Rockport. Eleven unique plant and animal communities occur in the four southernmost counties of Texas, and eight of the communities occur within the project corridor (USFWS 1988). These eight communities have been crosswalked to the National Vegetation Classification System at the ecological system level (NatureServe 2008) where eight ecological systems have been described by vegetation alliances and plant associations observed during field studies. Collectively labeled the Tamaulipan Brushland by Texas biogeographers, much of the landscape has been cleared, farmed, developed, grazed by livestock, or planted to nonnative pastures and agricultural crops.

Wildlife flourishes in a wide array of species and large numbers of individuals due to the extant habitat diversity resulting in part from a warm climate year-round, moderate precipitation, and the Rio Grande flowing into the Gulf of Mexico. The economics of Rio Grande Valley wildlife and habitat diversity are important to the international border region as approximately 200,000 tourists annually spend approximately $150 million. Because approximately 95% of the vegetation in the LRGV has been cleared or altered, National Wildlife Refuges (NWRs), state parks and wildlife areas, properties purchased for conservation by nonprofit organizations, and some private holdings, are important links in the efforts to protect the tremendous biodiversity and related economics of the region. To preserve and manage remnants of these communities and attempt restoration of adjacent disturbed lands, the USFWS has established the LRGVNWR, which consists of numerous parcels that are made up of from 2,000 to 20,000 acres per parcel.

5.7.2 Wildlife and Habitat Overview

The project corridor supports diverse populations and individuals of vertebrate and invertebrate wildlife species (see **Table 5-7**), and unique-to-common native and nonnative wildlife habitats, described as vegetation alliances, plant associations, and land use types in this BSR (see **Table 5-8**). **Table 5-7** lists wildlife observed during the field surveys. The table can provide a general indication of species richness in each section. **Table 5-8** lists the habitat observed during the surveys, and the estimated acreage in each segment. Along the international border, climate, geology, soils, land forms, geography, precipitation, and plant communities combine to provide excellent habitat diversity. Recent estimates concur that a small area, approximately 5% of the native landscape, remains on the lower Rio Grande and associated terraces and uplands, where it is generally distributed as discontinuous vegetation patches and stands.

However, vegetation and wildlife diversity within these native habitat fragments and nonnative stands totals more than 1,200 species of plants, 700 species of vertebrates (including nearly 500 bird species), and 300 species of butterflies. Within the LRGV project corridor, wildlife species observed and recorded during late summer and fall surveys included 13 species of mammals, 63 species of birds, 6 reptile species, 7 amphibian species, and 2 species of fish. The number of plant taxa observed and providing wildlife habitat within the project corridor was 301.

Within the LRGV project corridor the broad habitat types available to resident and migrating wildlife species include herbaceous vegetation, shrubland, woodland and forest, agriculture, water bodies, and residential and urban types. Most of the available wildlife habitat has become established on floodplain alluvium deposited within the LRGV, but only a few geologic exposures and uplands occur. This section provides a brief summary of wildlife habitats observed and sampled in 2007 (see **Table 5-8**), categorized as follows:

1. Herbaceous Vegetation: this class of wildlife habitat includes annual and perennial species of grasses, forbs, and graminoids, which typically are characterized by no less than 15% cover by shrubs or trees. Stands of herbaceous vegetation range from less than 0.5 up to 10.0 m tall and range from low to dense in terms of cover. Herbaceous wildlife habitat occurs within the entire length of the project corridor, as proposed.

Grasslands – predominantly nonnative grassland habitat characterized by buffelgrass, switchgrass, Guinea grass, windmill grass, and Bermuda grass occurs in patches to extensive stands on approximately 472 acres distributed throughout the project corridor. Occurring as pastures for grazing livestock, grass hay fields, woodland and shrubland clearings, and on the banks of the USIBWC levee, these nonnative grassland habitats typically have low floristic species diversity, provide thick mats of litter as ground cover, and occur as moderate to dense stands in terms of foliar cover. Wildlife species observed within grasslands commonly included the fulvous harvest mouse, blue spiny lizard, and Rio Grande

Table 5-7. Wildlife Observed During Natural Resources Surveys Conducted 1–7 October, and 11–14 December 2007

Common Name / Scientific Name	Status	Section Numbers																					Total Number of Species Occurrences Within Project Corridor Sections
		O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	
Fish																							
Mosquito Fish / *Gambusia affinis*	C								x														1
Texas Cichlid / *Herichthys cyanoguttatus*	C								x														1
Amphibians																							
Giant (Marine) Toad / *Bufo marinus*	C																	x					1
Gulf Coast Toad / *Bufo valliceps*	C																					x	1
Mexican Burrowing Toad / *Rhinophrynus dorsalis*	Potential Habitat		x																				1
Mexican Treefrog (2) / *Smilisca baudinii*	State Threatened Species										x												1
Rio Grande Chirping Frog / *Eleutherodactylus cystignathoides*	C								x	x													2
Rio Grande Leopard Frog / *Rana berlandieri*	C								x	x					x								3
White-lipped Frog / *Leptodactylus labialis*	Potential Habitat								x														1
Reptiles																							
Blue Spiny Lizard / *Sceloporus serrifer cyanogenys*	C	x						x															2
Eastern Fence Lizard / *Sceloporus undulatus*	C		x																				1
Laredo Striped Whiptail / *Aspidoscelis laredoensis*	C	x	x	x						x		x		x	x			x					8
Prairie Racerunner / *Aspidoscelis sexlineatus viridis*	C	x										x		x									3
Rio Grande River Cooter / *Pseudemys gorzugi*	C						x																1
Texas Horned Lizard / *Phrynosoma cornutum*	State Threatened Species		x																				1
Texas Indigo Snake / *Drymarchon corais erebennis*	State Threatened Species	x															x					x	3
Texas Spiny Softshell Turtle / *Apalone spinifera emoryi*	C														x								1
Birds																							
Altamira Oriole / *Icterus gularis*	C		x																				1
American Avocet / *Recurvirostra americana*	C																		x				1
American Coot / *Fulica americana*	C														x						x		2
American Kestrel / *Falco sparverius*	C	x					x				x		x	x			x	x		x			8
American White Pelican / *Pelicanus erythrorhynchos*	C									x												x	2
Anhinga / *Anhinga anhinga*	C														x								1
Barn Owl / *Tyto alba*	C														x								1
Bank Swallow / *Riparia riparia*	C									x													1
Barn Swallow / *Hirundo rustica*	C	x	x	x	x	x			x	x									x				8
Bewick's Wren	C													x									1
Black Vulture / *Coragyps atratus*	C	x		x																			2
Black-bellied Whistling Duck / *Dendrocygna autumnalis*	C									x					x				x			x	4
Black-necked Stilt / *Himantopus mexicanus*	C														x	x							2
Black Phoebe / *Sayornis nigricans*	C		x																				1
Blue-Gray Gnatcatcher / *Polioptila caerulea*	C		x								x												2
Brewer's Blackbird / *Euphagus cyanocephalus*	C		x																x				2
Bronzed Cowbird / *Molothrus aeneus*	C									x													1
Brown Jay / *Cyanocorax morio*	C	x																					1
Brownsville Common Yellowthroat / *Geothlypis trichas insperata*	State Monitored Species										x												1
Brown-crested Flycatcher / *Myiarchus tyrannulus*	C				x																		1
Birds (continued)																							
Brown-headed Cowbird / *Molothrus ater*	C										x		x				x						3

Common Name / Scientific Name	Status	Section Numbers																					Total Number of Species Occurrences Within Project Corridor Sections
		O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	
Cactus Wren / *Campylorhynchus brunneicapillus*	C	x	x																x				3
Carolina Wren / *Thryothorus ludovicianus*	C										x												1
Cattle Egret / *Bubulcus ibis*	C															x							1
Chihuahuan Raven / *Corvus cryptoleucus*	C	x																					1
Common Ground Dove / *Columbina passerina*	C		x	x	x	x	x		x	x	x					x	x	x		x		x	13
Couch's Kingbird / *Tyrannus couchii*	C	x	x	x	x	x	x		x	x	x		x	x	x		x	x	x	x	x	x	18
Crested Caracara / *Caracara cheriway*	C	x	x														x	x					4
Curved-Billed Thrasher / *Toxostoma curvirostre*	C	x			x																		2
Double-crested Cormorant / *Phalacrocorax auritus*	C									x					x							x	3
Eastern Meadowlark / *Sturnella magna*	C		x											x						x			3
European Starling / *Sturnus vulgaris*	C								x														1
Golden-fronted Woodpecker / *Melanerpes aurifrons*	C	x	x		x	x			x	x	x	x	x		x		x		x	x			13
Great Blue Heron / *Ardea herodias*	C									x		x				x			x		x		5
Great Egret / *Ardea alba*	C	x				x				x					x	x			x		x	x	8
Great Horned Owl / *Bubo virginianus*	C		x																				1
Great Kiskadee / *Pitangus sulphuratus*	C	x	x	x			x				x				x		x					x	8
Greater Roadrunner / *Geococcyx californianus*	C	x																					1
Greater Yellowlegs / *Tringa melanoleuca*	C									x													1
Great-tailed Grackle / *Quiscalus mexicanus*	C	x	x	x	x	x	x	x	x	x	x			x	x		x		x	x	x	x	17
Green Heron / *Butorides virescens*	C									x					x								2
Green Jay / *Cyanocorax yncas*	C	x	x				x				x											x	5
Groove-billed Ani / *Crotophaga sulcirostris*	C	x	x			x			x	X					x								6
Harris's Hawk / *Parabuteo unicinctus*	C			x																			1
Hooded Oriole / *Icterus cucullatus*	C								x														1
House Finch / *Carpodacus mexicanus*	C	x	x	x	x	x							x	x	x	x		x		x			11
House Sparrow / *Passer domesticus*	C	x	x												x		x						4
Killdeer / *Charadrius vociferous*	C	x		x					x						x			x	x				6
Ladder-backed Woodpecker / *Picoides scalaris*	C																					x	1
Lark Bunting / *Calamospiza melanocorys*	C																			x			1
Lark Sparrow / *Chondestes grammacus*	C																					x	1
Lesser Nighthawk / *Chordeiles acutipennis*	C	x		x																			2
Lesser Yellowlegs / *Tringa flavipes*	C															x							1
Loggerhead Shrike / *Lanius ludovicianus*	C		x																				1
Long-billed Curlew / *Numenius americanus*	C															x							1
Long-billed Dowitcher / *Limnodromus scolopaceus*	C																		x				1
Long-billed Thrasher / *Toxostoma longirostre*	C	x	x																				2
Mourning Dove / *Zenaida macroura*	C	x	x	x	x	x	x			X	x			x	x		x	x	x	x		x	15
Northern Bobwhite / *Colinus virginianus*	C														x								1
Northern Cardinal / *Cardinalis cardinalis*	C	x	x		x	x						x	x	x	x		x					x	10
Northern Flicker / *Colaptes auratus*	C		x	x					x		x		x						x			x	7
Northern Harrier / *Circus cyaneus*	C		x	x	x					X							x						5
Birds (continued)																							
Northern Mockingbird / *Mimus polyglottos*	C	x	x		x	x	x	x	x	X	x	x	x		x	x		x	x	x	x	x	18
Northern Rough-Winged Swallow / *Stelgidopteryx serripennis*	C									x													1
Olive Sparrow / *Arremonops rufivirgatus*	C		x			x																	2

Common Name / Scientific Name	Status	Section Numbers																					Total Number of Species Occurrences Within Project Corridor Sections
		O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	
Osprey / *Pandion haliaetus*	C	x																					1
Pied-billed Grebe / *Podilymbus podiceps*	C																		x				1
Plain Chachalaca / *Ortalis vetula*	C												x										1
Purple Gallinule / *Porphyrula martinica*	C																		x				1
Pyrrhuloxia / *Cardinalis sinuatus*	C	x												x			x		x				4
Red-tailed Hawk / *Buteo jamaicensis*	C		x	x					x													x	4
Red-winged Blackbird / *Agelaius phoeniceus*	C	x	x						x		x				x	x			x		x		8
Ringed Kingfisher / *Ceryle torquata*	C		x																				1
Rock Pigeon / *Columba livia*	C	x																		x			2
Ruby-crowned Kinglet / *Regulus calendula*	C	x																					1
Scissor-tailed Flycatcher / *Tyrannus forficatus*	C	x	x		x		x			x				x	x	x		x		x	x	x	12
Tree Swallow / *Tachycineta bicolor*	C													x									1
Turkey Vulture / *Cathartes aura*	C	x	x	x	x	x	x		x	x	x			x				x		x		x	13
Verdin / *Auriparus flaviceps*	C	x																					
Vermillion Flycatcher / *Pyrocephalus rubinus*	C									x													1
Western Sandpiper / *Calidris mauri*	C																		x				1
Western Yellow-billed Cuckoo / *Coccyzus americanus occidentalis*	Candidate Species									x													1
White Ibis / *Eudocimus albus*	C														x	x							2
White-tipped Dove / *Leptotila verreauxi*	C	x																					1
White-winged Dove / *Zenaida asiatica*	C		x					x															2
Wood Stork / *Mycteria Americana*	C														x								1
Yellow-rumped Warbler / *Dendroica coronata*	C	x																					1
Mammals																							
Black-Tailed Jackrabbit / *Lepus californicus*	C													x									1
Bobcat / *Lynx rufus*	C		x																				1
Collared Peccary (Javelina) / *Pecari tajacu*	C	x	x		x										x								4
Common Gray Fox / *Urocyon cinereoargenteus*	C														x								1
Common Raccoon / *Procyon lotor*	C		x																x				2
Coyote / *Canis latrans*	C	x	x	x															x			x	5
Desert Cottontail / *Sylvilagus audubonii*	C	x																					1
Eastern Cottontail / *Sylvilagus floridanus*	C												x										1
Fulvous Harvest Mouse / *Reithrodontomys fulvescens*	C	x									x				x								3
Gulf Coast Kangaroo Rat / *Dipodomys compactus*	C	x																					1
Hispid Cotton Rat / *Sigmodon hispidus*	C		x	x																			2
Mexican Ground Squirrel / *Spermophilus mexicanus*	C		x												x					x			3
Nine-banded Armadillo / *Dasypus novemcinctus*	C	x	x	x									x										4
Striped Skunk / *Mephitis mephitis*	C							x												x			2
	Total # Species Per Section:	35	34	15	3	13	10	5	14	24	17	4	9	13	25	12	14	10	22	12	8	20	

Note: C = Common

Table 5-8. Wildlife Habitat Types Observed in the Mapping Corridor

Wildlife HabitatType Observed		Acreage by Section Numbers																					Total Acreage of Wildlife Habitats	Total Acreage of Vegetation
	Components	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21		
Herbaceous Vegetation	16																							591.2445
Grassland	9	8.6899	31.2863	14.4413	61.6807	19.3424	47.4553	12.3069	14.9582	17.2993	14.9551	16.5890	10.9885	11.5466	27.5391	19.8154	20.2942	11.9101	29.8417	57.7185	10.2791	127.6986	586.6362	
Forbland	3				0.1643																		0.1643	
Emergent Wetland	4				1.9712										1.5815				0.8913				4.444	
Shrubland	8																							48.2063
Dwarf-shrub	1	<1.0																					<1.0	
Short Shrub	2	22.386																					22.386	
Tall Shrub	4			0.1797						0.6155	1.8421			9.1701					4.5172		5.7430		22.0676	
Shrub-Scrub Wetland	1	0.3384								1.9278				0.3684			0.9446					0.1735	3.7527	
Woodland and Forest	12																							343.1813
Upland	1																0.4408						0.4408	
Floodplain High Terrace	4					14.6851	0.3343				1.2256							6.3535	4.4324	4.9253		6.3048	38.261	
Floodplain Low Terrace	6	59.3075	64.8122	15.3256	35.2446	2.5191	3.4666	0.1902	11.1261	8.8722	4.5003	9.5875	8.4699		14.4914	1.7725	6.5703		6.6410	6.3546	0.3401	43.5241	303.1158	
Wooded Wetland	1								0.3341						0.2295						0.8001		1.3637	
Open Water	5																							10.6307
River/Creek/Canal	3		0.3934			0.2834		0.1452		0.0056		1.8758	0.1859	3.3284	0.5941		0.1319	0.9992	0.3261	0.0977		1.2352	9.6019	
Lake/Pond	2						0.1858												0.6244			0.2186	1.0288	
Land Use	6																							547.2158
Agriculture, Irrigated	1	0.1509	44.9461		0.1178		3.4035	12.4756	33.4576	27.5553	10.5534	5.7935	0.1150		1.3686	7.7576						5.5668	153.2617	
Agriculture, Fallow	1	1.4393	16.2957	3.3685	1.0925	3.3336	0.1470		3.6075	7.7982	7.8179	14.7887		12.3178	15.1593	2.3139	15.9866	9.7677	17.9527	0.2217		38.5635	171.9721	
Residential and Urban Development	2	8.7591	6.0813	10.9016	1.4657		16.0869	0.0792	0.9123	6.1304					1.4570	3.6282	1.6004	1.3719	8.4144	27.1158	4.0813	8.5841	106.6696	
Highways/Roads/Trails	2	3.4317	9.8034	1.6703	11.1189	1.3319	4.2190	3.1520	2.6857	5.9341	4.1392	0.8368	1.0325	9.5737	13.6012	1.6163	8.4174	2.1140	4.8982	10.8075	0.7526	14.1760	115.3124	
																						Total Acreage		1540.4786

leopard frog (when wetlands or water bodies were nearby). Tracks and scat indicate that raccoons, skunks, and coyotes commonly forage in the dense grassland habitat. Species of dove and the northern bobwhite often forage for seeds within and raptors including the Harris's and red-tailed hawks, northern harrier, and American kestrel hunt extensively over grassland habitat. Ground nesting birds, including the eastern meadowlark and lark bunting, rely on grasslands for forage, escape cover, nesting, and brood rearing.

   a. *Forblands* – forbs, including sunflowers, false ragweed, croton, pigweeds, Russian-thistle, and prairie aster are rare dominants within the project corridor, typically becoming established in fallow agricultural fields or in topographic depressions. Forb-dominated habitats occur on less than 1.0 acre within the project corridor and provide quantities of seeds and also limited escape cover for birds and small mammals. Granivores, particularly species of blackbirds, cowbirds, doves, finches, and sparrows feed extensively in forblands. Cottontail rabbits are common herbivores within forblands, as are the predators, coyote and gray fox.

   b. *Emergent Wetlands* – narrowleaf cattail, common reed, giant reed, smartweed, and sedges occur on the margins of resacas, ponds, canals, and ditches and on riverbanks, occupying approximately 5 acres within the project corridor. Emergent wetlands can be tall, from 2 m–10 m in height and dense, providing habitat for birds, mammals, reptiles, and many invertebrates. Avian species that use emergent wetlands for roosting, nesting and brood rearing; foraging; and as escape cover include the red-winged and Brewer's blackbirds, barn and tree swallows, Brownsville common yellowthroat, and purple gallinule. Vermillion and scissor-tailed flycatchers forage over emergent wetland stands. Adjacent shallow water, when present, is used by wading birds including herons and waterfowl particularly the American coot. Emergent wetlands provide important basking habitat for Texas spiny softshell turtle and the Rio Grande cooter and important escape cover and breeding habitat for the Rio Grande leopard frog.

2. <u>Shrublands</u>: this habitat class is somewhat rare within the project corridor, occupying approximately 39 acres. The characteristic shrubs range from 2 m–10 m tall and include mule's fat, honey mesquite, and a variety of upland thornscrub species. Shrublands provide sparse to dense cover and are more common on the ridges and hills of the western project terminus.

   a. *Dwarf-shrublands* – one dwarf-shrub stand occurs on less than one acre near the western project terminus and is characterized by bristleleaf dogweed and woody tiquilia that provide limited wildlife habitat. Reptiles including the blue spiny lizard, Laredo striped whiptail, prairie racerunner, and Texas horned lizard often use dwarf-shrub stands for foraging and as escape cover. Avian species likely to forage in and over dwarf-shrub stands include the greater roadrunner, loggerhead shrike, species of dove, and raptors.

b. *Short Shrublands* – stands of short shrubs occur predominantly on gravel-covered ridges and hills of the western project terminus and occupy approximately 19 acres. Short shrub stands are characterized by diverse thornscrub from 2 m–5 m tall that ranges from low to moderate in terms of foliar cover. Reptiles including the blue spiny lizard, Laredo striped whiptail, prairie racerunner, and Texas horned lizard are common to abundant in short shrub stands using them for foraging, breeding, resting, and as escape cover. Birds that commonly forage, breed, rest, and use short shrub habitats as escape cover include ruby-crowned kinglet, pyrrhuloxia, cactus wren, species of doves, and the greater roadrunner. Raptors, including the turkey and black vultures and Chihuahuan raven commonly hunt over short shrub habitats. Cottontail rabbits and coyotes commonly use short-shrub habitats for home ranges.

c. *Tall Shrublands* – stands of tall shrubs occur predominantly along the margins of the Rio Grande floodplain on second or third terraces or in topographic depressions. Characterized by retama, granjeno, mule's fat, and honey mesquite tall shrubs from 4 m–10 m tall, this habitat type ranges from moderate to dense in terms of foliar cover and occupies approximately 19 acres within the project corridor. Tall shrubs provide important perching, breeding, nesting, brood rearing, and escape cover for a variety of birds including species of doves, bobwhite quail, northern mockingbird, Couch's kingbird, and species of flycatchers. Mammals commonly use tall shrub habitats for resting, foraging, and as part of home ranges and include javelina, bobcat, coyote, gray fox, raccoon, cottontails, and the fulvous harvest mouse.

d. *Shrub-Scrub Wetlands* – this habitat type is rare within the project corridor, occupying less than 5 acres and typically occurs as narrow bands along water bodies or on saturated soils. Composed of mesic shrubs to 10 m tall, stands of shrub-scrub wetlands provide dense foliar cover that provides perching, breeding/nesting/brood rearing sites, and escape cover for species of flycatchers and doves, in particular. Mammals, including the javelina and raccoon prefer these often moist shrub-scrub wetland habitats.

3. <u>Woodlands and Forests</u>: open to closed-canopy stands of trees occupy approximately 276 acres throughout the length of the project corridor. Diverse riparian forests occupy the first terrace of the Rio Grande and woodlands more commonly occur on higher river terraces, in fencerows, and as restoration plantings in old agricultural fields. Woodlands typically provide moderate canopy cover and range between 5 m–15 m tall; dense stands of nonnative grasses, particularly buffelgrass and switchgrass almost always dominate the woodland understory. Forest stands range

between 10 m–25 m tall, provide dense canopy cover, and often have subcanopy and tall shrub layers, which enhance the wildlife habitat value.

a. *Upland* – open upland woodlands are rare because most of the project corridor lies within the Rio Grande floodplain and associated woodland and forest communities occupy the depositional terrace habitats described below. An upland woodland stand dominated by chinaberry, honey mesquite, huisache, and retama provided perching habitat and escape cover for the ruby-crowned kinglet, brown-headed cowbird, and great-tailed grackle. Crested caracaras, turkey vultures, and the red-tailed hawk were observed foraging in the vicinity. Small mammals, particularly the fulvous harvest mouse and cottontails, occupied the dense nonnative grass

b. *Floodplain High Terraces* – the second and third terraces of the Rio Grande floodplain support relatively open-canopied woodlands characterized by honey mesquite, Texas ebony, and retama trees. A moderately well-developed subcanopy and dense understory herbaceous layers provide additional wildlife habitat values. Numerous avifauna use the terrace woodland habitat for foraging, breeding, nesting, brood rearing, perching, and escape cover, including the northern flicker, golden-fronted woodpecker, flycatchers, gnatcatchers, doves, finches, sparrows, hooded oriole, northern mockingbird, and lesser nighthawk. Raptors, including hawks, falcons, and vultures perch in the larger floodplain trees and forage in their vicinity. Mammal use is moderate and particularly obvious signs (e.g., burrowing, rooting, bite marks, tracks) of javelinas, raccoon, cottontails, ground squirrels, skunk, coyote, and bobcat are abundant. Moderate to high diversity of invertebrates occurs within these terrace woodlands with bees common, foraging on honey mesquite nectar.

c. *Floodplain Low Terraces* – the first terrace of the Rio Grande supports nearly closed-canopy forests characterized by sugarberry, Texas ebony, honey mesquite, anacua, and Mexican ash trees. A well-developed subcanopy and understory layers provides additional wildlife habitat values. Numerous avifauna use the floodplain forest habitat for foraging, breeding, nesting, brood rearing, perching, and escape cover, including the plain chachalaca, green jay, hooded oriole, northern rough-winged swallow, golden-fronted woodpecker, northern mockingbird, blue-gray gnatcatcher, groove-billed ani, and Carolina wren. Raptors, including hawks, falcons, and vultures perch in the large riparian trees and forage in their vicinity. Mammal use is high and particularly obvious signs (e.g., burrowing, rooting, bite marks, tracks) of javelinas, raccoon, cottontails, ground squirrels, skunk, coyote, and bobcat are abundant. High diversity of invertebrates occurs within these floodplain forests.

d. *Wooded Wetlands* – in this region, wooded wetlands are rare, occupying less than 5 acres along flowing or standing water bodies, range from 5 m–15 m tall, and are characterized by black willow with low cover of retama and tepeguahe. Small wooded wetland stands provide dense foliar cover that provides perching, breeding/nesting/brood rearing sites, and escape cover for species of flycatchers, blackbirds, and doves, in particular and also the northern mockingbird, great kiskadee, and the rare western yellow-billed cuckoo. Mammals, including the javelina and raccoon, prefer these often moist wooded wetlands habitats.

4. Open Water: occupying less than 15 acres within the project corridor, open water habitats are species-rich in terms of wildlife use. Of the avian species observed during the field research, 20 species are waterfowl, wading birds, or shorebirds. Water bodies occur as flowing habitats including the Rio Grande, canals, and ditches and as still habitats including lakes and ponds. The bottom substrate is typically sand and fine sediments in the Rio Grande and fine sediments and mud in canals, ditches, and standing water bodies.

   a. Rivers, Creeks, and Canals – flowing open water habitat includes the Rio Grande; a few tributary creeks, streams, and arroyos; and, more commonly irrigation canals and ditches. Waterfowl species that commonly, use flowing open water to rest and forage include the black-bellied whistling duck and American coot and wading birds including the white ibis, herons, and lesser yellowlegs. Fish, reptiles, and amphibians were less frequently observed in the flowing open water habitats and included the Texas cichlid, Texas spiny softshell turtle, Rio Grande chirping frog, and Rio Grande leopard frog.

   b. *Lakes and Ponds* – lakes and ponds have formed in resacas, gravel pits, and topographic lows and provide still-water habitat in a variety of depths within the LRGV. The wetland and riparian vegetation surrounding the shoreline and the size of the water body can dictate the species using still open water, which include the American avocet, black-necked stilt, anhinga, pied-billed grebe, American white pelican, ringed kingfisher, great blue heron, and egrets, which feed on a variety of aquatic and wetland vertebrates and invertebrates. The Rio Grande cooter and Rio Grande leopard frog commonly occur in the small lake and pond habitats.

   c. *Land Use* – large acreages in the project corridor are maintained on a regular basis, ranging from nearly daily maintenance in urban areas to seasonal/annual maintenance on agricultural lands. Even though subject to disturbance these habitats are important to many species of resident and migratory wildlife for all life stages ranging from movement corridors to hiding and breeding sites to important foraging sites.

   d. *Irrigated Agriculture* – fields actively used to grow crops typically include sorghum, sugarcane, corn, and truck crops such as tomatoes and broccoli. The fields under production provide valuable hiding cover, dispersal corridors, roosts, forage, and some nesting habitat. Many individuals of a variety of wildlife species including toads, snakes, harvest mice, cotton rats, and passerine birds can be displaced to surrounding habitats or killed when crops are harvested by mechanical means, leaves are burned from sugarcane stalks, and the ground is tilled post-harvest. Open agricultural fields are commonly used for hunting by the American kestrel, a common winter resident in the LRGV. Cattle egrets often occur in pastures, away from water sources, where they prey on invertebrates exposed by the hooves of cattle, or when a field is being tilled.

e. *Fallow Agriculture* – fields under seasonal rest often contain waste grain or support annual forbs and grasses that produce quantities of seed used by foraging wildlife. Seeds present on fallow fields attracted the cottontail rabbit and species of doves, blackbirds, meadowlarks, cowbirds, European starlings, quail, ducks, and geese. Turkey vultures, ravens, and other raptor species roosted on the ground in fallow agricultural fields.

f. *Residential and Urban Development* – a myriad of habitats and food and water sources are present within residential and urban areas including landscaping, open fields, structures related to buildings and other urban infrastructure, pastures, corrals, and backyard feeding stations for domestic pets and birds. Domestic pets, particularly cats, can kill individuals of small mammals and birds within urban and adjacent rural areas. Wildlife species that use residential and urban habitats regularly include raccoons, skunks, house mice, Norwegian rats, European starlings, house sparrows and finches, mockingbirds, rock doves, mourning doves, and grackles.

g. *Highways, Roads, and Trails* – wildlife species use established transportation corridors to move and disperse rapidly across the landscape. As a result, low to moderately high death rates can be experienced depending on adjacent habitat importance to wildlife, population levels, and design speed and safety features of transportation corridors. Wildlife that forage on carrion or are omnivorous, including the turkey vulture, black vulture, crested caracara, raccoon, and coyote can benefit from the presence of road-killed animals. Transportation structures such as bridges can provide hiding and roosting cover for species including owls or nesting sites for swallows and rock doves.

5.8 Species Groups and Habitat Affinity

5.8.1 Mammals

Thirteen species of mammals were observed during late summer to fall field surveys within the project corridor (see Attachment D for a more complete LRGV list). Medium-sized predators included the coyote, bobcat, and common gray fox. The collared peccary was common along the Rio Grande and many habitats within the corridor. The common raccoon, striped skunk, nine-banded armadillo, and eastern and desert cottontails occurred rarely to commonly in the available habitats. Small mammals, including the fulvous harvest mouse, hispid cotton rat, Gulf Coast kangaroo rat, and the Mexican ground squirrel, were occasionally observed.

The federally endangered felines, ocelot and jaguarundi, historically occupied much of the brush-dominated habitats in the central, eastern, and southern portions of Texas. This habitat now occurs as patches and small stands within the LRGV. Potential habitat for ocelot and jaguarundi includes four vegetation types within the LRGV: (1) Mesquite-Granjeno Parks, (2) Mesquite-Blackbrush Brushland, (3) Live Oak Woods/Parks, and (4) Rio Grande Riparian forests. The jaguarundi typically uses dense thornscrub habitats with greater than 95% canopy cover, but forages in adjacent herbaceous vegetation.

5.8.2 Birds

Bird species are diverse because the Central and Mississippi flyways converge in the LRGV and the southernmost tip of Texas is also the northernmost range for many bird species. Nearly 500 avian species, including neotropical migratory birds, shorebirds, raptors, and waterfowl, can occur (Appendix D).

More than 800 species of birds spend all or part of their lives in the United States as they migrate from summer breeding grounds in the north to winter in warmer climates of the south, including Latin America (USFWS 2002). Because migratory birds depend on habitats across many political boundaries, a coordinated conservation effort has been established internationally, with the USFWS being the principal Federal authority in the United States. Large numbers of birds migrate seasonally through or overwinter in the LRGV using natural, managed, and agricultural habitats for forage, roosting, and cover. The rivers and other topographic features can serve as leading lines to guide raptors and neotropical migrants during migration.

Migratory birds are also economically important, e.g., birders recreate in many areas to identify migrant species and some hunters focus on migrating waterfowl, including species of ducks and geese. Organizations such as Ducks Unlimited use donations to protect and restore wetlands and associated riparian and upland systems used by migrating waterfowl and shorebirds, primarily. LRGV habitats including wetlands and riparian resources are a priority for conservation and management organizations and agencies, including TPWD, USFWS (partnership programs and wildlife refuges), Natural Resources Conservation Service (Wetlands Reserve and Environmental Quality Incentives [EQUIP] programs), and private and nonprofit land managers.

The establishment of the LRGVNWR units, TPWD WMAs, nonprofit-managed lands, and private lands is important to migratory bird management. The primary function of lands managed under the National Wildlife Refuge System is to provide habitat for waterfowl and shorebirds in addition to other wildlife-related benefits. Federal agencies in general are responsible to protect migratory birds under Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. This executive order states that migratory birds are of great ecological and economical value to the United States and to other countries. They contribute to biological diversity and bring tremendous enjoyment to those who study, watch, feed, or hunt them and the critical importance of this shared resource has been recognized through ratification of international, bilateral conventions for migratory bird conservation. A list of all migratory birds included under this executive order is available under 50 CFR 10.13; a focused list for species occurring in the project corridor is presented in Appendix D.

In general, the LRGV represents important and unique habitat for migrant bird species, largely a result of geography, diverse and unique plant communities, and protected lands. This region represents an important bird observation area due to the diversity of habitats and the uniqueness of the birds that occur; at least 485 avian species have been recorded from the LRGV (53% of all bird species recorded in North America). The range of open water, wetlands, riparian, playa, grassland, shrubland, woodland and forest, and agricultural land provide habitats for migrating birds. In addition to being one of the highest density migration pathways in the region, the LRGV provides crucial stopover habitat for more than 200 species of birds from eastern and western North America. These migrants breed in tundra, northern forest, grasslands, subtropical scrub forest, and all suitable habitats north of the international border. In the absence of stopover habitat, migration would be difficult to likely impossible for bird species that require places to rest, feed, and avoid predators. The LRGV functions as the final migratory destination and wintering area for dozens of species including world class aggregations of waterfowl.

Because of its strategic location between tropic and temperate environments, the LRGV represents a migratory crossroad for individuals and flocks of hawks, shorebirds, waterfowl and other waterbirds, hummingbirds, and songbirds. On a daily basis, birders can observe large migrations involving tens of thousands of hawks, pelicans, and other birds. The combination of high species diversity, several rare, threatened, and endangered species, large concentrations of wintering birds, several endemic subspecies, and an important migratory pathway results in the LRGV being an important avian region for North America. Endemic subspecies within this biotic province include the Texas red-shouldered hawk, Zapata Carolina wren, and Brownsville common yellowthroat.

Of great interest to birders are the tropical species that reach their northernmost limit in or just north of the LRGV; birders travel from great distances to observe these special occurrences. Included in this group are the least grebe, muscovy duck, hook-billed kite, gray hawk, white-tailed hawk, aplomado falcon, plain chachalaca, red-billed pigeon, white-tipped dove, green parakeet, red-crowned parrot, groove-billed ani, ferruginous pygmy-owl, pauraque, buff-bellied hummingbird, ringed kingfisher, green kingfisher, northern beardless-tyrannulet, brown-crested flycatcher, great kiskadee, tropical kingbird, Couch’s kingbird, green jay, brown jay, Tamaulipas crow, Chihuahuan raven, cave swallow, clay-colored robin, long-billed thrasher, tropical parula, white-collared seedeater, olive sparrow, Botteri’s sparrow, Altamira oriole, and Audubon’s oriole.

Located within the convergence area for the Central and Mississippi flyways (invisible aerial highways used by migratory bird species) the LRGV represents a popular region for recreational birding. For example, more than 290 bird species have been recorded within the borders of Bentsen-Rio Grande Valley State Park (588 acres). In addition, many species from the tropics occasionally wander to the LRGV, including jabiru, white-cheeked pintail, masked duck, snail kite, crane hawk, roadside hawk, short-tailed hawk, collared forest-falcon, northern jacana, white-crowned pigeon, ruddy ground-dove, ruddy quail-dove, dark-billed cuckoo, mangrove cuckoo, mottled owl, stygian owl, white-collared swift, green violet-ear, green-breasted mango, white-eared hummingbird, elegant trogon, social flycatcher, sulphur-bellied flycatcher, fork-tailed flycatcher, rose-throated becard, masked tityra, yellow-green vireo, black-whiskered vireo, gray-breasted martin, orange-billed nightingale-thrush, white-throated robin, rufous-backed robin, black catbird, gray silky-flycatcher, mangrove yellow warbler, gray-crowned yellowthroat, golden-crowned warbler, rufous-capped warbler, yellow-faced grassquit, crimson-collared grosbeak, blue bunting, and Fuertes orchard oriole.

5.8.3 Herpetiles

More than 200 species of reptiles and amphibians occur in Texas and the habitats composing the Tamaulipan Brushland region typically support 19 species of reptiles (see Attachment D for a more complete list of herpetile species in the LRGV). During late summer and fall field surveys, eight species of reptiles and five species of amphibians were recorded. Uplands provided habitat for reptiles, including the the blue spiny lizard, Laredo striped whiptail, prairie racerunner, and rarely the Texas horned lizard. The Texas spiny softshell turtle and Rio Grande cooter occurred in ponds and flowing water. Mesic and aquatic habitats also supported the amphibian species Rio Grande leopard frog, Rio Grande chirping frog, Mexican treefrog, Gulf Coast toad, and the giant (marine) toad (Attachment D).

5.8.4 Invertebrates

With more than 300 species of butterflies recorded within the LRGV, this region supports the most diverse butterfly fauna known in the United States (see

Attachment D for lists of butterflies, dragonflies, and damselflies). Peak diversity occurs between October and December. Unique and rare species include the pink-spotted swallowtail, pearly-gray hairstreak, green-backed ruby eye, four-spotted sailor, and telea hairstreak. Adult nectar sources including aster, heliotrope, and anacua that flower in the summer to fall seasons are common within the LRGV, along with ground cover species including Texas frog fruit, stonecrop, and the vines or lianas old man’s beard, climbing milkweed, and morning glory; these plant species represent important food sources for caterpillars.

5.9 Prehistoric Humans, Spanish Settlement, and Current Land Conservation

Prior to European exploration and settlement in South Texas, the Coahuiltecas and other Indian tribes practiced a hunting/gathering culture within the Rio Grande floodplain and its adjacent uplands (USFWS 2001). The floodplain habitat was likely densely forested with palmetto, sabal palm, sugarberry, Texas ebony, and anaqua trees. The Rio Grande carried larger volumes of water more consistently and was subject to seasonal and periodic overbank flooding that distributed sediments and nutrients across the floodplain. The adjacent uplands were thought to be mixtures of thornscrub and extensive grasslands or prairies.

Some of the first documentation and description of wildlife habitat in South Texas was recorded by early Spanish explorers in the mid to late 1600s. Grasslands apparently dominated the landscape with woody plants (trees and shrubs) present in thickets, on upland sites, in major drainages, and along river bottoms. Honey mesquite was common throughout South Texas, but evidently occurred at much lower densities than presently. Natural fires were an environmental driver that helped to maintain much of the regional wildlife habitat as a savannah, because woody plant densities were controlled by periodic burns.

In 1749, Spanish colonists became established in the Rio Grande Valley under the leadership of José de Escandón who founded the first settlement, Camargo. The Spanish settlers introduced domestic herd animals, e.g., cattle, horses, goats, sheep, and pigs, and they began to clear, plow, and cultivate agricultural plots and small fields within the floodplain. As a result, native humans and sensitive wildlife species, including the bear and jaguar, dispersed to other habitats or were killed by settlers. Soon afterward, the Spanish government awarded land grants for homesteading in the region of South Texas. Interestingly, these grants today play a key role in the USFWS and conservation group efforts to preserve and restore a natural wildlife corridor. The agencies and private organizations/groups on both sides of the international border work together to conserve both a wildlife and heritage corridor centered on the lower Rio Grande.

Additional European settlers arrived in large numbers in South Texas between 1820–1870, resulting in nearly immediate changes in the landscape and associated plant communities/wildlife habitat. Former grasslands were invaded by species of shrubs or brush, which appeared to intensify more rapidly near centers of populated areas than elsewhere (likely a result of livestock concentration near the towns). Shrub invasion occurred less on larger cattle ranches in the early years of settlement because cattle could move across the open range. However, the invention and introduction of barbed wire resulted in fencing the landscape, thus controlling livestock grazing and distribution, and resulting in overgrazing and shrub invasion of prairies and savannahs.

Following the U.S. annex of the State of Texas in 1845, American steamships sailed the waters of the Lower Rio Grande to trade with and among the small communities. Railroads and steam locomotives replaced steamships as the principal purveyor of transportation, goods, and services in the early 1900s. Additionally, farmers created mechanized irrigation techniques, which increased crop yields and farmed acreages, but also initiated high demand of Rio Grande flows. Falcon Dam, an irrigation structure on the mainstem Rio Grande, was completed in 1953 to provide additional water for farm fields and citrus orchards. The dam resulted in inundating riverine forests and historic towns under the permanent pool.

Conservation of Rio Grande Valley floodplain habitats has become a focus in recent decades. For example, generations of the Yturria and Garcia families were raised on Spanish land grant lands along the Rio Grande since the 1850s. They desired that these land grants become perpetually part of a managed and protected ecosystem, rather than becoming divided and developed. This desire led to a significant conservation acquisition; in 1999 the Yturria and Garcia families and several smaller landowners signed agreements with the USFWS to purchase thousands of Rio Grande floodplain habitat acres that provide important if not critical links in the regional wildlife corridor. These lands are now part of more than 90,000 acres managed as the LRGVNWR, established in 1979 to connect the remaining tracts of native brush land.

From Falcon Dam to the Gulf of Mexico, the LRGVNWR encompasses portions of the terminal 275 river miles of the Rio Grande. Birds using the Central and Mississippi flyways merge within the southern tip of Texas as do many species of birds from more southern latitudes that reach their extreme northernmost range. Additionally, wildlife habitats resulting from subtropical, temperate, coastal, and desert vegetation influences converge, creating an ideal situation for species diversity. A goal of the USFWS is to increase the size of the refuge to approximately 132,000 acres using land purchases (from willing sellers at fair market value) and conservation easements, primarily. The current 100-plus LRGV tracts complement an existing wildlife corridor, lands managed for the benefit of wildlife by the TPWD, National Audubon Society, The Nature Conservancy, private landowners, and the Santa Ana and Laguna Atascosa NWRs.

5.10 Habitat Monitoring and Management

It is important that land managers understand basic ecological principles of plant succession; plant growth; food chains; and water, mineral, and soil nutritive cycles as they affect range, wildlife, and grazing management. Additionally, the basic needs and preferences of the livestock and wildlife species being managed should be well-researched and documented. It is equally important to manage for a high level of plant succession and quality wildlife habitat using the basic tools of grazing, rest, fire, hunting, animal impact, disturbance, and technology. Management using these principles results in high-quality habitat for wildlife and can result in more stable conditions during stress periods such as droughts and during the winter season.

Quality habitats are the key to sustaining wildlife populations; by monitoring the vegetation and soils wildlife managers can assess the overall health of the habitat or ecosystem. Habitat biologists typically observe several components, including (1) diversity of shrub or brush species, (2) browsing pressure, (3) amount of herbaceous cover, (4) water distribution, (5) stocking rates and grazing systems for livestock, (6) deer and other large mammal density, and (7) the use of supplemental forage when assessing wildlife habitats. Low-quality wildlife habitats generally lack good shrub or brush diversity, have sparse grass and forb cover, and the shrubs often have a hedged appearance or browse line. Healthy wildlife habitats are characterized by moderate to high plant species diversity, vegetation structural diversity (grasses and forbs, low-growing shrubs, trees), and moderate to high ground cover.

Wildlife biologists and private landowners implement habitat enhancement techniques or management tools to mimic some of the natural processes that probably occurred prior to European settlement in South Texas. Important to managing natural resources is to use a holistic approach, where several techniques are typically applied to develop and maintain healthy ecosystems. Single species typically deserve less attention, while the system in which they occur requires more attention. During the late 1940s, Aldo Leopold expressed five basic wildlife habitat management tools, axe, cow, plow, fire, and gun, that if used properly in combination would enhance or possibly restore habitats and key species indigenous to the South Texas Brush Country.

The following management observations and points relative to wildlife habitat management tools were provided by TPWD:

(1) American bison ranged through the area prior to European settlement.

   a. Large American bison herds moved constantly allowing grazed vegetation to recover.

   b. The hooves disturbed the soil crust providing bare soil that supported annual forbs and grasses providing forage for herbivores (deer and pronghorn) and granivores (dove and quail).

c. Cattle can be grazed to mimic American bison herd movement.

(2) Livestock grazing role in wildlife management is primarily to reduce cover of dense grass monocultures, disturb the soil surface, expose soil to sunlight, and encourage a diversity of forbs and grasses.

a. Grazing process creates vegetation/habitat structural diversity supporting nesting, brood-rearing, and escape cover.

b. Successful grazing management requires stocking rates balanced with available forage.

c. Ensure that cattle graze grass species but are moved prior to significant consumption of forbs and browse typically used by wildlife.

d. Use rotational grazing that defers pastures to allow recovery (high intensity – low frequency model is most versatile in South Texas).

(3) Brush management or brush sculpturing intersperses cleared areas within dense shrub stands.

a. Cleared sites support forb regrowth and production of new browse, while retaining a mosaic of woody cover for hiding and escape, nesting, or protection from wind, rain, and other weather.

b. Plant species diversity is higher within a habitat mosaic.

c. Method of brush management should improve wildlife habitat and forage supply, i.e., use aeration rather than root-plowing.

d. Allow drainages and sensitive habitats/soils to remain intact and buffer them during brush management programs.

e. Highly erodible soils and steep topography should not be disturbed.

f. Adequate funding should be available to complete the project and to provide site monitoring per the program goals and objectives.

g. Always consider prior mechanical treatments applied onsite.

h. Plan monitoring and periodic maintenance of treated sites.

(4) A combination of mechanical treatments (fire, roller-chopping, aeration, disking) are typically used to disturb soils with a goal of increasing water retention, reducing competition from woody vegetation deemed undesirable, and returning the habitat to an early-succession growth stage.

a. New vegetation growth has increased nutritional value, higher forage production rates, and is more palatable for wildlife.

b. Prescribed fire fixes soil nitrogen, suppresses woody species, results in forb establishment (effects depend on timing and severity).

c. Prescribed fires can be cool (seldom harm mature trees) or hot (can top-kill mature trees).

d. Burning schedule during late winter/early spring is most productive for wildlife habitat benefits, planning depends on humidity, wind, and fuel moisture.

e. Conduct brush removal in strip or mosaic patterns based on topography onsite so that wildlife nesting and escape cover values are met.

f. Shallow soil disturbance to 6 inches deep suppresses nonnative grasses and increases forage quality, forage quantity, nutrient cycling, moisture infiltration into soil; and allows light penetration to soil surface to enhance forb and browse production.

g. Soil disturbance exposes the seed bank and results in germination of viable seeds.

h. Fallow disking encourages growth of forbs, land reseeds from existing soil seed bank (without introducing seeds), and practice commonly results in sunflower, ragweed, and croton establishment.

i. The fallow disking method can be used to establish wildlife food plots to supplement diets in late winter and early spring by reseeding disturbed soil with a native seed mix.

5.11 Habitat Restoration

A large nursery operation has become operational within Santa Ana NWR and it provides for all aspects of landscape restoration from seed collecting to planting seedlings on the various tracts of the LRGV. Several former agricultural fields that received restoration plantings and other treatments occur within the project corridor and were visited and sampled during field surveys. They ranged from recently planted/treated sites to sites that had recovered from 10 to 15 years. The more mature sites supported trees and tall shrubs of honey mesquite, huisache, Texas ebony, and tepeguahe that exceeded 5 m tall and were providing ground cover and producing seed. However, the understory was often dense stands of nonnative buffelgrass or switchgrass (observed within the Los Ebanos tract, among others) that could carry a very hot fire that would kill small shrubs and trees if burned. Fire appeared to be a management tool used to restore the health of Mexican sabal palm woodlands within the Bascaje de la Palma tract.

5.12 Urban Wildlife Habitat

More than 80% of the Texas population resides in urban areas and the six largest cities together total more than 30% of the state’s population. In South Texas towns and cities, the top three sounds that people prefer are natural sounds, including birds singing, wind in the trees, and gently moving water. The least-preferred sounds include urban noise such as vehicle traffic, emergency and enforcement sirens, and automobile backfires or gunfire. As Texas becomes increasingly urban, the need for nature in towns and cities becomes more important for human health. Habitat fragmentation, habitat alteration, noise, human presence, domestic pets, and the general process of urbanization are major issues facing wildlife populations and individuals in urban areas.

Many people in South Texas society often seek contact with nature and they benefit psychologically and financially from those positive experiences. For example, proximity to natural open space increases property values. A few studies have concluded that injured humans heal faster when natural views occur outside their hospital window. Employee satisfaction has been demonstrated to improve when natural open space is created for daily access on corporate properties. Three programs have been initiated by TPWD to provide guidance and support to Texas urban citizens, they are (1) Texas Master Naturalist Program in South Texas, (2) Texas Wildscapes Program in South Texas, and (3) Wildlife Education Programs.

To assist Texas cities to enhance the livability of urban environments, the TPWD has also assigned wildlife biologists to work in each of the largest urban areas. The duties of urban wildlife biologists include providing opportunities for urban residents to reconnect with natural or semi-natural systems, presenting educational programs for urbanites on a variety of habitat/wildlife issues, serving as technical advisors on multi-agency conservation planning initiatives, and assisting landowners with habitat restoration or enhancement projects. The South Texas Wildlife District of TPWD employs three urban wildlife biologists, one stationed in the Rio Grande Valley and two that reside in San Antonio (USFWS 2007 and TPWD 2007).

6. RARE SPECIES DATA

To ensure the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe 2007a). The data fields requested and geographic scope of this request were as follows:

1. Location and habitat data for endangered, threatened, and candidate species provided in list form by the USFWS and supplemented with online information from the TPWD and information from the NatureServe database.
2. The USFWS requested that all rare species occurring within 25 miles of the international border with Mexico be considered in this data search. Data were therefore requested for the South Texas counties of Brewster, Cameron, Culberson, Dimmitt, Edwards, El Paso, Hidalgo, Hudspeth, Jeff Davis, Jim Hogg, Kinney, Maverick, Pecos, Presidio, Starr, Terrell, Val Verde, Webb, Willacy, Zapata, and Zavala.
3. Data were requested to be delivered electronically in the form of Geographical Information System (GIS) layers depicting population polygons or point locations and Excel tables for species lists/tabular data and narratives of habitat and natural history information.

To protect sensitive data, a license agreement (LA) between NatureServe and e²M was signed in 2007 (NatureServe 2007b). Data covered under the LA reside in a Multi-Jurisdictional Dataset (MJD), which includes all precise species location data for species that are federally listed (listed endangered, listed threatened, or candidate) or are listed under the State of Texas endangered species legislation. Additionally, the license agreement describes a 25-mile occurrence corridor north of the international border between the United States and Mexico as the licensed dataset for this project. Data and text fields delivered by NatureServe under the LA included life history, threats, trends and management recommendations, classification status, confidence extent, county name, element information, U.S. Federal Information Processing Standard code, first observation date, global information, habitat types for animals, observation dates, location information, subnational information, survey information, and species status information (NatureServe 2007b).

The LA provides the following guidelines which stipulate external use of the data:

1. "Named" Locations: species names linked with locations cannot be displayed at a scale of less than 1:100,000 or the precise species location must be randomized within a USGS topographic quadrangle.
2. "Blind" Locations: when species names are not linked with locations, specific locations can be displayed, except when the species records are

flagged “sensitive” or if they can be identified easily by geographic attributes at a particular location.

3. Exceptions: the only allowable exception to the guidelines occurs when data are obtained from a source independent from NatureServe and the member programs.

7. PROJECT DATABASE AND INTERACTIVE GIS

A Microsoft Access database was developed to serve as a centralized storage system for data collected during biological field surveys. The database data entry form closely mimics the field form utilized to record ecological information within the project corridor (Attachment A).

During field surveys, UTM coordinates were collected with Global Positioning System (GPS) receivers to locate observation points, photodocumentation points, and wetlands. The GPS data were post-processed and incorporated into feature classes for use in a GIS. Additional data collected in the field were manually entered into the MS Access database.

The information stored in the database was also linked to an interactive GIS. The interactive file, or published map document, can be viewed with ESRI's ArcReader. The datasets collected and included in the published map are biological survey areas, observation points, NWI wetlands, e²M delineated wetlands, plant communities, wildlife habitats, wildlife areas and refuges, land use, and aerial photography. The observation points are interactively hyperlinked with ground photographs acquired in the field.

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ATTACHMENT A

BIOLOGICAL SURVEY
OBSERVATION POINT FORM AND INSTRUCTION MANUAL

OBSERVATION SURVEY FORM

SURVEY AND SITE INFORMATION

Point Code: TX __ __ __ Quad name: ____________ BPU Code: ________ Aerial Photo #: ________

Type of Observation (Please Circle One): VEG/OBS OTHER (Specify) ____________

Site Name ____________

Survey Date ____________ Surveyors ____________ Size of Area: ____________

GPS file name ____________ Field UTM X __ __ __ __ __ __ m E Field UTM Y __ __ __ __ __ __ m N

❑ Coordinates from USGS Quad Map (if checked enter coordinates under GPS comments)

Datum NAD 83 Zone: ________ GPS Unit: ____________ PDOP: ________ 3D Differential? Y / N

GPS Comments: Error: +/- ______ m

Camera Name and Model:

Roll #	**Frame #**	**Photographer**	**Direction/Comments**

ENVIRONMENTAL DESCRIPTION

Elevation ____________ m / f t From: GPS / Map (circle one) | Slope ____________ Aspect ____________

Topographic Position:

Landform: | Geology:

Cowardin System
___ Upland ___ Palustrine

Hydrology
___ Permanently Flooded
___ Semipermanently Flooded
___ Unknown
___ Seasonally Flooded
___ Saturated
___ Temporarily Flooded
___ Intermittently Flooded

Environmental Comments:

Unvegetated Surface: *(please use cover scale below)*
___ Bare soil
___ Bedrock
___ Small rocks (0.2-10cm)
___ Large rocks (>10cm)
___ Sand (0.1-2mm)
___ Wood (>1cm)
___ Litter / duff
___ Other (describe) ____________

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Cover scale for strata and unvegetated surfaces:
Trees and Shrubs ___ Evergreen ___ Cold-deciduous ___ Mixed evergreen-cold-deciduous Herbs ___ Annual ___ Perennial	___ Broad-leaved ___ Needle-leaved ___ Microphyllous ___ Graminoid ___ Forb ___ Pteridophyte ___ Non-vascular ___ Mixed (describe)	___ Forest ___ Woodland ___ Shrubland ___ Wooded Shrubland ___ Dwarf Shrubland ___ Shrub Herbaceous ___ Herbaceous ___ Nonvascular ___ Sparsely Vegetated ___ Wooded herbaceous	01 = 0 – 10% 02 = 10 – 25% 03 = 25 – 60% 04 = 60 – 100%

OBSERVATION SURVEY FORM

Provisional Community Name:__________ Plot Code: TX __ __ __

	Stratum Height Class	Stratum Cover Class	Dominant Species (mark Diagnostic species with *)	% Cover
T1 Emergent				
T2 Canopy				
T3 Sub-canopy				
S1 Tall shrub (> 2 m)				
S2 Short Shrub (< 2 m)				
S3 Dwarf Shrub (< 0.5 m)				
H Herbaceous				
N Non-vascular				

Height Scale for strata:

01 = < 0.5 m	06 = 10-15m
02 = 0.5-1 m	07 = 15-20m
03 = 1-2 m	08 = 20-35 m
04 = 2-5 m	09 = 35-50 m
05 = 5-10 m	10 = >50 m

Cover scale for strata and unvegetated surfaces:

01 = 0 – 10%
02 = 10 – 25%
03 = 25 – 60%
04 = 60 – 100%

Vegetation Characterization in Texas
OBSERVATION POINT MANUAL - 2007

This document is intended to assist you in collecting observation point data in Texas during the 2007 field season. Detailed, field-by-field instructions for data collection are provided.

VEGETATION DATA COLLECTION INSTRUCTIONS

LOCATING AN OBSERVATION POINT

You will locate sampling points based on homogenous or unique aerial photo signatures and by using site maps, topographic maps, handheld GPS receivers, and/or aerial photos.

- Topography (Topo) maps are useful in identifying the landscape through which you will be navigating, and in determining the elevation of a site.
- Aerial photos aid in navigating through the landscape, and are essential in determining where to sample to inform photo-interpreters (this will be explained in more detail). **Please** record the vegetation, and its condition, that you walk through and sample on the photo or accompanying digital orthophoto. Feel free to write comments regarding unique features as well.

Along the way... look around. Context is everything – you will have a much better sense of how your sample sites represent the landscape if you are always in analysis mode. Keep in mind that the goal of this field work and field work being conducted for vegetation classification is to sample **all** the different vegetation and geologic types that occur at the site.

Special Features… in the process of locating observation points you will encounter unique features or vegetative stands too small to sample, record their coordinates using the GPS receiver and note them on aerial photos and maps. These UTM coordinates may be added to the final production map as "Special Features. Locations of significant weed occurrences (highly invasive species that pose a big threat) and large areas of infestation may also be documented as they may represent a "semi-natural" vegetation type.

OBSERVATION POINT FORM INSTRUCTIONS – 2007

The primary role of Observation Point forms is to inform aerial photo interpretation; a secondary role is to **help** fill out plant association descriptions and provide distribution information for writing local descriptions of plant associations. They are representative of large and homogenous aerial photo signatures, unusual signatures, confusing signatures, and signatures that are slightly different due to shifts in dominant/understory species composition. The same vegetation type should be sampled where it occurs on different geology, where slope aspect leads to changes in density, and where effects due to fire, landslide, etc. have occurred.

- **IDENTIFIERS / LOCATORS SECTION**

Observation Point Code
This is a unique identifier you give each sample plot using the format "TX.XXX". **Please record the observation point code on both sides of the form in the provided field.**

Quad Name
Record the **full name** of the 7.5-minute quadrangle, such as "The Knoll".

1

Aerial Photo Number
The photo number is in the upper right hand corner of the photo in the format FLIGHTLINE-FRAME #. Record this number on the form. Locate your observation point on the Mylar overlay of the photo, and mark your location with a dot in a circle and the observation point number. *Again, please draw and comment on the photo overlay regarding the vegetation of the plot and the surroundings.*

County
This field will be completed in the office as part of processing the GPS data.

State
TX

Site Name
This is best determined from a topographic or site map. Select a nearby feature that is an obvious waypoint, such as the name of a canyon, lava flow, etc. This name does not need to be unique. If you sample a number of observation points in a small area, you can use the same site name for all of them.

Survey Date
Date the plot was sampled. Please use this format: Month - Day - Year.

Surveyors
List the last names of the field team members present.

GPS File Name - this is the name you give to the waypoint when you mark the observation point location in your GPS receiver. When logging an observation point, the file name would be "TX" and the number (e.g., TX101 for point #101). Mark the aerial photo with a dot with a circle around it and the observation point number, "TX101.

Datum
ALWAYS check datum settings on your GPS unit at the beginning of each day. It should **always** be NAD83. This information is **CRITICAL** for correctly applying your waypoints to the final vegetation map. If it is anything other than NAD83, **please, please, please** record this on the form. This step will keep your work from being wasted.

UTM Zone
This value is recorded from the GPS unit read-out.

Field UTM X, Field UTM Y
Record the UTM easting and northing you saved as a waypoint in your GPS receiver. Please double-check to make sure that the easting is six digits and the northing is seven digits. If recorded incorrectly, your plot will show up in Venezuela or the middle of Wyoming.

In mountainous or deep canyon country it is often difficult to obtain UTM coordinates from a GPS receiver (your unit has to be able to receive at least three or four satellites). If you are unable to obtain UTM coordinates in the observation point, or if the PDOP is greater than 8 (or EPE is greater than ±50m), first try to acquire a signal from a higher point outside (but still close to) the site. If that fails, you will need to estimate the UTM coordinates from the topo map, and manually enter these UTMs into the GPS unit.

Use a map which is in NAD83 if at all possible, since the project standard is the NAD83 datum. However, you may need to use USGS 7.5 minute maps, which use the NAD27 datum, note this.

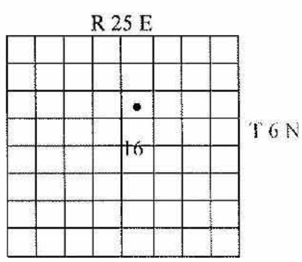
GPS Unit:
Record the name and model of the GPS receiver being used to record data for the observation point. If a GPS unit was not used to determine UTMs record 'none' here and be sure to complete the 'GPS Comments' field below.

GPS Error
Note the PDOP (or "Estimated Position Error" (EPE), if you're using a Garmin unit) displayed on your GPS unit. The lower the number, the more accurate your reading.

3D Differential?
Circle Y or N accordingly. 3D differential is obtained when your GPS unit can "see" a satellite that does nothing but correct the tiny errors in the positioning or clocks of other GPS satellites. This satellite broadcasts a real-time differential correction so that your location coordinates are as accurate as possible. It is in geosynchronous orbit in the southern sky, so if you can see the southern sky, you will generally be able to obtain 3D differential. This system is known as the Wide-Area Augmentation System, or WAAS. The Garmin and Trimble units have a field in their setup pages for turning WAAS on or off. Please make sure that WAAS is **always** on.

GPS Comments:
VERY IMPORTANT: If you resorted to estimating the observation point location UTMs on the topo map, note that in this field. If you're usual GPS croaked and you had to borrow an old Magellan from a friend, note that. Also, if you left the site to obtain a reading from a high point, record that here, along with the compass bearing and distance of the GPS location from the observation point site (unless you used the offset function on the Trimble GeoXM- in that case, enter "point offset.")

Directions to Observation Point
Give precise directions to the observation point beginning with a landmark (e.g., a named point on the topo map, a major highway, marked trailhead) readily locatable on a 7.5 minute topo map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances and use compass directions. Be aware of the ambiguity of words like "above", "near", beyond", "on the back side of", "past". Again, using the GPS unit to give distances can be very helpful. If observation point locations lack major landmark features as guides, use township, range and sections from the topo maps. If there are no features within a reasonable distance of your site and writing directions is taking an inordinately long time, you can use a TRS description to the nearest quarter-quarter-quarter section. The TRS for the plot in the section below is "NW4SW4NE4 Sec. 16, T 6 N, R 25 E".



Photos Taken?
Circle Y or N accordingly for observation point photos.

Camera Name and Model
Circle or enter the name and model of your camera

Photos: Type/Roll Number/Frame Number/Photographer/Direction and Comments
For each photo taken at the observation point record the following: *Photo type:* indicate whether photo is a 'stand' or 'landscape' photo. *Photo number*: record photo number. *Photographer*: record last name of person taking photograph.

3

Directions/Comments: record the direction the photos were taken from and towards (eg. SE→NW) and any other comments to clarify contents of the photo (especially landscape/scenery photos).

Taking photographs
Take one representative digital photo of each observation point. The purpose is to obtain a good representation of the vegetation, not individual species. Try to include a little sky (about 10%) for perspective. Use a chalkboard to record the observation point number and the direction the photo is taken. Thus, for observation point 241, the board in the photo taken from the SE edge, facing NW, will read "SDC241, SE→NW". Take the photograph looking across the contour if site occupies a steep slope. In addition, you will need to keep a photograph log for all photos not taken on observation points.

SDC241 SE→NW

- **ENVIRONMENTAL DESCRIPTION SECTION**

Elevation
Take this measurement from the GPS receiver, in meters. Specify on the data sheet whether the measurement is in feet or meters, and whether your elevation source was the GPS unit or the topo map.

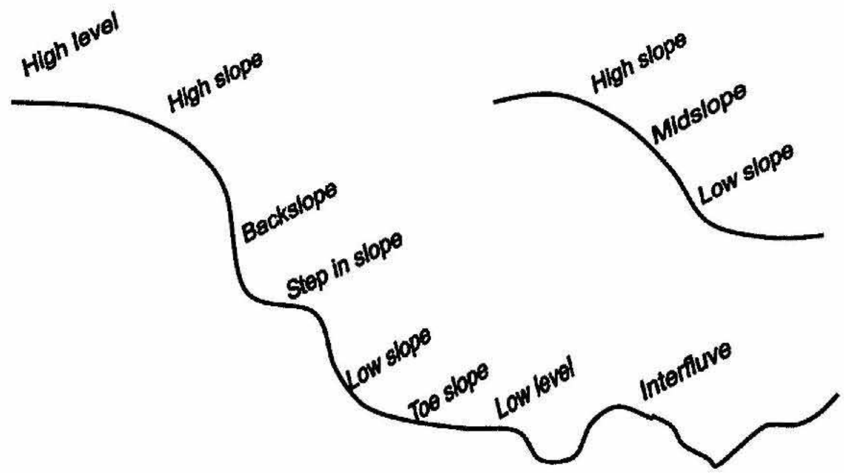
Slope
Measure the slope in degrees using a clinometer. The degree scale is the left-hand scale as you look through the clinometer. If the slope varies, estimate an average. If the observation point is on rolling microtopography, enter "variable." Describe these further under the Environmental Comments section.

Aspect
Measure the site aspect in degrees using a compass (set for local magnetic declination). If the slope is flat, enter "n/a" for aspect. If the site wraps around different aspects on a slope, enter "variable" and describe further under the Environmental Comments section.

Topographic Position
This is the position of the observation point on its related landform. Determining this requires you to think of the landform in cross-section, which is roughly diagramed below. You **must** use the terms listed below:

Interfluve (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two drainages that sheds water to the drainages.
High slope (shoulder slope, upper slope, convex creep slope). The uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.
High level (mesa, summit). Level top of a plateau.
Midslope (transportational midslope). Intermediate slope position.
Backslope (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments.
Step in slope (ledge, terracette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.
Lowslope (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.
Toeslope (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, usually gentle, linear and characterized by alluvial deposition.
Low level (terrace). Valley floor or shoreline representing the former position of an alluvial plain, or lake.

TOPOGRAPHIC POSITION



Landform

Enter the landform(s) that describes the site where the plot was sampled. Referring to the topo map for the landscape context may help you decide what landform(s) to choose. Note that the landform choices may describe different scales, or that a landform feature can be described by more than one term. For example, your plot may be on a ledge on the rim of a canyon. A suggested list of landforms and definitions is provided in **APPENDIX 1.**

Note: The topographic position selected above should relate to the scale of the landform chosen here.

Surficial Geology

Note the geologic substrate where the plant community occurs. The geology map should help, but if you can't tell the geology at all or you do not have the geology map with you at the plot, put a general description (e.g., coarse sandstone, green shale, aeolian sands, or obscured by soils).

Cowardin System

The majority of the plots you'll be conducting will be "Uplands". Any wetland plots will be in the Palustrine category. This includes riparian stands. They are all fed by groundwater and support vascular plant communities.

Palustrine: All nontidal wetlands dominated by trees, shrubs, persistent emergent species, emergent mosses, or lichens. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 ha; (2) lacking an active wave-formed or bedrock boundary; (3) water depth in the deepest part of the basin less than 2 m (6.6 ft) at low water; and (4) ocean-derived salinities less than 0.5 parts per thousand.

Hydrology

This field will mostly be completed if you are in a wetland, however, some areas considered uplands may be subject to intermittent flooding. Select from the following definitions (from Cowardin et al. 1979):

Permanently flooded. Water covers the land surface at all times of the year in all years.
Semipermanently flooded. Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface.
Seasonally flooded. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface.
Saturated. Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.
Temporarily flooded. Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands.
Intermittently flooded. Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations.
Unknown. The water regime of the area is not known. The unit is labeled a non-tidal wetland.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting and its effect on the vegetation. Examples include: "stunted trees due to shallow soils", "vegetation only where pockets of soil occur", or "large colluvial boulders and small rocks litter surface of soil". This field can also be used to describe site history such as fire events. This is an extremely important field for crews to document so please take the time to do a thorough job. Information from this field will be used to prepare local descriptions of the plant community and for photo interpretation.

Ground Cover
Estimate the approximate percentage of the *total* surface area covered by each category. The sum of all fields should equal 100%. A helpful hint in making ocular estimates is that in a 0.5-hectare (1.24-acre) observation point, one 7 x 7m square is equal to 1%. The sum of the cover values should equal 100%. *Notes*: Estimating lichens, dark cyanobacteria and moss also take an extra step in visualization. Also note that it is possible to have bare soil and sand in a plot if sand has blown in, or to have sand on the surface of the site. If a category is present but covers less than 1% (> 0.5%) of the ground, enter a "T" on the line next to it. If a category is present but covers a tiny bit (<0.5%) of ground, enter "t".

Animal Use Evidence
Comment on any evidence of use of the site by non-domestic animals (i.e., tracks, scat, burrows, etc.) and domestic animal use (grazing) under the Environmental Comments.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source, severity and effects on the vegetation. Common disturbances on sites include gullies, colluvial deposition of rocks on slopes flash flooding and sometimes old tin cans from cowboys or miners. Notes on livestock grazing and other disturbances you may encounter in the buffer include off-road vehicle use, fire, and mass-wasting are valuable. Enter disturbance comments under the Environmental Comments

Other Comments
Record any other comments. What is the extent of the community you sampled? Describe the landscape context of the community. Describe the adjacent plant communities and their relationship to the plot. Are there any other landscape features or processes influencing this community? Is there an important species that occurs in the stand but is not within your plot? Is there a large amount of a dead plant material in the plot? Record these under the Environmental Comments field.

Unvegetated Surface

This field is an ocular estimate of ground cover. Because there is no designated sample size for areas surveyed as Observation Points, you will have to estimate percent covers for whatever size the documented area encompasses. For this estimate, you must use the cover classes listed in the bottom right hand corner of the data sheet. If an unvegetated surface category is not present in your observation point area (e.g., water is very uncommon in the sampling units), leave the corresponding line blank.

• VEGETATION DESCRIPTION SECTION

Leaf Phenology

Select the best description for the leaf phenology of the **dominant** stratum. The dominant stratum is the tallest stratum that contains at least 10% cover. Leave blank for non-vascular plots.

Evergreen. Greater than 75% of the total woody cover is never without green foliage. (Some tricky examples: most *Artemisia* and all *Chrysothamnus*)
Cold deciduous. Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.
Mixed evergreen - cold deciduous. Evergreen and deciduous species are mixed within the type and generally contribute 25-75% of the total woody cover.
Perennial. Herbaceous vegetation composed of more than 50% perennial species.
Annual. Herbaceous vegetation composed of more than 50% annual species.

Leaf Type

Select the best description for the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% total plot coverage. Within that dominant stratum, the species that makes up greater than 50% of cover defines the leaf type.

Broad-leaved. Woody vegetation that is primarily broad-leaved (Sagebrush, oak, California lilac).
Needle-leaved. Woody vegetation that is primarily needle-leaved (Juniper, pine, spruce, fir, hemlock).
Microphyllous. Woody cover that is primarily microphyllous (*Ephedra*).
Graminoid. Herbaceous vegetation composed of more than 50 percent graminoid species (grasses, sedges, rushes, etc).
Forb (broad-leaf-herbaceous). Herbaceous vegetation composed of more than 50% broad-leaf forb species (*Phlox, Astragalus, Lupinus, Thalictrum, Erigeron,* etc).
Pteridophyte. Herbaceous vegetation composed of more than 50 percent ferns or fern allies (scouring rushes).
Non-vascular. Dominated by lichens or mosses.
Mixed. As with leaf phenology, the dominant stratum may be composed approximately equally of species with several different leaf types. Describe the mix briefly or circle leaf types that apply.

Physiognomic Class

This represents what you see when you are standing in the plot looking across at the vegetation. The following definitions can be used as guidelines. For example, areas with scattered pines and junipers may not fit the cover classes below but they would best be described as a woodland.

Forest. Trees with their crowns overlapping (generally forming 60-100% cover).
Woodland. Open stands of trees with crowns not usually touching (generally forming 10-60% cover). Canopy tree cover may be less than 10% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.
Shrubland. Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 10% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation composed of woody vines is included this class.
Wooded Shrubland
Trees forming approximately equal cover with a shrub component.

Dwarf-shrubland. Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 10% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively.
Shrub Herbaceous. Low or taller shrubs forming approximately equal cover with a grass or forb component. Individuals or clumps of shrubs generally not touching and usually forming more than 25% cover; trees less than 10% cover. Spaces between shrubs are generally mostly occupied by grasses and/or forbs.
Wooded Herbaceous. Trees forming approximately equal cover with a grass or forb component.
Herbaceous. Perennial herbs (graminoids or forbs) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 10% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
Nonvascular. Nonvascular cover (bryophytes, lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular perennial vegetation cover may be less than 25%, as long as it exceeds tree, shrub, dwarf-shrub, and herb cover.
Sparsely Vegetated. Abiotic substrate features dominant. Perennial vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources. Total vegetation cover is typically less than 10% and greater than 2%. Badlands, ash fields, lava beds, or sand dunes supporting communities of annual plants should be included in this category, regardless of cover.

Provisional Community Name
Record the dominant species names creating the association which most closely resembles your observation point. Devise the name based on: (1) the dominant species of the dominant strata (including nonvascular) and (2) indicate the physiognomic class (this must match the physiognomic class checked on the back side of the datasheet). For example, if you are in a P-J woodland with only scattered shrubs but a really nice galleta grass layer, you would use a provisional name like "*Pinus edulis – Juniperus osteosperma / Pleuraphis jamesii* Woodland". The provisional name is also a great help to the ecologists who will be using your work to construct a classification. Note: this field should be completed only after the entire plot is completed.

- **DOMINANT PLANT SPECIES LIST**

Species/Strata Data. The form has been developed for recording information on *species* composition and cover and *strata* cover and height. Species lists (diagnostic species) and cover estimates should be completed first; then cover class and height class estimates for strata should be recorded. Write out the complete species name. The main body of the table is dedicated to recording species names and associated cover estimates. To begin, the observer needs to make a species list for the diagnostic species in the stand and assign each species to the appropriate stratum. The next section provides a brief discussion on assigning species to the appropriate strata, followed by instructions for completing the species level information.

Stratum: Species names will be recorded within the appropriate stratum. It is important that all crew members are consistent in assignment of species to strata throughout this project. Following are some guidelines to use in determining strata. Begin by assessing the strata at your site. Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

T1 Emergent, T2 Canopy, T3 Subcanopy. A uniform stand of pine or hemlock trees would be a good example of T2"canopy", but where trees are absent you would begin with the shrubs, or herbaceous species if no shrubs are present. If the tree crowns in your plot are mostly touching and similar in height, but a given tree species is much taller that species would be a T1"emergent." Occasionally, you will sample an area where there may be several tall, scattered pines and then shorter scattered junipers. In this case, the pines would be your "canopy" and the junipers would be the "subcanopy". You may also have pines listed in the "subcanopy" layer, if there are a number of short saplings in addition to mature tall trees.

The remaining vegetative strata are (remember to check with plant list for consistency):

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S1 Tall Shrub. >2 meters tall. For example, *Sambucus racemosa, Amelanchier utahensis,*and *Cercocarpus ledifolius.*
S2 Short Shrub. <2 meters tall. For example, *Artemisia tridentata,* all *Symphoricarpos* spp.
S3 Dwarf Shrub. <0.5 meters tall. For example, *Artemisia arbuscula.*
H1 Graminoid. All grass species, including *Carex* spp. and *Juncus* spp.
H2 Forb. All forbs. (*Typha* is a forb.)
H3 Fern or Fern Ally. All ferns, including *Equisetum laevigatum.*
H4 Tree Seedlings. Seedlings are trees with vertical stems less than 1.5 m tall, but that may vary by species.
N Nonvascular. This is mainly mosses and lichens.
V Vine/liana. All vine species.
E Epiphyte. All epiphytic species.

Height can be used to define strata, but is not how species should be placed in strata. **Species characteristically belong to one stratum or another** (e.g., quaking aspen and juniper are canopy (T2), Utah serviceberry is a tall shrub (S1), antelope bitterbrush is a short shrub (S2), low sagebrush is a dwarf-shrub (S3), etc.), **EVEN when unusual environmental circumstances dictate that the plants have an unusually tall or unusually short growth form**. So even if the junipers growing in cracks are only 1.5 m tall, as long as they are mature trees, they are placed in the T2 category. About the only rule regarding height should be that the tree layer is (usually) higher than the tall shrub layer, is taller than the short shrub layer, etc.

The second point is to avoid splitting species between strata. If a few willow have been browsed to <1m tall, but most are 2m tall, they all are placed into the tall shrub stratum. There are two exceptions: (1) each height class covers more than 10% of plot, or (2) there is a reproductive layer of seedling shrubs or young trees.

The third point is how to define some of the "borderline/confusing" species. What we want to avoid is some folks calling *Apocynum* a forb and some calling it a dwarf-shrub or short shrub, for example.

Species / Percent Cover Estimates . Once you have identified your strata, list all diagnostic plant species in that strata and complete cover estimates per the following instructions.

1. **Species Name:** Refer to the plant list you have been provided for plant names used in this area. Always record the full scientific name for each species.
2. **Cover Class:** Estimate the aerial / crown cover of **each** species listed, using the cover class codes for the bottom of the page. These classes are as follows:
   01 = 0-10% 02 = 10-25% 03 = 25-60% 04 = 60-100%
3. **% Cover:** Record continuous cover value used to make cover class estimates.

Unknowns. If you can't identify or easily key out the plant at the site, assign a name to it to be recorded on your data sheet. For example, if you know what family it is in or its genus, label it "unknown Asteraceae sp." or "Unk. *Erigeron* sp.". If there is more than one unknown in a family, add a number to the name you give them. If you do not know the family, label the plant "Unknown 1", using consecutive numbers for additional unknowns. Record the cover class and other data for the unknown as you would for any other species. Then, take a sample of the species with as much of the plant as possible, especially intact sexual parts, if present. Place the sample in a plastic baggie, and either label the plant (if you are putting more than one plant in the baggie) or label the baggie with the plot code, the date and the name you gave it on the data form. Plant samples in baggies can be stored in coolers or refrigerators for short periods. If you are not able to key the plant out soon after collecting it, or you intend to keep the sample for the park collection, press the plant and with a label stating the plot or location of its collection (include UTMs if the sample is not from a plot), date, collectors name and name you assigned the plant. Also, thoroughly label any plant specimens collected as proof of plant occurrence for plants not listed on the site plant list.

Strata / Height Class, Cover Class and Diagnostic Species. Once the species list and associated cover data have been completed, the observer should then complete the following fields as specified below.

1. Indicate the average height class of the stratum in the first column, using the Height Scale at the bottom of the form. The height scale for this project is as follows:
2.

01 = <0.5 m	03 = 1- 2 m	05 = 5 – 10 m	07 = 15-20 m	09 = 35 – 50 m
02 = 0.5 – 1 m	04 = 2-5 m	06 = 10-15 m	08 = 20-35 m	10 = > 50 m

3. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale at the bottom of the form (same cover scale as for species above).
4. '*' – This Column is used to indicate which species in the strata are particularly abundant.

Record information on ***dominant species only***. There is one column that corresponds to the "Stratum" column in this table:

1. **Height.** Use the number code that best describes the heights of all plant species within a given stratum. The number codes are listed in the bottom left-hand corner of the data sheet.
2. **Cover Class.** For this ocular estimation you are looking at the aerial cover of **all** plants within a given stratum. Use the cover class codes listed in the bottom right hand corner of the data sheet and presented below.

Cover Classes	
01	0 – 10%
02	10 – 25%
03	25 - 60%
04	60 – 100%

3. **Dominant Species (Mark species that characterize the stand with a *).** List the plant species using the full scientific name. You may find that there are not enough lines, in which case you can write in the blank area under the stratum name and number codes.
4. **% Cover.** Estimate the percent aerial cover (T-100%) for each diagnostic plant species.

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APPENDIX 1: Landform Glossary
(http://soils.usda.gov/technical/handbook/contents/part629glossary1.html)

alluvial cone - A semi-conical type of alluvial fan with very steep slopes; it is higher, narrower, and steeper (e.g., > 40% slopes) than a fan, and composed of coarser, and thicker layers of material deposited by a combination of alluvial episodes and to a much lesser degree, landslides (e.g., debris flow). Compare - alluvial fan, talus cone.

alluvial fan - A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley; or where a tributary stream is near or at its junction with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

alluvial flat (a) (colloquial: western US) A nearly level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces or floodplain levels. Compare - flood-plain step, terrace, valley flat. (b) (**not preferred**) A general term for a small flood plain bordering a river, on which alluvium is deposited during floods.

alluvial plain - (a) A large assemblage of fluvial landforms (braided streams, terraces, etc.,) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their sources (e.g., High Plains of North America. SW (b) (not recommended, use flood plain.) An general, informal term for a broad flood plain or a low-gradient delta. Compare - alluvial flat.

alluvial plain remnant - An erosional remnant of an alluvial plain which retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to a present-day stream or drainage network. Compare - alluvial plain, erosional remnant, paleoterrace.

alluvial terrace - (not preferred) refer to stream terrace.

alluvium - Unconsolidated, clastic material subaerially deposited by running water, including gravel, sand, silt, clay, and various mixtures of these. Compare - colluvium, slope alluvium.

anticline - (a) A unit of folded strata that is convex upward and whose core contains the stratigraphically oldest rocks, and occurs at the earth's surface. In a single anticline, beds forming the opposing limbs of the fold dip away from its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally convex upward whose core contains the stratigraphically older rocks.

arroyo - (colloquial: southwest A.) The channel of a flat-floored, ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material; sometimes called a wash. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed. Where arroyos intersect zones of ground-water discharge, they are more properly classed as intermittent stream channels.

artificial levee - An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

backslope - The hillslope profile position that forms the steepest and generally linear, middle portion of the slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below. They may or may not include cliff segments (i.e. free faces). Backslopes are commonly erosional forms produced by mass movement, colluvial action, and running water. Compare - summit, shoulder, footslope, toeslope.

backswamp - A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces. Compare - valley flat.

badlands - A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

bajada - (colloquial: southwestern US.) A broad, gently inclined, alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins. Synonym - coalescent fan piedmont. Compare - colluvial apron.

ballena - (colloquial: western US.) A fan remnant having a distinctively-rounded surface of fan alluvium. The ballena's broadly-rounded shoulders meet from either side to form a narrow summit and merge smoothly with concave sideslopes and then concave, short pediments which form smoothly-rounded drainageways between adjacent ballenas. A partial ballena is a fan remnant large enough to retain some relict fan surface on a remnant summit. Compare - fan remnant.

ballon - (colloquial: western US). A rounded, dome-shaped hill, formed by erosion or uplift.

bar - A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar. A generic term for any of various elongate offshore ridges, banks, or mounds of sand, gravel, or other unconsolidated material submerged at least at high tide, and built up by the action of waves or currents, especially at the mouth of a river or estuary, or at a slight distance offshore from the beach.

barchan dune - A crescent-shaped dune with tips extending leeward (downwind), making this side concave and the windward (upwind) side convex. Barchan dunes tend to be arranged in chains extending in the dominant wind direction. Compare - parabolic dune.

base slope - A geomorphic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments (e.g., colluvium and slope alluvium). Distal base slope sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to form pedisediment over residuum. Compare - head slope, side slope, nose slope, interfluve, free face.

basin - (a) Drainage basin; (b) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. (c) (colloquial: western US) A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

basin floor - A general term for the nearly level, lower-most part of intermontane basins (i.e. bolsons, semi-bolsons). The floor includes all of the alluvial, eolian, and erosional landforms below the piedmont slope. Compare - basin, piedmont slope.

basin-floor remnant - (colloquial: western US) A flat erosional remnant of any former landform of a basin floor that has been dissected following the incision of an axial stream.

bench - (not preferred) refer to structural bench.

beveled base - The lower portion of a canyon wall or escarpment marked by a sharp reduction in slope gradient from the precipitous cliff above, and characteristically composed of thinly mantled colluvium (e.g. < 1 m) and / or carapaced with a thin surficial mantle of large rock fragments from above, which overly residuum of less resistant rock (e.g., shale) whose thin strata intermittently outcrop at the surface; a zone of erosion and transport common in the canyonlands of the semi-arid, southwestern US. Compare - talus slope.

blowout - A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand, loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Commonly small, some blowouts may be large (kilometers in diameter). Compare - deflation basin.

bluff - (a) A high bank or bold headland, with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water, especially on the outside of a stream meander; ex. a river bluff. (b) (not preferred) use cliff. Any cliff with a steep, broad face.

bolson - (colloquial: western US.) A landscape term for an internally drained (closed) intermontane basin into which drainages from surrounding mountains converge inward toward a central depression. Bolsons are often tectonically depressed areas and, according to Peterson, include alluvial flat, alluvial plain, beach plain, barrier beach, lake plain, sand sheets, dunes, and playa. The piedmont slope includes slopes of erosional origin adjoining the mountain front (pediments) and complex construction surfaces (fans). A semi-bolson is an externally drained (open) bolson. Synonym - intermontane basin.

borrow pit - An excavated area from which earthy material has been removed typically for construction purposes offsite; also called barrow pit.

bottomland - (not recommended) use flood plain. An obsolete, informal term loosely applied to varying portions of a flood plain.

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box canyon - a) A narrow gorge or canyon containing an intermittent stream following a zigzag course, characterized by high, steep rock walls and typically closed upstream by a similar wall, giving the impression, as viewed from its bottom, of being surrounded or "boxed in" by almost vertical walls. b) A steep-walled canyon heading against a cliff a dead-end canyon.

braided stream - A channel or stream with multiple channels that interweave as a result of repeated bifurcation and convergence of flow around inter-channel bars, resembling (in plan view) the strands of a complex braid. Braiding is generally confined to broad, shallow streams of low sinuosity, high bedload, non-cohesive bank material, and a steep gradient. At bank-full discharge, braided streams have steeper slopes and shallower, broader, and less stable channel cross sections than meandering streams. Compare - meandering channel, flood-plain landforms.

break - (slopes) An abrupt change or inflection in a slope or profile. Compare - knickpoint, shoulder, escarpment. (geomorphology) A marked variation of topography, or a tract of land distinct from adjacent land, or an irregular or rough piece of ground. Compare - breaks.

breaks - (colloquial: western US) A landscape or large tract of steep, rough or broken land dissected by ravines and gullies and marks a sudden change in topography as from an elevated plain to lower hilly terrain, or a line of irregular cliffs at the edge of a mesa or a river (e.g., the Missouri River breaks).

butte - An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments, commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks. Compare - mesa, plateau, cuesta.

caldera - A large, more or less circular depression, formed by explosion and/or collapse, which surrounds a volcanic vent or vents, and whose diameter is many times greater than that of the included vent, or vents. Compare - crater.

canyon - A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge. Compare - gorge, box canyon, slot canyon.

canyon bench - One of a series of relatively narrow, flat landforms occurring along a canyon wall and caused by differential erosion of alternating strong and weak horizontal strata; a type of structural bench.

canyonlands - A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors; commonly with considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs, and with broader summits or interfluves than found in badlands. Sideslopes exhibit extensive erosion, active back-wearing, and relatively sparse vegetation.

channel - (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) (colloquial: western US.) The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium. Channels may be enclosed by banks or splayed across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) Small, trough-like, arcuate or sinuous channels separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of *bar and channel* topography.

cinder cone - A conical hill formed by the accumulation of cinders and other pyroclastics, normally basaltic or andesitic composition. Slopes generally exceed 20 percent.

cliff - Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice. Compare - bluff.

climbing dune - A dune formed by the piling-up of sand by wind against a cliff or mountain slope; very common in arid regions with substantial local relief and strong winds. Compare - sand ramp.

closed depression - A generic name for an enclosed area that has no surface drainage outlet and from which water escapes only by evaporation or subsurface drainage; an area of low ground indicated on a topographic map by a hachured contour line forming a closed loop. Compare - open basin.

collapse sinkhole - A type of sinkhole that is formed by collapse of a cave within the underlying soluble bedrock (e.g., limestone, gypsum, salt). Compare - solution sinkhole.

colluvium - Unconsolidated, unsorted material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff. Compare - alluvium, slope alluvium, scree, talus, mass movement.

complex landslide - A category of mass movement processes, associated sediments (complex landslide deposit) or resultant landforms characterized by a composite of several mass movement processes none of which dominates or leaves a prevailing landform. Numerous types of complex landslides can be specified by naming the constituent processes evident (e.g. a complex earth spread - earth flow landslide). Compare - fall, topple, slide, lateral spread, flow, landslide.

crest - (a) The commonly linear, narrow top of a ridge, hill, or mountain. It is appropriately applied to elevated areas where retreating backslopes are converging such that these high areas are almost exclusively composed of convex shoulders; (b) (not preferred) Sometimes used as an alternative for the hillslope component *summit*. Compare - summit (*part b*), saddle.

cuesta - An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip (commonly less than 15 percent); produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope), that roughly parallels the inclined beds, and on the other side has a relatively short and steep or cliff-like slope (scarp) that cuts through the tilted rocks. Compare - hogback, mesa, dipslope, scarp slope, cuesta valley.

cuesta valley - A low relief, low angle, asymmetrical depression which lies parallel to the strike of underlying strata; a type of strike valley. It's formed by the differential erosion of weaker strata interbedded with more resistant bedrock. It may or may not contain a local drainage network and commonly lies above and is not connected to the regional drainage system. Compare - cuesta, valley, trough, hanging valley.

debris fall - The process, associated sediments (debris fall deposit) or resultant landform characterized by a rapid type of *fall* involving the relatively free, downslope movement or collapse of detached, unconsolidated material which falls freely through the air (lacks an underlying slip face); sediments have substantial proportions of both fine earth and coarse fragments; common along undercut stream banks. Compare - rock fall, soil fall, landslide.

debris flow - The process, associated sediments (debris flow deposit) or landform resulting from a very rapid type of *flow* dominated by a sudden downslope movement of a mass of rock, soil, and mud (more than 50% of the particles are > 2mm), and whether saturated or comparatively dry, behaves much as a viscous fluid when moving. Compare - lahar, mudflow, landslide.

deflation basin - A topographic basin excavated and maintained by wind erosion which removes unconsolidated material and commonly leaves a rim of resistant material surrounding the depression. Unlike a blowout, a deflation basin does not include adjacent deposits derived from the basin. Compare - blowout.

depression - Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g. a sinkhole). An open depression has a natural outlet for surface drainage. Compare - closed depression, open depression.

desert pavement - A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments, mantling a desert surface. It is formed where wind action and sheetwash have removed all smaller particles or where coarse fragments have migrated upward through sediments to the surface. It usually protects the underlying, finer-grained material from further deflation. The coarse fragments commonly are cemented by mineral matter. Compare - erosion pavement, stone line.

dike - A tabular igneous intrusion that cuts across the bedding or foliation of the country rock. Compare – sill.

dip - A geomorphic component (characteristic piece) of flat plains (e.g., lake plain, low coastal plain, low-relief till plain) consisting of a shallow and typically closed depression that tends to be an area of focused groundwater recharge but not a permanent water body and that lies slightly lower and is wetter than the adjacent talf, and favors the accumulation of fine sediments and organic materials.

ditch - An open and usually unpaved (unlined), channel or trench excavated to convey water for drainage (removal) or irrigation (addition) to or from a landscape; smaller than a canal; some ditches are modified natural waterways.

divide - (a) The line of separation; (b) The summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction. Compare – interfluve.

dome - (a) An uplift or anticlinal structure, either circular or elliptical in outline, in which the rocks dip gently away in all directions. A dome may be small (e.g. a salt dome) or many kilometers in diameter. (b) A smoothly rounded landform of rock mass such as a rock-capped mountain summit, that roughly resembles the dome of a building. (e.g. the rounded granite peaks of Yosemite, CA).

drainageway - (a) A general term for a course or channel along which water moves in draining an area. (b) a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

draw - A small, natural watercourse cut in unconsolidated materials, generally more open with a broader floor and more gently sloping sides than an arroyo, ravine or gulch, and whose present stream channel may appear inadequate to have cut the drainageway that it occupies.

dune - A low mound, ridge, bank or hill of loose, windblown, subaerially deposited granular material (generally sand), either barren and capable of movement from place to place, or covered and stabilized with vegetation, but retaining its characteristic shape. (See barchan dune, parabolic dune, parna dune, shrub-coppice dune, seif dune, transverse dune).

dune field - An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of steams by the sand. See dune lake.

earthflow - The process, associated sediments (earthflow deposit) or resultant landforms characterized by slow to rapid types of flow dominated by downslope movement of soil, rock, and mud (more than 50% of the particles are < 2 mm), and whether saturated or comparatively dry, behaves as a viscous fluid when moving. Compare - debris flow (coarser, less fluid), mudflow (finer, more fluid).

eolian deposit - Sand, silt or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g. tephra) are handled separately. Compare - loess, parna, beach sands.

eolian sands - Sand-sized, clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet. Compare - beach sands.

ephemeral stream - Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times. Compare - arroyo, intermittent stream, perennial stream.

eroded fan remnant - All, or a portion of an alluvial fan that is much more extensively eroded and dissected than a fan remnant; sometimes called an *erosional fan remnant*. It consists primarily of a) eroded and highly dissected sides (*eroded fan-remnant sideslopes*) dominated by hillslope positions (shoulder, backslope, etc.), and b) to a lesser extent an intact, relatively planar, relict alluvial fan "summit" area best described as a tread.

eroded fan-remnant sideslope - A rough or broken margin of an *eroded fan remnant* highly dissected by ravines and gullies that can be just a fringe or make up a large part of an eroded alluvial fan; its bounding escarpments (risers), originally formed by inset channels, have become highly dissected and irregular such that terrace components (tread and riser) have been consumed or modified and replaced by hillslope positions and components (shoulder, backslope, footslope, etc.); sometimes referred to as *fan remnant sideslopes*. Compare - eroded fan remnant.

escarpment - A continuous, steep slope or cliff produced by erosion or faulting and that topographically interrupts or breaks the general continuity of more gently sloping land surfaces . The term is most commonly applied to cliffs produced by differential erosion. Synonym = scarp.

falling dune - An accumulation of sand that is formed as sand is blown off a mesa top or over a cliff face or steep slope, forming a solid wall, sloping at the angle of repose of dry sand, or a fan extending downward from a re-entrant in the mesa wall. Compare - climbing dune, sand ramp.

fan - (a) A gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan (not preferred – use alluvial fan). Compare - alluvial fan, alluvial cone. (b) A fan-shaped mass of congealed lava that formed on a steep slope by the continually changing direction of flow.

fan apron - A sheet-like mantle of relatively young alluvium and soils covering part of an older fan piedmont (and occasionally alluvial fan) surface, commonly thicker and further down slope (e.g., mid-fan or mid-fan piedmont) than a fan collar. It somewhere buries an older soil that can be traced to the edge of the fan apron where the older soil emerges as the land surface, or relict soil. No buried soils should occur within a fan-apron mantle itself. Compare - fan collar.

fan collar - A landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin (near the proximal end or apex) of a major alluvial fan. The young mantle somewhere buries an older soil that can be traced to the edge of the collar where the older soil emerges at the land surface as a relict soil. Compare - fan apron.

fan remnant - A general term for landforms that are the remaining parts of older fan-landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan-remnants) or partially buried (nonburied fan-remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan-surface. A nonburied fan-remnant is a relict surface in its entirety. Compare - eroded fan remnant, ballena.

fan skirt - The zone of smooth, laterally-coalescing, small alluvial fans that issue from gullies cut into the fan piedmont of a basin or that are coalescing extensions of the inset fans of the fan piedmont, and that merge with the basin floor at their toeslopes. These are generally younger fans which onlap older fan surfaces.

fault-line scarp - (a) A steep slope or cliff formed by differential erosion along a fault line, as by the more rapid erosion of soft rock on the side of a fault as compared to that of more resistant rock on the other side; e.g. the east face of the Sierra Nevada in California. (b) (not recommended) A fault scarp that has been modified by erosion. This usage is not recommended because the scarp is usually not located on the fault line.

fen - Waterlogged, spongy ground containing alkaline decaying vegetation, characterized by reeds, that develops into peat. It sometimes occurs in sinkholes of karst regions. Compare - bog, marsh, swamp.

finger ridge - One in a group of small, tertiary spur ridges that form crudely palmate extensions of erosional remnants along the flanks or nose of larger ridges. Compare - ballena, rib.

flat - (a) (adjective) Said of an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that lacks any significant curvature, slope, elevations, or depressions. (b) (noun) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief. Compare - mud flat. (c) (not recommended) A nearly level region that visibly displays less relief than its surroundings.

flood plain - The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

foothills - A steeply sloping upland composed of hills with relief of 30 up to 300 meters and fringes a mountain range or high-plateau escarpment. Compare - hill, mountain, plateau. SW &

footslope - The hillslope profile position that forms the concave surface at the base of a hillslope. It is a transition zone between upslope sites of erosion and transport (shoulder, backslope) and downslope sites of deposition (toeslope). Compare - summit, shoulder, backslope, and toeslope.

free face - A geomorphic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and backslope positions, and can comprise part or all of a nose slope or side slope. Compare - interfluve, crest, nose slope, side slope, head slope, base slope.

gorge - (a) A narrow, deep valley with nearly vertical, rocky walls, smaller than a canyon, and more steep-sided than a ravine; especially a restricted, steep-walled part of a canyon. (b) A narrow defile or passage between hills or mountains.

graben - An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form that may or may not be geomorphically expressed as a rift valley. Compare - horst.

gravel pit - A depression, ditch or pit excavated to furnish gravel for roads or other construction purposes; a type of borrow pit.

ground soil - Any soil at the present-day land surface and actively undergoing pedogenesis,

gulch - (colloquial: western US.; not preferred - refer to ravine) A small stream channel, narrow and steep-sided in cross section, and larger than a gully, cut in unconsolidated materials. General synonym - ravine. Compare - arroyo, draw, gully, wash.

gully - A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water usually during and immediately following heavy rains or ice / snow melt. A gully generally is an obstacle to wheeled vehicles and too deep (e.g., > 0.5 m) to be obliterated by ordinary tillage; (a rill is of lesser depth and can be smoothed over by ordinary tillage). Compare - rill, ravine, arroyo, swale, draw.

hanging valley - A tributary valley whose floor at the lower end is notably higher than the floor of the main valley in the area of junction.

head slope - A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway, resulting in converging overland water flow (e.g. sheet wash); head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Headslopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cummulic profiles) where they are not directly contributing materials to channel flow. Compare - side slope, nose slope, free face, interfluve, crest, base slope.

headwall - A steep slope at the head of a valley; e.g. the rock cliff at the back of a cirque. Compare - cirque headwall.

high hill - A generic name for an elevated, generally rounded land surface with high local relief, rising between 90 meters (approx. 300 ft.) to as much as 300 m (approx. 1000 ft.) above surrounding lowlands. Compare - low hill, hill, hillock.

hill - A generic term for an elevated area of the land surface, rising at least 30 m (100 ft.) to as much as 300 meters (approx. 1000 ft.) above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent. A hill can occur as a single, isolated mass or in a group. A hill can be further specified based on the magnitude of local relief: *low hill* (30 - 90 m) or *high hill* (90 - 300 m). Informal distinctions between a hill and a mountain are often arbitrary and dependent on local convention. Compare - hillock, plateau, mountain, foothills, hills.

hillock - A generic name for a small, low hill, generally between 3 - 30 m in height and slopes between 5 and 50% (e.g., bigger than a mound but smaller than a hill); commonly considered a microfeature. Compare - mound, hill.

hillslope - A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. Compare - mountain slope.

hogback - A sharp-crested, symmetric (homoclinal) ridge formed by highly tilted resistant rock layers; produced by differential erosion of interlayered resistant and weak rocks with dips greater than about 25 degrees (45 percent). Compare - cuesta.

hoodoo - A bizarrely shaped column, pinnacle, or pillar of rock produced by differential weathering or erosion in a region of sporadically heavy rainfall. Formation is facilitated by joints and layers of varying hardness. Compare - earth pillar.

horst - An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

hummock - (a) (not preferred - see hillock). An imprecise, general term for a rounded or conical mound or other small elevation. (b) (not preferred) A slight rise of ground above a level surface.

impact crater - a) A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordinance into earthy or rock material. Compare - caldera, crater, meteorite crater. SW; b) (not recommended - use meteorite crater) A generally circular crater formed by the impact of an interplanetary body (projectile) on a planetary surface.

inset fan - (colloquial; western US) The flood plain of an ephemeral stream that is confined between fan remnants, ballenas, basin-floor remnants, or closely-opposed fan toeslopes of a basin.

interdune - The relatively flat surface, whether sand-free or sand-covered, between dunes. GG

interfluve - A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways. Compare - divide.

intermittent stream - A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e. solely during wet periods), or b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. Compare - ephemeral stream.

island - (a) Land completely surrounded by water; (b) An elevated area of land surrounded by swamp, or marsh, or isolated at high water or during floods. Compare - barrier island.

knob - (a) A rounded eminence, a small hill or mountain; especially a prominent or isolated hill with steep sides, commonly found in the Southern United States. (b) A peak or other projection from the top of a hill or mountain. Also, a boulder or group of boulders or an area of resistant rocks protruding from the side of a hill or mountain. Compare - stack.

knoll - A small, low, rounded hill rising above adjacent landforms.

lake - An inland body of permanent standing water, fresh or saline, occupying a depression, generally of appreciable size (larger than a pond) and too deep to permit vegetation (excluding subaqueous vegetation) to take not completely across the expanse of water.

lakebed - (a) The flat to gently undulating ground underlain or composed of fine-grained sediments deposited in a former lake. (b) The bottom of a lake; a lake basin.

lakeshore - The narrow strip of land in contact with or bordering a lake; especially a beach.

landslide - A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials, caused by gravitational forces and which may or may not involve saturated materials. Names of landslide types generally reflect the dominant process and/or the resultant landform. The main operational categories of mass movement are *fall* (rockfall, soil fall, topple), *slide* (rotational landslide, block glide, debris slide, lateral spread), *flow* [rock fragment flow (especially rockfall avalanche), debris avalanche, debris flow (e.g., lahar), earthflow, (creep, mudflow)], and *complex landslides*. Compare - solifluction.

ledge - (a) A narrow shelf or projection of rock, much longer than wide, formed on a rock wall or cliff face, as along a coast by differential wave action on softer rocks; erosion is by combined biological and chemical weathering. (b) A rocky outcrop; solid rock. (c) A shelf-like quarry exposure or natural rock outcrop. Compare - structural bench.

levee - An artificial or natural embankment built along the margin of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel. Compare artificial levee, natural levee.

longitudinal dune - A long, narrow sand dune, usually symmetrical in cross profile, oriented parallel to the prevailing wind direction ; it is wider and steeper on the windward side but tapers to a point on the lee side. It commonly forms behind an obstacle in an area where sand is abundant and the wind is strong and constant. Such dunes can be a few meters high and up to 100 km long. Compare - seif dune, transverse dune.

low hill - A generic name for an elevated, generally rounded land surface with low local relief, rising between 30 meters (100 ft.) to as much as 90 m (approx. 300 ft.) above surrounding lowlands. Compare - high hill, hill, hillock.

lowland - (a) A generic, imprecise term for low-lying land or an extensive region of low-lying land, especially near a coast and including the extended plains or country lying not far above tide level. (b) (not preferred) A generic, imprecise term for a landscape of low, comparatively level ground of a region or local area, in contrast with the adjacent higher country. (c) (not recommended - use valley, bolson, etc.) A generic term for a large valley. Compare - upland.

marsh - Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Compare - salt marsh, swamp, bog, fen.

meander belt - The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops. Landform components of the meander-belt surface are produced by a combination of gradual (lateral and down-valley) migration of meander loops and avulsive channel shifts causing abrupt cut-offs of loop segments. Landforms flanking the sinuous stream channel include: point bars, abandoned meanders, meander scrolls, oxbow lakes, natural levees, and flood-plain splays. Meander belts may not exhibit prominent natural levee or splay forms. Flood plains of broad valleys may contain one or more abandoned meander belts in addition to the zone flanking the active stream channel.

meander scar - (a) A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream which impinged upon and undercut the bluff; if it's no longer adjacent to the modern stream channel it indicates an

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abandoned route of the stream; (b) (not recommended - refer to oxbow) An abandoned meander, commonly filled in by deposition and vegetation, but still discernable.

meander scroll - (a) One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank. Compare - meander belt, point bar. (b) (not recommended; refer to oxbow lake) - A small, elongate lake on a flood plain in a well-defined part of an abandoned stream channel.

mesa - A broad, nearly flat-topped, and usually isolated landmass bounded by steep slopes or precipitous cliff and capped by layers of resistant, nearly horizontal, rocky summit width greater than the height of bounding escarpments. (Colloquial: western US; not preferred) Also used to designate broad structural benches and alluvial terraces that occupy intermediate levels in stepped sequences of platforms bordering canyons and valleys. Compare - butte, plateau, cuesta.

monocline - (a) A unit of folded strata that dips from the horizontal in one direction only, is not part of an anticline or syncline, and occurs at the earth's surface.. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting. Compare - anticline, syncline, fold. (b) - A local steepening in an otherwise uniform gentle dip.

mountain - A generic term for an elevated area of the land surface, rising more than 300 meters above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without considerable bare-rock exposed. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by tectonic activity and/or volcanic action and secondarily by differential erosion. Compare - hill, hillock, plateau, foothills, mountains.

natural levee - A long, broad low ridge or embankment of sand and coarse silt, built by a stream on its flood plain and along both sides of its channel, especially in time of flood when water overflowing the normal banks is forced to deposit the coarsest part of its load. It has a gentle slope away from the river and toward the surrounding floodplain, and its highest elevation is closest to the river bank. Compare - levee, artificial levee, meander belt.

open depression - A generic name for any enclosed or low area that has a surface drainage outlet whereby surface water can leave the enclosure; an area of lower ground indicated on a topographic map by contour lines forming an incomplete loop or basin indicating at least one surface exit. Compare - closed basin.

overbank deposit - Fine-grained sediments (silt and clay) deposited from suspension on a flood plain by floodwaters that cannot be contained within the stream channel.

overflow stream channel - A watercourse that is generally dry but conducts flood waters that have overflowed the banks of a river, commonly from large storms or annual meltwater.

oxbow - A closely looping stream meander having an extreme curvature such that only a neck of land is left between the two parts of the stream. (colloquial: northeastern A.) the land enclosed, or partly enclosed, within an oxbow. Compare - meander belt, oxbow lake, bayou.

oxbow lake - The crescent-shaped, often ephemeral body of standing water situated by the side of a stream in the abandoned channel (oxbow) of a meander after the stream formed a neck cutoff and the ends of the original bend were silted up. Compare - meander belt, oxbow.

parabolic dune - A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, whose ground plan, when perfectly developed, approximates the form of a parabola.

peak - Sharp or rugged upward extension of a ridge chain, usually at the junction of two or more ridges; the prominent highest point of a summit area.

pediment - A gently sloping erosional surface at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland. In hill-foot slope terrain the mantle is designated "pedisediment." The term has been used in several geomorphic contexts: Pediments may be classed with respect to (a) landscape positions, for example, intermontane-basin piedmont or valley-border footslope surfaces (respectively, apron and terrace pediments); (b) type of material eroded, bedrock or regolith; or (c) combinations of the above. Compare - Piedmont slope.

perennial stream - A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream. Compare - Ephemeral stream, Intermittent stream.

piedmont - (adjective) Lying or formed at the base of a mountain or mountain range; e.g., a piedmont terrace or a piedmont pediment. (noun) An area, plain, slope, glacier, or other feature at the base of a mountain; e.g., a foothill or a bajada. In the United States, the Piedmont is a low plateau extending from New Jersey to Alabama and lying east of the Appalachian Mountains.

piedmont slope - (colloquial - western US) The dominant gentle slope at the foot of a mountain; generally used in terms of intermontane-basin terrain in arid to subhumid regions. Main components include: (a) An erosional surface on bedrock adjacent to the receding mountain front (pediment, rock pediment); (b) A constructional surface comprising individual alluvial fans and interfan valleys, also near the mountain front; and (c) A distal complex of coalescent fans (bajada), and alluvial slopes without fan form. Piedmont slopes grade to basin-floor depressions with alluvial and temporary lake plains or to surfaces associated with through drainage (e.g., axial streams). Compare - bolson, fan piedmont.

plain - A general term referring to any flat, lowland area, large or small, at a low elevation. Specifically, any extensive region of comparatively smooth and level gently undulating land. A plain has few or no prominent hills or valleys but sometimes has considerable slope, and usually occurs at low elevation relative to surrounding areas. Where dissected, remnants of a plain can form the local uplands. A plain may be forested or bare of trees and may be formed by deposition or erosion. Compare - lowland, plateau.

plateau - A comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 100 meters) above adjacent lower-lying terrain, and is commonly limited on at least one side by an abrupt descent, has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level. Compare - hill, foothill, mountain, mesa, plain.

playa - The usually dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have high water table and saline conditions.

point bar - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by the slow addition of individual accretions accompanying migration of the channel toward the outer bank. Compare - meander scroll.

pond - (a) A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger than a pool. (b) A small artificial body of water, used as a source of water. Compare - salt pond.

pool - A small, natural body of standing water, usually fresh; e.g. a stagnant body of water in a marsh, or a transient puddle in a depression following a rain.

quarry - Excavation areas, open to the sky, usually for the extraction of stone.

ravine - A small stream channel; narrow, steep-sided, commonly V-shaped in cross section and larger than a gully, cut in unconsolidated materials. General synonym (not preferred) - gulch. Compare - arroyo, draw, gully.

reef - (a) A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Also, such a structure built in the geologic past and now enclosed in rock, commonly of differing lithology. (b) A mass or ridge of rocks, especially coral and sometimes sand, gravel, or shells, rising above the surrounding sea or lake bottom to or nearly to the surface, and dangerous to navigation; specifically such a feature at 10 fathoms (18.3 m) or less, formerly 6 fathoms (11 m).

ridge - A long, narrow elevation of the land, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

rill - A very small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water, usually during and immediately following moderate rains or after ice/snow melt. Generally, a rill is not an obstacle to wheeled vehicles and is shallow enough to be obliterated by ordinary tillage. Compare - gully.

rim - The border, margin, edge, or face of a landform, such as the curved brim surrounding the top part of a crater or caldera; specifically the rimrock of a plateau or canyon.

rise - (refer to lake plain) (a) A general term for a slight increase in slope and elevation of the land surface, usually with a broad summit and gently sloping sides. (b) same as (a) but the term is restricted to microfeatures in areas of very low relief such as lake plains or coastal plains.

river - (a) A general term for a natural, freshwater surface stream of considerable volume and generally with a permanent base flow, moving in a defined channel toward a larger river, lake, or sea. (b) (not recommended: colloquial - New England, US) A small watercourse which elsewhere in the US is known as a *creek*. Compare - stream.

river valley - an elongate depression of the Earth's surface; carved by a river during the course of it's development. Compare - valley side, valley floor.

rockfall - The process, associated sediments (rockfall deposit) or resultant landform characterized by a very rapid type of *fall* dominated by downslope movement of detached rock bodies which fall freely through the air or by leaps and bounds (lacks an underlying slip face); also spelled rock fall. Compare - debris fall, soil fall, landslide.

rock pediment - An erosion surface of low relief, cut directly into and across bedrock and composed of either bare rock or thinly veneered pedisediment or residuum (e.g. < 1.5 m) over bedrock; it occurs along the flanks of mountain fronts, or at the base of mountains or high hills. Its surface grades to the backwearing mountain slopes or hillslopes above, and generally grades down to and merges with a lower-lying alluvial plain, piedmont slope or valley floor below.

rotational slide - The process, associated sediments (rotational landslide deposit) or resultant landforms characterized by an extremely slow to moderately rapid type of slide, composed of comparatively dry and largely soil-rock materials, portions of which remain largely intact and in which movement occurs along a well-defined, concave shear surface and resulting in a backward rotation of the displaced mass. The landform may be single, successive (repeated up and down slope), or multiple (as the number of slide components increase). Compare - rotational debris slide, rotational earth slide, rotational rock slide, translational slide, lateral spread, landslide.

rubble - An accumulation of loose angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a breccia. Compare - scree, talus.

saddle - A low point on a ridge or interfluve, generally a divide (pass, col) between the heads of streams flowing in opposite directions. Compare - summit, crest.

sandhills - A region of semi-stabilized sand dunes or sandy hills, either covered with vegetation or bare, as in north-central Nebraska and the midlands of the Carolinas.

sand plain - (a) A sand-covered plain which may originate by deflation of sand dunes, and who's lower limit of erosion is governed by the ground-water level. Also spelled *sandplain*. (b) (not preferred - refer to *sandy* outwash plain) A small outwash plain composed chiefly of sand deposited by meltwater streams flowing from a glacier.

sand ramp - A sand sheet blown up onto the lower slopes of a bedrock hill or mountain and forming an inclined plane, sometimes filling small mountain-side valleys and even crossing low passes. Compare - climbing dune, sand sheet.

sand sheet - A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height. Compare - escarpment.

scarp slope - The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata. Compare - dip slope.

scree - A collective term for an accumulation of coarse rock debris or a sheet of coarse debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs. Compare - talus, colluvium, mass movement.

scree slope - A portion of a hillside or mountainslope mantled by scree and lacking an up-slope rockfall source (i.e. cliff). Compare - talus slope, scree, talus.

seep - (noun) An area, generally small, where water or oil percolates slowly to the land surface. For water, it may be considered as a seepage spring, but it is used by some for flows too small to be considered as springs.

shoulder - The hillslope profile position that forms the convex, erosional surface near the top of a hillslope. If present, it comprises the transition zone from summit to backslope. Compare - summit, crest, backslope, footslope, and toeslope.

shrub-coppice dune - A small, streamlined dune that forms around brush and clump vegetation.

side slope - A laterally planar area of a hillside, resulting in predominantly parallel overland water flow (e.g., sheet wash); contour lines generally form straight lines. Side slopes are dominated by colluvium and slope wash sediments. Slope complexity (downslope shape) can range from simple to complex. Compare - head slope, nose slope, free face, interfluve, crest, base slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width.

slide - (a) Mass movement processes, associated sediments (slide deposit) or resultant landforms (e.g., rotational, translational, and snow slide) characterized by a failure of earth, snow, or rock under shear stress along one or several surfaces that are either visible or may reasonably be inferred. The moving mass may or may not be greatly deformed, and movement may be rotational (rotational slide) or planar (translational slide). A slide can result from lateral erosion, lateral pressure, weight of overlying material, accumulation of moisture, earthquakes, expansion owing to freeze-thaw of water in cracks, regional tilting, undermining, fire, and human agencies. Compare -fall, topple, lateral spread, flow, complex landslide. (b) The track of bare rock or furrowed earth left by a slide. (c) The mass of material moved by or deposited by a slide.

slip face - The steeply sloping surface of a dune, standing at or near the angle of repose of loose sand, and advancing downwind by a succession of slides wherever that angle is exceeded.

slope - (also called slope gradient or gradient) The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100.

slope alluvium - Sediment gradually transported down mountain or hill slopes primarily by non-channel alluvial processes (i.e., slope wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of pebbles or cobbles and burnished peds distinguish these materials from unsorted colluvial deposits. Compare - colluvium, slope wash.

slope wash - A collective term for non-fluvial, incipient alluvial *processes* (e.g. overland flow, minor rills) that detach, transport, and deposit sediments down hill and mountain slopes. Related sediments (*slope alluvium*) exhibit nominal sorting or rounding of particles, peds, etc., and lateral sorting downslope on long slopes; stratification is crude and intermittent and readily destroyed by pedoturbation and frost action. Also called *slope wash processes*. Compare - slope alluvium, colluvium, valley-side alluvium.

slot canyon - A long, narrow, deep and tortuous channel or drainageway with sheer rock walls eroded into sandstone or other sedimentary rocks, especially in the semi-arid western US (e.g. Colorado Plateau); subject to flash flood events; depth to width ratios exceed 10:1 over most of its length and can approach 100:1; commonly containing unique ecological communities distinct from the adjacent, drier uplands.

strath terrace - A type of stream terrace, formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

stream - (a) A body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the ground surface, in a subterranean cavern, or beneath or in a glacier. It is a mixture of water and dissolved, suspended, or entrained matter. (b) A term used in quantitative geomorphology interchangeably with channel. Compare - river.

stream terrace - One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). Erosional surfaces cut into bedrock and thinly mantled with stream deposits (alluvium) are called "strath terraces." Remnants of constructional valley floors thickly mantled with alluvium are called alluvial terraces. Compare - alluvial terrace, flood-plain step, strath terrace, terrace.

strike valley - A subsequent valley eroded in, and developed parallel to the strike of, underlying weak strata; such as a cuesta; a valley that often, but not necessarily contains a strike valley.

structural bench - A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled, and in contrast to stream terraces, have no geomorphic implication of former, partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching. Compare - pediment, ledge; see scarp.

summit - (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. Compare - shoulder, backslope, footslope, and toeslope, crest. (b) A general term for the top, or highest area of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluve area of relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

swale - (a) A shallow, open depression in unconsolidated materials which lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be more moist and thicker (cummulic) compared to surrounding soils. (b) A small, shallow, typically closed depression in an undulating ground moraine formed by uneven glacial deposition; Compare - swell-and-swale topography. (c) (not preferred; refer to interdune) A long, narrow, generally shallow, trough-like depression between two beach ridges, and aligned roughly parallel to the coastline.

syncline - (a) A unit of folded strata that is concave upward whose core contains the stratigraphically younger rocks, and occurs at the earth's surface. In a single syncline, beds forming the opposing limbs of the fold dip toward its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally concave upward whose core contains the stratigraphically younger rocks.

tableland - A term for a broad upland with an extensive, nearly level or undulating summit area and steep side slopes descending to surrounding lowlands. Compare - plateau, mesa, cuesta.

talus - Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of loose broken rock formed chiefly by falling, rolling, or sliding. Compare - talus slope, colluvium, mass movement, scree.

talus cone - A small, steep, cone-shaped landform at the base of a cliff or escarpment, that heads in a relatively small declivity or ravine, and composed of poorly sorted rock and soil debris that has accumulated primarily by episodic rockfall or, to a lesser degree, by slope wash. Not to be confused with an *alluvial cone*; a similar feature but of fluvial origin, composed of better stratified and more sorted material, and that tapers up into a more extensive drainageway. Compare - alluvial cone, beveled base, talus slope.

talus slope - a portion of a hillslope or mountainslope mantled by talus and lying below a rockfall source (e.g. cliff). Compare - scree slope, scree, talus. Compare - beveled base.

tank - (colloquial: southwestern US) A natural depression or cavity in impervious rocks in which water collects and remains for the greater part of the year.

terrace - A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, or lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper slope (scarp, riser), descending to a lower base level. Compare - stream terrace, flood-plain step. Practically, terraces are considered to be generally flat alluvial areas above the 100 yr. flood stage.

terracettes - Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock such as sheep or cattle. Synonyms (not preferred) - catstep, sheep or cattle track.

toeslope - The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hill-slope continuum that grades to valley or closed-depression floors. Compare - summit, shoulder, backslope, footslope, valley floor.

translational slide - A category of mass movement processes, associated sediments (translational slide deposit) or resultant landforms characterized by the extremely slow to moderately rapid downslope displacement of comparatively dry soil-rock material on a surface (slip face) that is roughly parallel to the general ground surface, in contrast to falls, topples, and rotational slides. The term includes such diverse *slide* types as translational debris slides, translational earth slide, translational rock slide, block glides, and slab or flake slides. Compare - rotational slide, slide, landslide.

transverse dune - A very asymmetric sand dune elongated perpendicular to the prevailing wind direction, having a gentle windward slope and a steep leeward slope standing at or near the angle of repose of sand; it generally forms in areas of sparse vegetation. Compare - longitudinal dune.

valley - An elongate, relatively large, externally drained depression of the Earth's surface that is primarily developed by stream erosion or glacial activity. Compare - basin.

valley floor - A general term for the nearly level to gently sloping, lowest surface of a valley. Landforms include axial stream channels, the flood plain, flood-plain steps, and, in some areas, low terrace surfaces. Compare - flood-plain landforms, meander, braided channel, valley side.

valley side - The sloping to very steep surfaces between the valley floor and summits of adjacent uplands. Well-defined, steep valley sides have been termed valley walls (not recommended). Note: Scale, relief, and perspective may require use of closely related terms such as hill slope or mountain slope.

wash (dry wash) - (colloquial: western US.) The broad, flat- floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium. Note: When channels reach intersect zones of ground-water discharge they are more properly classed as "intermittent stream" channels. Synonym - arroyo. Compare - gully.

zibar - A small, low-relief sand dune that lacks discernible slip faces and commonly occurs on sand sheets, in interdune areas, or in corridors between larger dunes. Zibar spacing can range from 50-400 m with local relief < 10 m. Unlike coppice dunes, zibars are unrelated to deposition around vegetation. Generally dominated by coarse sand. Compare - dune, coppice dune.

CONSIDERATIONS FOR PLANNING

Planning for the day:

1. Safety and sustenance: Plenty of food, water, first-aid kit, raingear, sunscreen.
2. Field communications:
   a. Develop a plan with team-mate for check-in time.
   b. Does park staff know the area in which you will be working?
3. Make sure you have the right maps and photos.
4. Check your GPS receiver (Datum set to NAD83? WAAS on? Needs new batteries?).
5. Plan the day's mission before departing using a) USGS quads, b) aerial photos, c) Park/BLM/FS maps.
6. Considerations for mission planning:
   a. Plan travel based on topography, best access routes, density and complexity of vegetation (more time for forest and woodland sites, less for herbaceous and shrub).
   b. Plan data collection based on priority needs; new types get higher priority.
   c. Communicate to make sure you aren't duplicating effort when unnecessary.

Planning for the Week (do this on the first day of the trip)

1. Do you have all appropriate maps, photos?
2. Develop a reasonable estimate of the number of plots for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week to capture all essential associations in the work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information and backups for the week's planning? E.g., blank field forms, film, plenty of batteries.

Wrapup

1. Clean, recharge and repair equipment.
2. Hold brief meeting to discuss data collection issues, things that came up during the day/week, and plan for next days activities.
3. Edit field forms and file them systematically.
4. Re-file the aerial photos and maps.
5. Download flashcards.
6. Key unknown plants.
7. Enter edited data into database.

Communicate among teams / Topics for wrap-up meetings.

1. What were your questions about the sites visited daily/weekly?
2. Do you have any questions about the forms or fields?
3. What was accomplished, what was not accomplished?
4. Pass on developments and questions, e.g., were there problems with interpreting the aerial photos, or are there personnel issues, problems in consistency in interpreting the forms, or with park-related logistics?

Materials Checklist

- Site research permit
- Topo maps
- Site maps for general navigation
- Digital orthophoto for easy reference
- Geology map
- Aerial photos
- Compass with adjustable declination
- Clinometer
- GPS receiver
- Plenty of AA batteries for GPS receivers, walkie talkies, etc.
- Radio or walkie talkie and/or cell phone
- Digital camera and flash cards
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pens / sharpies
- Forms: observation point
- Clipboard/forms holder
- Pens, pencils, pencil lead, slate board, chalk, and chalkboard eraser
- Most recent version of provisional classification of the park
- All ancillary information (cheat sheet, species list, floras, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

ATTACHMENT B

DESCRIPTION OF FEDERALLY LISTED SPECIES

Brown pelican (*Pelecanus occidentalis*)

Cameron County

The brown pelican was listed as endangered on October 13, 1970.

Distribution: The brown pelican historical range included the Atlantic and Gulf coasts from South Carolina to Florida and west to Texas. Currently, the brown pelican occurs throughout its historic range but in greatly reduced numbers. Within Texas, numbers dropped drastically from an estimated 5,000 birds in 1918 to less than 100 individuals and only 10 breeding pairs in 1974. According to a 2003 survey, there were 8 colonies and 3,895 active nests in Texas. Today, brown pelicans occur along the Texas coast from Chambers County on the upper coast to Cameron County on the lower coast. Most of the breeding birds nest on Pelican Island in Corpus Christi Bay and Sundown Island near Port O'Connor.

Natural History:

Habitat: The brown pelican is a coastal bird that is rarely seen inland or far out at sea. They feed in shallow estuarine waters usually less than 40 miles from shore. Pelicans use sand spits, offshore sand bars, and islets for roosting and loafing.

Breeding: Egg laying varies by location; in Texas, brown pelican populations nest irregularly usually beginning in late fall and extending through June. The clutch size averages 2–3 eggs and incubation lasts 28–30 days. The young pelicans leave the nests around 35 days after hatching, fledge around 63 days after hatching, and fly around 71–88 days after hatching. Reproductive success is highly variable and susceptible to disturbance by humans, starvation of young, and/or flooding of nests. In Texas, brown pelicans build their nests on small isolated coastal islands that are safe from predators such as raccoons and coyotes.

Diet: The brown pelican is a piscivore that primarily feeds upon menhaden and mullet in Texas. They spot the fish from above and the dive beak-first into the water to scoop up the fish.

Threats: The brown pelican has undergone several sharp population declines in Texas. The first decline occurred in the 1920–30s when local fishermen would kill the birds because of incorrect assumptions that the brown pelican competed with humans for fish. The second sharp decline occurred in the 1960s and 1970s when the brown pelican would eat menhaden containing the pesticides DDT and Endrin. Pesticide ingestion caused a severe decline in brown pelican reproductive success. Currently, human encroachment and development of the Texas coast provides the most significant threat to brown pelican populations.

Green sea turtle (*Chelonia mydas*)

Cameron County

The green sea turtle was listed as endangered on July 28, 1978.

Distribution: The green sea turtle occurs in tropical waters of the Atlantic, Pacific, and Indian Oceans. Their main nesting grounds occur on Aves Island in Costa Rica and Surinam. Green sea turtleshave rarely been observed nesting in Texas one sighting of a single female was recently observed in Kenedy County, Texas. Juveniles occupy offshore areas from Texas to Massachusetts (NatureServe 2007).

Natural History:

Habitat: Hatchlings are typically restricted to floating in masses of sea plants in the convergence zone while juveniles roam into temperate waters. Adults stay in the coral reefs and rocky outcrops near feeding pastures in tropical waters (NatureServe 2007).

Breeding: The green sea turtle nests from March to October in the Gulf of Mexico region with the peak between May and June. The female lays 1–8 clutches of 90–140 eggs. The incubation period is 1.5–3 months and the hatchlings emerge between early June and late December (NatureServe 2007).

Diet: The green sea turtle feeds in shallow waters with abundant submerged vegetation. The adults are herbivorous and eat seagrass, macroalgae, and other marine plants while the juveniles are more invertivorous and prey on mollusks, sponges, crustaceans, and jellyfish (NatureServe 2007).

Threats: The major threats to green sea turtle populations are degradation of nesting habitat, collection of nesting females and eggs for human consumption, mortality in fishing gear (nets, etc.), and contact with pollution (NatureServe 2007).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 17, 2007).

Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*)

Cameron, Hidalgo, and Starr Counties

The Gulf Coast jaguarundi was listed as endangered on June 14, 1976.

Distribution: Because of the secretive nature of the jaguarundi, little is known about its exact distribution within Texas. The only documented sighting of a jaguarundi in Texas was a road killed specimen found in Cameron County. Possible counties where the jaguarundi may exist include Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, Nueces, San Patricio, Starr, Willacy, and Zapata. Jaguarundi occurs in Central and South America in greater numbers than occur in the United States (USFWS 1990).

Natural History:

Habitat: The habitat of the jaguarundi includes the Tamaulipan Biotic Province and Texas Thornscrub and brushland. Potential habitat includes four vegetation types within the LRGV: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Jaguarundi prefers dense thornscrub habitats with greater than 95% canopy cover, but will forage in associated herbaceous communities. Their minimal home range is about 40 ha (USFWS 1990).

Breeding: The jaguarundi mates in November or December and gestation lasts 9–10 weeks. There may be two litters of 1–4 (average 2) young per year. In Mexico, the young are born between March and August. Little is known of the breeding habits within the United States.

Diet: The jaguarundi is active at night and preys primarily on birds, small rodents, and rabbits.

Threats: The largest threat to jaguarundi populations in the United States is habitat loss and fragmentation in southern Texas. The jaguarundi requires a large hunting area and appropriate habitat is being lost to development and agriculture. Habitat loss creates islands of habitat with insufficient connecting corridors and jaguarundi cannot travel from area-to-area thus exposing them to predation.

U.S. Fish and Wildlife Service. 1990. Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on the Ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

Hawksbill sea turtle (*Eretmochelys imbricata*)

Cameron County

Distribution: The hawksbill sea turtle occurs in tropical and sub-tropical seas of the Atlantic, Pacific, and Indian Oceans. It is widely distributed in the Caribbean Sea and western Atlantic Ocean. The sea turtle utilizes the northern Gulf of Mexico (especially near Texas) for some life history stages (NMFS and USFWS 1993).

Natural History:

Habitat: Hawksbill habitat use depends on the life stage. Posthatchling hawksbills occupy the pelagic environment, hiding from predators in communities of marine algae, eelgrass, etc. Juveniles swim to coastal waters with coral reefs a preferred habitat for foraging for juveniles, sub-adults, and adults (NMFS and USFWS 1993).

Breeding: The hawksbill chooses low- and high-energy beaches in tropical oceans of the world for nests. The hawksbill has a 6 month nesting season with the peak season depending on location. The courtship and mating occurs during migration or near the nesting beach. They nest from 4 to 5 times per season and not every attempt is successful. Clutch size averages 140 eggs with some variation (NMFS and USFWS 1993).

Diet: The diet of posthatchling hawksbills is largely unknown. Eggs of pelagic fish and pelagic species of *Sargassum* have been found in their gut contents. Adults feed primarily on sponges (NMFS and USFWS 1993).

Threats: Threats to hawksbill populations are split into those that affect their nesting sites and those that affect their feeding sites in the ocean. Nesting sites are threatened by poaching, beach erosion, erosion control measures, sand mining, and use of off-road vehicles on beaches. Threats to their marine environment include entanglement in nets, ingestion of marine debris, and the loss and/or degradation of coral reefs (NMFS and USFWS 1993).

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

Kemp's ridley sea turtle (*Lepidochelys kempii*)

Cameron County

Kemp's ridley sea turtle was listed as endangered on December 2, 1970.

Distribution: Kemp's ridley sea turtle has a restricted breeding range, the most restricted nesting distribution of any sea turtle, with one nesting beach that receives the majority of the nesting females. This beach is located near Rancho Nuevo in southern Tamaulipas, Mexico. An attempt has been made to create another nesting site on San Padre Island, Texas. Adults are essentially restricted to the Gulf of Mexico while juveniles also inhabit the U.S. Atlantic coast (USFWS and NMFS 1992).

Natural History:

Habitat: The sea turtles usually remain in the Gulf of Mexico. Young sea turtles frequent bays, coastal lagoons, and river mouths while the adults are found near the Mississippi River mouth and the Campeche Banks (USFWS and NMFS 1992).

Breeding: Courtship and mating areas of the ridley sea turtle are not well known. Nesting occurs from April into July and is restricted to the beaches of the western Gulf of Mexico, primarily the state of Tamaulipas, Mexico. The clutch averages 101 eggs and the incubation period is 45–58 days.

Diet: Posthatchling ridley sea turtles likely feed on the available *Sargassum* spp. (brown algae) and associated fauna and other epipelagic species within the Gulf of Mexico. Juveniles and adults appear to be shallow water, benthic feeders whose diet is composed primarily of crabs with a preference for portunid crabs (USFWS and NMFS 1992).

Threats: Before the ridley's sea turtle was protected, eggs were removed from the Rancho Nuevo nesting beach from the 1940s to early 1960s. Another threat to ridley sea turtle populations is the trawling industry within the Gulf of Mexico which caught turtles in their trawls and decimated ridley sea turtle populations (USFWS and NMFS 1992).

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1992. Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Florida.

Leatherback sea turtle (*Dermochelys coriacea*)

Cameron County

The leatherback sea turtle was listed as endangered on June 2, 1970.

Distribution: The leatherback sea turtle is a circumglobal species that forages in temperate waters. It nests on the beaches of the Atlantic, Indian, and Pacific Oceans in tropical and sub-tropical latitudes. Historically, nesting sites occurred along the coast of Texas, but none have been reported recently (NatureServe 2007).

Natural History:

Habitat: The leatherback usually occupies habitats along the continental shelf and pelagic environments. It also occurs in seas, gulfs, bays, and estuaries (NMFS and USFWS 1998).

Breeding: The female lays over 10 clutches of 50–170 eggs at 1–2 week intervals. The female nests at night from March-August and the incubation period is 8–10 days. There are no known nesting sites in the United States. The greatest number of leatherback sea turtles nest on the Pacific coast of Mexico, mostly in the states of Michoacán, Guerrero, and Oaxaca (NMFS and USFWS 1998).

Diet: The leatherback's diet consists of medusa, siphonophores, and salpae in temperate and boreal latitudes with jellyfish as their primary prey (NatureServe 2007).

Threats: The greatest threat to the leatherback sea turtle is disruption to their nesting sites, especially those along the Pacific coast of Mexico. Increased human presence and construction and the corresponding habitat loss or degradation occurs along many coastal Pacific areas. Harvest of sea turtles and/or eggs for food remains a threat. Incidental take by commercial fishing boats also poses a great threat to the leatherback sea turtle (NMFS and USFWS 1998).

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*).

National Marine Fisheries Service, Silver Spring, MD.

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 17, 2007).

Loggerhead sea turtle (*Caretta caretta*)

Cameron County

The loggerhead sea turtle was listed as endangered on July 28, 1978.

Distribution: The loggerhead sea turtle occupies the warmer parts of the Atlantic, Pacific, and Indian oceans and range into temperate zones to feed in the summer. Major nesting sites include the southeastern U.S., Mexico, Oman, and South Africa. A few nests have been established on the barrier islands along the Texas coast. The waters of the Gulf of Mexico are used for feeding during non-breeding times (NatureServe 2007).

Natural History:

Habitat: The loggerhead sea turtle occupies the open seas up to 500 miles from the shore primarily over the continental shelf, in bays, estuaries, lagoons, creeks, and the mouths of rivers. Nesting occurs on open, sandy beaches above the high-tide mark (NatureServe 2007).

Breeding: In the southeastern United States, mating occurs in late March to early June with the female laying 1–9 clutches of 45–200 eggs from late April to early September. Incubation requires 7–11 weeks with the hatchlings emerging from the nests after a few days (NatureServe 2007).

Diet: The loggerhead sea turtle feeds on a variety of invertebrates including crustaceans, mollusks, sponges, cnidaria, and echinoderms. They also eat plants and fish. Adults forage on the bottom while the young feed on prey concentrated at the surface (NatureServe 2007).

Threats: The loggerhead turtle is threatened by collection of adult turtles and eggs for food, drowning by entanglement in shrimp trawls, and by habitat degradation from beach development (NatureServe 2007).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 17, 2007).

Northern aplomado falcon (*Falco femoralis septentrionalis*)

Cameron and Hidalgo Counties

The northern aplomado falcon was designated as a federally endangered species on March 27, 1986.

Distribution: The geographic distribution of the northern aplomado falcon includes most of South America from Tierra del Fuego to Ecuador and from sea level to 3,000 m in the Andes. The falcon also inhabits most of Central America and Mexico. The historic range includes areas of Texas, New Mexico, and Arizona. In Texas, northern aplomado falcons occur in south Texas and the Trans-Pacos region (USFWS 1990).

Natural History:

Habitat: In populations within the United States, northern aplomado falcons inhabit yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered curly-mesquite (*Hilaria belangeri*) and yucca. They do not construct nests and must use abandoned nests of other species including the Swainson's hawk (*Buteo swainsoni*), crested caracara (*Caracara cheriway*), and the Chihuahuan raven (*Corvus cryptoleucus*) (USFWS 1990).

Breeding: Most clutches are laid during April and May with a clutch size of 2–3 eggs. The incubation period is 31–32 days. The nestlings fledge at 32–40 days and are dependent on the adults for an additional four weeks after fledging (USFWS 1990).

Diet: Northern aplomado falcons prey on a variety of small birds, insects, rodents, and reptiles. Preferred bird species include doves, cuckoos, woodpeckers, blackbirds, flycatchers, thrushes, and other fringillids that feed in trees. Common insect species include grasshoppers, beetles, dragonflies, cicadas, crickets, butterflies, moths, wasps, and bees (USFWS 1990).

Threats: Populations in the United States experienced a severe decline due to loss of habitat from over-grazing and encroachment of agricultural lands on traditional northern aplomado falcon habitat. The use of DDT during the 1970s also caused a decline in populations due to the inability for falcons to produce viable eggs. Overall, the greatest threat to populations in the United States is habitat loss through development (USFWS 1990).

U.S. Fish and Wildlife Service. 1990. Northern aplomado falcon recovery plan. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 56pp.

Ocelot (*Leopardus (=Felis) pardalis*)

Cameron, Hidalgo, and Starr Counties

The ocelot was listed as endangered on March 28, 1972.

Distribution: The ocelot is found from northern Mexico into the southern extremes of Texas and Arizona to northern Argentina, Paraguay, and Uruguay. Little is known of the exact distribution of the ocelot in Texas. Ocelots recorded by trapping or photo documentation include several areas within five counties: Cameron, Willacy, Kenedy, Jim Wells, and Hidalgo. Areas that have been identified as having potential ocelot habitat include Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, Nueces, San Patricio, Starr, Willacy, and Zapata (USFWS 1990).

Natural History:

Habitat: The ocelot occurs within the Tamaulipan Biotic Province of Texas, which includes several variations of sub-tropical thornscrub and brushland. Potential habitat includes four vegetation types within the Lower Rio Grande Valley: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Ocelots prefer dense thornscrub habitats with greater than 95% canopy cover. Their average home range is about 15 km^2 (USFWS 1990).

Breeding: In Texas, the ocelot breeds in late summer with gestation lasting about 70 days. Births occur in fall and winter and the litter size is 2–4. Dens are found in caves, hollow trees, thickets, or the spaces between closed buttress roots of large trees (NatureServe). Juveniles appear to travel with their mother even following lactation and one study found two young females up to 2 years old with home ranges that significantly overlapped their mother's home range (USFWS 1990).

Diet: The ocelot is active at night and preys primarily on birds, small rodents, and rabbits, but may also include reptiles, fish and invertebrates. Other potential prey species include opossum, raccoon, javelina, white-tailed deer, skunks, nine-banded armadillo, feral swine, poultry, quail, doves, chachalaca, numerous passerine birds and waterfowl, snakes, and lizards.

Threats: Habitat loss and fragmentation especially along the Rio Grande pose a critical threat to the long term survival of the ocelot. Efforts need to be taken to preserve key habitat and biological corridors necessary for ocelot survival (USFWS 1990).

U.S. Fish and Wildlife Service. 1990. Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on the Ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

Piping plover (*Charadrius melodus*)

Cameron County

The piping plover was listed as endangered on July 10, 1986.

Distribution: The piping plover is a migratory bird that breeds on coastal beaches from Newfoundland to North Carolina and winters along the Atlantic Coast from North Carolina south, along the Gulf Coast including the coast of Texas, and in the Caribbean (USFWS 1996).

Natural History:

Habitat: Piping plovers choose the accreting ends of barrier islands, sandy peninsulas, and coastal inlets for their winter grounds. In the winter, they prefer sandflats adjacent to inlets or passes, sandy mudflats along prograding spits, and overwash areas for foraging (USFWS 1996).

Breeding: Piping plover nests are located above the high tide line on coastal beaches, sandflats, foredunes, and washover areas cut into or between dunes. Eggs are laid from mid-April to late July and clutch size is usually four eggs. Incubation time averages 27–30 days and the chicks fledge in 25–35 days. Piping plovers migrate to their breeding grounds in late February through early April and return to their winter grounds from late July to September (USFWS 1996).

Diet: The piping plover feeds on inverterbrates including marine worms, fly larvae, beetles, crustaceans, and mollusks. They feed along the intertidal portions of ocean beaches, and the shorelines of coastal ponds, lagoons, or salt marshes (USFWS 1996).

Threats: The piping plover’s winter grounds have been threatened by recreational activities (both motorized and pedestrian), inlet and shoreline stabilization, dredging of inlets, beach maintenance and renourishment, and pollution (USFWS 1996).

U.S. Fish and Wildlife Service. 1996. Piping Plover *(Charadnus melodus),* Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.

South Texas ambrosia (*Ambrosia cheiranthifolia*)

Cameron County

The south Texas ambrosia was listed as endangered on September 23, 1994.

Distribution: The South Texas ambrosia is a species endemic to southern Texas and northern Mexico that historically occupied areas of Cameron, Jim Wells, Kleberg, and Nueces Counties in Texas, and the state of Tamaulipas in Mexico. Three populations are currently known including two populations in Nueces County and one in Kleberg County.

Natural History:

Morphology: The south Texas ambrosia is a perennial herb that is a member of the aster family. It is erect, has a silvery to grayish-green appearance, and is 10–30 cm tall. It has simple, opposite leaves on the lower stem, which transition to alternate near the inflorescence. The flowers are dioecious with the staminate flowers on terminal racemes and the pistillate flowers in small clusters along the leaf axils.

Habitat: The south Texas ambrosia grows on open clay-loam to sandy-loam prairies and savannas. Associated native grasses include Texas grama *(Bouteloua rigidiseta),* buffalo grass *(Buchloe dactyloides),* Texas speargrass *(Stipa leucotricha*), and tobosa *(Hilaria mutica*).

Threats: The native habitat for the south Texas ambrosia has largely been converted to agricultural fields, improved pastures, or urban areas. Humans have also altered the fire regime of these grasslands allowing thorny shrub and tree species to invade the grasslands.

Star cactus (*Astrophytum asterias*)

Cameron, Hidalgo, and Starr Counties

The star cactus was listed as endangered on October 18, 1993.

Distribution: The star cactus is a species endemic to southern Texas and northern Mexico with historical range that includes Hidalgo, Starr, Zapata, and possibly Cameron counties in Texas and the states of Nuevo Leon and Tamaulipas in Mexico. Known populations occur on private land in Starr County, Texas, Tamaulipas, Mexico, and Nuevo Leon, Mexico. Other populations likely occur but remain unknown because of difficulty surveying private lands (USFWS 2003).

Natural History:

Morphology: The star cactus is a disk or dome-shaped member of the cactus family that is spineless. It is 2–15 cm across and up to 7 cm tall. The color is dull green-to-brown and the plant is often covered in tiny white scales. The star cactus is divided into eight, vaguely triangular sections. The flowers are yellow with orange centers and up to 15 cm in diameter while the fruits are green to grayish-red and fleshy when mature. Star cactus flower from March through May with fruiting between April and June (USFWS 2003).

Habitat: The star cactus occupies sparse, open thorn shrub and grasslands in a warm-temperate, sub-tropical steppe climate in the United States and dry, hot thornscrub in Mexico. These habitats are characterized by scattered mesquite and grasses on sandy soils and thorn brush on heavier soils (USFWS 2003).

Threats: The star cactus is threatened by habitat destruction and modification, collection, and decreased population numbers.

U.S. Fish and Wildlife Service. 2003. Recovery Plan for Star Cactus (*Astrophytum asterias*). U.S. DOI Fish and Wildlife Service, Albuquerque, New Mexico. i-vii + 38pp., A1-19, B-1-8.

Texas ayenia (*Ayenia limitaris*)

Cameron and Hidalgo Counties

The Texas ayenia was listed as endangered on September 23, 1994.

Distribution: The Texas ayenia is an endemic species of southern Texas and northern Mexico with a historical range including Cameron and Hidalgo Counties, Texas, and the states of Coahuila, Nuevo Leon, and Tamaulipas in Mexico. The status of Mexican populations is unknown and the only confirmed population of the Texas ayenia occurs on private property within Hidalgo County.

Natural History:

Morphology: The Texas ayenia is a sub-shrub with pubescent leaves and stems from 60 cm to 150 cm long. The leaves are alternate and simple. The flowers are axillary with up to four per node and their color ranges between green, pink, and cream.

Habitat: The Texas ayenia occupies dense sub-tropical woodland communities at low elevations. The current population occupies a Texas Ebony – Anacua (*Pithecellobium ebano-Ehretia anacua*) plant community. This woodland community occurs on well-drained riparian terraces with canopy cover close to 95%. Additional plant species occurring within this community includes bumelia *(Bumelia celastrina),* brasil *(Condalia hookeri),* granjeno (*Celtis pallida),* and snake-eyes *(Phaulothamnus spinescens).*

Threats: Habitat loss and degradation from agriculture or urban development have reduced the Texas Ebony – Anacua vegetation community by greater than 95%. The species has been reduced to one known population of 20 individuals that is extremely vulnerable to extinction.

Walker's manioc (*Manihot walkerae*)

Hidalgo and Starr Counties

Walker’s manioc was listed as endangered on October 2, 1991.

Distribution:Historically, Walker's manioc was known from the Lower Rio Grande Valley of Texas (Hidalgo and Starr counties) and northern Tamaulipas, Mexico. Until recently, it was believed that this species was represented in the U.S. by a single plant in the wild, discovered in Hidalgo County in 1990. In 1995, Walker's manioc was located in three different areas on the Lower Rio Grande National Wildlife Refuge in Starr and Hidalgo Counties (TPWD web site).

Natural History:

Morphology: Walker’s manioc is a perennial, branched herb that is about 0.5 m in height. The leaves are alternate, deeply incised, and palmately five-lobed. Flowers are dioecious with staminate flowers tubular and light purplish. Pistillate flowers are white and purple. The known Texas plant flowers in late spring and autumn in response to seasonal rainfall (USFWS 1993).

Habitat: Walker’s manioc usually grows among low shrubs, native grasses and herbaceous plants, either in full sunlight, or in partial shade of shrubs. It is found in sandy, calcareous soil, shallowly overlying indurated caliche and conglomerate of the Goliad Formation on rather xeric slopes and uplands, or over limestone.

Threats: Over 95% of Walker’s manioc native brush habitat has been cleared in the United States for agriculture, urban development, and recreation. The U.S. population has been reduced to a few locations that makes the species extremely vulnerable to extinction in the United States (USFWS 1993).

U.S. Fish and Wildlife Service. 1993. Walker’s Manioc (*Manihot walkerae*) Recovery Plan. USD1 Fish and Wildlife Service, Albuquerque, New Mexico. 57 pp.

Ashy dogweed (*Thymophylla tephroleuca*)

Starr County

The ashy dogweed was listed as endangered on July 19, 1984.

Distribution: The ashy dogweed is a relict species, the only known population occurs on 1 acre in Zapata County, Texas. The population includes approximately 1,300 individuals.

Natural History:

Morphology: The ashy dogweed is a perennial herb with erect stems up to 30 cm in height. The leaves are linear and covered with soft, woolly, white hairs that emit a pungent odor when crushed. The flower heads are yellow and flowering occurs from March to May.

Habitat: The ashy dogweed grows on fine, sandy-loam soils in open areas of a grassland-shrub community. The dominant genera of shrub herbaceous stands include: *Costela, Cordia, Prosopis, Microrhamnus, Leucophyllum, Cercidium*, and *Yucca*.

Threats: The existence of this species is endangered by overgrazing, habitat loss through roadside blading and brush clearing, oil and gas development, and possible collecting or vandalism.

Johnston's frankenia (*Frankenia johnstonii*)

Starr County

Johnston's frankenia was listed as endangered on August 7, 1984; however, it has been proposed for delisting.

Distribution: Johnston's frankenia is an endemic species of southern Texas and northern Mexico. When it was first listed as an endangered species five populations were known in Texas and another population occurred near Monterrey, Mexico. However, Johnston's frankenia has been found on 30 additional sites in Starr and Zapata counties in Texas (NatureServe 2007).

Natural History:

Morphology: Johnston's frankenia is a member of the Frankeniaceae. The plant is blue-green with a wiry appearance. The branches appear hedged possibly from browsing by large herbivores. It is a perennial shrub that grows up to 62 cm. The leaves and stems are grayish- or bluish-green from a dense covering of short-whitish hairs. The shrub flowers from September to May.

Habitat: Johnston's frankenia grows on rocky flats or slopes of open thorn shrublands. The soils are saline, sometimes with high gypsum content (NatureServe 2007).

Threats: The species remains threatened by brush clearing and oil and gas development, but conservation agreements are being signed by private landowners to protect the species (NatureServe 2007).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 16, 2007).

Least tern (*Sterna antillarum*)

Starr County

The interior population of the least tern was listed as endangered on June 27, 1985.

Distribution: The historic breeding range of the least tern included the Mississippi River, Red River, and Rio Grande. The breeding range extended from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. Currently, the least tern maintains breeding grounds on all these river systems although suitable habitat has dwindled. In Texas, populations have been observed on the Red River system and along the Texas/Oklahoma border as far east as Burkburnett, Texas. Least terns have been observed on three reservoirs (including Amistad Reservoir in Val Verde County) along the Rio Grande and along the Pecos River at the Bitter Lake National Wildlife Refuge, New Mexico (USFWS 1990).

Natural History:

Habitat: Within systems such as the Rio Grande, least terns nest on sparsely vegetated sand and gravel bars deposited along a wide, unobstructed river channel or on salt flats along lake shorelines. Least terns also nest on artificial habitats such as sand and gravel pits and dredge islands (USFWS 1990).

Breeding: Least terns form colonies on the breeding grounds for 4–5 months arriving from late April to early June. Nests are shallow depressions in open, sandy areas, gravelly patches, or exposed flats. The tern nests in colonies. Clutch size is usually 2–3 eggs and the eggs are laid by late May. Incubation lasts 20–25 days and fledgling occurs after three weeks. Parental attention continues until migration at the end of the breeding season (USFWS 1990).

Diet: The least tern is a fish-eater (piscivore) that hunts in the shallow waters of rivers, streams and lakes. Fish prey is small-sized and include the following genera: *Fundulus, Notropis, Campostoma, Pimephales, Gambusia, Blonesox, Morone, Dorosoma, Lepomis,* and *Carpiodes.* Terns usually hunt near their nesting sites (USFWS 1990).

Threats: The damming of river systems for irrigation, navigation, hydroelectric power, and recreation has altered the river channels that the least tern depends on for breeding grounds. Stabilized river systems eliminate most of the sandbars that terns utilize for breeding grounds by channeling wide, braided rivers into single, narrow navigation channels.

U. S. Fish and Wildlife Service. 1990. Recovery plan for the interior population of the least tern (*Sterna antillarum*). U. S. Fish and Wildlife Service, Twin Cities, Minnesota. 90 pp.

Zapata bladderpod (*Lesquerella thamnophila*)

Starr County

The Zapata bladderpod was listed as endangered on November 22, 1999

Distribution: The Zapata bladderpod is endemic to southern Texas and possibly northern Mexico. Four populations occur in Starr County. Of these, two populations occur within the Lower Rio Grande Valley National Wildlife Refuge and two occur on private land. Three populations are known from Zapata County; two occur within highway rights-of-way between the towns of Zapata and Falcon and another occurs near Falcon Lake (USFWS 2004).

Natural History:

Morphology: The Zapata bladdepod is a pubescent, silvery-green perennial plant of the Mustard Family. It has sprawling stems 43–85 cm long and the basal leaves are narrowly elliptical to oblanceolate and acute with entire or slightly toothed margins. The leaves have stellate trichomes that give the plant its silvery-green appearance. The inflorescence is a loose raceme of bright, yellow flowers. The plant flowers at all times of the year depending on weather conditions (USFWS 2004).

Habitat: The Zapata bladderpod occurs on graveled to sandy-loam upland terraces above the Rio Grande floodplain. It is associated with highly calcareous sandstones and clays. The bladderpod is a component of an open *Leucophyllum frutescens – Acacia berlanderi* shrubland alliance. The shrublands are sparsely vegetated and include the following species *Acacia ridigula*, *Prosopis* sp., *Celtis pallida*, *Yucca treculeana*, *Zizyphus obtusifolia*, and *Guaiacum angustifolium* (USFWS 2004).

Threats: Habitat modification and destruction from increased road and highway construction and urban development, increased oil and gas exploration and development, and conversion of plant communities to improve pastures, overgrazing and vulnerability due to low population numbers are all threats to the Zapata bladderpod

U.S. Fish and Wildlife Service. 2004. Zapata Bladderpod (*Lesquerella thamnophila*) Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. i-vii + 30 pp., Appendices A-B.

ATTACHMENT C

GIS PRODUCTS

GIS PRODUCTS

- GIS Interactive File
- Access Database for PF225
- GIS Layer: Vegetation Database
- Maps Including Vegetation Layer
- Field Photographs

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ATTACHMENT D

.RGV SPECIES LISTS

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Accipitridae				
Accipiter cooperii	Cooper's Hawk	G5/S4		
Accipiter striatus	Sharp-shinned Hawk	G5/S2		
Aquila chrysaetos	Golden Eagle	G5/S3		
Asturina (Buteo) nitidus	Gray Hawk	G5/S2		
Buteo albicaudatus	White-tailed Hawk	G4G5/S4	Threatened	
Buteo albonotatus	Zone-tailed Hawk	G4/S3	Threatened	
Buteo brachyurus	Short-tailed Hawk	G4G5/No TX Record		
Buteo jamaicensis	Red-tailed Hawk	G5/S5		
Buteo lineatus	Red-shouldered Hawk	G5/S4		
Buteo magnirostris	Roadside Hawk	No NS Record		
Buteo playpterus	Broad-winged Hawk	G5/S3		
Buteo regalis	Ferruginous Hawk	G4/S2		
Buteo swainsoni	Swainson's Hawk	G5/S4		
Buteogallus anthracinus	Common Black-Hawk	G4G5/S2	Threatened	
Chondrohierax uncinatus	Hook-billed Kite	G4/S2		
Circus cyaneus	Northern Harrier	G5/S2		
Elanoides forficatus	Swallow-tailed Kite	G5/S2	Threatened	
Elanus leucurus	White-tailed Kite	G5/S4		
Geranospiza caerulescens	Crane Hawk	No NS Record		
Haliaeetus leucocephalus	Bald Eagle	G5/S3	Threatened	

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Ictinia mississippiensis	Mississippi Kite	G5/S4		
Pandion haliaetus	Osprey	G5/S4		
Parabuteo unicinctus	Harris's Hawk	G5/S3		
Rostrhamus sociabilis	Snail Kite	G4G5/No TX Record		
Alaudidae				
Eremophila alpestris	Horned Lark	G5/S5		
Alcedinidae				
Ceryle (Megacryle) alcyon	Belted Kingfisher	G5/S5		
Ceryle (Megaceryle) torquata	Ringed Kingfisher	G5/S3		
Chloroceryle americana	Green Kingfisher	G5/S4		
Anatidae				
Aix sponsa	Wood Duck	G5/S4		
Anas acuta	Northern Pintail	G5/S3		
Anas americana	American Wigeon	G5/S3		
Anas bahamensis	White-cheeked Pintal	No TX Record		
Anas clypeata	Northern Shoveler	G5/S3		
Anas crecca	Green-winged Teal	G5/S2		
Anas cyanoptera	Cinnamon Teal	G5/S3		
Anas discors	Blue-winged Teal	G5/S3		
Anas fulvigula	Mottled Duck	G4/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Anas penelope	Eurasian Wigeon	G5/No TX Record		
Anas platyrhynchos	Mallard	G5/S3		
Anas platyrhynchos novimexicanus	Mexican Duck	No TX Record		
Anas strepera	Gadwall	G5/S3		
Anser albifrons	Greater White-fronted Goose	G5/S5		
Aythya affinis	Lesser Scaup	G5/S3		
Aythya americana	Redhead	G5/S3		
Aythya collaris	Ring-necked Duck	G5/No TX Record		
Aythya marila	Greater Scaup	G5/No TX Record		
Aythya valisineria	Canvasback	G5/S4		
Branta bernicla	Brant	G5/S2		
Branta canadensis	Canada Goose	G5/S5		
Bucephala albeola	Bufflehead	G5/No TX Record		
Bucephala clangula	Common Goldeneye	G5/No TX Record		
Cairina moschata	Muscovy Duck	G4/S3		
Chen caerulescens	Snow Goose	G5/S5		
Chen rossii	Ross' Goose	G4/S3		
Clangula hyemalis	Long-tailed Duck	G5/No TX Record		
Cygnus buccinator	Trumpeter Swan	G4/No TX Record		
Cygnus columbianus	Tundra Swan	G5/No TX Record		
Dendrocygna autumnalis	Black-bellied Whistling-Duck	G5/S5		
Dendrocygna bicolor	Fulvous Whistling-Duck	G5/S4		
Histrionicus histrionicus	Harlequin Duck	G4/No TX Record		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Lophodytes cucullatus	Hooded Merganser	G5/S3		
Melanitta fusca	White-winged Scoter	G5/No TX Record		
Melanitta perspicillata	Surf Scoter	G5/No TX Record		
Mergus merganser	Common Merganser	G5/No TX Record		
Mergus serrator	Red-breasted Merganser	G5/No TX Record		
Nomonyx dominicus	Masked Duck	G5/S3		
Oxyura jamaicensis	Ruddy Duck	G5/S3		
Anhingidae				
Anhinga anhinga	Anhinga	G5/S4		
Apodidae				
Chaetura pelagica	Chimney Swift	G5/S3		
Streptoprocne zonaris	White-collared Swift	No NS Record		
Ardeidae				
Ardea albus	Great Egret	G5/S5		
Ardea herodias	Great Blue Heron	G5/S5		
Botaurus lentiginosus	American Bittern	G4/S3		
Bubulcus ibis	Cattle Egret	G5/Exotic		
Butorides virescens	Green Heron	G5/S5		
Egretta caerula	Little Blue Heron	G5/S5		
Egretta rufescens	Reddish Egret	G4/S3	Threatened	

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Egretta thula	Snowy Egret	G5/S5		
Egretta tricolor	Tricolored Heron	G5/S5		
Ixobrychus exilis	Least Bittern	G5/S4		
Nyctanassa violacea	Yellow-crowned Night-Heron	G5/S4		
Nycticorax nycticorax	Black-crowned Night-Heron	G5/S4		
Bombycillidae				
Bombycilla cedrorum	Cedar Waxwing	G5/N5		
Caprimulgidae				
Caprimulgus carolinensis	Chuck-will's-widow	G5/S3		
Caprimulgus vociferous	Whip-poor-will	G5/S4		
Chordeiles acutipennis	Lesser Nighthawk	G5/S4		
Chordeiles minor	Common Nighthawk	G5/S4		
Nyctidromus albicollis	Common Pauraque	G5/S5		
Phalaenoptilus nuttallii	Common Poorwill	G5/S4		
Cardinalidae				
Cardinalis cardinalis	Northern Cardinal	G5/S5		
Cardinalis sinuatus	Pyrrhuloxia	G5/S4		
Cyanocompsa parellina	Blue Bunting	No NS Record		
Passerina amoena	Lazuli Bunting	G5/S3		
Passerina caerulea	Blue Grosbeak	G5/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Passerina ciris	Painted Bunting	G5/S4		
Passerina cyanea	Indigo Bunting	G5/S5		
Passerina versicolor	Varied Bunting	G5/S4		
Pheucticus ludovicianus	Rose-breasted Grosbeak	G5/S4		
Pheucticus melanocephalus	Black-headed Grosbeak	G5/S4		
Rhodothraupis celaeno	Crimson-collared Grosbeak	No NS Record		
Spiza americana	Dickcissel	G5/S4		
Cathartidae				
Cathartes aura	Turkey Vulture	G5/S5		
Coragyps atratus	Black Vulture	G5/S5		
Certhiidae				
Certhia americana	Brown Creeper	G5/S4		
Charadriidae				
Charadrius alexandrius	Snowy Plover	G4/S3		
Charadrius melodus	Piping Plover	G3/S2	Threatened	Threatened
Charadrius montanus	Mountain Plover	G2/S2		
Charadrius semipalmatus	Semipalmated Plover	G5/S4		
Charadrius vociferous	Killdeer	G5/S5		
Charadrius wilsonia	Wilson's Plover	G5/S4		
Pluvialis dominicus	American Golden-Plover	G5/S3		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Pluvialis squatarola	Black-bellied Plover	G5/S4		
Ciconiidae				
Jabiru mycteria	Jabiru	No NS Record		
Mycteria americana	Wood Stork	G4/SH	Threatened	
Columbidae				
Columba flavirostris	Red-billed Pigeon	No NS Record		
Columba leucocephala	White-crowned Pigeon	No NS Record		
Columba livia	Rock Dove	G5/Exotic		
Columbina inca	Inca Dove	G5/S5		
Columbina passerine	Common Ground-Dove	G5/S4		
Columbina talpacoti	Ruddy Ground-Dove	G5/No TX Record		
Geotrygon montana	Ruddy Quail-Dove	No NS Record		
Leptotila verreauxi	White-tipped Dove	G5/S4		
Streptopelia decaucto	Eurasian Collared-Dove	G5/Exotic		
Zenaida asiatica	White-winged Dove	G5/S5		
Zenaida macroura	Mourning Dove	G5/S5		
Corvidae				
Cyanocitta cristata	Blue Jay	G5/S5		
Corvus cryptoleucus	Chihuahuan Raven	G5/S4		
Corvus imparatus	Tamaulipas Crow	G5/S3		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Cyanocorax morio	Brown Jay	G5/S2		
Cyanocorax yncas	Green Jay	G5/No TX Record		
Cracidae				
Ortalis vetula	Plain Chachalaca	G5/S3		
Cuculidae				
Coccyzus erythrophthalmus	Black-billed Cuckoo	G5/S3		
Coccyzus americanus	Yellow-billed Cuckoo	G5/S4		
Coccyzus melacoryphus	Dark-billed Cuckoo	No NS Record		
Coccyzus minor	Mangrove Cuckoo	G5/No TX Record		
Crotophaga sulcirostris	Groove-billed Ani	G5/S4		
Geococcyx californianus	Greater Roadrunner	G5/S4		
Diomedeidae				
Thalassarche chlororhynchos	Yellow-nosed Albatross	No NS Record		
Emberizidae				
Sporophila torqueola	White-collared Seedeater	G5/S1		
Aimophila botterii	Botteri's Sparrow	G4/S3		
Aimophila cassinii	Cassin's Sparrow	G5/S4		
Aimophila ruficeps	Rufous-crowned Sparrow	G5/S4		
Ammodramus bairdi	Baird's Sparrow	G4/S2		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Ammodramus leconteii	Le Conte's Sparrow	G4/S3		
Ammodramus maritimus	Seaside Sparrow	G4/S4		
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	G5/No TX Record		
Ammodramus savannarum	Grasshopper Sparrow	G5/S3		
Amphispiza bilineata	Black-throated Sparrow	G5/S4		
Arremonops rufivirgatus	Olive Sparrow	G5/S4		
Calamospiza melanocorys	Lark Bunting	G5/S4		
Calcarius ornatus	Chestnut-collared Longspur	G5/S3		
Chondestes grammacus	Lark Sparrow	G5/S4		
Junco hyemalis	Dark-eyed Junco	G5/S5		
Melospiza georgiana	Swamp Sparrow	G5/S4		
Melospiza lincolnii	Lincoln's Sparrow	G5/S5		
Melospiza melodia	Song Sparrow	G5/S5		
Passerculus sandwichensis	Savannah Sparrow	G5/S4		
Pipilo arcticus	Spotted Towhee	No NS Record		
Pipilo chlorurus	Green-tailed Towhee	G5/S4		
Pipilo erythrophthalmus	Eastern Towhee	G5/S2		
Plectrophenax nivalis	Snow Bunting	G5/No TX Record		
Pooecetes gramineus	Vesper Sparrow	G5/S5		
Spizella arborea	American Tree Sparrow	G5/No TX Record		
Spizella breweri	Brewer's Sparrow	G5/S4		
Spizella pallida	Clay-colored Sparrow	G5/S4		
Spizella passerine	Chipping Sparrow	G5/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Spizella pusilla	Field Sparrow	G5/S5		
Tiaris olivaceus	Yellow-faced Grassquite	G5/No TX Record		
Zonotrichia albicollis	White-throated Sparrow	G5/No TX Record		
Zonotrichia leucophrys	White-crowned Sparrow	G5/S5		
Zonotrichia querula	Harris's Sparrow	G5/S4		
Falconidae				
Caracara plancus	Crested Caracara	G5/S4		
Falco columbarius	Merlin	G5/No NS Record		
Falco femoralis	Aplomado Falcon	G4/S1	Endangered	Endangered
Falco mexicanus	Prairie Falcon	G5/S3		
Falco peregrinus	Peregrine Falcon	G4/S3	Endangered, Threatened	
Falco sparverius	American Kestrel	G5/S4		
Micrastur semitorquatus	Collared Forest-Falcon	No NS Record		
Fregatidae				
Fregata magnificens	Magnificent Frigatebird	G5/No TX Record		
Fringillidae				
Carduelis flammea	Common Redpoll	G5/No TX Record		
Carduelis pinus	Pine Siskin	G5/S2		
Carduelis psaltria	Lesser Goldfinch	G5/S5		
Carduelis tristis	American Goldfinch	G5/S2		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Carpodacus mexicanus	House Finch	G5/S5		
Carpodacus purpureus	Purple Finch	G5/S4		
Loxia curvirostra	Red Crossbill	G5/S3		
Gaviidae				
Gavia adamsii	Yellow-billed Loon	G4/No Tx Record		
Gavia immer	Common Loon	G5/No Tx Record		
Gavia pacifica	Pacific Loon	G5/No Tx Record		
Gruidae				
Grus americana	Whooping Crane	G1/S1	Endangered	Endangered
Grus canadensis	Sandhill Crane	G5/S5		
Haematopodidae				
Haematopus palliatus	American Oystercatcher	G5/S3		
Hirundinidae				
Progne subis	Purple Martin	G5/S5		
Hirundo rustica	Barn Swallow	G5/S5		
Petrochelidon fulva	Cave Swallow	G5/S4		
Petrochelidon pyrrhonota	Cliff Swallow	G5/S4		
Progne chalybea	Gray-breasted Martin	No NS Record		
Riparia riparia	Bank Swallow	G5/S2		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Stelgidopteryx serripennis	Northern Rough-winged Swallow	G5/S3		
Tachycineta bicolor	Tree Swallow	G5/S3		
Tachycineta thalassina	Violet-green Swallow	G5/S4		
Hydrobatidae				
Oceanodroma castro	Band-rumped Storm-Petrel	G4/No TX Record		
Oceanodroma leucorhoa	Leach's Storm-Petrel	G5/No TX Record		
Icteridae				
Agelaius phoeniceus	Red-winged Blackbird	G5/S5		
Dolichonyx oryzivorus	Bobolink	G5/S3		
Euphagus carolinus	Rusty Blackbird	G4/S3		
Euphagus cyanocephalus	Brewer's Blackbird	G5/S5		
Icterus bullockii	Bullock's Oriole	G5/S4		
Icterus cucullatus	Hooded Oriole	G5/S4		
Icterus galbula	Baltimore Oriole	G5/S4		
Icterus graduacauda	Audubon's Oriole	G5/S4		
Icterus gularis	Altamira Oriole	G5/S3		
Icterus parisorum	Scott's Oriole	G5/S3		
Icterus spurious	Orchard Oriole	G5/S4		
Icterus spurious fuertesi	Fuerte's Orchard Oriole	No NS Record		
Molothrus aeneus	Bronzed Cowbird	G5/S5		
Molothrus ater	Brown-headed Cowbird	G5/S5		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Molothrus bonariensis	Shiny Cowbird	G5/No TX Record		
Quiscalus major	Boat-tailed Grackle	G5/S4		
Quiscalus mexicanus	Great-tailed Grackle	G5/S5		
Quiscalus quiscula	Common Grackle	G5/S5		
Sturnella magna	Eastern Meadowlark	G5/S5		
Sturnella neglecta	Western Meadowlark	G5/S5		
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	G5/S3		
Jacanidae				
Jacana spinosa	Northern Jacana	No NS Record		
Laniidae				
Lanius ludovicianus	Loggerhead Shrike	G4/S4		
Laridae				
Anous stolidus	Brown Noddy	G5/No TX Record		
Catharacta skua	South Polar Skua	G4G5/No TX Record		
Chlidonias niger	Black Tern	G4/S3		
Larus argentatus	Herring Gull	G5/S5		
Larus atricilla	Laughing Gull	G5/S5		
Larus californicus	California Gull	G5/No TX Record		
Larus crassirostris	Black-tailed Gull	No NS Record		
Larus delawarensis	Ring-billed Gull	G5/S5		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Larus fuscus	Lesser Black-backed Gull	G5/No TX Record		
Larus glaucoides	Iceland Gull	G5/No TX Record		
Larus hyperboreus	Glaucous Gull	G5/No TX Record		
Larus marinus	Great Black-backed Gull	G5/No TX Record		
Larus occidentalis	Western Gull	G5/No TX Record		
Larus philadelphia	Bonaparte's Gull	G5/S4		
Larus pipixcan	Franklin's Gull	G4G5/S2		
Larus ridibundus	Black-headed Gull	G5/No TX Record		
Larus schistisagus	Slaty-backed Gull	G5/No TX Record		
Larus thayeri	Thayer's Gull	G5/No TX Record		
Rissa tridactyla	Black-legged Kittiwake	G5/No TX Record		
Rynchops niger	Black Skimmer	G5/S4		
Stercorarius longicaudus	Long-tailed Jaeger	G5/No TX Record		
Stercorarius parasiticus	Parasitic Jaeger	G5/No TX Record		
Stercorarius pomarinus	Pomarine Jaeger	G5/No TX Record		
Sterna anaethetus	Bridled Tern	No NS Record		
Sterna antillarum	Least Tern	No NS Record		
Sterna caspia	Caspian Tern	No NS Record		
Sterna forsteri	Forster's Tern	G5/S5		
Sterna fuscata	Sooty Tern	No NS Record	Threatened	
Sterna hirundo	Common Tern	G5/S1		
Sterna maxima	Royal Tern	No NS Record		
Sterna nilotica	Gull-billed Tern	No NS Record		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Sterna sandvicensis	Sandwich Tern	No NS Record		
Xema sabini	Sabine's Gull	G5/No TX Record		
Mimidae				
Dumetella carolinensis	Gray Catbird	G5/S4		
Melanoptila glabrirostris	Black Catbird	No NS Record		
Melanotix caerulescens	Blue Mockingbird	No NS Record		
Mimus polyglottos	Northern Mockingbird	G5/S5		
Oreoscoptes montanus	Sage Thrasher	G5/No NS Record		
Toxostoma curvirostre	Curve-billed Thrasher	G5/S4		
Toxostoma longirostre	Long-billed Thrasher	G5/S4		
Toxostoma rufum	Brown Thrasher	G5/S4		
Motacillidae				
Anthus rubescens	American Pipit	G5/S4		
Anthus spragueii	Sprague's Pipit	G4/No TX Record		
Odontophoridae				
Callipepla squamata	Scaled Quail	G5/S4		
Colinus virginianus	Northern Bobwhite	G5/S4		
Paridae				
Baeolophus atricristatus	Black-crested Titmouse	G5/S5		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Parus (Poecile) carolinensis	Carolina Chickadee	G5/S5		
Parulidae				
Basileuterus culicivorus	Golden-crowned Warbler	No NS Record		
Basileuterus rufifrons	Rufous-capped Warbler	No NS Record		
Cardellina rubrifrons	Red-faced Warbler	G5/No TX Record		
Dendroica caerulescens	Black-throated Blue Warbler	G5/S3		
Dendroica castanea	Bay-breasted Warbler	G5/S4		
Dendroica cerulean	Cerulean Warbler	G4/SH		
Dendroica chrysoparia	Golden-cheeked Warbler	G2/S2	Endangered	Endangered
Dendroica coronata auduboni	Audubon's Yellow-rumped Warbler	G5T5/No TX Record		
Dendroica coronata coronata	Myrtle Yellow-rumped Warbler	G5T4/No TX Record		
Dendroica discolor	Prairie Warbler	G5/S3		
Dendroica dominica	Yellow-throated Warbler	G5/S4		
Dendroica fusca	Blackburnian Warbler	G5/S3		
Dendroica magnolia	Magnolia Warbler	G5/S4		
Dendroica nigrescens	Black-throated Gray Warbler	G5/SH		
Dendroica occidentalis	Hermit Warbler	G4G5/S3		
Dendroica palmarum	Palm Warbler	G5/S3		
Dendroica pensylvanica	Chestnut-sided Warbler	G5/No TX Record		
Dendroica petechia	Yellow Warbler	G5/S2		
Dendroica petechia bryanti	Mangrove Yellow Warbler	No NS Record		
Dendroica pinus	Pine Warbler	G5/S5		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Dendroica striata	Blackpoll Warbler	G5/S3		
Dendroica tigrina	Cape May Warbler	G5/S2		
Dendroica townsendi	Townsend's Warbler	G5/S4		
Dendroica virens	Black-throated Green Warbler	G5/S4		
Geothlypis poliocephala	Gray-crowned Yellowthroat	No NS Record		
Geothlypis trichas	Common Yellowthroat	G5/S5		
Helmitheros vermivorus	Worm-eating Warbler	G5/S3		
Icteria virens	Yellow-breasted Chat	G5/S5		
Limnothlypis swainsonii	Swainson's Warbler	G4/S3		
Mniotilta varia	Black-and-white Warbler	G5/S4		
Myioborus miniatus	Slate-throated Redstart	No NS Record		
Myioborus pictus	Painted Redstart	G5/S3		
Oporornis formosus	Kentucky Warbler	G5/S3		
Oporornis philadelphia	Mourning Warbler	G5/S4		
Oporornis tolmiei	MacGillivray's Warbler	G5/S4		
Parula americana	Northern Parula	G5/S4		
Parula pitiayumi	Tropical Parula	G5/S3	Threatened	
Protonotaria citrea	Prothonotary Warbler	G5/S3		
Seiurus aurocapillus	Ovenbird	G5/S4		
Seiurus motacilla	Louisiana Waterthrush	G5/S3		
Seiurus noveboracensis	Northern Waterthrush	G5/S4		
Setophaga ruticilla	American Redstart	G5/S2		
Vermivora celata	Orange-crowned Warbler	G5/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Vermivora chrysoptera	Golden-winged Warbler	G4/S3		
Vermivora crissalis	Colima Warbler	G3G4/S3		
Vermivora peregrine	Tennessee Warbler	G5/S4		
Vermivora pinus	Blue-winged Warbler	G5/S4		
Vermivora ruficapilla	Nashville Warbler	G5/S5		
Vermivora virginiae	Virginia's Warbler	G5/S3		
Wilsonia canadensis	Canada Warbler	G5/S4		
Wilsonia citrine	Hooded Warbler	G5/S5		
Wilsonia pusilla	Wilson's Warbler	G5/S4		
Passeridae				
Passer domesticus	House Sparrow	G5/Exotic		
Pelecanidae				
Pelecanus erythrorhynchos	American White Pelican	G3/S2		
Pelecanus occidentalis	Brown Pelican	G4/S3	Endangered	Endangered
Phaethontidae				
Phaethon aethereus	Red-billed Tropicbird	G5/No TX Record		
Phalacrocoracidae				
Phalacrocorax auritus	Double-crested Cormorant	G5/S3		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Phalacrocorax brasilianus	Neotropic Cormorant	G5/S4		
Phasianidae				
Meleagris gallopavo	Wild Turkey	G5/S5		
Phoenicopteridae				
Phoenicopterus ruber	Greater Flamingo	G3/No TX Record		
Picidae				
Colaptes auratus	Northern Flicker	G5/S3		
Melanerpes aurifrons	Golden-fronted Woodpecker	G5/S5		
Melanerpes carolinus	Red-bellied Woodpecker	G5/S5		
Melanerpes erythrocephalus	Red-headed Woodpecker	G5/S3		
Melanerpes formicivorus	Acorn Woodpecker	G5/S4		
Picoides pubescens	Downy Woodpecker	G5/S4		
Picoides scalaris	Ladder-backed Woodpecker	G5/S5		
Sphyrapicus nuchalis	Red-naped Sapsucker	G5/S3		
Sphyrapicus varius	Yellow-bellied Sapsucker	G5/No TX Record		
Podicipedidae				
Aechmophorus occidentalis	Western Grebe	G5/S3		
Podiceps auritus	Horned Grebe	G5/No Tx Record		
Podiceps nigricollis	Eared Grebe	G5/S3		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Podilymbus podiceps	Pied-billed Grebe	G5/S5		
Tachybaptus dominicus	Least Grebe	G5/S3		
Procellariidae				
Calonectris diomedea	Cory's Shearwater	G5/No TX Record		
Puffinus gravis	Greater Shearwater	G5/No TX Record		
Puffinus griseus	Sooty Shearwater	G5/No TX Record		
Puffinus lherminieri	Audubon's Shearwater	G4G5/No TX Record		
Puffinus puffinus	Manx Shearwater	G5/No TX Record		
Psittacidae				
Amazona viridigenalis	Red-crowned Parrot	G2/S2		
Aratinga holochlora	Green Parakeet	G3/S3		
Ptilogonatidae				
Phainopepla nitens	Phainopepla	G5/S4		
Ptilogonys cinereus	Gray Silky-flycatcher	No NS Record		
Rallidae				
Coturnicops noveboracensis	Yellow Rail	G4/No TX Record		
Fulica americana	American Coot	G5/S4		
Gallinula chloropus	Common Moorhen	G5/S4		
Laterallus jamaicensis	Black Rail	G4/S2		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Porphyrio martinica	Purple Gallinule	G5/S4		
Porzana carolina	Sora	G5/S3		
Rallus elegans	King Rail	G4/S3		
Rallus limicola	Virginia Rail	G5/S3		
Recurvirostridae				
Himantopus mexicanus	Black-necked Stilt	G5/S5		
Recurvirostra americana	American Avocet	G5/S4		
Regulidae				
Regulus calendula	Ruby-crowned Kinglet	G5/S5		
Regulus satrapa	Golden-crowned Kinglet	G5/No TX Record		
Remizidae				
Auriparus flaviceps	Verdin	G5/S4		
Scolopacidae				
Actitis macularia	Spotted Sandpiper	G5/S3		
Arenaria interpres	Ruddy Turnstone	G5/S5		
Bartramia longicauda	Upland Sandpiper	G5/S3		
Calidris alba	Sanderling	G5/S5		
Calidris alpine	Dunlin	G5/S4		
Calidris bairdii	Baird's Sandpiper	G5/S3		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Calidris canutus	Red Knot	G4/No TX Record		
Calidris ferruginea	Curlew Sandpiper	G5?/No TX Record		
Calidris fuscicollis	White-rumped Sandpiper	G5/S3		
Calidris himantopus	Stilt Sandpiper	G5/S3		
Calidris maritime	Purple Sandpiper	G5/No TX Record		
Calidris mauri	Western Sandpiper	G5/S5		
Calidris melanotos	Pectoral Sandpiper	G5/S4		
Calidris minutilla	Least Sandpiper	G5/S5		
Calidris pusilla	Semipalmated Sandpiper	G5/S5		
Catoptrophorus semipalmatus	Willet	G5/S5		
Gallinago delicate	Wilson's Snipe	No NS Record		
Heteroscelus incanus	Wandering Tattler	G5/No TX Record		
Limnodromus griseus	Short-billed Dowitcher	G5/S3		
Limnodromus scolopaceus	Long-billed Dowitcher	G5/S4		
Limosa fedoa	Marbled Godwit	G5/S4		
Limosa haemastica	Hudsonian Godwit	G4/S2		
Numenius americanus	Long-billed Curlew	G5/S3		
Numenius borealis	Eskimo Curlew	GH/SH	Endangered	Endangered
Numenius phaeopus	Whimbrel	G5/S4		
Phalaropus fulicarius	Red Phalarope	G5/No TX Record		
Phalaropus tricolor	Wilson's Phalarope	G5/S3		
Phalarupus lobatus	Red-necked Phalarope	G4G5/No TX Record		
Philomachus pugnax	Ruff	G5/No TX Record		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Scolopax minor	American Woodcock	G5/S2		
Tringa flavipes	Lesser Yellowlegs	G5/S5		
Tringa melanoleuca	Greater Yellowlegs	G5/S5		
Tringa solitaria	Solitary Sandpiper	G5/S5		
Tryngites subruficollis	Ruff-breasted Sandpiper	G4/S2		
Sittidae				
Sitta canadensis	Red-breasted Nutchatch	G5/S2		
Strigidae				
Asio flammeus	Short-eared Owl	G5/No TX Record		
Asio otus	Long-eared Owl	G5/S2		
Asio stygius	Stygian Owl	No NS Record		
Athene cunicularia	Burrowing Owl	G4/S3		
Bubo virginianus	Great Horned Owl	G5/S5		
Ciccaba virgata	Mottled Owl	No NS Record		
Glaucidium brasilianum	Ferruginous Pygmy-Owl	G5/S3		
Micrathene whitneyi	Elf Owl	G5/S4		
Otus asio	Eastern Screech-Owl	G5/S2		
Otus flammeolus	Flammulated Owl	G4/S3		
Strix varia	Barred Owl	G5/S5		
Sturnidae				

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Sturnus vulgaris	European Starling	G5/Exotic		
Sulidae				
Morus bassanus	Northern Gannet	G5/No TX Record		
Sula dactylatra	Masked Booby	G5/S3		
Sula leucogaster	Brown Booby	G5/No TX Record		
Sylviidae				
Polioptila caerulea	Blue-gray Gnatcatcher	G5/S3		
Polioptila melanura	Black-tailed Gnatcatcher	G5/S4		
Thraupidae				
Piranga bidentata	Flame-colored Tanager	No NS Record		
Piranga flava	Hepatic Tanager	G5/S4		
Piranga ludoviciana	Western Tanager	G5/S4		
Piranga olivacea	Scarlet Tanager	G5/S4		
Piranga rubra	Summer Tanager	G5/S5		
Threskiornithidae				
Eudocimus albus	White Ibis	G5/S4		
Platalea ajaja	Roseate Spoonbill	G5/S4		
Plegadis falcinellus	Glossy Ibis	G5/S3		
Plegadis chihi	White-faced Ibis	G5/S4	Threatened	

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Trochilidae				
Amazilia violiceps	Violet-crowned Hummingbird	G5/No TX Record		
Amazilia yucatanensis	Buff-bellied Hummingbird	G4/S3		
Anthracothorax prevostii	Green-breasted Mango	No NS Record		
Archilochus colubris	Ruby-throated Hummingbird	G5/S4		
Archilocus alexandri	Black-chinned Hummingbird	G5/S5		
Calypte anna	Anna's Hummingbird	G5/No TX Record		
Colibri thalassinus	Green Violet-ear	G5/S3		
Cynanthus latirostris	Broad-billed Hummingbird	G4/SH		
Hylocharis leucotis	White-eared Hummingbird	G5/No TX Record		
Lampornis clemenciae	Blue-throated Hummingbird	G5/S3		
Sealsphorus rufus	Rufous Hummingbird	G5/No TX Record		
Selasphorus platycercus	Broad-tailed Hummingbird	G5/S3		
Troglodytidae				
Campylorhynchus brunneicapillus	Cactus Wren	G5/S4		
Cistothorus palustris	Marsh Wren	G5/S4		
Cistothorus platensis	Sedge Wren	G5/S4		
Salpinctes obsoletus	Rock Wren	G5/S5		
Thryomanes bewickii	Bewick's Wren	G5/S5		
Thryothorus ludovicianus	Carolina Wren	G5/S5		
Troglodytes aedon	House Wren	G5/S2		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Troglodytes troglodytes	Winter Wren	G5/No TX Record		
Turdidae				
Catharus aurantiirostris	Orange-billed Nightingale-Thrush	No NS Record		
Catharus fuscescens	Veery	G5/No TX Record		
Catharus guttatus	Hermit Thrush	G5/S4		
Catharus mexicanus	Black-headed Nightingale-Thrush	No NS Record		
Catharus minimus	Gray-cheeked Thrush	G5/S4		
Catharus ustulatus	Swainson's Thrush	G5/S4		
Hylocichla mustelina	Wood Thrush	G5/S4		
Ixoreus naevius	Varied Thrush	G5/No TX Record		
Myadestes townsendi	Townsend's Solitaire	G5/No TX Record		
Oenanthe oenanthe	Northern Weatear	G5/No TX Record		
Sialia currucoides	Mountain Bluebird	G5/S3		
Sialia sialis	Eastern Bluebird	G5/S5		
Turdus assimilis	White-throated Robin	No NS Record		
Turdus grayi	Clay-colored Robin	G5/S2		
Turdus migratorius	American Robin	G5/S4		
Turdus rufopalliatus	Rufous-backed Robin	G5/No TX Record		
Tytonidae				
Tyto alba	Barn Owl	G5/S5		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Tyrannidae				
Camptostoma imberbe	Northern Beardless-Tyrannulet	G5/S3	Threatened	
Contopus cooperi	Olive-sided Flycatcher	G4/S3		
Contopus pertinax	Greater Pewee	G5/No TX Record		
Contopus sordidulus	Western Wood-Pewee	G5/S4		
Contopus virens	Eastern Wood-Pewee	G5/S4		
Empidonax alnorum	Alder Flycatcher	G5/S4		
Empidonax flaviventris	Yellow-bellied Flycatcher	G5/No TX Record		
Empidonax hammondii	Hammond's Flycatcher	G5/S3		
Empidonax minimus	Least Flycatcher	G5/S5		
Empidonax traillii	Willow Flycatcher	G5/S1		
Empidonax virescens	Acadian Flycatcher	G5/S4		
Legatus leucophaius	Piratic Flycatcher	No NS Record		
Myiarchus cineruscens	Ash-throated Flycatcher	G5/S3		
Myiarchus crinitus	Great Crested Flycatcher	G5/S4		
Myiarchus tuberculifer lawrencei	Dusky-capped Flycatcher	G5/No TX Record		
Myiarchus tyrannulus	Brown-crested Flycatcher	G5/S4		
Myiodynastes luteiventris	Sulphur-bellied Flycatcher	G5/No TX Record		
Myiozetetes similes	Social Flycatcher	No NS Record		
Pachyramphus aglaiae	Rose-throated Becard	G4G5/No Tx Record	Threatened	
Pitangus sulphuratus	Great Kiskadee	G5/S4		
Pyrocephalus rubinus	Vermilion Flycatcher	G5/S4		
Sayornis nigricans	Black Phoebe	G5/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Sayornis phoebe	Eastern Phoebe	G5/S4		
Sayornis saya	Say's Phoebe	G5/S4		
Tityra semifasciata	Masked Tityra	No NS Record		
Tyrannus couchii	Couch's Kingbird	G5/S4		
Tyrannus dominicensis	Gray Kingbird	G5/No TX Record		
Tyrannus forficatus	Scissor-tailed Flycatcher	G5/S3		
Tyrannus melancholicus	Tropical Kingbird	G5/S1		
Tyrannus savanna	Fork-tailed Flycatcher	No NS Record		
Tyrannus tyrannus	Eastern Kingbird	G5/S4		
Tyrannus verticalis	Western Kingbird	G5/S3		
Tyrannus vociferans	Cassin's Kingbird	G5/S3		
Vireonidae				
Vireo altiloquus	Black-whiskered Vireo	G5/No TX Record		
Vireo atricapillus	Black-capped Vireo	G2G3/S2	Endangered	Endangered
Vireo bellii	Bell's Vireo	G5/S3		
Vireo cassini	Cassin's Vireo	G5/No TX Record		
Vireo flavifrons	Yellow-throated Vireo	G5/S4		
Vireo flavoviridis	Yellow-green Vireo	G5/S2		
Vireo gilvus	Warbling Vireo	G5/S3		
Vireo griseus	White-eyed Vireo	G5/S5		
Vireo olivaceus	Red-eyed Vireo	G5/S5		
Vireo philadelphicus	Philadelphia Vireo	G5/S4		

Birds				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Vireo solitarius	Blue-headed Vireo	G5/No TX Record		

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Mammals				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
MARSUPIALS				
Didelphidae				
Didelphis virginiana californica	Virginia Opossum	G5/S5		
INSECTIVORES				
Soricidae				
Cryptotis parva berlandieri	Least Shrew	G5/S4		
BATS				
Molossidae				
Tadarida brasiliensis mexicana	Mexican Free-tailed Bat	No NS Record		
Mormoopidae				
Mormoops megalophylla	Peter's Ghost-faced Bat	G4/S2		
Phyllostomidae				
Choeronycteris mexicana	Mexican Long-tongued Bat	G4/S1		

Mammals				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Vespertilionidae				
Myotis velifer incautus	Cave Myotis	G5/S4		
Antrozous pallidus obscurus	Pallid Bat	G5/S5		
Eptesicus fuscus fuscus	Big Brown Bat	G5/S5		
Lasiurus borealis borealis	Red Bat	G5/S4		
Lasiurus cinereus cinereus	Hoary Bat	G5T5/No Ranking		
Lasiurus intermedius intermedius	Northern Yellow Bat	G4G5/S4		
Nycticeius humeralis mexicanus	Evening Bat	G5/S5		
Pipistrellus subflavus subflavus	Eastern Pipistrelle	No NS Record		
Molossidae				
Tadarida brasiliensis mexicana	Mexican Free-tailed Bat	No NS Record		
ARMADILLOS				
Dasypodidae				
Dasypus novemcinctus mexicanus	Nine-banded Armadillo	G5/S5		
HARES and RABBITS				
Leporidae				
Lepus californicus merriami	Black-tailed Jackrabbit	G5/S5		
Sylvilagus floridanus chapmani	Eastern Cottontail	G5/No TX Record		

Mammals				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
RODENTS				
Castoridae				
Castor canadensis mexicanus	Beaver	G5/S5		
Oryzomus palustris couesi	Coues' Rice Rat	No NS Record		
Cricetidae				
Baiomys taylori taylori	Northern Pygmy Mouse	G4G5/S4		
Neotoma micropus micropus	South Plains Wood Rat	G5/S5		
Peromyscus leucopus texanus	White-footed Mouse	G5/S5		
Reithrodontomys julvescens	Fulvous Harvest Mouse	G5/S5		
Sigmodon hispidus berlandieri	Hispid Cotton Rat	G5/S5		
Heteromyidae				
Chaetodipus hispidus hispidus	Hispid Pocket Mouse	G5/S5		
Liomys irroratus texensis	Mexican Spiny Pocket Mouse	G5/S3		
Muridae				
Mus musculus	House Mouse	G5/Exotic		
Rattus norvegicus	Norway Rat	G5/Exotic		
Rattus rattus	Black Rat	G5/Exotic		

Mammals				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Myocastoridae				
Myocastor coypus	Coypu	G5/Exotic		
Sciuridae				
Sciurus niger	Fox Squirrel	G5/S5		
Spermophilus mexicanus parvidens	Mexican Ground Squirrel	G5/S5		
CARNIVORES				
Canidae				
Canis latrans microdon	Coyote	G5/S5		
Urocyon cinereoargenteus scottii	Gray Fox	G5/S5		
Felidae				
Felis concolor	Mountain Lion	G5/S2		
Felis rufus texensis	Bobcat	G5/S5		
Felis yagouaroundi cacomitli	Jaguarundi	G4T3/S1	Endangered	Endangered
Leopardus pardalis albescens	Ocelot	G4/S1	Endangered	Endangered
Mephitidae				
Mephitis mephitis varians	Striped Skunk	G5/S5		
Spilogale putorius interrupta	Eastern Spotted Skunk	G5T4		

Mammals				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Mustelidae				
Mustela frenata frenata	Long-tailed Weasel	G5/S5		
Taxidea taxus berlandieri	Badger	G5T5/No TX Record		
Procyonidae				
Bassariscus astutus flavus	Ringtail	G5/S4		
Procyon lotor fuscipes	Raccoon	G5/S5		
HOOVED MAMMALS				
Suidae				
Sus scrofa	Feral Hog	G5/Exotic		
Tayassuidae				
Dicotyles (Tyassu) tajacu	Collared Peccary, Javelina	G5/S5		

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Reptiles				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**

TURTLES

Emydidae				
Terrapene ornata ornata	Ornate Box Turtle	G5T5/No TX Record		
Trachemys scripta elegans	Red-eared Slider	G5T5/No TX Record		
Kinosternidae				
Kinosternon flavescens flavescens	Yellow Mud Turtle	G5T5/No TX Record		
Testudinidae				
Gopherus berlandieri	Texas Tortoise	G4/T3	Threatened	
Trionychidae				
Trionyx (Apalone) spiniferus emoryi	Texas Spiny Softshell	G5T4/No ranking		

LIZARDS

Gekkonidae				
Hemidactylus turcicus	Mediterranean Gecko	G5/Exotic		
Phrynosomatidae				

Reptiles				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Phrynosoma cornutum	Texas Horned Lizard	G4G5/S4	Threatened	
Sceloporus olivaceus	Texas Spiny Lizard	G5/S5		
Sceloporus undulates consbrinus	Southern Prairie Lizard	G5T5/No ranking		
Sceloporus variabilis marmoratus	Rosebelly Lizard	G5T5/No ranking		
Sceloperus grammicus	Mesquite Lizard	No NS Record		
Polychrotidae				
Anolis carolinensis	Green Anole	G5/S5		
Scincidae				
Eumeces tetragrammus	Four-lined Skink	G5/S5		
Scincella lateralis	Ground Skink	G5/S5		
Teiidae				
Cnemidophorus gularis gularis	Texas Spotted Whiptail	No NS Record		
Cnemidophorus laredoensis	Laredo Striped Whiptail	No NS Record		

SNAKES

Colubridae				
Arizona elegans arenicola	Texas Glossy Snake	No NS Record		
Coluber constrictor oaxaca	Mexican Racer	G5T4/No ranking		
Coniophanes imperialis imperialis	Black-Striped Snake	G4G5T4?/No ranking	Threatened	

Reptiles				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Drymarchon corais erebennus	Texas Indigo Snake	G5T4/No ranking	Threatened	
Drymobius margaritiferus	Speckled Racer	No NS Record	Threatened	
Elaphe guttata emoryi	Great Plains Rat Snake	G5/No TX Record		
Ficimia streckeri	Mexican Hooknose Snake	G4/S4		
Masticophis flagellum testaceus	Western Coachwhip	G5/No TX Record		
Masticophis taeniatus ruthveni	Ruthven's Whipsnake	G5T5/No TX Record		
Nerodia rhombifera rhombifera	Diamondback Water Snake	G5T5/No TX Record		
Opheodrys aestivus majalis	Western Rough Green Snake	G5/S5		
Pituophis melanoleucus sayi	Bullsnake	No NS Record		
Salvadora grahamiae lineata	Texas Patchnose Snake	G5/S5		
Sonora semiannulata taylori	Taylor's Ground Snake	G5/No TX Record		
Sotoreria dekayi texana	Texas Brown Snake	No NS Record		
Thamnophis marcianus marcianus	Checkered Garter Snake	G5/S5		
Thamnophis proximus orarius	Gulf Coast Ribbon Snake	G5T4/No TX Record		
Elapidae				
Micrurus fulvius tenere	Texas Coral Snake	G5/S5		
Leptotyphlopidae				
Leptotyphlops dulcis dulcis	Plains Blind Snake	G5/S5		

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Amphibians				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Bufonidae				
Bufo marinus	Giant (Marine) Toad	G5/S2		
Bufo speciosus	Texas Toad	G5/S5		
Bufo valliceps valliceps	Gulf Coast Toad	No NS Record		
Hylidae				
Hyla cinerea	Green Treefrog	G5/S5		
Smilisca baudinii	Mexican Treefrog	G5/S3	Threatened	
Microhylidae				
Gastrophryne olivacea	Great Plains Narrowmouth Toad	G5/S5		
Hypopachus variolosus	Sheep Frog	G5/S2	Threatened	
Ranidae				
Rana berlandieri	Rio Grande Leopard Frog	G5/S5		
Salamandridae				
Notophthalmus meridionalis	Black-spotted Newt	G1/S1	Threatened	
Scaphiopodidae				
Scaphiopus couchii	Couch's Spadefoot	G5/S5		

Amphibians				
Scientific Name	**Common Name**	**Natureserve Rankings**	**State Status**	**Federal Status**
Syrrhophus cystignathoides campi	Rio Grande Chirping Frog	No NS Record		
		Sirenidae		
Siren intermedia texana	Rio Grande Lesser Siren	G5/S5		

Butterflies

Scientific Name	Common Name	Natureserve Rankings	
Achalarus jalapus	Jalapus Cloudywing	No NS record	
Achalarus toxeus	Coyote Cloudywing	G5/SNR/SU	
Achlyodes pallida	Pale Sicklewing	No NS record	
Achlyodes thraso	Sickle-winged Skipper	No NS record	
Adelpha basiloides	Spot-celled Sister	No NS record	
Adelpha bredowii	California Sister	G5/SNR/SU	
Adelpha fessonia	Band-celled Sister	G5/No TX record	
Agraulis vanillae	Gulf Fritillary	G5/SNR/SU	
Aguna asander	Gold-spotted Aguna	No NS record	
Aguna claxon	Emerald Aguna	No NS record	
Aguna metophis	Tailed Aguna	No NS record	
Allosmaitia strophius	Strophius Hairstreak	No NS record	
Amblyscirtes celia	Celia's Roadside-Skipper	G4/S4	
Amblyscirtes eos	Dotted Roadside-Skipper	G5/SNR/SU	
Amblyscirtes nysa	Nysa Roadside-Skipper	G5/SNR/SU	
Anaea (Memphis) forreri	Guatemalan Leafwing	No NS record	1st. U.S. Record 11/17/07
Anaea aidea	Tropical Leafwing	No NS record	
Anaea andria	Goatweed Leafwing	G5/SNR/SU	
Anaea glycerium	Angled Leafwing	G5/SNR/SU	
Anaea pithyusa	Pale-spotted Leafwing	No NS record	
Anartia fatima	Banded Peacock	No NS record	
Anartia jatrophae	White Peacock	G5/SNR/SU	
Anastrus sempiternus	Common Bluevent	No NS record	

Butterflies			
Scientific Name	**Common Name**	**Natureserve Rankings**	
Anatrytone logan	Delaware Skipper	G5/SNR/SU	
Anatrytone mazai	Glowing Skipper	No NS record	
Ancyloxypha arene	Tropical Least Skipper	G5/SNR/SU	
Ancyloxypha numitor	Least Skipper	G5/SNR/SU	
Anteos clorinde	White Angled-Sulphur	No NS record	
Anteos maerula	Yellow Angled-Sulphur	No NS record	
Anthocharis midea	Falcate Orangetip	G4G5/S4	
Antigonus erosus	Dusted Spurwing	No NS record	
Apodemia multiplaga	Narrow-winged Metalmark	No NS record	
Apodemia walkeri	Walker's Metalmark	No NS record	
Appias drusilla	Florida White	G5/No TX record	
Archaeoprepona demophon	One-spotted Prepona	No NS record	1st. U.S. Record 11/18/07
Arteurotia tractipennis	Starred Skipper	No NS record	
Ascia monuste	Great Southern White	G5/SNR/SU	
Asterocampa celtis	Hackberry Emperor	G5/SNR/SU	
Asterocampa clyton	Tawny Emperor	G5/SNR/SU	
Asterocampa leilia	Empress Leilia	G5/SNR/SU	
Astraptes alardus	Frosted Flasher	No NS record	
Astraptes anaphus	Yellow-tipped Flasher	No NS record	
Astraptes egregius	Small-spotted Flasher	No NS record	
Astraptes fulgerator	Two-barred Flasher	No NS record	
Astraptes gilberti	Gilbert's Flasher	No NS record	
Atalopedes campestris	Sachem	G5/SNR/SU	

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Atlides halesus	Great Purple Hairstreak	G5/SNR/SU
Battus philenor	Pipevine Swallowtail	G5/S5
Battus polydamas	Polydamas Swallowtail	G5/No TX record
Biblis hyperia	Red Rim	No NS record
Bolla brennus	Obscure Bolla	No NS record
Bolla clytius	Mottled Bolla	No NS record
Brephidium exile	Western Pygmy-Blue	G5/SNR/SU
Cabares potrillo	Potrillo Skipper	G4G5/SNR/SU
Calephelis nemesis	Fatal Metalmark	G5/SNR/SU
Calephelis perditalis	Rounded Metalmark	G3G4/SNR/SU
Calephelis rawsoni	Rawson's Metalmark	G4/SNR/SU
Callophrys xami	Xami Hairstreak	G4/SNR/SU
Calpodes ethlius	Brazilian Skipper	G5/SNR/SU
Calycopis isobeon	Dusky-blue Groundstreak	G5/SNR/SU
Caria ino	Red-bordered Metalmark	G5/SNR/SU
Carrhenes canescens	Hoary Skipper	No NS record
Catasticta nimbice	Mexican Dartwhite	No NS record
Celaenorrhinus fritzgaertneri	Fritzgaertner's Flat	No NS record
Celaenorrhinus stallingsi	Stallings' Flat	No NS record
Celotes nessus	Common Streaky-Skipper	G5/SNR/SU
Chioides catillus	White-striped Longtail	No NS record
Chioides zilpa	Zilpa Longtail	No NS record
Chiomara asychis	White-patched Skipper	G5/SNR/SU

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Chlorostrymon simaethis	Silver-banded Hairstreak	G5/SNR/SU
Chlorostrymon telea	Telea Hairstreak	No NS record
Chlosyne definita	Definite Patch	G3G4/SNR/SU
Chlosyne ehrenbergii	White-rayed Patch	No NS record
Chlosyne endeis	Banded Patch	GN4/No TX Record
Chlosyne janais	Crimson Patch	No NS record
Chlosyne lacinia	Bordered Patch	G5/SNR/SU
Chlosyne marina	Red-spotted Patch	No NS record
Chlosyne rosita	Rosita Patch	No NS record
Chlosyne theona	Theona Checkerspot	G5/SNR/SU
Codatractus alcaeus	White-crescent Longtail	No NS record
Cogia calchas	Mimosa Skipper	G5/SNR/SU
Cogia hippalus	Acacia Skipper	G5/SNR/SU
Cogia outis	Outis Skipper	G3G4/SNR/SU
Colias cesonia	Southern Dogface	No NS record
Colias eurytheme	Orange Sulphur	G5/S5
Conga chydaea	Hidden Ray Skipper	No NS record
Copaeodes aurantiacus	Orange Skipperling	G5/S5
Copaeodes minimus	Southern Skipperling	G5/S5
Corticea corticea	Redundant Skipper	No NS record
Cupido (Everes) comyntas	Eastern Tailed-Blue	G5/SNR/SU
Cyanophrys goodsoni	Goodson's Greenstreak	G3G5/No TX record
Cyanophrys herodotus	Tropical Greenstreak	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Cyanophrys miserabilis	Clench's Greenstreak	G4/SNR/SU
Cyllopsis gemma	Gemmed Satyr	G5/S5
Cymaenes odilia	Fawn-spotted Skipper	No NS record
Danaus eresimus	Soldier	G5/SNR/SU
Danaus gilippus	Queen	G5/SNR/SU
Danaus plexippus	Monarch	G5/S4
Decinea percosius	Double-dotted Skipper	G1G3/SNR/SU
Dione moneta	Mexican Silverspot	No NS record
Dircenna klugii	Klug's Clearwing	No NS record
Doxocopa laure	Silver Emperor	No NS record
Doxocopa pavon	Pavon Emperor	No NS record
Dryadula phaetusa	Banded Orange Heliconian	No NS record
Dryas iulia	Julia Heliconian	G5/SNR/SU
Dymasia dymas	Tiny Checkerspot	G5/SNR/SU
Dynamine dyonis	Blue-eyed Sailor	No NS record
Dynamine postverta	Four-spotted Sailor	No NS record
Electrostrymon canus	Muted Hairstreak	No NS record
Electrostrymon sangala	Ruddy Hairstreak	G5/SNR/SU
Emesis emesia	Curve-winged Metalmark	No NS record
Emesis tenedia	Falcate Metalmark	G5/No TX record
Enantia albania	Costa-spotted Mimic-White	No NS record
Epargyreus clarus	Silver-spotted Skipper	G5/SNR/SU
Epargyreus exadeus	Broken Silverdrop	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Epiphile adrasta	Common Banner	No NS record
Erynnis funeralis	Funereal Duskywing	G5/SNR/SU
Erynnis horatius	Horace's Duskywing	G5/SNR/SU
Erynnis tristis	Mournful Duskywing	G5/SNR/SU
Eueides isabella	Isabella's Heliconian	No NS record
Eunica monima	Dingy Purplewing	G5/No TX record
Eunica tatila	Florida Purplewing	G5/No TX record
Euphyes vestris	Dun Skipper	G5/SNR/SU
Euptoieta claudia	Variegated Fritillary	G5/S5
Euptoieta hegesia	Mexican Fritillary	No NS record
Eurema albula	Ghost Yellow	No NS record
Eurema boisduvaliana	Boisduval's Yellow	No NS record
Eurema daira	Barred Yellow	G5/No TX record
Eurema dina	Dina Yellow	No NS record
Eurema lisa	Little Yellow	No NS record
Eurema mexicana	Mexican Yellow	G5/SNR/SU
Eurema nicippe	Sleepy Orange	No NS record
Eurema nise	Mimosa Yellow	No NS record
Eurema proterpia	Tailed Orange	No NS record
Eurema salome	Salome Yellow	No NS record
Eurytides philolaus	Dark Kite-Swallowtail	No NS record
Feniseca tarquinius	Harvester	G4/SNR/SU
Ganyra josephina	Giant White	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Gesta gesta	False Duskywing	G5/SNR/SU
Gorgythion begga	Variegated Skipper	No NS record
Grais stigmatica	Hermit Skipper	No NS record
Greta morgane	Thick-tipped Greta	No NS record
Hamadryas amphinome	Red Cracker	No NS record
Hamadryas februa	Gray Cracker	No NS record
Hamadryas feronia	Variable Cracker	No NS record
Hamadryas guatemalena	Guatemalan Cracker	No NS record
Heliconius charithonia	Zebra Heliconian	G5/SNR/SU
Heliconius erato	Erato Heliconian	No NS record
Heliopetes arsalte	Veined White-Skipper	No NS record
Heliopetes domicella	Erichson's White Skipper	No NS record
Heliopetes laviana	Laviana White-Skipper	G5/SNR/SU
Heliopetes macaira	Turk's-cap White-Skipper	G5/SNR/SU
Heliopetes sublinea	East-Mexican White-Skipper	No NS record
Hemiargus ceraunus	Ceraunus Blue	G5/SNR/SU
Hemiargus isola	Reakirt's Blue	No NS record
Hermeuptychia sosybius	Carolina Satyr	G5/SNR/SU
Hesperopsis alpheus	Saltbush Sootywing	G4/SNR/SU
Hylephila phyleus	Fiery Skipper	G5/SNR/SU
Hypanartia lethe	Orange Mapwing	No NS record
Hypolimnas misippus	Mimic	No NS record
Itaballia demophile	Cross-barred White	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Junonia coenia	Common Buckeye	G5/S5
Junonia evarate	Mangrove Buckeye	G4G5/SNR/SU
Junonia genoveva	Tropical Buckeye	G5/SNR/SU
Kricogonia lyside	Lyside Sulphur	G5/SNR/SU
Lasaia sula	Blue Metalmark	G5/SNR/SU
Leptophobia aripa	Common Greeneyed-White	No NS record
Leptotes cassius	Cassius Blue	G5/SNR/SU
Leptotes marina	Marine Blue	G5/No TX record
Lerema accius	Clouded Skipper	G5/S5
Lerema liris	Liris Skipper	No NS record
Lerodea arabus	Violet-clouded Skipper	G5/SNR/SU
Lerodea dysaules	Olive-clouded Skipper	No NS record
Lerodea eufala	Eufala Skipper	G5/S5
Libytheana carinenta	American Snout	G5/SNR/SU
Limenitis archippus	Viceroy	G5/SNR/SU
Limenitis arthemis	Red-spotted Admiral	G5/SNR/SU
Lycorea cleobaea	Tiger Mimic-Queen	No NS record
Marpesia chiron	Many-banded Daggerwing	G5/No TX record
Marpesia coresia	Waiter Daggerwing	No NS record
Marpesia petreus	Ruddy Daggerwing	G5/No TX record
Megathymus yuccae	Yucca Giant-Skipper	G5/SNR/SU
Melanis pixe	Red-bordered Pixie	G5/SNR/SU
Melete lycimnia isandra	Common Melwhite	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Mestra amymone	Common Mestra	G5/SNR/SU
Microtia elva	Elf	No NS record
Ministrymon azia	Gray Ministreak	G5/No TX record
Ministrymon clytie	Clytie Ministreak	G5/SNR/SU
Monca tyrtaeus	Violet-patched Skipper	G4?/SNR/SU
Myscelia cyananthe	Blackened Bluewing	No NS record
Myscelia ethusa	Mexican Bluewing	G5/SNR/SU
Nastra lherminier	Swarthy Skipper	G5/SNR/SU
Nastra julia	Julia's Skipper	G5/SNR/SU
Nathalis iole	Dainty Sulphur	G5/SNR/SU
Nisoniades rubescens	Purplish-black Skipper	No NS record
Noctuana stator	Red-studded Skipper	No NS record
Nyctelius nyctelius	Violet-banded Skipper	No NS record
Nymphalis antiopa	Mourning Cloak	G5/SNR/SU
Ocaria ocrisia	Black Hairstreak	No NS record
Oenomaus ortygnus	Aquamarine Hairstreak	No NS record
Panoquina fusina	Evans' Skipper	No NS record
Panoquina hecebola	Hecebolus Skipper	No NS record
Panoquina ocola	Ocola Skipper	G5/SNR/SU
Panoquina panoquinoides	Obscure Skipper	G5/SNR/SU
Panoquina sylvicola	Purple-washed Skipper	No NS record
Papilio anchisiades	Ruby-spotted Swallowtail	G5/SNR/SU
Papilio astyalus	Broad-banded Swallowtail	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Papilio cresphontes	Giant Swallowtail	G5/SNR/SU
Papilio garamas	Magnificent Swallowtail	No NS record
Papilio glaucus	Eastern Tiger Swallowtail	G5/SNR/SU
Papilio ornythion	Ornythion Swallowtail	No NS record
Papilio palamedes	Palamedes Swallowtail	G4/SNR/SU
Papilio pharnaces	Pink-spotted Swallowtail	No NS record
Papilio pilumnus	Three-tailed Swallowtail	No NS record
Papilio polyxenes	Black Swallowtail	G5/S5
Papilio thoas	Thoas Swallowtail	No NS record
Papilio victorinus	Victorine Swallowtail	No NS record
Pellicia angra	Confused Pellicia	No NS record
Pellicia arina	Glazed Pellicia	No NS record
Pellicia dimidiata	Morning Glory Pellicia	No NS record
Perichares philetes	Green-backed Ruby-eye	No NS record
Phocides belus	Beautiful Beamer	No NS record
Phocides polybius	Guava Skipper	No NS record
Phoebis agarithe	Large Orange Sulphur	G5/SNR/SU
Phoebis neocypris	Tailed Sulphur	No NS record
Phoebis philea	Orange-barred Sulphur	G5/SNR/SU
Phoebis sennae	Cloudless Sulphur	G5/SNR/SU
Phoebis statira	Statira Sulphur	No NS record
Pholisora catullus	Common Sootywing	G5/SNR/SU
Pholisora mejicana	Mexican Sootywing	G5/No TX record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Phyciodes argentea	Chestnut Crescent	No NS record
Phyciodes phaon	Phaon Crescent	G5/SNR/SU
Phyciodes ptolyca	Black Crescent	No NS record
Phyciodes texana	Texan Crescent	G5/SNR/SU
Phyciodes tharos	Pearl Crescent	G5/SNR/SU
Phyciodes tulcis	Pale-banded Crescent	No NS record
Phyciodes vesta	Vesta Crescent	No NS record
Pieriballia viardi	Painted White	No NS record
Pieris rapae	Cabbage White	G5/Exotic
Polites vibex	Whirlabout	G5/SNR/SU
Polygonia interrogationis	Question Mark	G5/S5
Polygonus leo	Hammock Skipper	No NS record
Polygonus manueli	Manuel's Skipper	No NS record
Polythrix mexicanus	Mexican Longtail	No NS record
Polythrix octomaculata	Eight-spotted Longtail	No NS record
Pontia protodice	Checkered White	G4/S4
Proteides mercurius	Mercurial Skipper	No NS record
Pteronymia cotytto	Broad-tipped Clearwing	No NS record
Pyrgus albescens	White Checkered-Skipper	G5/SNR/SU
Pyrgus communis	Common Checkered-Skipper	G5/S5
Pyrgus oileus	Tropical Checkered-Skipper	G5/SNR/SU
Pyrgus philetas	Desert Checkered-Skipper	G5/SNR/SU
Quasimellana eulogius	Common Mellana	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Rekoa marius	Marius Hairstreak	No NS record
Rekoa palegon	Gold-bordered Hairstreak	No NS record
Rekoa stagira	Smudged Hairstreak	No NS record
Rhinthon osca	Osca Skipper	No NS record
Satyrium favonius	Oak Hairstreak	G4/SNR/SU
Siderus tephraeus	Pearly-gray Hairstreak	No NS record
Siproeta epaphus	Rusty-tipped Page	No NS record
Siproeta stelenes	Malachite	G5/No TX record
Smyrna blomfildia	Blomfild's Beauty	No NS record
Sostrata bifasciata	Blue-Studded Skipper	No NS record
Spathilepia clonius	Falcate Skipper	No NS record
Stallingsia maculosa	Manfreda Giant-Skipper	No NS record
Staphylus ceos	Golden-headed Scallopwing	G5/SNR/SU
Staphylus hayhurstii	Hayhurst's Scallopwing	G5/SNR/SU
Staphylus mazans	Mazan's Scallopwing	G5/S4
Strymon albata	White Scrub-Hairstreak	No NS record
Strymon alea	Lacey's Scrub-Hairstreak	G3G4/SNR/SU
Strymon bazochii	Lantana Scrub-Hairstreak	G5/No TX record
Strymon bebrycia	Red-lined Scrub-Hairstreak	No NS record
Strymon cestri	Tailless Scrub-Hairstreak	No NS record
Strymon istapa	Mallow Scrub-Hairstreak	G5/SNR/SU
Strymon melinus	Gray Hairstreak	G5/SNR/SU
Strymon rufofusca	Red-crescent Scrub-Hairstreak	No NS record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Strymon yojoa	Yojoa Scrub-Hairstreak	No NS record
Synapte malitiosa	Malicious Skipper	No NS record
Synapte salenus	Salenus Skipper	No NS record
Systasea pulverulenta	Texas Powdered-Skipper	G5/SNR/SU
Temenis laothoe	Orange Banner	No NS record
Texola elada	Elada Checkerspot	G5/SNR/SU
Thespieus macareus	Chestnut-marked Skipper	No NS record
Thorybes pylades	Northern Cloudywing	G5/SNR/SU
Timochares ruptifasciatus	Brown-banded Skipper	G5/SNR/SU
Tmolus echion	Red-spotted Hairstreak	G5/No TX record
Typhedanus undulatus	Mottled Longtail	No NS record
Urbanus belli	Double-striped Longtail	No NS record
Urbanus dorantes	Dorantes Longtail	G5/SNR/SU
Urbanus doryssus	White-tailed Longtail	No NS record
Urbanus esmeraldus	Esmeralda Longtail	No NS record
Urbanus evona	Turquoise Longtail	No NS record
Urbanus procne	Brown Longtail	G5/SNR/SU
Urbanus pronus	Pronus Longtail	No NS record
Urbanus proteus	Long-tailed Skipper	G5/SNR/SU
Urbanus simplicius	Plain Longtail	No NS record
Urbanus tanna	Tanna Longtail	No NS record
Urbanus teleus	Teleus Longtail	G5/SNR/SU
Vanessa annabella	West Coast Lady	G5/No TX record

Butterflies		
Scientific Name	**Common Name**	**Natureserve Rankings**
Vanessa atalanta	Red Admiral	G5/S5
Vanessa cardui	Painted Lady	G5/S5
Vanessa virginiensis	American Lady	G5/S5
Vettius fantasos	Fantastic Skipper	No NS record
Vidius perigenes	Pale-rayed Skipper	G5/SNR/SU
Wallengrenia otho	Southern Broken-Dash	G5/S5
Xenophanes tryxus	Glassy-winged Skipper	No NS record
Ziegleria guzanta	Orange-crescent Groundstreak	GNR/SNR/SU
Zizula cyna	Cyna Blue	G4G5/SNR/SU

Damsel Flys			
Scientific Name	**Common Name**	**Status**	**County**
Damselflies			
Acanthagrion quadratum	Mexican Wedgetail	G5/SNR/SU	C
Argia apicalis	Blue-fronted Dancer	G5/SNR/SU	C, H, S
Argia immunda	Kiowa Dancer	G5/SNR/SU	C, H, S
Argia moesta	Powdered Dancer	G5/SNR/SU	C, H, S
Argia plana	Springwater Dancer	No NS record for TX	C
Argia rhoadsi	Golden-winged Dancer	G3/SNR/SU	C, H
Argia sedula	Blue-ringed Dancer	G5/SNR/SU	C, H, S
Argia translata	Dusky Dancer	G5/SNR/SU	C, H
Enallagma basidens	Double-striped Bluet	G5/SNR/SU	C, H, S
Enallagma civile	Familiar Bluet	G5/SNR/SU	C, H, S
Enallagma durum	Big Bluet	G5/SNR/SU	C, H, S
Enallagma novaehispaniae	Neotropical Bluet	G5/SNR/SU	C, H, S
Enallagma signatum	Orange Bluet	G5/SNR/SU	C, H, S
Hetaerina americana	American Rubyspot	G5/SNR/SU	C, H, S
Hetaerina titia	Smokey Rubyspot	G5/SNR/SU	C, H, S
Ischnura hastata	Citrine Forktail	G5/SNR/SU	C, H, S
Ischnura posita	Fragile Forktail	G5/SNR/SU	C, H
Ischnura ramburii	Rambur's Forktail	G5/SNR/SU	C, H, S
Leptobasis melinogaster	Cream-tipped Swampdamsel	No NS record	C, H

Damsel Flys			
Scientific Name	**Common Name**	**Status**	**County**
Lestes alacer	Plateau Spreadwing	G5/SNR/SU	C, H
Lestes australis	Southern Spreadwing	G5/SNR/SU	C, H
Lestes forficula	Rainpool Spreadwing	G5/SNR/SU	C, H, S
Lestes sigma	Chalky Spreadwing	G5/SNR/SU	C, H, S
Neoerythromma cultellatum	Caribbean Yellowface	G5/No TX record	C, H
Neoneura aaroni	Coral-fronted Threadtail	G4?/SNR/SU	H
Neoneura amelia	Amelia's Threadtail	G4?/SNR/SU	C, H
Protoneura cara	Orange-striped Threadtail	G4?/SNR/SU	H
Telebasis salva	Desert Firetail	G5/SNR/SU	C, H
Dragonflies			
Anax amazili	Amazon Darner	G5/SNR/SU	C, H
Anax concolor	Blue-spotted Comet Darner	No NS record	H
Anax longipes	Comet Darner	G5/SNR/SU	C, H
Aphylla angustifolia	Broad-striped Forceptail	G4/SNR/SU	C, H, S
Aphylla protracta	Narrow-striped Forceptail	G5/SNR/SU	C, H, S
Brachymesia furcata	Red-tailed Pennant	G5/SNR/SU	C, H, S
Brachymesia gravida	Four-spotted Pennant	G5/SNR/SU	C, H, S
Brachymesia herbida	Tawny Pennant	G5/SNR/SU	C, H, S
Brechmorhoga mendax	Pale-faced Clubskimmer	G5/SNR/SU	H
Cannaphila insularis funerea	Gray-waisted Skimmer	G5/SNR/SU	C, H
Celithemis eponina	Halloween Pennant	G5/SNR/SU	C, H

Damsel Flys			
Scientific Name	**Common Name**	**Status**	**County**
Coryphaeschna adnexa	Blue-faced Darner	G5/SNR/SU	C, H
Coryphaeschna ingens	Regal Darner	G5/SNR/SU	C
Dromongomphus spoliatus	Flag-tailed Spinyleg	No NS record	C, H, S
Dythemis fugax	Checkered Setwing	G5/SNR/SU	C, H
Dythemis nigrescens	Black Setwing	G5/SNR/SU	C, H, S
Dythemis velox	Swift Setwing	G5/SNR/SU	H, S
Epitheca (Epicordulia) princeps	Prince Bakettail	G5/SNR/SU	C, H, S
Erpetogomphus designatus	Eastern Ringtail	G5/SNR/SU	H, S
Erythemis mithroides	Claret Pondhawk	No NS record	C, H
Erythemis plebeja	Pin-tailed Pondhawk	G5/SNR/SU	C, H, S
Erythemis simplicicollis simplicicollis	Eastern Pondhawk	G5/SNR/SU	C, H, S
Erythemis vesiculosa	Great Pondhawk	G5/SNR/SU	C, H, S
Erythrodiplax berenice	Seaside Dragonlet	G5/SNR/SU	C, H
Erythrodiplax minuscula	Little Blue Dragonlet	G5/SNR/SU	C, H
Erythrodiplax umbrata	Band-winged Dragonlet	G5/SNR/SU	C, H, S
Gomphus gonzalezi	Tamaulipan Clubtail	G2/SNR/SU	C, H, S
Gomphus militaris	Sulphur-tipped Clubtail	G5/SNR/SU	C, H, S
Gynacantha mexicana	Bar-sided Darner	No NS record	C, H
Libellula comanche	Comanche Skimmer	G5/SNR/SU	H
Libellula croceipennis	Neon Skimmer	G5/SNR/SU	S
Libellula needhami	Needham's Skimmer	G5/SNR/SU	C, H, S
Libellula pulchella	Twelve-spotted Skimmer	G5/SNR/SU	C, H

Damsel Flys			
Scientific Name	**Common Name**	**Status**	**County**
Libellula saturata	Flame Skimmer	G5/SNR/SU	H, S
Macrodiplax balteata	Marl Pennant	G5/SNR/SU	C, H, S
Macromia annulata	Bronzed River Cruiser	G5/SNR/SU	H
Macrothemis inacuta	Straw-colored Sylph	G5/SNR/SU	C, H, S
Miathyria marcella	Hyacinth Glider	G5/SNR/SU	C, H, S
Micrathyria aequalis	Spot-tailed Dasher	G5/SNR/SU	C, H
Micrathyria didyma	Three-striped Dasher	G5/SNR/SU	C, H
Micrathyria hagenii	Thornbush Dasher	G5/SNR/SU	C, H, S
Orthemis discolor	Carmine Skimmer	G5/SNR/SU	C, H
Orthemis ferruginea	Roseate Skimmer	G5/SNR/SU	C, H, S
Pachydiplax longipennis	Blue Dasher	G5/SNR/SU	C, H, S
Pantala flavescens	Wandering Glider	G5/SNR/SU	C, H, S
Pantala hymenaea	Spot-winged Glider	G5/SNR/SU	C, H, S
Perithemis domitia	Slough Amberwing	G5/SNR/SU	C, H
Perithemis tenera	Eastern Amberwing	G5/SNR/SU	C, H, S
Phyllocycla breviphylla	Ringed Forceptail	No NS record	H, S
Phyllogomphoides albrighti	Five-striped Leaftail	G4/SNR/SU	C, H, S
Plathemis lydia	Common Whitetail	G5/SNR/SU	H
Pseudoleon superbus	Filigree Skimmer	G5/SNR/SU	C, H, S
Rhionaeschna dugesi	Arroyo Darner	G4/SNR/SU	C, H
Rhionaeschna psilus	Turquoise-tipped Darner	G5/SNR/SU	C, H, S
Stylurus plagiatus	Russet-tipped Clubtail	G5/SNR/SU	H, S

Damsel Flys			
Scientific Name	**Common Name**	**Status**	**County**
Sympetrum corruptum	Variegated Meadowhawk	G5/SNR/SU	C, H, S
Tauriphila azteca	Aztec Glider	G4/SNR/SU	C
Tholymis citrina	Evening Skimmer	G5/SNR/SU	C, H
Tramea abdominalis	Vermilion Saddlebags	No NS TX record	H
Tramea calverti	Striped Saddlebags	G5/SNR/SU	C, H, S
Tramea lacerata	Black Saddlebags	G5/SNR/SU	C, H, S
Tramea onusta	Red Saddlebags	G5/SNR/SU	C, H, S
Triacanthagyna septima	Pale-green Darner	No NS record	C, H

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APPENDIX E

Biological Resources Plan

BIOLOGICAL RESOURCES PLAN

FOR

CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE

FOR

RIO GRANDE VALLEY SECTOR, TEXAS

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL RIO GRANDE VALLEY SECTOR

Prepared by

Solutions Today for a Sustainable Tomorrow

JULY 2008

Abbreviations and Acronyms

BMP	Best Management Practice
BRP	Biological Resources Plan
CBP	U.S. Customs and Border Protection
DHS	U.S. Department of Homeland Security
ESA	Endangered Species Act
ESP	Environmental Stewardship Plan
FM	Farm-to-Market road
FR	Federal Register
GIS	Geographic Information System
GPS	Global Positioning System
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act
LRGVNWR	Lower Rio Grande Valley National Wildlife Refuge
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	miles per hour
NLCD	National Land Cover Data
OBP	Office of Border Patrol
PCE	Primary constituent element
POE	Ports of Entry
ROW	right of way
SWPPP	Storm Water Pollution Prevention Plan
TPWD	Texas Parks and Wildlife Department
TxDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USIBWC	U.S. International Boundary and Water Commission
WMA	Wildlife Management Area
WOUS	Waters of the United States

EXECUTIVE SUMMARY

The U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), U.S. Border Patrol (USBP) plans to construct, operate, and maintain approximately 70 miles of tactical infrastructure in 21 sections in the USBP Rio Grande Valley Sector. Customs and Border Protection plans to install and operate tactical infrastructure consisting of primary pedestrian fence (including picket, bollard, floating, and concrete flood protection structure/concrete fence), concrete retaining wall, and access and patrol roads along the U.S./Mexico international border in Starr, Hidalgo, and Cameron counties, Texas. There are 17 federally listed species that are known to occur, or that could occur, within or adjacent to the project area (see **Tables ES-1**, **ES**–**2**, and **ES-3**). Additionally, two of the listed species have designated critical habitat in the project area. The species and habitats listed in **Tables ES**–**1**, **ES**–**2**, and **ES-3** are known to occur within 25 miles of the border in Starr, Hidalgo, and Cameron counties.

Table ES-1. Federally Listed Species and Critical Habitats Within Starr County and the Determination of Effects Resulting from the Project

Species	Listing/Critical Habitat Designated	Determination of Effect
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Likely to adversely affect
Least tern, *Sterna antillarum*	Endangered	No effect
Piping plover, *Charadrius melodus*	Endangered	No effect
Piping plover, critical habitat	Designated	No effect
Ashy dogweed, *Thymophylla tephroleuca*	Endangered	No effect
Johnston's frankenia, *Frankenia johnstonii*	Endangered	Not likely to adversely affect
Star cactus, *Astrophytum asterias*	Endangered	Not likely to adversely affect
Walker's manioc, Manihot walkerae	Endangered	Not likely to adversely affect
Zapata bladderpod, *Lesquerella thamnophila*	Endangered	Likely to adversely affect
Zapata bladderpod, critical habitat	Designated	Likely to adversely affect

Table ES-2. Federally Listed Species and Critical Habitats Within Hidalgo County and the Determination of Effects Resulting from the Project

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, Herpailurus yagouaroundi cacomitli	Endangered	Likely to adversely affect
Northern aplomado falcon*, Falco femoralis septentrionalis*	Endangered	No effect
Star cactus, *Astrophytum asterias*	Endangered	No effect
Piping plover, *Charadrius melodus*	Endangered	No effect
Piping plover, critical habitat	Designated	No effect
Texas ayenia, *Ayenia limitaris*	Endangered	Not likely to adversely affect
Walker's manioc, *Manihot walkerae*	Endangered	Not likely to adversely affect

Table ES-3. Federally Listed Species and Critical Habitats Within Cameron County and the Determination of Effects Resulting from the Project

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Likely to adversely affect
Brown pelican, *Pelecanus occidentalis*	Endangered	No effect
Northern aplomado falcon, *Falco femoralis septentrionalis*	Endangered	No effect
Hawksbill sea turtle, *Eretmochelys imbricata*	Endangered	No effect
Kemp's Ridley sea turtle, *Lepidochelys kempii*	Endangered	No effect
Leatherback sea turtle, *Dermochelys coriacea*	Endangered	No effect
South Texas ambrosia, *Ambrosia cheiranthifolia*	Endangered	Not likely to adversely affect
Texas ayenia, *Ayenia limitaris*	Endangered	Not likely to adversely affect
Piping plover, *Charadrius melodus*	Threatened	No effect
Piping plover critical habitat	Designated	No effect
Green sea turtle, *Chelonia mydas*	Threatened	No effect
Loggerhead sea turtle, *Caretta caretta*	Threatened	No effect

Based upon the information provided regarding the tactical infrastructure sections, no effects are anticipated for the least tern, the piping plover, piping plover critical habitat, and the ashy dogweed in Starr County; the star cactus, the Northern aplomado falcon, the piping plover, and piping plover critical habitat in Hidalgo County; and the brown pelican, the Northern aplomado falcon, the hawksbill sea turtle, the Kemp's ridley sea turtle, the leatherback sea turtle, the piping plover, piping plover critical habitat, the green sea turtle, and the loggerhead sea turtle in Cameron County. Therefore, those species and habitats are not discussed in detail in this Biological Resources Plan (BRP).

On April 1, 2008, the Secretary of DHS, pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure expeditious construction of tactical infrastructure along the U.S./Mexico international border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under these laws, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment. To that end, CBP has prepared the following BRP, which analyzes the potential impacts on threatened and endangered species associated with construction of tactical infrastructure in the USBP's Rio Grande Valley Sector. The BRP also discusses CBP's plans as to how potential impacts on threatened and endangered species can be mitigated. The BRP will help to guide CBP's efforts going forward.

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BIOLOGICAL RESOURCES PLAN
RIO GRANDE VALLEY SECTOR

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1. PROJECT DESCRIPTION

The U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), U.S. Border Patrol (USBP) will construct, operate, and maintain 225 miles of pedestrian and vehicle fence along the U.S./Mexico international border, with construction expected to be completed by December 31, 2008.

On April 1, 2008, the Secretary of DHS, pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure expeditious construction of tactical infrastructure along the U.S./Mexico international border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations for laws that are included in the waiver, including the Endangered Species Act, the Secretary committed DHS to continue responsible environmental stewardship of our valuable natural and cultural resources. CBP has worked with resource agencies to consider alternative designs and locations that would minimize environmental impacts. To that end, CBP has prepared the following BRP, which analyzes the potential impacts on threatened and endangered species associated with construction of tactical infrastructure in the USBP's Rio Grande Valley Sector. The BRP also discusses CBP's plans as to how potential impacts on threatened and endangered species can be mitigated. The BRP will help to guide CBP's efforts going forward.

1.1 LOCATION

CBP, USBP plans to install and operate tactical infrastructure consisting of primary pedestrian fence (including picket, bollard, floating, and concrete flood protection structure/concrete fence), concrete retaining wall, and access and patrol roads along approximately 70 miles of the U.S./Mexico international border in 21 discrete sections (designated as Sections O-1 to O-21) within Starr, Hidalgo, and Cameron counties, Texas, within the USBP Rio Grande Valley Sector (see **Figures 1-1,**. **1-2**, and **1-3**). Each tactical infrastructure section will be an individual project and could proceed to completion independent of the other sections. **Table 1-1** presents detailed information for each of the 21 sections.

The primary pedestrian fence alignment generally follows the Rio Grande in Sections O-1 through O-3. There is currently an existing patrol road within the footprint of Sections O-1 through O-3. The fence alignment follows the U.S. International Boundary and Water Commission (USIBWC) levee system associated with the Rio Grande along Sections O-4 through O-21. In Section O-19, the fence alignment will follow the Public Utilities Board of Brownsville levee to the approximate midpoint, where it will meet up with the USIBWC levee. For Sections O-4 through O-10, the fence alignment and patrol road will be within the current USIBWC levee Right of Way (ROW) on the south side of the levee. For Sections O-11 through O-21, the fence alignment will typically be placed approximately 30 feet from the toe of the north side of the levee (i.e., the lowest point at the base of the structure facing away from the Rio Grande). These configurations will allow the infrastructure to be placed in an existing levee ROW without disturbing current USIBWC operations or USBP patrol roads. The tactical infrastructure within several of the 21 sections will also encroach on multiple privately owned land parcels. Some fence sections will also encroach upon portions of the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR), Texas Parks and Wildlife Department (TPWD), Wildlife Management Areas (WMAs), and The Nature Conservancy lands in the Rio Grande Valley.

1.2 CONSTRUCTION, OPERATION, AND MAINTENANCE

The Project will impact a total of 461 acres and consists of the following components: (1) installing, operating, and maintaining a primary pedestrian fence and patrol road; (2) improving existing roads to improve access for construction and maintenance; and (3) developing temporary construction staging areas (see **Table 1-2**). Construction of the tactical infrastructure will begin in Spring 2008 and continue through December 2008.

Project Footprint, Sections O-1 through O-3 and O-11 through O-21. The project footprint will directly impact an approximately 60-foot-wide corridor (see **Figure 1-4**). This corridor will include fences and patrol roads. Vegetation will be cleared, and grading will occur where needed. The area permanently impacted by the construction of tactical infrastructure will total approximately 362 acres.

Project Footprint, Sections O-4 through O-10. The project footprint for the concrete flood protection structures/concrete fence will impact a corridor between 24 and 40 feet wide on the river side of the levee. This construction corridor consists of approximately 24 feet of existing levee on the Rio Grande side of the levee that will be removed (see **Figure 1-5**). Up to 16 additional feet within the USIBWC ROW will be temporarily impacted by construction.

The total area permanently impacted by construction of the concrete flood protection structure/concrete fence will be approximately 99 acres. Wherever possible, existing roads and previously disturbed areas will be used for construction access and staging areas.

1.2.1 Fence Installation

The five fence types that will be constructed for the USBP Rio Grande Valley Sector include two styles of primary pedestrian fence, floating primary pedestrian fence, concrete retaining wall, and concrete flood protection structures/concrete fence. The two styles of primary pedestrian fence consist of steel bollards or pickets and bollards anchored into concrete footings (see **Figure 1-6**). Floating primary pedestrian fence consist of prefabricated floating fence panels placed on

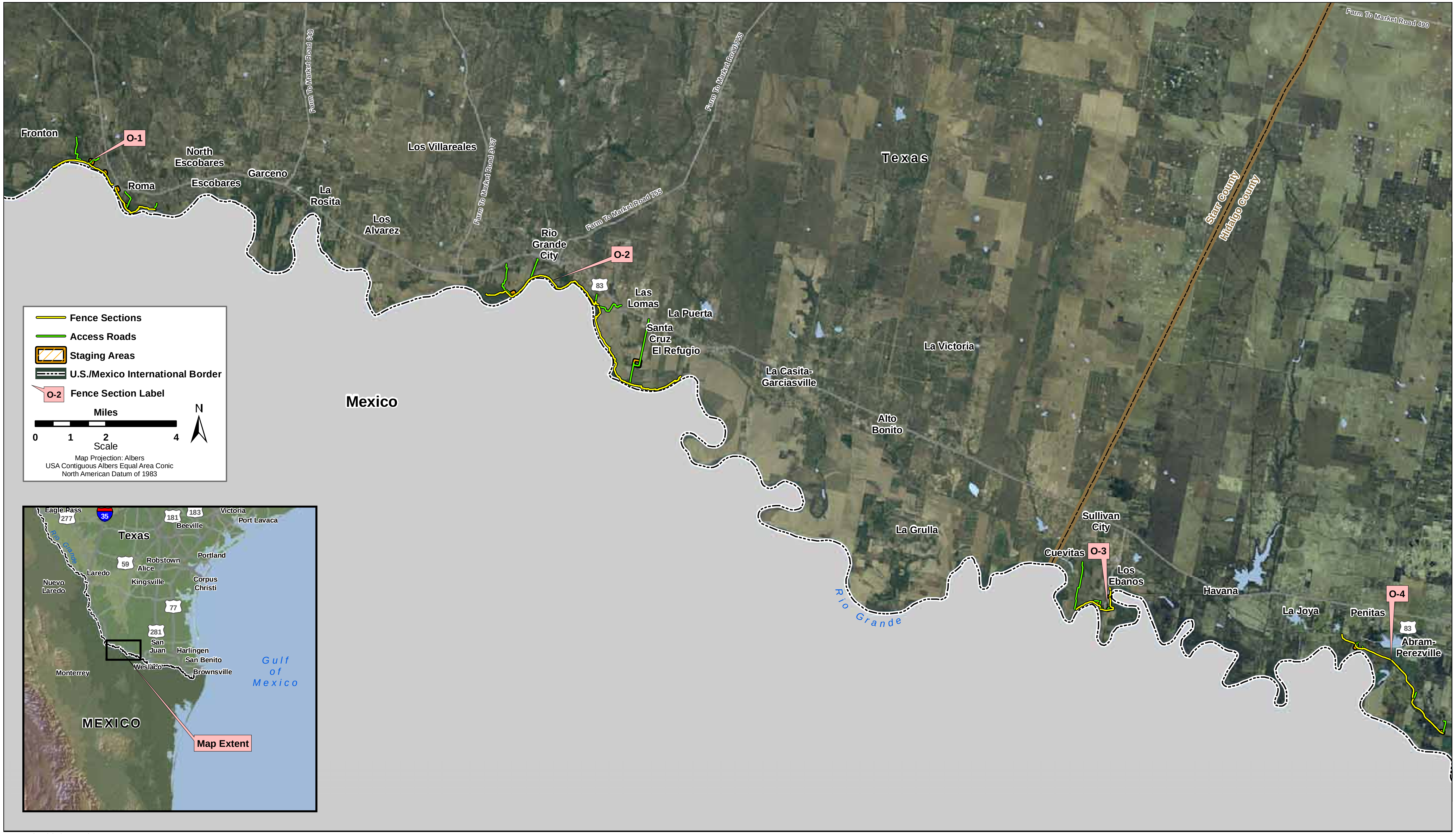
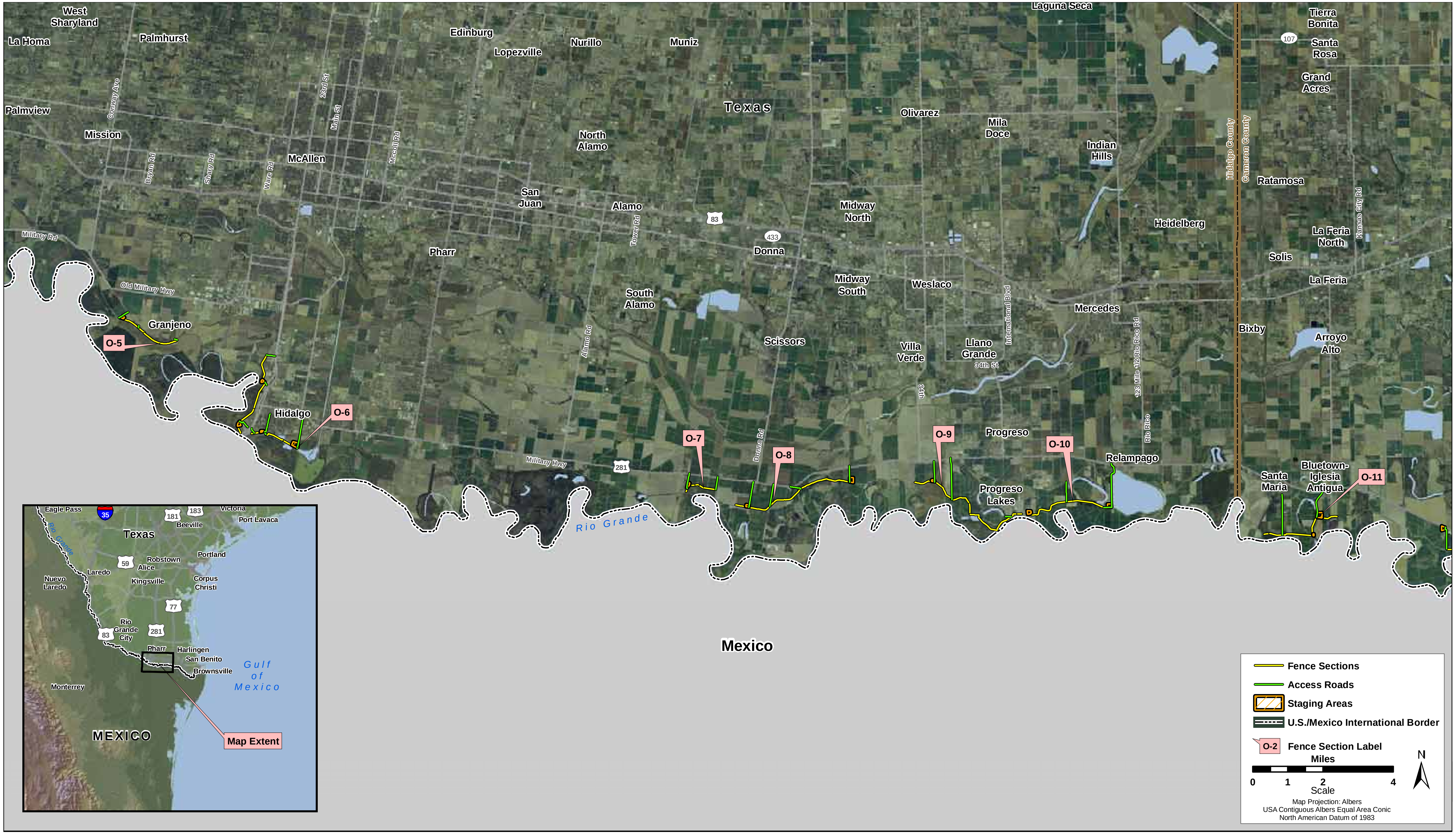
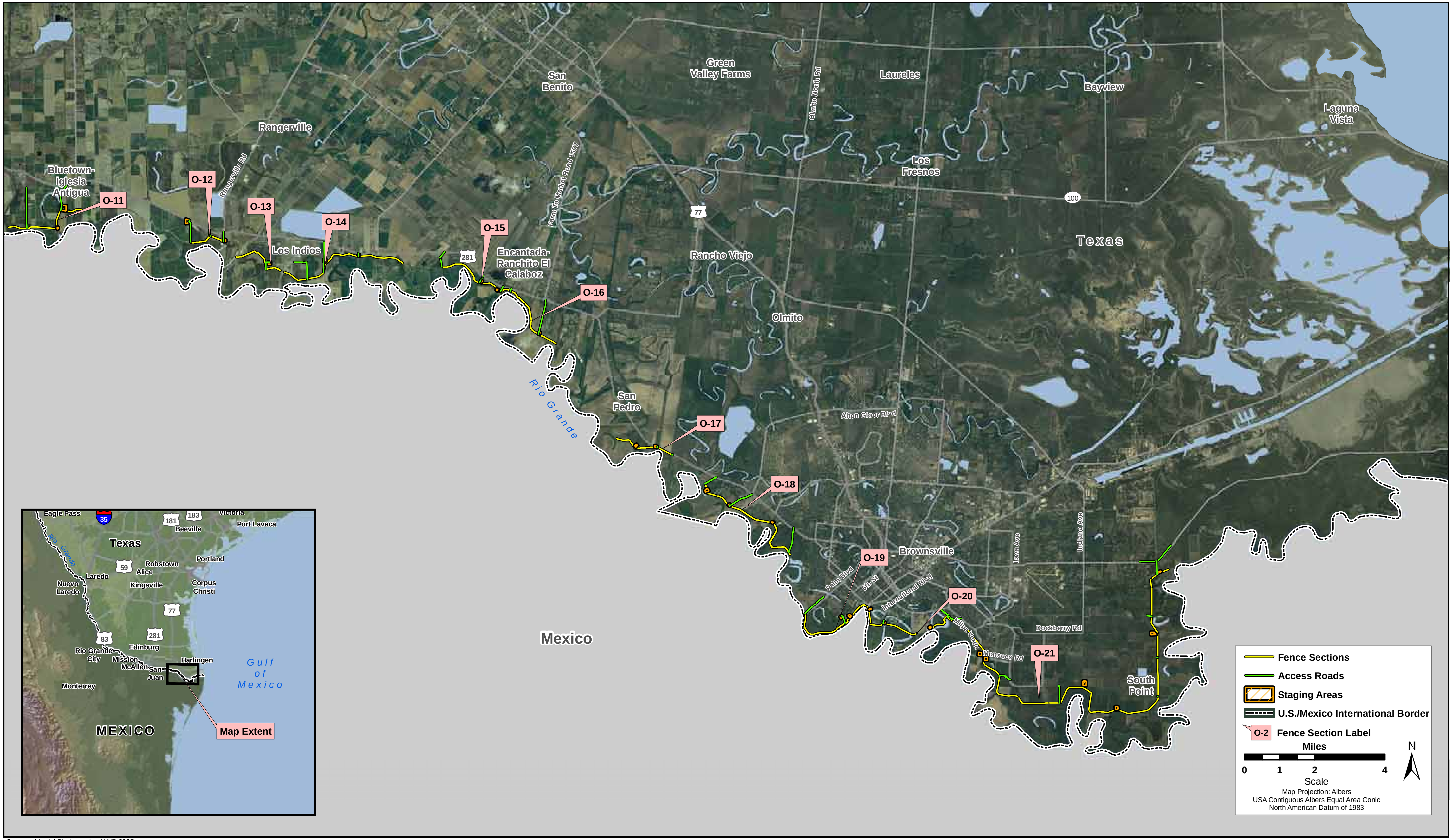


Figure 1-1. Location of the Project in Starr, Cameron, and Hidalgo Counties (Map 1 of 3)



Source of Aerial Photography: NAIP 2005

Figure 1-2. Location of the Project in Starr, Cameron, and Hidalgo Counties (Map 2 of 3)



Source of Aerial Photography: NAIP 2005

Figure 1-3. Location of the Project in Starr, Cameron, and Hidalgo Counties (Map 3 of 3)

Table 1-1. Primary Pedestrian Fence Sections

Section	USBP Station	Approximate Location	Length (miles)
O-1	Rio Grande City	Near Roma POE	3.76
O-2	Rio Grande City	Near Rio Grande City POE	8.75
O-3	McAllen	Los Ebanos POE	1.85
O-4	McAllen	From Peñitas to Abram	4.35
O-5	McAllen	Future Anzalduas POE	1.73
O-6	McAllen	Hidalgo POE	3.86
O-7	Weslaco	Proposed Donna POE	0.90
O-8	Weslaco	Retamal Dam	3.25
O-9	Weslaco	West Progreso POE	3.87
O-10	Weslaco	East Progreso POE	2.33
O-11	Harlingen	Unnamed Border Patrol Road 1—Nemo Road	2.33
O-12	Harlingen	Weaver's Mountain	0.96
O-13	Harlingen	West Los Indios POE	1.59
O-14	Harlingen	East Los Indios POE	3.59
O-15	Harlingen	Triangle—La Paloma	1.93
O-16	Harlingen	Unnamed Border Patrol Road 2—Estero	2.45
O-17	Brownsville	Proposed Carmen Road Freight Train Bridge	1.63
O-18	Brownsville	Proposed Flor De Mayo POE to Garden Park	3.58
O-19	Brownsville	Brownsville/Matamoros (B&M) POE to Los Tomates	3.37
O-20	Brownsville	Los Tomates to Veterans International Bridge	0.93
O-21	Fort Brown	Veterans International Bridge to Sea Shell Inn	12.99
Total			**70.00**

Notes:
[a] Primary pedestrian fence includes picket, bollard, floating, and concrete flood protection structure/concrete fences.
POE = port of entry.

Table 1-2. Fence Properties and Species' BMPs to be Implemented by Section

Tactical Infrastructures Section	Length (miles)	Pile Driving	Access Roads (numbers)	Staging Area (number/ acres)	Species' BMPs[a,b]	Wildlife Openings
O-1	3.76	Yes	3	4/15.88	Ocelot, Jaguarundi, Johnston's Frankenia, Star Cactus, Zapata Bladderpod	20
O-2	8.75	No	5	2/23.91	Ocelot, Jaguarundi, Star Cactus, Walker's Manioc	34
O-3	1.85	No	6	3/2.68	Ocelot, Jaguarundi, Texas ayenia, Walker's Manioc	21
O-4	4.35	Yes	3	4/4.29	Ocelot, Jaguarundi	0
O-5	1.73	Yes	3	1/2.1	Ocelot, Jaguarundi, Walker's Manioc	0
O-6	3.86	Yes	7	5/28.9	Ocelot, Jaguarundi	0
O-7	0.90	Yes	3	1/3.43	Ocelot, Jaguarundi	0
O-8	3.25	Yes	4	2/10.1	Ocelot, Jaguarundi	0
O-9	3.87	Yes	3	2/8.23	Ocelot, Jaguarundi, Texas ayenia	0
O-10	2.33	Yes	2	2/11.03	Ocelot and Jaguarundi	0
O-11	2.33	No	2	3/28.8	Ocelot, Jaguarundi	35
O-12	0.96	Yes	2	2/3.75	Ocelot, Jaguarundi	35

Tactical Infrastructures Section	Length (miles)	Pile Driving	Access Roads (numbers)	Staging Area (number/ acres)	Species' BMPs[a,b]	Wildlife Openings
O-13	1.59	No	1	1/4.6	Ocelot, Jaguarundi	35
O-14	3.59	Yes	4	4/2.19	Ocelot, Jaguarundi, Texas ayenia	13
O-15	1.93	No	3	2/5.26	Ocelot, Jaguarundi, Texas ayenia	37
O-16	2.45	No	3	1/1.11	Ocelot, Jaguarundi, South Texas Ambrosia	19
O-17	1.63	No	2	2/3.58	General, Ocelot, Jaguarundi	27
O-18	3.58	No	4	4/6.55	Ocelot and Jaguarundi, Texas ayenia	28
O-19	3.37	No	4	2/6.17	Ocelot, Jaguarundi, Texas ayenia	21
O-20	0.93	No	1	2/2.37	Ocelot, Jaguarundi	11
O-21	12.99	Yes	14	6/26.4	Ocelot, Jaguarundi, South Texas Ambrosia, Texas ayenia	102

Notes:

[a] Respective species' BMPs will be implemented in each section to the extent possible.

[b] General BMPs and BMPs for temporary impacts will be implemented in all sections to the extent possible.

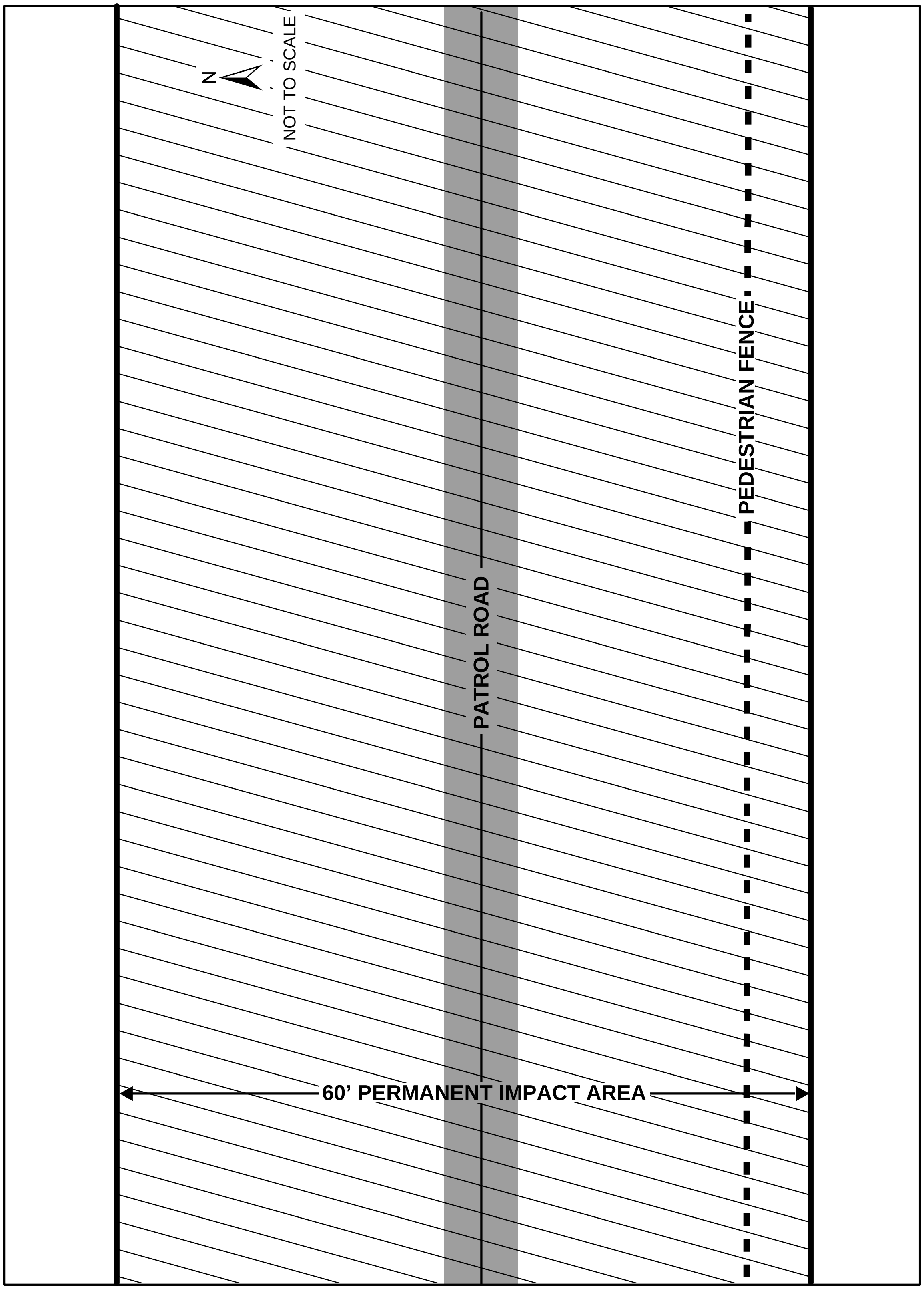


Figure 1-4. Schematic of Typical Project Footprint for Sections O-1 and O-3 and O-11 through O-21

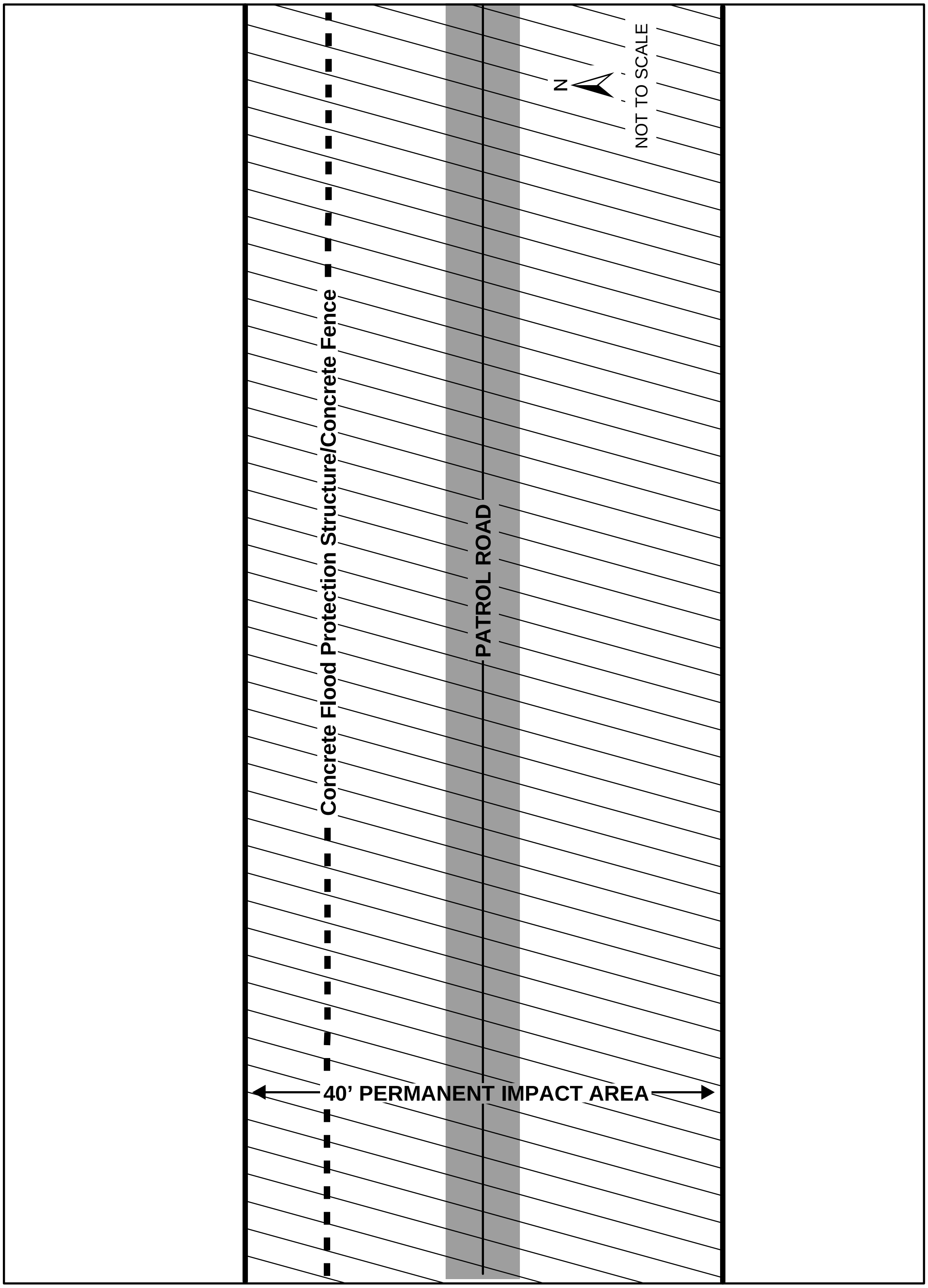


Figure 1-5. Schematic of Typical Project Footprint for Sections O-4 through O-10

Figure 1-6. Photograph of a Typical Primary Pedestrian Fence (Representing Fence Types P-1 and P-2)

the levee (see **Figure 1-7**). Floating fences are generally concrete barriers with pickets anchored on top. Concrete retaining walls consist of prefabricated concrete wall panels sheet-piled into an existing embankment. The concrete flood protection structures/concrete fence consists of a concrete retaining wall built on the south side of the levee and includes a road within the current footprint of the levee ROW (see **Figure 1-8**). Wildlife openings cannot be placed into floating fence, concrete retaining walls, or concrete flood protection structures/concrete fence.

Additional details on each fence design and construction sequencing are presented below. Construction of the proposed tactical infrastructure will begin in Spring 2008 and continue through December 2008. Because each discrete tactical infrastructure section represents an individual project that could proceed independently, multiple sections will be under construction simultaneously.

All equipment and materials (e.g., steel bollards, pickets, prefabricated fence and wall panels) will be transported to the site using heavy diesel trucks such as tractor trailers and dump trucks using the designated construction access roads. The storing and staging of equipment will occur in the staging areas. Construction access areas and staging areas will be temporarily used for the duration of construction for each section. Existing roads will be used for

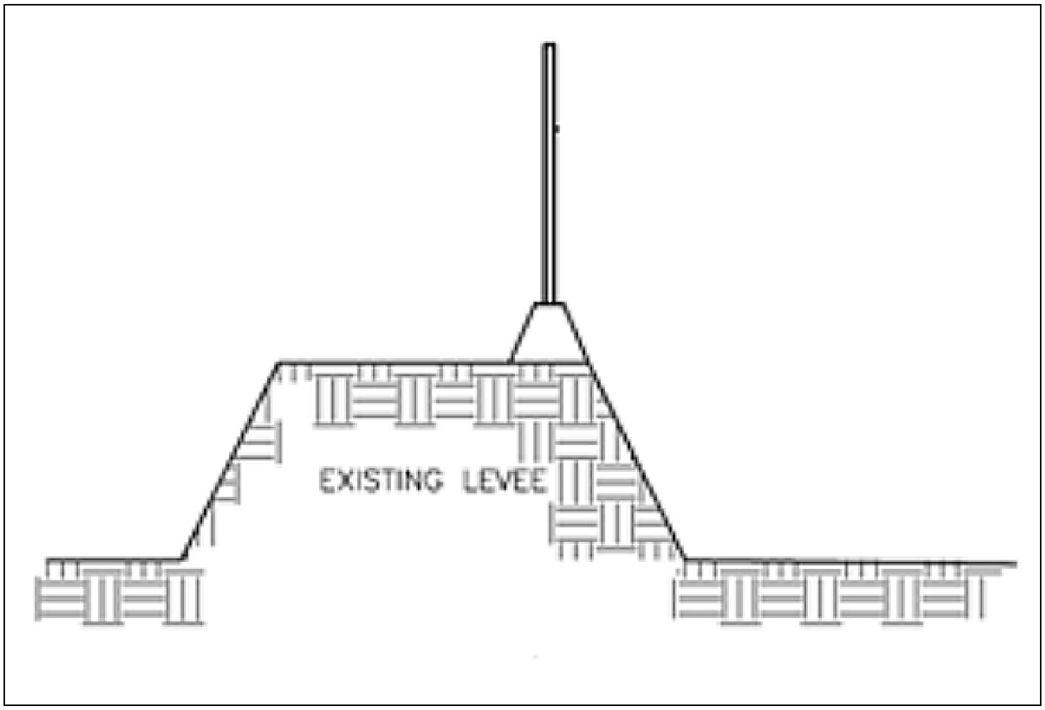


Figure 1-7. Cross Section of Typical Floating Primary Pedestrian Fence (Fence Type P-3B-15)

construction access, but vegetation removal and disturbance will be required. Staging areas were planned for disturbed areas to the maximum extent practicable; however, vegetated areas will also be used for staging areas.

For all fence types, construction will begin with site preparation, which includes necessary grading, contouring, and vegetation removal. It is anticipated that grading and contouring will be minimal for primary pedestrian fence and floating primary pedestrian fences. Site preparation will be more involved for flood protection structures/concrete fence (as described below). Early phases of construction will be accomplished using heavier diesel earthmoving equipment. Later phases of construction projects involve tasks such as welding, cutting, and applying surface coatings. These will be accomplished using generally lighter, gasoline powered equipment.

It is assumed that noise generation will last only for the duration of construction activities. Noise attenuates over distance; a gradual decrease in noise levels occur the farther a receptor is away from the source of noise. Typical construction noise levels will decrease as the distance increases from the source. It is estimated that at around 50 feet from certain construction activities the noise level will be approximately 85 dBA, at around 300 feet the noise level will be approximately 70 dBA, and at around 5,280 feet (1 mile) the noise level will be approximately 45 dBA (which would be less than expected ambient noise levels). Additionally, pile driving will be used for construction within Sections O-1, O-4 through O-10, O-12, O-14, and O-21. However, when pile driving occurs,

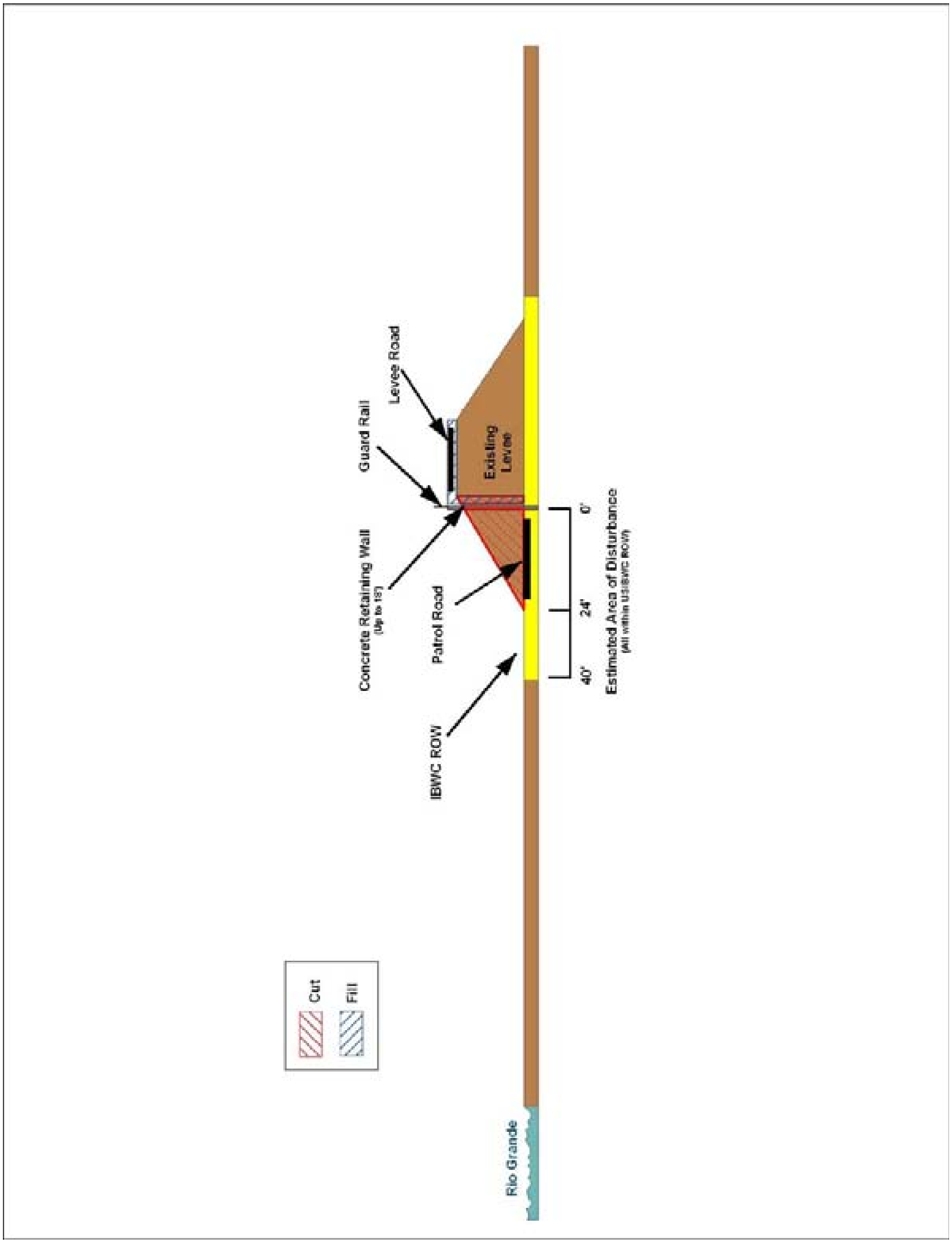


Figure 1-8. Illustration of Typical Flood Protection Structure/Concrete Fence

noise levels will be 101 dBA at 50 feet and will attenuate to 70 dBA at around 1,800 feet. It is assumed that no pile driving will occur at night. Noise will not affect the entire corridor at one time, but will move along the corridor with construction. An additional temporary source of noise will be associated with construction vehicle traffic along temporary construction access roads. Existing roads will be used as construction access roads.

Primary Pedestrian Fence Fence (Sections O-1 through O-3 and O-11 through O-21). To primary pedestrian fences, trenches will be dug and filled with concrete. The steel bollards and/or pickets will be placed into the concrete-filled trenches. Bollards will then be filled with additional concrete. Pickets (Fence Type P–1) and bollards (Fence Type P-2) will be spaced approximately 3 to 4 inches apart. Bollards and pickets will be 15 to 18 feet high. Wildlife openings (8.5 by 11 inches) will be placed in the fence at ground level. Primary pedestrian fences will require very little site preparation (grading and contouring).

Floating Primary Pedestrian Fence (Sections O-1, O-2, O-3, O-14, O-17, O–19, O-21). Sections of prefabricated floating primary pedestrian fence (Fence Type P-3B-15) will be placed on the levee using heavy diesel equipment. Floating fence is removable prefabricated floating fence sections constructed with 15-foot bollards anchored into the concrete barrier. Bollards will be spaced 6 inches apart and will then be filled with additional concrete. Prefabricated floating sections will require very little site preparation (grading and contouring).

Concrete Retaining Wall (Fence Type M-1) (Section O-1). The concrete retaining wall will be constructed by driving prefabricated concrete retaining wall panels (sheet pile) into or against existing embankments. Site preparation will include cutting, filling, and grading of existing embankment. Heavy diesel equipment will be used both for site preparation and placement of prefabricated wall panels.

Concrete Flood Protection Structure/Concrete Fence (Southern Toe of Levee), O-4 through O-10. The concrete flood protection structure/concrete fence will range from 15 to 18 feet high (based on USIBWC requirements to not impact floodwaters in Mexico, in accordance with international treaty obligations).

A guard rail or bollard fence will be constructed on top of the concrete flood protection structure/concrete fence for the safety of drivers on the patrol road atop the levee. A patrol road will be built on the river side of and adjacent to the bottom of the concrete flood protection structure/concrete fence (see **Figure 1-8**). Gates and ramps will be constructed to provide access to landowners, where determined to be applicable during site visits. Additionally, intermittent metal fencing will be constructed where necessary. Construction of additional tactical infrastructure might be required in the future, as mission and operational requirements are continually reassessed.

The concrete flood protection structure/concrete fence will be constructed within the footprint of the USIBWC levee ROW, and the patrol roads and all construction activities will be contained within the USIBWC ROW. Construction contractors will be restricted to disturbing a maximum of 500-foot sections of levee fence construction, in case the levee has to be restored in preparation for a hurricane or flood. Construction of the concrete flood protection structure/concrete fence will consist of the following:

1. Removing and stockpiling levee soils. Levee cut and fill requirements are estimated to be 978,592 cubic yards. Temporary stockpiling of soils will occur within the USIBWC ROW or on approved construction staging areas.
2. Installing temporary sheet piles or concrete forms where the levee soils have been removed. This step will require pile driving.
3. Placing preformed concrete panels or pouring concrete to form the concrete flood protection structure/concrete fence. The estimated quantity of concrete required for the concrete flood protection structure/concrete fence is 230,778 cubic yards.
4. Replacing levee soils behind the concrete flood protection structure/concrete fence and repairing the 16- to 24-foot-wide patrol road on top of the USIBWC levee.
5. Building a USBP patrol road adjacent to and on the river side of the concrete flood protection structure/concrete fence.

It is estimated that 23 construction crews will work simultaneously on the concrete flood protection structure/concrete fence. In addition to the laborers, these crews will use standard construction equipment such as dump trucks, excavators, and concrete pump trucks. If approved, construction of the concrete flood protection structure/concrete fence will begin around June 2008 and continue through December 2008.

Gates and Ramps. Gates and ramps will be constructed to allow USBP personnel, USIBWC, and landowners to have access to land, the Rio Grande and other water resources, and infrastructure. The Project will include the construction of approximately 90 secure access gates. Gates will be wide enough to allow access for necessary farming or firefighting equipment. In other cases, gates will be situated to provide access to existing recreational amenities; water resources, including pump houses and related infrastructure; grazing areas; existing parks; and other areas.

1.2.2 Roads

Patrol roads will be constructed on the north side of the primary pedestrian fence in Sections O-1 through O-3, O-11 through O-16, and O-21; and on the south side in Sections O-4 through O-10 and O-17 through O-20, within the current footprint of the levee ROW. Patrol roads will be constructed primarily by grading and contouring with heavy diesel earthmoving equipment. The patrol roads will be surfaced with caliche or other similar local material, if necessary for construction, which will be transported to the project site with heavy diesel equipment, such as dump trucks.

1.2.3 Operations and Maintenance

There will be no significant change in USBP Rio Grande Valley Sector operations based on the Project. Operational activities (for example, patrols and apprehensions) will move from existing patrol roads to the new patrol roads that are being built along the north side of the primary pedestrian fence (Sections O-1 through O-3, Sections O-11 through O-16, and Section O-21) or the south side of the levees (Sections O-4 through O-10 and Sections O-17 through O-20), but no significant change in the number of patrols is expected. The USBP Rio Grande Valley Sector operations routinely adapt to evolving operational requirements, and will continue to do so under the Project. The USBP Rio Grande Valley Sector will retain its current flexibility to use the most effective methods to provide a law enforcement resolution to illegal cross-border activity.

Maintenance of the primary pedestrian fence will include removal of debris and vegetation, and provide fence and wall repairs, when necessary, in addition to other maintenance activities. The fences will be made from non-reflective steel. No painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain event to avoid potential future flooding. Soil/sand that builds up against the fence and brush will also be removed as needed. Vegetation will be maintained as needed, under a fence maintenance contract. Vegetation removal could include mowing, removal of small trees, and the application of herbicides if needed within the 60-foot project corridor on the north side of the levee for Sections O-1 through O-3 and O-11 through O-21, and in the 40-foot project corridor on the south side of the levee for Sections O-4 through O-10. CBP will continue to coordinate with USIBWC regarding requirements for USIBWC mowing operations. During normal patrols, Sector personnel will observe the condition of the fence. Any damage or breaches of the fence will be repaired, as needed, by a contractor.

Fence maintenance will initially be performed by USBP Sector personnel but will eventually be contractor-performed. A Memorandum of Agreement (MOA) between CBP and USIBWC will be developed to address each agency's responsibilities for maintaining the concrete flood protection structure/concrete fence, patrol roads, and access roads.

1.3 BEST MANAGEMENT PRACTICES

1.3.1 Pre-Construction

Pre-Construction Surveys

Prior to the Secretary's waiver and in order to meet the schedule requirements associated with the Project and avoid impacts on ocelot, jaguarundi, federally listed plants (including Walker's manioc, Texas ayenia, and Zapata bladderpod) and their habitats, and Zapata bladderpod critical habitat, the U.S. Army Corps of Engineers (USACE) requested emergency consultation for pre-project surveys to assess environmental concerns in support of the Environmental Stewardship Plan (ESP). These surveys included the following:

- Visual inspections
- Natural resource surveys
- Cultural resource surveys
- Ground control and aerial fly-overs
- Geotechnical surveys
- Wetland delineations
- Environmental due diligence assessments.

For biological resources, the U.S. Fish and Wildlife Service (USFWS) concurred with the request for emergency consultation. Based on the emergency consultation, CBP, USACE, and their consultants coordinated their activities with the USFWS to plan project implementation in a manner designed to avoid and minimize impacts to threatened and endangered species to the extent practicable. A biological monitor accompanied all pre-construction surveys. To date, impacts to federally listed species have not occurred during pre-project surveys. If impacts do occur during these surveys, they will be documented. The following best management practices (BMPs) are being implemented during pre-construction surveys to avoid or minimize impacts:

1. Pre-construction surveys will identify any ocelot habitat in or adjacent to the project area, and the presence of the ocelot at the habitat area will be assumed.
2. Pre-construction surveys will identify any jaguarundi habitat in or adjacent to the project area, and the presence of the jaguarundi at the habitat area will be assumed.
3. Pre-construction surveys will be conducted on all intact Texas ayenia habitat within the impact corridor in Cameron, Hidalgo, and Starr counties prior to initiation of activities that may affect individual plants or habitat.

1.3.2 Construction BMPs

The following BMPs should be implemented to avoid or minimize impacts associated with the Project during construction. All general BMPs and BMPs for temporary impacts will be implemented in each tactical infrastructure section, to the extent possible. Species-specific BMPs will only be implemented in sections where the Project may affect a federally listed species. The species-specific BMPs that will be implemented in each tactical infrastructure section, to the extent possible, are listed in **Table 1-2**. These represent project objectives for implementation to the extent possible and will be incorporated into construction and monitoring contracts.

General BMPs

1. Where, based on species location maps and/or results of surveys, individuals of a federally listed species could be present on or near the project site, a designated biological monitor will be present during the activity to protect individuals of the species from harm. Duties of the designated biological monitor will include ensuring that activities stay within designated project areas, evaluating the response of individuals that come near the project site, and implementing the appropriate BMPs. The designated biological monitor will notify the construction manager of any activities that may harm or harass an individual of a federally listed species. Upon such notification, the construction manager shall temporarily suspend all subject activities and notify the Contracting Officer, the Administrative Contracting Officer, and the Contracting Officer's Representative of the suspense so that the key USACE personnel may be notified, apprised of the situation, and the potential conflict resolved.
2. All construction and maintenance projects in federally listed habitats should have a designated biological monitor on site during the work. The biological monitor should document implementation of construction-related BMPs as designed for the project to reduce the potential for adverse effects to the species or their habitats. Reports from the biological monitor should be used for developing the Project Report.
3. If an individual of a federally listed species is found in the designated project area, work will cease in the area of the species until either a qualified biological monitor can safely remove the individual, or it moves away on its own, to the extent possible, construction schedule permitting.
4. During construction activities in or within 500 feet of ocelot habitat (or such distance that noise, light, or other effects reach the habitat), the designated biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.
5. During construction activities in or within 500 feet of jaguarundi habitat (or such distance that noise, light, or other effects reach the habitat), a biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.
6. CBP will develop (in coordination with the USFWS) a training plan regarding Trust Resources for CBP and construction personnel. At a minimum, the program will include the following topics: occurrence of the listed and sensitive species in the area, their general ecology, sensitivity of the species to human activities, project features designed to reduce the impacts to these species and promote continued successful occupation of the project area environments by the species.

Included in this program will be color photos of the listed species, which will be shown to the employees. Following the education program, the photos will be posted in the contractor and resident engineer office, where they will remain throughout the duration of the project. The selected construction manager will be responsible for ensuring that employees are aware of the listed species. This BMP does not apply to border patrol operations.

7. Project Reports. For fence construction, within 3 months of project completion, a Project Report will be developed that details the BMPs that were implemented, identifies how well the BMPs worked, discusses ways that BMPs could be improved for either protection of species and habitats or implementation efficiency, and reports on any federally listed species observed at or near the project site. If site restoration is included as part of the project, the implementation of that restoration and any follow-up monitoring will be included. Annual reports may be required for some longer term projects. The Project Report and any annual reports will be made available to the USFWS.

8. Relocation of individuals of federally listed plants found in the project area is generally not a suitable activity. Relocation of aquatic species is not appropriate. Relocation of small cacti has not been very successful, and is not recommended. Survival rates of translocated plants are usually very low; however, translocation may be considered where there are no other alternatives. For particular actions, the USFWS will advise CBP regarding relocation of plants.

9. Particular importance is given to proper design and locating roads such that the potential for roadbed erosion into federally listed species habitat will be avoided or minimized.

10. Particular importance is given to proper design and locating roads such that the potential for entrapment of surface flows within the roadbed due to grading should be avoided or minimized. Depth of any pits created will be minimized so animals do not become trapped.

11. Particular importance is given to proper design and locating roads such that the widening of existing or created roadbed beyond the design parameters due to improper maintenance and use will be avoided or minimized.

12. Where, practicable, Particular importance is given to proper design and locating roads such that stream crossings should not be located near or at bends or meanders but rather at straight stream reaches where channel stability is enhanced.

13. Particular importance is given to proper design and locating roads such that excessive use of unimproved roads that results in their deterioration and affects the surrounding federally listed species habitat areas will be minimized. Road construction and road use for construction will be monitored and documented in the Project Report.

14. Particular importance is given to proper design and locating roads such that the fewest roads needed for the projects will be constructed and they are maintained to proper standards. Roads no longer needed by the government will be closed and restored to natural surface and topography using appropriate techniques. The GPS coordinates of roads that are thus closed will be recorded and integrated into the Office of Border Protection (OBP) GIS database. A record of acreage or miles of roads taken out of use, restored, and revegetated, will be maintained.
15. The width of all roads that are created or maintained by CBP will be measured and recorded using GPS coordinates and integrated into the OBP GIS database. Maintenance actions will not increase the width of the roadbed or the amount of disturbed area beyond the roadbed.
16. The perimeter of all areas to be disturbed during construction or maintenance activities will be clearly demarcated using flagging or temporary construction fence, and no disturbance outside that perimeter will be authorized.
17. Materials such as gravel or topsoil will be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the project area.
18. All access routes into and out of the project disturbance area will be flagged, and no construction travel outside those boundaries will be authorized.
19. If new access is needed or existing access requires improvements to be usable for the project, related road construction and maintenance BMPs will be incorporated into the access design and implementation.
20. When available, areas already disturbed by past activities or those that will be used later in the construction period will be used for staging, parking, and equipment storage.
21. Within the designated disturbance area, grading or topsoil removal will be limited to areas where this activity is needed to provide the ground conditions needed for construction or maintenance activities. Minimizing disturbance to soils will enhance the ability to restore the disturbed area after the project is complete.
22. Removal of trees and brush in habitats of federally listed species will be limited to the smallest amount needed to meet the objectives of the project. This would likely be a permanent impact on habitat.
23. Water for construction use shall be from wells or irrigation water sources at the discretion of the landowner (depending on water rights). If local groundwater pumping is an adverse effect to aquatic, marsh, or riparian dwelling federally listed species, treated water from outside the immediate area will be utilized.
24. Surface water from aquatic or marsh habitats will not be used if that site supports aquatic federally listed species or if it contains non-native

invasive species or disease vectors and there is any opportunity to contaminate a federally listed species habitat through use of the water at the project site.

25. Wells or irrigation water sources will be used when within 1 mile of aquatic habitat for federally listed aquatic species. This is to prevent the transfer of invasive animals or disease pathogens between habitats, if water on the construction site were to reach the federally listed species habitats.
26. Storage tanks containing untreated water will be of a size that if rainfall was to occur, the tank (assuming open), would not be overtopped and cause a release of water into the adjacent drainages. Water storage on the project area will be in on-ground containers located on upland areas, not in washes.
27. Pumps, hoses, tanks, and other water storage devices will be cleaned and disinfected with a 10 percent bleach solution at an appropriate facility before use at another site (this water is not to enter any surface water area). If a new water source is used that is not from a treated or groundwater source, the equipment will require additional cleaning. This is important to kill any residual disease organisms or early life stages of invasive species that may affect local populations of federally listed species.
28. CBP will develop and implement storm water management plans for every project.
29. All construction shall follow DHS management directive 5100 for waste management.
30. A CBP-approved spill protection plan will be developed and implemented at construction and maintenance sites to ensure that any toxic substances are properly handled and that escape into the environment is prevented. Agency standard protocols will be used. Drip pans underneath equipment, containment zones used when refueling vehicles or equipment, and other measures are to be included.
31. Nonhazardous waste materials and other discarded materials, such as construction waste, will be contained until removed from the construction site. This will assist in keeping the project area and surroundings free of litter and reduce the amount of disturbed area needed for waste storage.
32. To eliminate attracting predators of protected animals, all food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed daily from the project site.
33. Waste water is water used for project purposes that is contaminated with construction materials or from cleaning equipment and thus carries oils or other toxic materials or other contaminants as defined in state regulations. Waste water will be stored in closed containers on site until removed for disposal. Concrete wash water will not be dumped on the

ground, but is to be collected and moved offsite for disposal. This wash water is toxic to aquatic life.

34. Waste management may be of special concern at staging areas, work camps, bivouacs, and camp details. Provision will be made for proper waste disposal at these sites, and implementation of waste management protocols will be made the responsibility of the appropriate project officers.

35. Construction speed limits will not exceed 35 mph on major unpaved roads (graded with ditches on both sides) and 25 mph on all other unpaved roads. Night time travel speeds will not exceed 25 mph, and may be less based on visibility and other safety considerations. Construction at night will be minimized.

36. If construction or maintenance activities continue at night, all lights will be shielded to direct light only onto the work site and the area necessary to ensure the safety of the workers. The minimum foot candles needed will be used and the number of lights will be minimized.

37. Noise levels for day or night construction and maintenance will be minimized. All generators will be in baffle boxes (a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards.

38. Transmission of disease vectors and invasive non-native aquatic species can occur if vehicles cross infected or infested streams or other waters, and water or mud remains on the vehicle. If these vehicles subsequently cross or enter uninfected or noninfested waters, the disease or invasive species may be introduced to the new area. To prevent this, crossing of streams or marsh areas with flowing or standing water will be avoided, and if not avoidable, the vehicle will be sprayed with a 10 percent bleach solution.

39. Materials used for on-site erosion control in uninfested native habitats will be free of non-native plant seeds and other plant parts to limit potential for infestation. Since natural materials cannot be certified as completely weed-free, if such materials are used, there will be follow-up monitoring to document establishment of non-native plants, and appropriate control measures will be implemented for a period of time to be determined in the site restoration plan.

40. Fences and walls will provide for passage of wildlife species. Impermeable fences and walls will not be constructed in key wildlife movement corridors, to the extent practicable. The type of passage needed will vary with the location of the barrier and the species that occur in that area. Specific designs and locations will be coordinated with the USFWS, TPWD, and the landowner/manager.

41. For purposes of construction, infrastructure sites will be accessed using only designated roads. Parking will be in designated areas. This will limit

the development of multiple trails to such sites and reduce the effects to federally listed habitats in the vicinity.

42. Appropriate techniques to restore the original grade, replace soils, and restore proper drainage will be implemented.
43. During follow-up monitoring and during maintenance activities, invasive plants found on the site will be removed. Removal will be done in ways that eliminate the entire plant and remove all plant parts to a disposal area. All chemical applications on refuges must be used in coordination with the refuge manager to ensure accurate reporting. Herbicides can be used according to label directions. The monitoring period will be defined in the site restoration plan. Training to identify non-native invasive plants will be provided for CBP contractor personnel or contractors, as necessary.
44. To prevent entrapment of wildlife species when emplacing vertical posts/bollards, all vertical fence posts/bollards that are hollow (i.e., those that will be filled with a reinforcing material such as concrete), shall be covered so as to prevent wildlife from entrapment. Covers will be deployed from the time the posts or hollow bollards are erected to the time they are filled with reinforcing material.

BMPs for Temporary Impacts

The following apply as offsetting conservation measures for temporary impacts.

45. Site restoration for staging areas and construction access routes will be monitored (see **General BMP, Number 2**), as appropriate.
46. During follow-up monitoring of any restoration areas, invasive plants that appear on the site will be removed. Mechanical removal will be done in ways that eliminate the entire plant and remove all plant parts to a disposal area. All chemical applications on refuges must be used in coordination with the refuge manager to ensure accurate reporting. Herbicides can be used according to label directions. The monitoring period will be defined in the site restoration plan. Training to identify non–native invasive plants will be provided for CBP contractor personnel or contractors, as necessary.

Ocelot

1. Pre-construction surveys will identify any ocelot habitat in or adjacent to the project area, and the presence of the ocelot at the habitat area will be assumed.
2. During construction activities in or within 500 feet of ocelot habitat (or such distance that noise, light, or other effects reach the habitat), a biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.

3. In planning for roads, fences, and other facilities that require land clearing, include avoidance of wetlands, dense thorn scrub, and riparian vegetation as a consideration for facility location.
4. Removal of wetland habitat, dense thorn scrub, or riparian vegetation will be avoided or minimized.
5. Removal of dense thorn scrub or riparian vegetation within the conservation easements established by the USIBWC for the Rio Grande will be avoided to the extent practicable.
6. To the extent practicable, impermeable fences/barriers will not be constructed that bisect or fragment ocelot dispersal corridors.
7. If freshwater sources are limited, impermeable barriers will not be constructed that prevent ocelot access to freshwater sources, to the extent practicable.
8. Where artificial lighting must be used during construction, directed (shielded) lighting will be used and directed away from ocelot (thorn scrub and riparian) habitat. The number and wattage of lights will be limited to the minimum needed to ensure construction worker safety and productivity.
9. Documentation of ocelots in project and activity areas will be reported to USFWS.
10. Construction and maintenance activities will be conducted during daylight hours only to avoid noise and lighting issues during the night. If construction or maintenance work activities continue at night, all lights will be shielded to direct light only onto the work site or as required for worker safety and productivity; the minimum wattage needed will be used, and the number of lights will be minimized.

Jaguarundi

1. Pre-construction surveys will identify any jaguarundi habitat in or adjacent to the project area, and the presence of the jaguarundi at the habitat area will be assumed.
2. During construction activities in or within 500 feet of jaguarundi habitat (or such distance that noise, light, or other effects reach the habitat), a biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.
3. In planning for roads, fences, and other facilities that require land clearing, the avoidance of wetlands, dense thorn scrub, and riparian vegetation as a consideration for facility location will be included.
4. Removal of wetland habitat, dense thorn scrub, or riparian vegetation will be avoided or minimized.

5. To the extent practicable, removal of dense thorn scrub or riparian vegetation within the conservation easements for the cat corridor established by the USIBWC along the Rio Grande will be avoided.
6. To the extent practicable, impermeable fences/barriers will not be constructed that bisect or fragment jaguarundi dispersal corridors.
7. If freshwater sources are limited, impermeable barriers will not be constructed that prevent jaguarundi access to freshwater sources, to the extent practicable.

Texas Ayenia

1. Surveys will be conducted on all intact Texas ayenia habitat within the impact corridor in Cameron, Hidalgo, and Starr counties before beginning activities that may affect individual plants or habitat.
2. Prevent or control guinea grass and other invasive plants from colonizing uninfested native habitat following CBP disturbance.
3. Minimize permanent impacts to individual populations and habitats.
4. Reduce the duration of impacts to populations and habitats.
5. Where it is necessary to temporarily remove vegetation, cut plants above ground level rather than clearing with bulldozers, root plows, or other implements that cut into the soil.
    a. Above-ground cutting only in demonstrably high-quality Texas ayenia habitat.
    b. Above-ground height not to exceed 2 inches.

Star Cactus

1. Disturbance to star cactus populations and occupied habitat, including land clearing, introduction and spread of invasive plants, herbivory, trampling, and exposure to toxic substances, should be avoided. Surveys should be conducted on all intact star cactus habitat and potential habitat in the impact corridor in western Hidalgo and Starr counties before beginning activities that may affect individual plants or habitat. In cases where project activities cannot completely avoid star cactus populations and occupied habitat, the impacts to the populations and habitat should be minimized as much as possible. Minimization may be accomplished by, but is not limited to, the following methods:
    - Prevent or control buffelgrass and other invasive plants from colonizing sites following disturbance.
    - Minimize permanent impacts to individual populations and habitats.
    - Reduce the duration of impacts to populations and habitats.
    - Where it is necessary to temporarily remove vegetation, cut plants

above ground level rather than clearing with bulldozers, root plows, or other implements that cut into the soil.

Johnston's frankenia

1. Disturbance to Johnston's frankenia populations and occupied habitat, including land clearing, introduction and spread of invasive plants, herbivory, trampling, and exposure to toxic substances, should be avoided. Surveys should be conducted on all intact Johnston's frankenia habitat and potential habitat in the impact corridor in Starr County before beginning activities that may affect individual plants or habitat. In cases where project activities cannot completely avoid Johnston's frankenia populations and occupied habitat, the impacts to the populations and habitat should be minimized as much as possible. Minimization may be accomplished by, but is not limited to, the following methods:
   - Prevent or control buffelgrass and other invasive plants from colonizing sites following disturbance.
   - Minimize permanent impacts to individual populations and habitats.
   - Reduce the duration of impacts to populations and habitats.
   - Where it is necessary to temporarily remove vegetation, cut plants above ground level rather than clearing with bulldozers, root plows, or other implements that cut into the soil.

Walker's Manioc

1. Surveys will be conducted in the impact corridor on all intact Walker's manioc habitat in Starr and Hidalgo counties before beginning activities that may affect individual plants or habitat.
2. Prevent or control invasive plants from colonizing uninfested native habitat following disturbance.
3. Minimize permanent impacts to individual populations and habitats.
4. Reduce the duration of impacts to populations and habitats.
5. Where it is necessary to temporarily remove vegetation, cut plants above ground level rather than clearing with bulldozers, root plows, or other implements that cut into the soil.
   a. Above-ground cutting only in suitable Walker's manioc habitat.
   b. Above ground height not to exceed 2 inches.

Zapata Bladderpod

1. Because loss of habitat is a significant risk to the Zapata bladderpod, no roads, fences, structures, or other on-ground facilities will be placed on areas containing the substrates that support the Zapata bladderpod. If

these areas cannot be avoided, minimization and compensation will be included in the project design.

2. Pre-construction surveys are not required as long as projects are located outside suitable habitat areas. Projects within suitable habitat will require site-specific surveys of the project area.
3. Materials such as gravel will be obtained from existing developed or previously used sources, not from habitat areas that could support the Zapata bladderpod.
4. The need for and extent of site restoration will be coordinated with the landowner/manager.
5. Directed research, surveys, or restoration activities included in the Recovery Plan may be implemented, by USFWS, if areas of Zapata bladderpod habitat are adversely affected. The scope of compensation will depend on the amount of area disturbed or degree of effect on the Zapata bladderpod.

South Texas Ambrosia

1. Disturbance to south Texas ambrosia populations and occupied habitat, including land clearing, introduction and spread of invasive plants, herbivory, trampling, and exposure to toxic substances, should be avoided. Surveys should be conducted on all intact south Texas ambrosia habitat and potential habitat in the impact corridor in the coastal grassland of Cameron County before beginning activities that may affect individual plants or habitat. In cases where project activities cannot completely avoid south Texas ambrosia populations and occupied habitat, the impacts to the populations and habitat should be minimized as much as possible. Minimization may be accomplished by, but is not limited to, the following methods:
   - Prevent or control buffelgrass, Kleberg bluestem, and other invasive plants from colonizing sites following disturbance.
   - Minimize permanent impacts to individual populations and habitats.
   - Reduce the duration of impacts to populations and habitats.
   - Where it is necessary to temporarily remove vegetation, cut plants above ground level rather than clearing with bulldozers, root plows, or other implements that cut into the soil.

1.3.3 Compensation

The following apply as offsetting compensation for impacts associated with the project (based on GIS data, dated 6 May 2008). Actual impacts to habitats will be documented during construction by the environmental monitors and included in the Project Report which will be made available to USFWS.

1. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for any vegetation removal or disturbance for all staging areas by acquiring like land in the ratio of 3:1 for shrubland, woodland, and forest habitat types (for every 1 acre removed or disturbed, 3 acres will be acquired), and 1:1 for grasslands (see **Table 1**–**3**). Open water and wetland habitats may be compensated for as appropriate for waters of the United States. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
2. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for any vegetation removal or disturbance for all access roads by acquiring like land in the ratio of 3:1 for shrubland, woodland, and forest habitat types, and 1:1 for grasslands (see **Table 1**–**3**). Open water and wetland habitats may be compensated for as appropriate for waters of the United States. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
3. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for any vegetation removal or disturbance resulting from all other activities not mentioned above, including loss of connectivity and for the footprint of the project in Section O-4 to O-10, by acquiring 1,700 acres of land with habitat value south of the concrete flood protection wall (concrete fence). See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
4. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for all activities and for the footprint of the project that abuts or enters National Wildlife Refuge or Refuge-managed property in Section O-1 to O-3 and O-11 to O-21 by acquiring like land in the amount of 73 acres/mile of impact area. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
5. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for any vegetation removal or disturbance in the footprint of the project in Section O-1 to O-3 and O-11 to O-21 by acquiring like land in the ratio of 3:1 for shrubland, woodland, and forest habitat types, and 1:1 for grasslands (see **Table 1-3**). Open water and wetland habitats may be compensated for as appropriate for waters of the United States. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.

Table 1-3. Acres of Vegetation Impacts in the Project Footprint

Project Component	Vegetation Impacts*						
	Grassland (acres)	Shrubland (acres)	Woodland (acres)	Open Water (acres)	Riparian Wetlands	Other Land Use (acres)	Total (acres)
60-foot impact corridor, north of Sections O-1 through O-3 and O–11 through O-21	183.834	17.255	63.249	0.705	0	97.298	362.339
40-foot impact corridor, south of Sections O-4 through O-10	52.020	0	1.126	0	5.646	39.846	98.638
Staging areas	57.072	1.993	21.586	0	0	72.159	152.810
Construction access Roads[a]	94.229	16.173	101.922	16.734	0	331.008	560.065
Total Impacts	**387.2**	**35.4**	**187.9**	**17.4**	**5.6**	**540.3**	**1173.9**
Mitigation Ratio	**1:1**	**3:1**	**3:1**	**WOUS[b]**	**WOUS[b]**	**0**	**—**
Acreage of Habitat to Offset	**387.2**	**106.3**	**563.6**	**—**	**—**	**0.0**	**1057.1**

*Based on GIS data, dated 6 May 2008

Notes:

[a] Impacts associated with construction access roads are assumed to be 75 feet from the centerline of the road.

[b] Will be compensated for as appropriate as waters of the United States (WOUS).

6. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for the temporary disturbance impacts of lights in Section O–1 to O-3 and O-11 to O-21 by acquiring 0.25:1 acre of land for the 150-foot corridor around the footprint of the project for those portions of sections which are in potential ocelot and jaguarundi habitat (those that contain suitable native shrub or herbaceous cover which could provide a movement corridor, not agricultural fields or other open, disturbed areas). See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
7. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for the temporary disturbance impacts of noise by acquiring 0.025:1 acre of land for the 300-foot zone of disturbance in sections O-2, O-3, O-11, O-13, and O-15 to O-20; and for the 1,800-foot zone of disturbance in those portions of sections O-1, O-12, O-14, and O-21 that require pile driving. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
8. Using funds contributed to the mitigation fund by CBP, the USFWS may compensate for reduction or loss of connectivity in Section O-1 to O-3 and O-11 to O-21, in areas with wildlife-friendly fence openings, by acquiring 21.6 acres of land/mile of fence; and in areas where floating fence is used, by acquiring 43.2 acres of land/mile. See **Table 1-4** for a summary of the acreage of habitat to offset impacts, by tactical infrastructure section. Land acquired will be conserved in perpetuity by an appropriate legal instrument.
9. Using funds contributed to the mitigation fund by CBP, the USFWS may develop permanent freshwater sources north of the fence (for example, a water tank powered by a windmill) in Section O-1, O-2, O-8, O–11, and O-21 upon coordination with the natural resource agencies.
10. Surveys were not conducted during the peak season for detecting the presence of federally listed plants. If federally listed plants are found during construction monitoring, CBP will coordinate with the USFWS to implement BMPs and initiate compensation measures.
11. Using funds contributed to the mitigation fund by CBP, the USFWS may fund and/or pursue appropriate conservation measures or recovery objectives in compensation for unavoidable impacts to star cactus populations and habitat. Compensation may be accomplished by, but is not limited to, the following methods:
    - Star cactus habitat that has been destroyed may be replaced by acquiring a similar quantity and quality of habitat which will be conserved in perpetuity by an appropriate legal instrument.

Table 1-4. Compensation Acreage for Habitat Impacts

Tactical Infrastructure Section	Compensation (acres)[a]															
	Access Roads Impacts			Staging Areas Impacts			Project Footprint Impacts , O–4 through O–10	Impacts in National Wildlife Refuges	Project Footprint Impacts, O-1 through O-3 and O-11 through O-21			Impacts from Lights	Impacts from Noise	Impacts from Floating Fence	Impacts from Picket or Bollard Fence	Section Total
	Grassland	Shrubland	Woodland	Grassland	Shrubland	Woodland			Grassland	Shrubland	Woodland					
O-1	7.6	29.6	26.4	8.9	0.03	9.0	—	25.6	3.2	26.6	37.6	17.3	23.4	9.9	61.3	286.43
O-2	10.2	6.7	75.7	9.7	0	0.5	—	93.7	11.9	0	69.1	39.6	7.9	13.0	182.5	520.5
O-3	7.3	0	20.7	0.6	0	3.2	—	49.4	5.2	0.5	9.5	8.9	1.8	5.2	38.4	150.7
O-4	4.2	0	17.4	2.0	0	5.9		—	—	—	—	—	—	—	—	29.5[b]
O-5	1.6	0	6.5	0	0	6.3		—	—	—	—	—	—	—	—	14.4[b]
O-6	5.7	0	12.0	17.7	0	3.1		—	—	—	—	—	—	—	—	38.5[b]
O-7	6.9	0.7	2.2	0	0	0	1700	—	—	—	—	—	—	—	—	9.8[b]
O-8	4.6	0	18.1	0.1	0	0		—	—	—	—	—	—	—	—	22.8[b]
O-9	2.5	0	0.7	1.8	0	0		—	—	—	—	—	—	—	—	5[b]
O-10	10.1	0	2.2	6.0	0	0		—	—	—	—	—	—	—	—	18.3[b]
O-11	1.0	4.8	10.1	0.05	0	2.6	—	—	8.7	0	9.6	10.8	2.2	—	50.3	100.15
O-12	3.4	0	11.0	1.5	0	0	—	—	3.7	0	7.1	4.4	8.6	—	20.1	59.8
O-13	1.7	4.0	0	0.5	4.4	0	—	7.2	5.2	5.2	0	7.5	1.5	—	34.3	71.5
O-14	1.5	0	5.9	0.3	0	0.2	—	—	13.5	0	9.7	16.6	22.7	103.7	25.9	200
O-15	1.7	0	6.9	0.7	0	2.9	—	—	11.2	0	0	8.7	2.1	—	47.7	81.9
O-16	0.6	0.8	23.8	0.03	0	0	—	—	6.7	0.3	4.7	9.8	1.9	—	44.5	93.13
O-17	0.5	0	0	0	0	0.1	—	—	6.9	0	7.0	7.5	1.6	19.0	25.5	68.1
O-18	4.4	1.7	42.5	0.4	0	10.5	—	85.3	20.6	1.5	0.5	16.5	3.3	—	77.5	264.7
O-19	6.0	0.2	2.4	4.2	0	0	—	—	14.4	2.8	5.8	15.4	3.1	47.1	49.2	150.6
O-20	0.5	0.03	1.0	0.6	1.5	0.3	—	—	5.9	0.7	0.3	4.3	0.9	—	20.1	36.13
O-21	12.3	0	20.3	2.0	0	20.0	—	43.9	66.7	14.1	28.9	57.5	71.8	121.0	219.7	678.2
Total	**94.3**	**48.5**	**305.8**	**57.1**	**5.9**	**64.6**	**1700**	**305.1**	**183.8**	**51.7**	**189.8**	**224.8**	**152.8**	**318.9**	**897.0**	4600.1

[a]Based on GIS data, dated 6 May 2008

[b]Includes an additional 1700 acres (total) for Section O-4 through O-10.

- Star cactus habitat that is degraded through vegetation impacts, invasive plant colonization, or other deleterious changes shall be restored to a condition that is consistent with long-term survival and growth of the star cactus population.
- Individual star cactus plants that have been destroyed may be replaced through propagation and reintroduction of star cactus plants in suitable habitat managed by an approved conservation organization. If possible, seeds for propagation should be obtained from populations prior to impact. If this is not possible, propagation may be accomplished using seeds of this species that are available through several conservation seed banks. Successful propagation methods have been developed (Strong 2007). Compensation for destroyed individuals of star cactus shall consist of 10 or more propagated, reintroduced plants for each individual destroyed.

12. Using funds contributed to the mitigation fund by CBP, the USFWS may fund and/or pursue appropriate conservation measures or recovery objectives in compensation for unavoidable impacts to Johnston's frankenia populations and habitat. Compensation may be accomplished by, but is not limited to, the following methods:

- Johnston's frankenia habitat that has been destroyed may be replaced by acquiring a similar quantity and quality of habitat which will be conserved in perpetuity by an appropriate legal instrument.
- Johnston's frankenia habitat that is degraded through vegetation impacts, invasive plant colonization, or other deleterious changes shall be restored to a condition that is consistent with long-term survival and growth of the Johnston's frankenia population.
- Individual Johnston's frankenia plants that have been destroyed may be replaced through propagation and reintroduction of Johnston's frankenia plants in suitable habitat managed by an approved conservation organization. If possible, seeds or cuttings for propagation should be obtained from populations prior to impact. If this is not possible, propagation may be accomplished using seeds or cuttings of this species that are available through several conservation seed banks. Successful propagation methods have been developed by the Agricultural Research Service at the U.S. Department of Agriculture (USDA). Compensation for destroyed individuals of star cactus shall consist of 10 or more propagated, reintroduced plants for each individual destroyed.

13. Using funds contributed to the mitigation fund by CBP, the USFWS may fund and/or pursue appropriate conservation measures or recovery objectives in compensation for unavoidable impacts to south Texas ambrosia populations and habitat. Compensation may be accomplished by, but is not limited to, the following methods:

- South Texas ambrosia habitat that has been destroyed may be replaced by acquiring a similar quantity and quality of habitat which will be conserved in perpetuity by an appropriate legal instrument.
- South Texas ambrosia habitat that is degraded through vegetation impacts, invasive plant colonization, or other deleterious changes shall be restored to a condition that is consistent with long-term survival and growth of the south Texas ambrosia population.
- Individual south Texas ambrosia plants that have been destroyed may be replaced through propagation and reintroduction of south Texas ambrosia plants in suitable habitat managed by an approved conservation organization. If possible, seeds or cuttings for propagation should be obtained from populations prior to impact. If this is not possible, propagation may be accomplished using seeds or cuttings of this species that are available through several conservation seed banks. Successful propagation methods have been developed. South Texas ambrosia has been successfully propagated by the San Antonio Botanical Gardens and the Kika de la Garza Plant Materials Center (USDA Natural Resources Conservation Service). Compensation for destroyed individuals of star cactus shall consist of 10 or more propagated, reintroduced plants for each individual destroyed.

14. Using funds contributed to the mitigation fund by CBP, the USFWS may fund and/or pursue appropriate conservation measures or recovery objectives in compensation for unavoidable impacts to Texas ayenia populations and habitat. Compensation may be accomplished by, but is not limited to, the following methods:
    - Suitable habitat (determined in coordination with the USFWS) of Texas ayenia that has been destroyed may be replaced by acquiring a similar quantity and quality of habitat which will be conserved in perpetuity by an appropriate legal instrument.
    - Individual Texas ayenia plants that have been destroyed may be replaced through propagation and reintroduction of Texas ayenia plants in suitable habitat managed by an approved conservation organization. If possible, seeds for propagation will be obtained from populations prior to impact. If this is not possible, propagation may be accomplished using seeds of this species that are available through several conservation seed banks. Successful propagation methods have been developed at LRGVNWR. Compensation for destroyed individuals of Texas ayenia shall consist of five or more propagated, reintroduced plants for each individual destroyed.
15. Using funds contributed to the mitigation fund by CBP, the USFWS may fund and/or pursue appropriate conservation measures or recovery objectives in compensation for unavoidable impacts to Walker's manioc

populations and habitat. Compensation may be accomplished by, but is not limited to, the following methods:

- Suitable Walker's manioc habitat (according to USFWS guidance) that has been destroyed may be replaced by acquiring a similar quantity and quality of habitat which will be conserved in perpetuity by an appropriate legal instrument.
- Individual Walker's manioc plants that have been destroyed may be replaced through propagation and reintroduction of Walker's manioc plants in suitable habitat managed by an approved conservation organization. If possible, seeds for propagation will be obtained from populations prior to impact. If this is not possible, propagation may be accomplished using seeds of this species that are available through several conservation seed banks. Compensation for destroyed individuals of Walker's manioc shall consist of five or more propagated, reintroduced plants for each individual destroyed.
- Transplantation of Walker's manioc to suitable locations may be possible.

2. DESCRIPTION OF SPECIES AND THEIR HABITAT

This section summarizes information regarding some of the key species and habitats addressed in this document. Some listed species are not included here because the implementation of the agreed upon BMPs and conservation measures are anticipated to provide conditions that avoid adverse effect. For more complete information and supporting citations regarding species' descriptions, distribution and abundance, habitat needs, life history, and population ecology, the local USFWS office can be contacted.

2.1 OCELOT

In 1982, the ocelot (*Leopardus pardalis*) was designated as an endangered species under the Endangered Species Act (ESA) of 1973, as amended, a status that extended U.S. protections to the species throughout its range in 22 countries, including Mexico and Central and South American countries. Critical habitat has not been designated for the ocelot. Ocelot populations gained greater protections in 1989, when the species was upgraded to Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES); a protection that prohibits CITES signatories from permitting any trade in the species or its parts. Two subspecies occur in the United States: the Texas ocelot (*L.p. albescens*) and the Sonoran ocelot (*L.p. sonoriensis*). The Texas ocelot is isolated from the Sonoran ocelot by the Sierra Madre highlands (Tewes and Schmidly 1987, USFWS 1990).

2.1.1 Species Description

The ocelot is a medium-sized cat, measuring up to 3 feet (0.91 meters) in body length and weighing twice as much as a large domestic cat. It is slender and covered with attractive, irregular-shaped rosettes and spots that run the length of its body. The ocelot's background coloration can range from light yellow to reddish gray, to gold, and to a grayish gold color. It has a white underside. The head has spots, two black stripes on the cheeks, and four to five longitudinal black stripes on the neck, and their black ears have large white spots on the back. The tail has dark bars or incomplete rings. Though it resembles the margay (*Leopardus wiedii*), the ocelot is approximately twice the size of a margay, with a slightly shorter tail (Murray and Gardner 1997, de Oliveira 1998).

2.1.2 Distribution and Abundance

Historically, the ocelot occurred in Arkansas, Arizona, southern California, Texas, Mexico and southward through Central and South America to Peru, Uruguay, and northern Argentina (Navarro-Lopez 1985). Today it ranges from southern Texas and northern Sonora, Mexico, to Central America, Ecuador, and northern Argentina, but in reduced numbers (Tewes and Everett 1986; Emmons 1990; Murray and Gardner 1997).

Two U.S. populations of ocelot occur in southern Texas (Tewes and Everett 1986). One population occurs in Willacy and Kenedy counties, primarily on private lands (Navarro-Lopez 1985), and the other in Cameron County, primarily on the Laguna Atascosa National Wildlife Refuge (LANWR) (Laack 1991).

In Texas, over the past 20 years, individual ocelots have only been documented in Cameron, Hidalgo, Willacy, Kenedy, and Jim Wells counties (Tewes and Hughes 2001). Laack and Rappole (1986) documented ocelot sightings in Cameron County. Shinn (2002) used camera traps and hair snares on 25 widely scattered tracts managed by the South Texas Refuges Complex, and did not find evidence of ocelot west of Brownsville on the Rio Grande River. His studies did confirm the presence of the species in extreme southern Cameron County and in extreme western Willacy County.

In Hidalgo County, at the Santa Ana National Wildlife Refuge, at least one ocelot has been radio-tracked from the 1990s, and it is believed that they may still occur in the area (Mays 2007). Fischer (1998) trapped, radio-tracked, and tagged an adult female from 1992 through 1996 along the Rio Grande River in southeastern Hidalgo County. Out of 8,304 trap-nights he caught 21 bobcats, 300 non-target animals, and no other ocelots.

In 1982, Tewes (1986) trapped two ocelots on a private ranch in Willacy County. Five ocelots (three females, one male and one of unknown sex) were identified in Willacy County near Raymondville, Texas, in December 2002. Based on two photographs on October 11, 2003, one of the females was pregnant; therefore, a sixth resident ocelot may have been born (Sternberg and Chapa 2004). Between October and December 2003, camera traps photographed three cats on another private ranch in Willacy.

"Occupied habitat" occurring in Jim Wells, Nueces, Live Oak, and Kleberg counties, 50 miles north of the Willacy-Kenedy population, is shown in Figure 9 of the recovery plan (USFWS 1990). It is presumed that ocelots may still occur there because of documented roadkills on Highway 77 south, but no reproducing populations have been found. In 1997 and 1998, Tuovila (1999) did a trapping study in the southern half of Live Oak County and northernmost Jim Wells. He trapped 17 bobcats and 238 non-target animals, but no ocelots. No ocelots were documented at Choke Canyon Reservoir in Live Oak and McMullen counties, Texas, during trapping efforts, despite a 10-year increase in optimal ocelot cover (Grassman et al. 2006).

Tewes and Everett (1986) based a "crude estimate" of the total ocelot population size in south Texas of 80 to 120 individuals upon an aerial survey of brush habitat and knowledge gained from following the movements of radio-collared ocelots trapped in or near LANWR. Haines et al. (2005a) estimated the number of breeding individuals in the LANWR population was 19 ocelots, with a total population of 38 ocelots in Cameron County. He estimated the population by averaging ocelot home range sizes reported by Navarro-Lopez (1985), Tewes (1986), and Laack (1991) and extrapolating this estimate to the amount of available dense thorn scrub habitat, and assumed that adults equaled half of the total population. Today, as few as 50 to 100 individuals may remain in south Texas and the United States. The Cameron County ocelot population is estimated at 25 to 35 individuals (Mays 2007).

A much larger population of the Texas ocelot occurs in Tamaulipas, Mexico, near San Fernando, approximately 100 miles south of the U.S./Mexico international border (Caso 1994). In forested South America alone, Emmons (1988) noted that even at the lowest density estimates (one animal per 5 km^2), there will be approximately 800,000 ocelots, and suggested that true numbers are probably 1.5 to 3 million.

2.1.3 Habitat

Tamaulipan brushland is a unique ecosystem found only in south Texas and northeastern Mexico. Characteristic vegetation of Tamaulipan brushland is dense and thorny. It is estimated that approximately 95 percent has been cleared for agriculture, urban development, road developments and expansions, and recreation (USFWS 1990, Jahrsdoerfer and Leslie 1988). Tewes and Everett (1986) found less than 1 percent of southern Texas supported the extremely dense thorn scrub used by ocelots.

Tewes and Everett (1986) classified ocelot habitat in Texas according to the amount of foliar canopy. Class A or optimal habitat was 95 percent canopy cover, Class B or suboptimal habitat was 75 percent to 95 percent canopy cover, and Class C, with 75 percent or less canopy cover, was considered inadequate. The most critical habitat component is probably dense cover near the ground (less than 3 feet in height) and that core areas of ocelot home ranges on LANWR contained more thorn scrub than peripheral areas of their home ranges. Jackson et al. (2005) suggest that the ocelot in Texas prefers closed canopy over land cover types, but that areas used by this species tend to consist of more patches with greater edge. The cat is reported to occur along watercourses, and will readily enter the water (Goodwyn 1970 as cited by USFWS 1990), but it is unclear whether this proximity to water is a habitat requisite or simply an indication of where dense cover is most likely to occur.

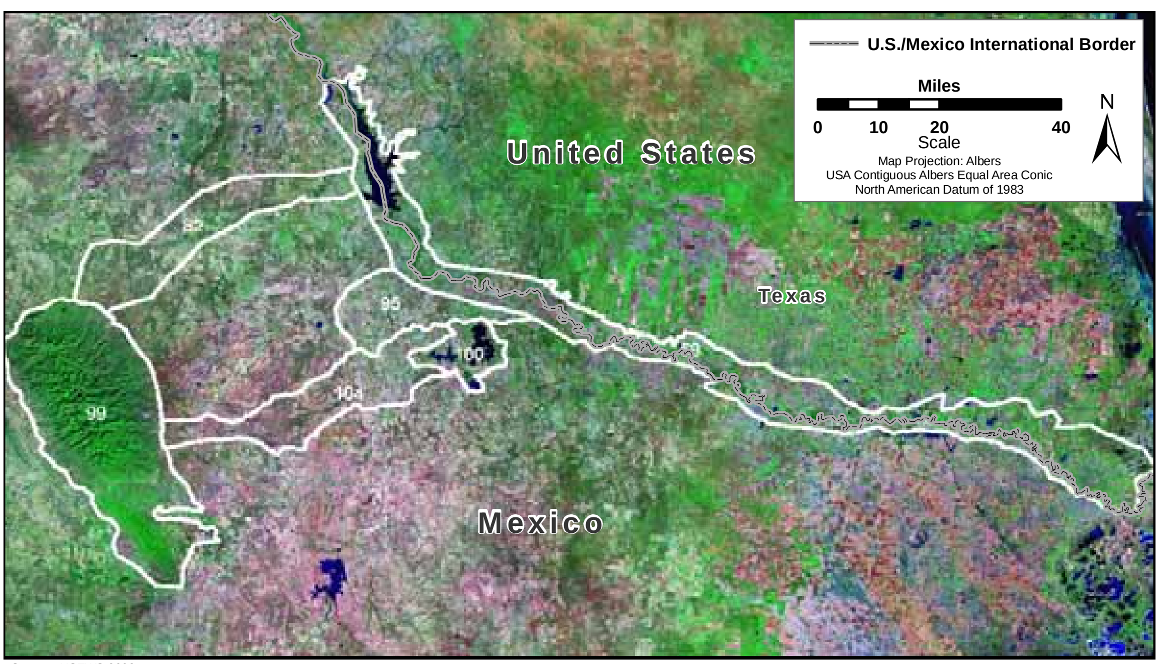
Species composition of shrubs used by ocelots was quantified in three plant communities, two in Texas and one in Mexico (Shindle and Tewes 1998, Caso 1994). At the Texas sites, 45 woody species were found at the LANWR in Cameron County and 28 woody species on a private ranch in Willacy County (Shindle and Tewes 1998). The dominant species were granjeno (*Celtis pallida*), crucita (*Eupatorium odoratum*), Berlandier fiddlewood (*Citharexylum berlandieri*), honey mesquite (*Prosopis glandulosa*), and desert olive (*Forestiera angustifolia*) at LANWR, and honey mesquite and snake-eyes (*Phaulothamnus spinescens*) in Willacy County.

In Mexico, ocelot habitat use was 97.6 percent mature forest (heavy rain forest to sparse tropical deciduous forest) and 2.4 percent pasture-grassland (Caso

1994). In Veracruz, Hall and Dalquest (1963) found that ocelots utilized the forests and jungles. Ocelots are known from the tropical forest of Belize, lowland rain forest of Peru, and semideciduous forest and seasonally flooded marshes of Brazil (Ludlow and Sunquist 1987).

2.1.4 Threats

Fragmentation of habitat and habitat loss due to brush clearing are primary reasons for ocelot decline. Ocelots rely upon thick vegetation along the Lower Rio Grande and the south Texas Tamaulipan brush community for foraging, resting, and establishing dens. They require corridors, such as rivers, shorelines, and natural drainages, to travel between optimal habitat areas. It is important to maintain connectivity with international wildlife corridors within Mexico in order to increase the genetic exchange of the South Texas ocelots with the ones found in Northern Mexico. The USFWS is currently coordinating with different government, and state and nongovernmental organizations in Mexico, to reconnect wildlife corridors north and south of the U.S./Mexico international border and along the Rio Grande River in Texas, generally this has focused on establishing conservation easement agreements with private landowners in Mexico. There are two priority wildlife corridors identified between Falcon Dam and Sierra Picachos Natural Protected Area in the State of Nuevo Leon. See **Figure 2-1** for an aerial photograph of Picachos Corridor. This corridor will connect to the Lower Rio Grande Valley NWR tracts in Starr County. The other international corridor is along the Laguna Madre coastal area that is intended to provide a corridor for ocelots between Laguna Atascosa NWR and Laguna Natural Protected Area in Mexico. This corridor also connects along the Rio Grande River.



Source: USFWS 2008

Figure 2-1. Aerial Photograph of Picachos Corridor

Destruction and fragmentation of optimal habitat and travel corridors increases threats to the ocelot, such as urban expansion and development, new roads and expansion, loss of agricultural lands to development, mortality from vehicles, incidental trapping, and competition from feral dogs and cats. In Mexico, particularly in the northeast, ocelots suffer from habitat loss due to charcoal production, agriculture, and livestock ranching. Human population increases and associated urban expansion in the lower Rio Grande Valley have resulted in brush clearing and increased pollution (USFWS 1986). Industrialization has degraded water quality (USFWS 1986). Brushland habitats have also been converted to rangeland with herbicides (Bontrager et al. 1979), root plowing, and fire (Hanselka 1980).

Pesticides can be incorporated into the food chain and are potentially harmful or fatal to terrestrial and aquatic organisms. Agriculture pesticides are used year-round in the Lower Rio Grande Valley (LRGV), and drift and overspray from aerial applications occur periodically on NWR lands. In the LRGV, runoff from cultivated fields may concentrate pesticides and herbicides in permanent bodies of water. Pesticide application rates have been extensive and heavy throughout the LRGV. As a result, pesticide accumulation in the biota remains a major concern in management of Tamaulipan brushland. Dichlorodiphenyldichloroethylene, polychlorinated biphenyls, and mercury have been detected in ocelot blood and hair samples at low concentrations but are not believed to be a problem at this time (Mora et al. 2000).

Although habitat loss in south Texas is mainly attributable to agricultural and urban expansion, other contributing factors include human modifications of the Rio Grande with dams and reservoirs for flood control and hydroelectric power; floodway systems that remove water from the stream channel during peak flows; water diversions for irrigation, municipal, and industrial usage; and channel restriction and canalization (CIMP 1995).

As a result of increasing economic integration between the United States and Mexico, there is increasing pressure for highways and bridge infrastructure. In addition, recently growing national security concerns have increased pressure for fences and lighting in the Texas/Mexico border region. There are nine existing and three proposed international bridges (Anzalduas, Donna, Brownsville Navigation District) along the Rio Grande between Falcon International Reservoir and the Gulf of Mexico. Local human population growth and rapid industrialization on the Mexican side of the border have raised USFWS concern regarding the placement of road and bridge infrastructure in the lower Rio Grande Valley. Increased construction of these bridges may impact certain parcels of the LRGVNWR, the Rio Grande floodplain, and the remaining riparian wildlife habitat, and disrupt the continuity of the wildlife corridor.

Importing and exporting skins of many spotted cats became illegal in the United States between 1967 and 1973, and the ocelot was added to Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora during 1989. Recommendations were made by Tewes and Everett (1986) for selective methods of predator control and the education of hunters to avoid accidental shooting of ocelots. In 1997 the USFWS entered into a Section 7 consultation with the U.S. Department of Agriculture's Animal Damage Control for the use of leg-hold traps, snares, and M-44 explosive predator baits in south Texas and provided for the avoidance and minimization of impacts on federally–listed cats.

Data are limited regarding disease in the ocelot, but several diseases and parasites have been documented. Some include Notoedric mange (*Notoedres cati*) (Pence et al. 1995), Hepatozoon in the blood, Cytauxzoon in their red blood cells, fleas (*Pulex* sp.), dog ticks (*Dermacentor variabilis*), and Amblyomma ticks (Mercer et al. 1988). The tapeworm (*Taenia taeniaeformis*) (USFWS 1990) and helminthes (Pence et al. 2003) were also reported in ocelots.

Ocelot mortality has also been attributed to aggression and predation by other animals. Ocelots can be prey of domestic dogs, coyotes, snakes, alligators, and bobcats (USFWS 1990).

Vehicular collisions are the greatest known cause of ocelot mortality in south Texas, accounting for 45 percent of deaths of 80 radio-tagged ocelots monitored by Haines et al. (2005b) between 1983 and 2002. Underpasses and culverts have been or are to be installed in critical areas to be used as travel corridors for ocelots. The construction or modification of two roads that underwent formal Section 7 consultation, State Highway 48 and Farm-to-Market Road (FM) 106, made provisions for the careful placement, design, and maintenance of such culverts. It is anticipated that these culverts and underpasses will allow ocelots to disperse between patches of suitable habitat and reduce genetic isolation of the populations.

2.2 GULF COAST JAGUARUNDI

The jaguarundi was listed as endangered on June 14, 1976 (41 FR 24064). The jaguarundi is also listed in the CITES Appendix I of the convention which bans international commerce. CITES offers some protection over much of its range. Hunting is prohibited in Argentina, Belize, Bolivia, Colombia, Costa Rica, French Guiana, Guatemala, Honduras, Mexico, Panama, Paraguay, Surinam, Uruguay, the United States, and Venezuela. Hunting is regulated in Peru, while no legal protection is offered in Brazil, Nicaragua, Ecuador, El Salvador, and Guyana. No critical habitat is designated for this species.

2.2.1 Species Description

The jaguarundi has a long slender body, short legs, and sleek unpatterned fur, and looks more like a large weasel than a cat. It is roughly twice the size of a domestic cat, weighing about 7 to 22 lbs., standing 10 to 14 inches at the shoulder, and can be up to 4 feet long from nose to tail tip, with the tail taking up about a third of its length. It has a long and flat head instead of a round one. The ears are short and rounded, and it is one of the few cat species that does not have a contrasting color on the backs of the ears. Its eyes are small and set closely together.

The jaguarundi has two distinct color phases, red and gray, although the latter phase has also been called blue. The phases are so distinct that at one time they were thought to be separate species, the red one being called *Felis eyra*. A third color phase, black, has also been reported, but apparently does not occur in Texas (Goodwyn 1970). These cats are not known to be closely related to the other small South American cats. Instead of having 36 chromosomes, like the South American cats, it has 38 like the cougar and puma (Tewes and Schmidly 1987).

2.2.2 Distribution and Abundance

The jaguarundi historically occurred in southeast Arizona, south Texas, Mexico, and Central and South America as far south as northern Argentina. Today this cat has a similar distribution, but in reduced numbers, although it probably no longer occurs in Arizona (Tewes and Schmidly 1987). It may also be extinct in Uruguay. It is reported to occur at Masaya National Park in Nicaragua, Soberania National Park in Panama, and El Imposible National Park in El Salvador (Nowell and Jackson 1996). The presence of jaguarundis in Florida is likely the result of human introduction (Nowak and Paradiso 1983).

In Texas, the jaguarundi has been known to occur in Cameron and Willacy counties. Tewes and Everett (1986) analyzed the records of a clearinghouse established in 1981 to coordinate reception and filing of reports of jaguarundi (and ocelots) in Texas. Many of the reports were solicited by sending out questionnaires to trappers. The jaguarundi was reported from central Texas and the upper Gulf Coast as well as from south Texas. However, due to a lack of any tangible evidence, such as road kills, most of the sightings in the first two areas are believed to have been of black feral house cats. Tewes and Everett (1986) could make no estimate of the jaguarundi population in south Texas, although its population is presumably smaller than that of the ocelot, because confirmed sightings are rare. Goodwyn (1970) reported from interviews he conducted in 1969 that jaguarundis were thought to occur in seven specific areas: Santa Ana National Wildlife Refuge; LANWR "Paso Real," an area along the lower Arroyo Colorado on the border between Cameron and Willacy counties; the southern part of the El Sauz Ranch in northeast Willacy County; a small area west of Olmito in southern Cameron County; an area east of Villa Nueva; and an area near the Port Isabel airport in Cameron County.

Tewes (1987) and Tewes and Everett (1986) documented several other credible reports of jaguarundis in Cameron, Willacy, and Webb counties. The last confirmed sighting of a jaguarundi in Texas was at Laguna Atascosa NWR in November 2004 by an Ecological Service biologist and other Service staff during a 1-week period of time (Reyes 2008). While this was the last confirmed record of a jaguarundi in Texas, unconfirmed jaguarundi sightings in Hidalgo County include Bentsen Rio Grande State Park, Santa Ana National Wildlife Refuge, LRGVNWR, LANWR, Cimarron Country Club, Wimberley Ranch, the Anacua Unit of the Texas Parks and Wildlife Department's Las Palomas Wildlife Management Area, and other areas (Prieto 1990, Tewes 1992, Benn 1997). Other unconfirmed sightings of a jaguarundi occurred at the Sabal Palm Grove Sanctuary in Cameron County in 1988 (Anonymous 1989) and at the Santa Ana National Wildlife Refuge in March 1998 (Santa Ana National Wildlife Refuge data). Based upon sighting reports, personnel of the Santa Ana National Wildlife Refuge suspect the presence of jaguarundi on the refuge (Benn 1997).

2.2.3 Habitat

Habitat requirements in Texas are similar to those for the ocelot: thick, dense thorny brushlands or chaparral. Approximately 1.6 percent of the land area in south Texas is this type of habitat (Tewes and Everett 1986). The thickets do not have to be continuous but may be interspersed with cleared areas. The jaguarundi possibly shows a preference for habitat near streams (Goodwyn 1970, Davis and Schmidly 1994) and may be more tolerant of open areas than the ocelot.

The jaguarundi uses mature forest (brush) and pasture-grassland (Caso 1994). Jaguarundi habitat use was 53.0 percent mature forest and 47 percent pasture–grassland. Jaguarundis use open areas for hunting and sometimes resting, but if threatened with a potential danger they will seek cover in brush areas.

In South America, habitat includes high mountain forests, tropical forests, swamp forests, savannahs, overgrown pastures, and thickets (USFWS 1980, Tewes and Schmidly 1987). In Venezuela, it has been most frequently found to occur in drier tropical forest relative to other habitat types. They are rarer and thinly distributed in moist forest types, especially deep rain forest. They have been reported to prefer forest edges and secondary brush communities, but this is where they are most frequently seen. In Belize's Cockscomb Basin Wildlife Sanctuary, jaguarundi are most frequently associated with water and old-field habitats. It appears to be the most flexible cat in its ability to occupy different habitats, and having access to dense ground vegetation appears to determine habitat suitability (Nowell and Jackson 1996).

The most common plants occurring in habitats in the lower Rio Grande Valley where the jaguarundi is known to occur are huisache (*Acacia farnesiana*), blackbrush acacia (*Acacia rigidula*), prairie baccharis (*Baccharis texana*), chilipiquin (*Capsicum annuum*), lotebush (*Ziziphus obtusifolia*), allthorn goatbush (*Castela texana*), Texas persimmon (*Diospyros texana*), coyotillo (*Karwinskia humboldtiana*), common lantana (*Lantana horrida*), berlandier wolfberry (*Lycium berlandier*), javelinabrush (*Microrhammus ericoides*), Texas pricklypear (*Opuntia lindheimeri*), retama (*Parkinsonia aculeata*), honey mesquite (*Prospis* *glandulosa*), cedar elm (*Ulmus crassifolia*), and lime pricklyash (*Zanthoxylum fagara*) (Goodwyn 1970).

2.2.4 Threats

Loss of habitat is one of the main threats to the jaguarundi. Historically, dense mixed brush occurred along dry washes, arroyos, resacas, and the flood plains of the Rio Grande. A majority of shrubland has been converted to agriculture and urban development. Unfortunately for the jaguarundi, the best soil types used for agricultural crops also grow the thickest brush and thus produce the best habitat for the jaguarundi. Less than 5 percent of the original vegetation remains in the Rio Grande Valley.

2.3 SOUTH TEXAS AMBROSIA

The proposed rule to list south Texas ambrosia (*Ambrosia cheiranthifolia*) as endangered was published in the Federal Register on August 5, 1993 (58 FR 41696; USFWS 1993b). Final listing of the south Texas ambrosia as an endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) occurred on August 24, 1994 (USFWS 1994). Critical habitat was not designated.

2.3.1 Species Description

The first collection on record of south Texas ambrosia was taken by Luis Berlandier in 1835 in San Fernando, Tamaulipas, Mexico (USFWS 1994). In 1859, Asa Gray named the collection *Ambrosia cheiranthifolia* (Turner 1983). In 1932, the first collection of *Ambrosia cheiranthifolia* in the United States was taken from an area near Barreda (now Russelltown) in Cameron County, Texas, by Robert Runyon (Turner 1983).

South Texas ambrosia is an herbaceous ashy blue-gray rhizomatous perennial in the Asteraceae (sunflower) family. Erect stems are 3.9–23.8 inches tall. The number of plants present is difficult to count, as they usually form closely spaced colonies with rhizomatous growth habits inhibiting number counts. The leaves are usually opposite at the base, and alternate above. The leaves are mostly oblanceolate 0.8–2.8 inches long, with the blade narrowing gradually at the base. Leaves are mostly unlobed and entire, although the lower and larger leaves of juvenile plants may be undulate or shallowly pinnate. Leaves appear whitened due to a fine and short appressed pubescence, giving the leaf an ashy blue-gray color. The inflorescence is usually unbranched and composed of separate male and female flowers. The male flowers occur in a terminal raceme 2–4 inches long composed of 10–12 small, light yellow, saucer-shaped flowers that are about 0.16 inches wide and have 4-6 acute, triangular lobes. The female flowers are in small clusters in the axils of the leaves. The fruit is an achene, somewhat angled and long with a stout beak. The fruit has 4 to 5 blunt spines spread across the surface (Correll and Johnston 1970; Jones 1977). South Texas ambrosia is distinguished from related species within its geographical range by its simple leaves and the ashy blue-gray color; however, this species is easily obscured by taller native and introduced grasses (Turner 1983).

2.3.2 Distribution and Abundance

The species is considered rare or infrequent in the coastal prairies of the Rio Grande Plains (Correll and Johnston 1970). South Texas ambrosia was known from 30 locations in Cameron, Jim Wells, Kleberg and Nueces counties, Texas, and one in Tamaulipas, Mexico. Three of these locations are historical occurrences that have not been relocated: one each in Jim Wells and Cameron counties and the Mexico location. Currently, south Texas ambrosia occurs in 27 sites within Kleberg and Nueces counties. Of these 27 current sites, 3 are on State land, 13 on Federal land (Kingsville Naval Air Station), and 11 on private land or in local jurisdictions in and around the communities of Bishop (Nueces County), Kingsville (Kleberg County), and Robstown (Nueces County), Texas. The species currently occurs primarily on private ranch lands that have not been subjected to continuous mowing, plowing, and/or herbicide use. Suitable habitat for the south Texas ambrosia probably exists in Kenedy and Willacy counties, based on the historical and current presence of the plants in Cameron and Nueces counties.

2.3.3 Habitat

South Texas ambrosia grows at low elevations (26–66 feet) in open prairies and savannas of south Texas, on soils varying from clay-loams to sandy-loams. It inhabits the Gulf Coastal grasslands in clay soils derived primarily from the Beaumont clay series (Turner 1983). This soil is typically clay-loam to sandy–loam, usually deep clay soils and occasionally on wind-blown clay dunes along streams. Two of the Bishop area populations occur on slightly alkaline soils, with an average pH of 7.4. Precipitation averages range from up to 15.7 inches per year but is variable. The average frost-free season is 250–310 days annually (Brown et al. 1976).

South Texas ambrosia is almost always associated with native grasses such as Texas grama (*Bouteloua rigidiseta*), buffalo grass (*Buchlöe dactyloides*), Texas spear grass (*Stipa leucotricha*), and curley mesquite (*Hilaria mutica*) (USFWS 1994). Some of the invading non-native grasses include such species as buffelgrass (*Pennisetum ciliaris*), King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), Kleberg bluestem (*Dichanthium annulatum*), bermudagrass (*Cynodon dactylon*), and St. Augustine grass (*Stenotaphrum secundatum*). Native woody species scattered in the grassland include mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), huisachillo (*Acacia schaffneri*), brasil (*Condalia hookeri*), granjeno (*Celtis pallida*), and lotebrush (*Ziziphus obtusifolia*) (USFWS 1994). Associated forb species include Western ragweed (*Ambrosia psilostachya*), plains gumweed (*Grindelia oolepis*), violet ruellia (*Ruellia nudiflora*), scarlet pea (*Indigofera miniata*), small-flowered verbena (*Glandularia* *bipinnatifida*), painted tongue (*Bouchetia erecta*), false mallow (*Malvastrum coromandelianum*), false ragweed (*Parthenium hysterophorus*), old man's beard (*Clematis drummondii*), and cowpen daisy (*Verbesina microptera*).

At three locations in Nueces County, the endangered slender rush-pea (*Hoffmannseggia tenella*) occurs in association with the south Texas ambrosia. The endangered black lace cactus (*Echinocereus reichenbachii* var. *albertii*) occurs in close proximity to the ambrosia at a site in Kleberg County.

2.3.4 Threats

The USFWS (1994) described three major threats to the South Texas ambrosia that justified listing the species as endangered: (1) destruction or modification of range through agricultural practices, highway construction; and urbanization; (2) invasive exotic grasses; and (3) decreased genetic variability and viability through the loss and/or modification of habitat and fragmentation.

Habitat destruction is the primary threat to South Texas ambrosia. Past practices of converting parts of South Texas to agricultural fields, urbanized areas, and industrial parks has limited the amount of habitat available for colonization.

Results from various invasive grass studies indicate that there is shade and root competition between native plants and invasive grasses (Pressly 2002), as well as possible allelopathic effects (suppression of growth of one plant species by another due to release of toxic substances) by invasives on native forbs and grasses (Nurdin and Fulbright 1990 as cited by USDA 1998). When native plants must compete for light, moisture, and/or nutrients, energy is expended to produce vegetative growth for photosynthesis and survival. Seed production then decreases, restricting seedling recruitment and limiting range expansion of the species. Highly invasive species also create monotypic habitats quickly and bypass the important components of natural ecosystem processes. Other potential prairie habitat may be invaded by thorny shrub and tree species as a result of fire suppression or overgrazing. Along railway and roadway rights-of-way, where several of the South Texas ambrosia populations occur, herbicide application is used to discourage weedy growth that impairs the view of operators of motor vehicles and/or railway cars, but may also prevent ambrosia populations from expanding.

Separation of plant populations that rely on pollination for reproduction can lead to the loss of genetic diversity due to a lack of gene exchange, resulting in inbreeding of small groups of plants and amplifying the effects of deleterious alleles. With reduced numbers of individuals and populations of South Texas ambrosia, stochastic events can lead to the extinction of isolated local populations. Although the clonal habit of the species may alleviate deleterious allelic problems, it only perpetuates a small amount of isolated genetic material that may or may not be able to survive disease or extreme seasonal climatic changes. Species that evolved with small isolated populations have already adapted to such factors over geologic time, but widespread species like the

South Texas ambrosia should not be expected to change within a few decades to adjust to such conditions (Poole et al. 2007).

2.4 STAR CACTUS

In 1993, the star cactus (*Astrophytum asterias*) was designated as an endangered species under the Endangered Species Act of 1973, as amended (USFWS 1993c). Critical habitat has not been designated for this species. According to the recovery plan, in 1997, Texas Parks and Wildlife Executive Order No. 97-002 established the star cactus status as endangered by the State of Texas (USFWS 2003).

2.4.1 Species description

A member of the family Cactaceae, the star cactus is spineless, and dome or disk-shaped. It is up to 6 inches in diameter and divided into eight symmetrical triangular segments. Each segment has a central line of areoles containing tufts of white hairs. When soil moisture is available to the plants, the stems expand up to 2 inches above the ground, and the star cactus is usually a dull green color. During dry weather, the stems shrink into flat disks, the cacti turn dull brown, and often become concealed under gravel. Flowers of the star cactus are yellow with orange centers. Fruits are green to grayish red and can be hidden by the tufts of hairs (USFWS 2003).

2.4.2 Distribution and Abundance

In the United States, 13 small populations are currently known in Starr County, Texas, on Catahoula and Frio soils. Reliable historic records include similar habitat types in Zapata and Jim Hogg counties. Other reports of star cactus from Hidalgo and Cameron counties may be misleading; these anecdotal accounts do not indicate specific locations, nor were voucher specimens deposited in any herbaria (Best 2008a). Ten star cactus populations have also been documented from the Mexican states of Nuevo León and Tamaulipas.

2.4.3 Habitat

The star cactus occurs among sparse, low shrubs, grasses, and halophytic (salt-tolerant) plants on xeric upland sites. Soils are usually gravelly clays or loams, and typically contain high levels of gypsum, salt, or other alkaline minerals. Some Mexican populations occur on soils derived from caliche or limestone.

In the wild, the star cactus is restricted to xeric sites that usually have high levels of salt, gypsum, or other minerals. It is often grown in commercial nurseries in substrates that lack these high mineral levels. Therefore, it is believed that this species tolerates mineral levels that are toxic to most plants, but does not absolutely require them. Strong (2007) has measured diameter growth rates of 0.5 mm to 4.2 mm per year in the wild. Such slow growth renders star cactus unable to compete with more aggressive grasses and herbaceous plants; rather, it has evaded competition through adaptation to harsh sites where most plants cannot live.

The star cactus may occur in full sun, or beneath the partial shade of low grasses and sub-shrubs, such as red grama (*Bouteloua trifida*), saladillo (*Varilla texana*) and calderona (*Krameria ramosissima*). However, it does not tolerate the dense shade of taller shrubs and trees.

2.4.4 Threats

The collection of wild star cactus plants has eliminated most of the wild populations and has greatly depleted many of the remaining ones. Wild star cactus plants are sold illegally to cactus collectors; however, star cactus can be legally propagated from captive seed and sold to collectors. Additionally, star cactus plants are often collected accidentally by licensed or illegal collectors of peyote (*Lophophora williamsii*). These two cactus species are similar in appearance and often occur in the same habitats (USFWS 2003).

Land clearing is the complete removal of native vegetation from a specific area, to create cropland and improved pasture, and to construct buildings, roads, utility rights of way, and other infrastructure. Clearing often includes complete restructuring of the soil profile and contour. Land clearing results in long-term or permanent loss of habitat and destruction of existing populations. Individual plants and populations of star cactus are also harmed when physically trampled by pedestrians, livestock, or vehicles (USFWS 2003).

Introduced invasive plants compete with star cactus for light, water, nutrients, and physical space. Buffelgrass (*Pennisetum ciliare*) is a highly invasive, drought-tolerant grass that displaces individual star cactus plants and populations, degrades habitats, and impedes reproduction throughout the species' range (USFWS 2003).

Habitat fragmentation may lead to genetic isolation and depletion of star cactus populations through the loss of gene flow (pollen transfer) between populations. Star cactus is an obligate out-crosser; populations lacking sufficient genetic diversity are not able to reproduce (Best 2008b).

Chemical contamination from oil well spills or other activities related to oil and gas exploration, as well as herbicides, is potentially harmful to individual plants, populations, and habitats (USFWS 2003).

2.5 TEXAS AYENIA

Texas ayenia (*Ayenia limitaris*) was listed on August 24, 1994, as an endangered species under the Endangered Species Act of 1973, as amended (USFWS 1994). It was first collected by C. G. Pringle in 1888 in Hidalgo County under the name *Nephropetalum pringlei*. It was also referred to as *A. berlandieri*, a more southerly species. In 1960, Carmen Cristobal revised the genus *Ayenia* and at the same time described *Ayenia limitaris* as a new species (Cristobal 1960, as cited in Damude and Poole 1990). Critical habitat is not designated for this species.

2.5.1 Species Description

Texas ayenia is a perennial herb/shrub that reaches 2 to 5 feet tall. The juvenile stems are covered with short downy hair that gives it a silvery appearance. Mature stems are reddish brown, stippled with white lenticels (dots). The leaves are simple, alternate, and heart-shaped, and gradually narrow at the tip. Leaf margins are finely toothed, and the blades have three to five veins. The upper leaf surfaces have sparse, fine hairs, while the lower surfaces have a dense, silvery covering of hairs that appear star-shaped under magnification.

Clusters of two or three flowers are produced on short stems arising from the axils of the upper leaves. The flowers are usually greenish, cream-colored or light rosy pink in color. The individual flower stems are about 1/8 to 1/4 inch long. The five hooded petals have a slender claw that is more than 1-1/2 times as long as the expanded part of the petal.

The fruit is a five-celled, rounded capsule with short, curved, sharply pointed prickles with very short hairs covering it. When the capsule ripens, it splits violently into five one-seeded segments that eject and disperse the seeds. The seeds are dark grey to blackish in color and are ovoid, tapering to a point at one end, with the surface appearing variously warty or wrinkled.

2.5.2 Distribution and Abundance

Historical occurrences of Texas ayenia were found in the lower Rio Grande Valley in Hidalgo and Cameron counties, Texas, and in the states of Coahuila and Tamaulipas, Mexico.

In 1994, only two of the historic locations were verified, one in Hidalgo County, Texas, and one in the Municipio of Soto La Marina, in Tamaulipas, Mexico. Surveys of the Hidalgo County site in 1988 documented only six small plants. The following year, only one plant was found (Damude and Poole 1990), and in 1990 and 1991 none were observed. In 1992, one plant was located at this site (USFWS 1994), and in 1994, 20 additional plants were verified by Joe Ideker of the Native Plant Project. That same year several intensive searches were made at some sites where Texas ayenia had been reported (Olmito-Barreda area, three state parks, Audubon Sabal Palm Grove Sanctuary, Resaca del Rancho Viejo) but proved unsuccessful (Ideker 1994).

A 3-year project that included landowner outreach and rare plant surveys on private lands was conducted between May 1, 2002, and August 31, 2006, by Texas Parks and Wildlife and The Nature Conservancy. Its objective was to develop an umbrella candidate conservation agreement for rare plants of the lower Rio Grande Valley under which sub-permittee conservation agreements with private landowners could be implemented (TPWD 2006).

Surveys were conducted in Willacy, Cameron, and Hidalgo counties, Texas. In Willacy County, surveys documented a population on a large ranch. No landowner agreement was signed; however, The Nature Conservancy is pursuing a conservation agreement. In Cameron County, a population of approximately 100 plants was located in Harlingen along the Arroyo Colorado. Another property was surveyed north of Rio Hondo, along the Arroyo Colorado, that had been reported to have Texas ayenia, but no plants were observed at the time of the survey. Agreements were signed with both Cameron County landowners (TPWD 2006). The population in Hidalgo County still exists; however, no agreement has been signed to protect this population.

To date there are six known Texas ayenia populations in the United States, four in Cameron County, one in Hidalgo County, and one in Willacy County.

In Mexico, a collaborative 3-year study with Pronatura, TPWD, The Nature Conservancy, and the USFWS was conducted to determine the status of individuals and/or populations and their distribution, and to identify and implement conservation strategies at private sites for the three species of rare plants in the Lower Rio Grande, including Texas ayenia (Pronatura Noreste 2005). During the surveys, between 2003 and 2005, Texas ayenia was observed at 13 sites near San Jose de Las Rusias, municipality of Soto La Marina, all in Tamaulipas. In March and April 2005, flowers and capsule formation were observed at eight locations. In August, the plant was observed at seven sites (Pronatura Noreste 2005). Prior to the Pronatura NE project, only two populations were known to occur in Mexico. After surveys were performed, there are now a total of 13 known populations.

2.5.3 Habitat

Texas ayenia occurs in subtropical woodland and savanna, in soils ranging from silty clays to fine sandy loams (Best 2007c). At one site in the lower Rio Grande Valley, the species grows in a plant community known as the Texas Ebony-Anacua series (Chloroleucon ebano-Ehretia anacua) (Diamond 1990). Past occurrences have been described in openings among brush, on the edges of thickets in chaparral (Correll and Johnston 1979). Recently discovered sites in Tamaulipas and Willacy County, Texas, are in partial sunlight at the edges of brush thickets. The sandy clay loam soil is derived from Holocene alluvial deposits and terraces on floodplains along the Rio Grande (Damude and Poole 1990).

Associated species of Texas ayenia include coma (*Sideroxylon celastriuma*), brasil (*Condalia hookeri*), mesquite (*Prosopis glandulosa*), lotebrush (*Ziziphus obtusifolia*), granjeno (*Celtis pallida*), colima (*Xanthoxylum fagara*), and snake eyes (*Phaulothamnus spinescens*) (Diamond and Poole 1990). The community at the Hidalgo site was once an extensive thicket that covered much of the Rio

Grande delta; however, less than 5 percent of the original acreage remains, mainly along fencerows, highway rights of way, canals, and ditch banks (Jahrsdoerfer and Leslie 1988).

Mexican habitat was low semi-deciduous tropical savanna with a mix of tall thorn scrub, grasses, and herbaceous plants. Soil was rich in organic material and had a great quantity of fine sands. Plants were flowering from August to May and had capsules with seeds. Associated flora was very diverse, with more than 120 species. Habitat is vulnerable to human pressure such as housing construction, illegal garbage dumps, fires, and agricultural practices (Pronatura Noreste 2005).

2.5.4 Threats

In both locations, the species is threatened by human impacts on thorn scrub due to agricultural, recreational, and urban development (Jahrsdoerfer and Leslie 1988). The species and its habitat are also threatened by the introduction of exotic grasses into the area. The low population numbers contribute to the decline of this species (Damude and Poole 1990).

Another major concern is the loss of its habitat, the riparian thorn woodland and savanna. Over 95 percent of this habitat has already been lost (Damude and Poole 1990). Habitat destruction mainly occurs through agricultural, recreational, and urban developments. At the U.S. Hidalgo site, agricultural practices such as brush clearing, pesticide uses, and irrigation threaten the existence of this habitat. In developing urban areas, clearing of the thorn scrub for flood control, dam construction, and other water development projects affects the flow patterns of the Rio Grande on which this riparian habitat depends (Jahrsdoerfer and Leslie 1988). Due to recent highway construction, this site is also located in the center of utility and highway rights-of-way, which was probably responsible for the loss of several individuals of this species.

2.6 WALKER’S MANIOC

Walker’s manioc was federally listed as endangered on October 2, 1991. It is also listed as endangered by the state of Texas. At the time of listing there was only one known U.S. population, found in Hidalgo County, Texas, and it consisted of a single plant. No critical habitat is designated for this species.

2.6.1 Species Description

Walker’s manioc, a member of the spurge family (Euphorbiacea), is a spindly, almost vine-like perennial herb that can reach up to 6 feet tall. It is found in semi-arid subtropical brush in extreme south Texas and neighboring Tamaulipas, Mexico.

The leaves have up to five lobes that may be shallowly or deeply indented. The narrow stems are smooth and grayish brown. The tuberous roots of the Walker’s manioc measure up to 10 inches in length and 4 inches in width and resemble carrots or turnips. When fresh, all plant parts have a strong cyanide odor. The five-lobed male and female flowers are separate, but on the same plant, and occur in racemes. Male flowers are about 0.5 inches long, white with light purple streaks, and are almost tubular in shape. The 0.375-inch long female flowers occur at the base of the male flower stalks. The fruit is a dry, globular capsule about 0.5 inches long, occurring on slightly downward curved stalks and containing three seeds. The seeds are round or slightly flattened and gray, with small irregular dark spots (TPWD 2007a, USFWS 1993a).

2.6.2 Distribution and Abundance

Walker's manioc was first discovered in 1853 by Arthur Schott near Fort Ringgold, Texas, a historic fort near Rio Grande City in Starr County. It was sighted again in 1888 on the Mexican side of the Rio Grande, and in 1940 Mrs. E. J. Walker collected the plant near Mission and La Joya in Hidalgo County, Texas. She sent the specimen to the University of Texas in Austin, which named it after her (USFWS 2007).

The specimens collected in 1853 near Ringgold Barracks, Rio Grande City, Starr County, and again in 1940 have not been relocated. A modern wastewater treatment plant occupies a portion of the old Ringgold barracks site, and no Walker's manioc has been relocated at the site. Attempts to locate plants where Mrs. Walker collected them near Mission and La Joya, Texas, have also been unsuccessful (USFWS 1993a).

In 1960, Marshall Johnston discovered Walker's manioc growing among remnant grasslands at two locations in east-central Tamaulipas, Mexico. He collected specimens from the Rancho Loreto area of Tamaulipas. In 1989, this area was resurveyed by a Mexican botanist, but no plants were found. The species was feared to be extinct in the wild, since years had passed with unsuccessful survey results (USFWS 2007).

A vigorous colony of Walker's manioc on the University of Texas Austin campus, planted from material received from Mrs. Walker, was vandalized in the spring of 1982. The population was reduced to only two or three plants, and a severe freeze in 1990 left only one plant at this location. Thereafter, the Center for Plant conservation had plants from the University of Texas stand under cultivation in pots at the San Antonio Botanical Garden (USFWS 1993a).

In 1990, botanist Phil Clayton found a single plant on private property near La Joya, Texas. Landowners were willing to protect the single plant and allow botanists to study it and collect seeds. In 1992, Mexican botanist Francisco Gonzales Medrano, aided by a grant from the USFWS, rediscovered a small population near Johnston's 1960 find, as well as a new population in southern Tamaulipas, Mexico (USFWS 2007). The Rancho Loreto site was identified as having only 8 to 10 individuals and reduced available habitat. The reduced available habitat may have been a result of long-term cattle grazing (USFWS 1993a).

In 1995, Walker's manioc was located in three different areas on the Lower Rio Grande National Wildlife Refuge in Starr and Hidalgo counties. The populations consisted of 6 to 150 individual plants, with individual populations often many miles from the next nearest population (Rio Delta Wild 2007). A map was generated of refuge sites using Global Positioning System (GPS) information (USFWS 2007). It is very likely that additional populations still exist on lands that have not been surveyed (Rio Delta Wild 2007).

Dr. Robert Lonard discovered a new population of Walker's manioc in March 1997 on a public road ROW north of La Joya. In May 1997, Tom Patterson and Chris Best discovered another population consisting of 6 individuals along Mexican Highway 97 north of Pedro J. Mendez, Tamaulipas. During that same period, Arturo Longoria discovered a viable population on a private ranch about 7 miles north of Rio Grande City (Best 1998). A small population (more than 20 plants) was also discovered at a cemetery in Peñitas, Hidalgo County, and another population was discovered by The Nature Conservancy on private lands in Duval County (Best 2007a)

Since 1998, the Texas Department of Transportation (TxDOT) has protected a single population found along the FM 2221 right-of-way in Hidalgo County. The population is offered protection, management, and monitoring under the Pharr District Resource Protection Signing Program. In July and August 2002, 13 additional Walker's manioc plants were counted at that site on a routine field survey. That same year, a new population consisting of several plants was found approximately 0.2 miles north of the existing population. No other new populations have been found to date (TxDOT 2007).

Currently 10 populations of Walker's manioc exist in the United States. There are 5 in Starr County and 5 in Hidalgo County. These populations occur on private and public lands. From 2003 to 2005, Pronatura Noreste biologist Alberto Contreras, in collaboration with The Nature Conservancy, Texas Parks and Wildlife, and USFWS personnel, visited more than 200 sites and collected more than 300 plant specimens in northeast Mexico. The Pronatura Noreste survey detected Walker's manioc in 24 locations, including previously reported sites at Rancho Loreto and Ejido Morales in east central Tamaulipas (Best 2007a). It is not known, however, if the Mexican plants are too distantly related to be crossed with the U.S. plants (Rio Delta Wild 2007, USFWS 2007).

2.6.3 Habitat

Walker's manioc usually grows among low shrubs, native grasses, and herbaceous plants, either in full sunlight or in the partial shade of shrubs. It is found in sandy, calcareous soil, shallowly overlying indurated caliche and conglomerate of the Goliad Formation on rather xeric slopes and uplands, or over limestone as in the case of the Aldama population (TPWD 2007a, Rio Delta Wild 2007).

Principal woody associates at the largest known site—on very gentle upper slopes of bluffs along the Rio Grande near Rio Grande City—include calderona (*Krameria ramosissima*), blackbrush acacia (*Acacia rigidula*), cenizo (*Leucophyllum frutescens*), Mission fiddlewood (*Citharexylum spathulatum*), coyotillo (*Karwinskia humboldtiana*), and tasajillo (*Opuntia leptocaulis*). Other plants that grow in association with Walker's manioc include anacahuita (*Cordia boissieri*), barreta (*Helietta parvifolia*), blue sage (*Salvia ballotaeflora*), drago (*Jatropha dioica*), elbowbush (*Forestiera angustifolia*), guayacan (*Guaiacum angustifolium*), oregano cimarron (*Lippia graveolens*), and colima (*Zanthoxylum fagara*) (USFWS 1993a).

2.6.4 Threats

Among the threats facing Walker's manioc are habitat destruction/modification and fragmentation, since much of the native plant cover in this region of Texas, approximately 95 percent, has been lost to agricultural activities, residential development, and highway construction activities. Destruction and fragmentation of native brush and grassland habitat can occur by mechanical and chemical means, and prescribed fire activities (USFWS 1993a).

Mechanical brush clearing could include heavy steel chains, roller choppers, root plows, brush mowers, and tree grubbers, and could create soil disturbances. Herbicides are destructive because they are selective on broad-leaved plants. It is not known if the Walker's manioc tuberous root provides any protection for complete destruction from herbicides. Fire usually has temporary effects, because native vegetation resprouts from the roots after being burned (USFWS 1993a).

Fragmentation leaves remnant tracts of habitat surrounded by cultivated fields and development, potentially vulnerable to agricultural chemicals spread by drift from aerial spraying and runoff following rains. Uncontrolled fires caused by colonias (unincorporated border settlements) burning trash also threaten remnant tracts of brush, and the introduction of exotic species, especially grasses, has displaced some native vegetation (USFWS 1993a).

Walker's manioc is also vulnerable to strip or surface mining of caliche outcroppings for road-building material, because it occurs in scattered populations of soils overlying caliche ridges. Some level of herbivory has been observed at several population sites in Texas, although the agent and the effects of this herbivory are unknown. Also of note, in 2003, Refuge Law Enforcement Officer Joe Resendez and Refuge Ecologist Chris Best determined that tubers of Walker's manioc plants at three refuge tracts were occasionally excavated by wild animals. They were able to positively identify javelina tracks at a recently excavated site; this does not preclude that other animals may also be digging the roots (Best 2007a).

The human population is projected to increase 81 to 100 percent in Hidalgo County and 61 to 80 percent in Starr County between the years 2000-2025

(Murdock et al, 2002). With increased human population comes more commercial and residential development, further removing or fragmenting the last remaining tracts of habitat.

2.7 JOHNSTON'S FRANKENIA

Johnston's frankenia (*Frankenia johnstonii*) was listed August 7, 1984 (49 FR 31418), as an endangered species under the Endangered Species Act of 1973. Critical habitat was not designated for this species. On May 22, 2003, a proposed rule was published to delist the plant, but to date the final rule has not been published (68 FR 27961).

2.7.1 Species Description

Johnston's frankenia is a low, somewhat sprawling, perennial shrub, in the Frankeniaceae family. Mature plants are approximately 12 to 18 inches high, 12 to 24 inches wide, and rounded in appearance. This spineless sub-shrub has a woody, trunk-like stem that gives rise to several to many ascending or recurved herbaceous stems. The entire plant may be grayish-green or bluish-green most of the year, turning rusty brown in late fall, when it is easily detected among its surrounding deciduous neighbors. This color change can also be brought on by severe drought conditions (Janssen and Williamson 1993). The gray-green leaf surfaces are haired, with salt crystals frequently visible on the underside of the leaves. Leaf margins are somewhat rolled or turned under. Flowers are small, with five slightly fringed or toothed white petals and a distinct yellow center. Flowering occurs from April to November, especially when stimulated by rainfall (Janssen and Williamson 1994).

2.7.2 Distribution and Abundance

Johnston's frankenia was first collected in 1966 in Zapata County, Texas, by Dr. D. S. Correll, who later named the species in honor of Dr. M. C. Johnston (Correll 1966). At the time it was listed, Johnston's frankenia was known at only four sites in Texas (two in Zapata County and two in Starr County) and at one locality in Mexico. When the recovery plan for this species was finalized in 1988, a total of seven populations, including the original five, had been located, all occurring on private land. At that time, the six Texas populations were encompassed within a 56-mile radius, with the population in Mexico located approximately 125 miles to the west. The listing of Johnston's frankenia and subsequent recovery planning and implementation efforts generated increased inventory activities for the species throughout its known range and beyond. Since 1993, intensive surveys in Webb, Zapata, and Starr counties in southern Texas, as well as additional information from Mexico, have shown this species to be more widespread and abundant than was previously known. The discovery of new populations has extended the species' range to north and west of Laredo in Webb County, farther east in Zapata County, and farther south in Starr County (Janssen 1999). Currently a total of four populations are known in Mexico.

Three of these are relatively close to one another along Highway 53 in the State of Nuevo Leon, while the location of the fourth population extends the species' range north–northeast to the vicinity of Nuevo Laredo in western Tamaulipas (Janssen 1999).

An intensive status survey and study of ecological and biological characteristics of Johnston's frankenia was undertaken by TPWD botanist Gena Janssen between 1993 and 1999. The final report for this 6-year study contained documentation for 58 populations of Johnston's frankenia in the United States and 4 in Mexico (Janssen 1999). Four of these 62 total populations were part of the 7 populations referenced in the recovery plan. The results of the more recent status survey have dramatically increased the known numbers of individual plants, from approximately 1,500 at the time of listing to more than 9 million by 1999 (Janssen 1999).

Since the publication of the draft proposed rule to delist Johnston's frankenia in May 2003, additional populations have been discovered. One recently located Starr County population occurs south of the town of El Sauz and north of Rio Grande City. In Zapata County, a landowner who had previously signed conservation agreements for two populations on his ranch found four new sites on this property. Surveys on a Zapata County ranch that became accessible in 2004 turned up a previously undocumented large population containing "hundreds of thousands, if not millions" of plants (Janssen 2004). Also in 2004, a new site for *F. johnstonii* was located in Webb County. It is likely that this site is part of an already-documented population on an adjoining ranch. This population is located in the most northwestern part of the species' range, and the newly discovered portion of the population occurs on land belonging to individuals who have expressed an interest in rare plant conservation (Williams 2004). Adding these newly documented populations to those described in Janssen's 1999 report brings the total number of known populations in Texas to at least 60.

It is probable that populations still remain undiscovered throughout suitable habitat in all three Texas counties, with the highest potential in Zapata County, and in Mexico (Janssen 2001). In Mexico, the level of effort to survey for Johnston's frankenia has been limited. In Texas, Janssen estimated that approximately 80 percent of potential habitat had been surveyed for Johnston's frankenia (Janssen 2001). Landowner permission for access was one of the primary factors affecting the extent of potential habitat covered by surveys, since parts of all populations located to date occur on privately owned land. Within Texas, a greater extent of suitable habitat, defined by the presence of the correct types of soils, exists in Zapata County than in the neighboring Starr or Webb counties (Janssen 2000).

2.7.3 Habitat

Johnston's frankenia generally grows on open or sparsely vegetated, rocky, gypseous hillsides or saline flats. In Texas, this species is endemic to Webb, Zapata, and Starr counties, where it occurs within the mesquite-blackbrush community encompassed in the South Texas Plains vegetation zone as described by McMahan et al. (1984). Johnston's frankenia populations have a clumped distribution, occurring in openings of the Tamaulipan thorn scrub where the plant thrives in a setting with high light intensity. Populations of this species appear to be restricted to pockets of hyper-saline soil, analysis of which shows salinity and sodium content that is approximately 10 times greater than that found in soils occurring outside the populations (Janssen and Williamson 1994). The population in Mexico occurs in the transition zone between the Tamaulipan scrub and the Chihuahuan desert (Whalen 1980).

2.7.4 Threats

At the time of listing, Johnston's frankenia was considered to be vulnerable to extinction due to the following: (1) the low number and restricted distribution of populations; (2) low numbers of individual plants; (3) threats to the integrity of the species' habitat, such as clearing and planting to improve pasture species, including introduced grasses; (4) direct loss from construction associated with highways, residential development, and oil- and natural gas-related activities; and (5) the species' low reproductive potential.

The intensive survey effort by TPWD in South Texas has shown Johnston's frankenia to be much more widespread and abundant than was known at the time of listing or when the recovery plan was prepared. Initial information regarding the species' vulnerability to competition from exotic plant species such as buffelgrass (*Pennisetum ciliare*) have been alleviated, as data collected for soils, structural characteristics, and composition of the surrounding plant community show Johnston's frankenia to be well adapted to the harsh environment in which it is a dominant vegetative component. This plant is a halophytic (salt-loving) perennial, suited to life in hyper-saline soils in which the elevated salinity and sodium levels are likely to exclude buffelgrass, the non–native grass species that is most frequently planted for pasture improvement purposes in Webb, Zapata, and Starr counties (Reilley 2001). In fact, Johnston's frankenia is the dominant woody species within the plant community where it is found (Janssen 1999).

Mechanical and chemical brush-clearing practices that are commonly used prior to planting pasture grasses can, however, adversely impact Johnston's frankenia populations or portions thereof by uprooting or damaging plants. Public lands on which Johnston's frankenia occurs include a National Wildlife Refuge tract, USIBWC-controlled lands, and a TxDOT right of way. All three (and possibly the fourth) sites on Federal land are small populations, and the state highway department ROW site has only 36 individual plants.

Oil and gas exploration and production activities, which can pose threats to portions of populations via road or well-pad construction or clearing of seismic lines, are impossible to quantify or to project in terms of future geographic sitings.

Rare species can be vulnerable to reproductive failure, and low reproductive potential was cited in the recovery plan as a potential threat to Johnston's frankenia (Turner 1980, USFWS 1988). Among the factors that can heighten the risk of reproductive failure in plants are high dependence on specialized pollinators, absence of back-up reproductive mechanisms such as self–fertilization and vegetative reproduction, and poor ability to compete for pollinators (Janssen 1999).

2.8 ZAPATA BLADDERPOD

The Zapata bladderpod was federally listed as endangered on November 22, 1999, with four populations being located and described in Starr and Zapata counties in South Texas (USFWS 1999). Since the listing, additional populations have been documented. Zapata bladderpod has a total of 11 occurrences (USFWS 2004). Critical habitat was designated on December 22, 2000 (USFWS 2000).

Data supporting the union of *Lesquerella* and *Physaria* resulted in 91 names in *Lesquerella*, including 75 at the specific rank, to be transferred to *Physaria*. Thus, Zapata bladderpod is now named *Physaria thamnophilia* (Al-Shehbaz and O'Kane 2002).

2.8.1 Species Description

Zapata bladderpod is a pubescent, silvery-green, herbaceous perennial of the Brassicaceae (Mustard) family, with sprawling stems 17 to 34 inches long. Basal leaves are narrowly elliptical to oblanceolate and acute, 1.5 to 4.8 inches long, and 0.3 to 0.6 inch wide, with entirely or slightly toothed margins. Stems leaves are linear to narrowly elliptical and acute, 1 to 1.5 inches long and 0.1 to 0.3 inches wide, and have entire or slightly toothed margins (USFWS 2004).

The flower is a loose raceme of yellow petals that appear after sufficient rainfall. The fruit is small, round, and inflated like a tiny bladder, and measures approximately 0.2 to 0.8 centimeters (0.08 to 0.3 inches) in diameter, and are on short, downward curving pedicels (Poole 1989).

2.8.2 Distribution and Abundance

When the species was listed in 1999, four populations were known to exist in Starr and Zapata counties (USFWS 1999) along approximately 2 miles of sandstone bluffs along the Rio Grande. In 2004, the species was known in Texas from 11 occurrences, with seven sites in Starr County and four in Zapata.

Only four of the seven populations known historically to occur in Starr County still support Zapata bladderpod plants (USFWS 2004). Two of the seven are in the highway rights of way between Zapata and Falcon, and one is on private property in the Siesta Shores subdivision. The largest populations occur on three tracts of LRGVNWR and on a privately owned ranch in Starr County

(USFWS 2004). These populations number in the thousands of individuals in rainy years but have a very restricted area covering only a few acres (Best 2006). In Zapata County, three of the four historically documented sites still support Zapata bladderpod.

In 2001, permanent monitoring plots were established on an LRGVNWR tract where a ROW was cleared with a Woodgator, a piece of equipment that cuts brush and trees without disturbing the soil. A dramatic increase in the Zapata bladderpod density and reproduction was observed in the cleared ROW during the first 2 years. Two newly discovered sites have also been added to the monitoring program. Surveys in similar areas resulted in two new populations being discovered on privately owned land in March 2007. One site, in Zapata County, had several hundred individuals. The other, in Starr County, had an undetermined number of plants (Best 2007b), bringing the total to nine known populations occurring in Starr and Zapata counties.

In 2005, botanists from TPWD, Pronatura Noreste, and USFWS relocated a historic population in Mexico (TPWD 2007b). The population has been documented at Rancho Loreto, in the State of Tamaulipas (USFWS 2004); however, recent genetic evidence demonstrates that the Tamaulipan population now appears to be a distinct, undescribed species (Pepper 2007).

The predominance of private lands in South Texas limits access for surveys, so the species range may be more extensive than what is currently known. The size of populations fluctuates, depending on rainfall and weather cycles, making them more difficult to locate (USFWS 2004).

2.8.3 Habitat

Zapata bladderpod is endemic to South Texas and Tamaulipas. In Starr and Zapata counties, Texas, Zapata bladderpod occurs as a narrow geo-endemic on sandstone outcrops of the Jackson, Yegua, and Laredo formations, in close association with overlying deposits of fossil eocene oyster shell. Soils are classified as Catarina and Copita series; specifically, these are yellowish sandy soils with crystalline gypsum (calcium sulfate) often visible at the soil surface. Due to low cohesiveness and sloping topography, these soils are extremely susceptible to hydraulic erosion.

Upon review in September 2007, Chris Best, state botanist, clarified that the soil types where the bladderpod occurred were high in gypsum (calcium sulfate). The final rule describes these as calcareous soils (usually interpreted as high in calcium carbonate), and included the Jimenez-Quemado soil series. However, none of the populations in Starr and Zapata counties are found in the Jimenez-Quemado soils, or other limestone or caliche-derived soils high in calcium carbonate. The primary constituent elements of this species are found in the Catarina soil series, generally along the slopes of hills, with sandy loam to loamy sand of low to moderate salinity and high gypsum content, and an absence of substantial previous soil disturbance and seeding or sodding of exotic grasses.

The associated vegetation includes cenizo (*Leucophyllum frutescens*), Wherry mimosa (*Mimosa wherryana*), palo verde (*Parkinsonia texana* var. *texana*), and other shrubs, together with slim tridens (*Tridens muticus*), red grama (*Bouteloua trifida*), side-oats grama (*B. curtipendula*), and other grasses and herbaceous plants. Zapata bladderpod tolerates partial shading by shrubs, but the highest densities and reproductive growth occur where there is little or no competition from woody plants.

A disjunct population occurs 150 miles to the southeast of Starr County, in the Loreto sand plain of Tamaulipas. The Loreto population occurs in loose sandy soil shallowly overlying indurated caliche of the Miocene or Pliocene Goliad formation. The associated vegetation is open grassland, including slender grama (*B. radicosa*), seacoast little bluestem (*Schyzachyrium scoparium* var. *litorrale*), and pan-American balsamscale (*Elioneuron trypsacoides*), with other herbaceous and sub-shrub plants. However, recent DNA analyses have shown that the Loreto plants are genetically distinct from the Texas population and probably represent a new, undescribed species (Pepper 2007).

2.8.4 Threats

Primary threats to the survival of the Zapata bladderpod have been identified as habitat modification and destruction from increased road and highway construction and associated urban development, increased oil and gas exploration and development, alteration and conversion of native plant communities to improved pastures, overgrazing, and vulnerability due to extreme endemism and low population numbers (USFWS 1999, 2004).

2.9 ZAPATA BLADDERPOD CRITICAL HABITAT

Eight critical habitat units were designated in Starr County. Seven of the units encompass 5,158 acres of the LRGVNWR. Refuge tracts designated as critical habitat include Cuellar, Chapeno, Arroyo Morteros, Las Ruinas, Arroyo Ramirez, Los Negros Creek, and La Puerta. Only two critical habitat units of the seven contain Zapata bladderpod plants. The remaining five refuge units contain the same vegetation and soil qualities as the known population sites and could serve as potential reintroduction sites. The eighth unit consists of 1.36 acres on private property. Critical habitat was not designated at the occupied sites in Zapata County due to the low numbers of plants present on-site and the associated low potential for continued survival or sustainability at these sites (USFWS 2004).

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3. ACTION AREA

The Action Area is defined by a corridor that extends approximately 300 feet from construction access routes, staging areas, and construction sites where pile driving will not occur, or 1,800 feet from construction sites where pile driving will occur. These are the areas affected by the Project. The extension of 300 feet represents the approximate distance that project-related noise (with the exception of pile driving) is estimated to attenuate to ambient noise levels of 55 to 80 dBA. Pile driving is estimated to attenuate to ambient noise levels of 55 to 80 dBA within approximately 1,800 feet. Pile driving will not occur in staging areas or along construction access roads. The Action Area includes primary pedestrian fence and patrol road construction activities, construction access roads, and construction staging areas (see **Appendix A** for a detailed map of the Action Area).

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4. EFFECTS OF THE ACTION

Approximately 1,175 acres of vegetation will be directly impacted by the installation of the primary pedestrian fence in the Rio Grande Valley Sector, based on GIS data, dated 6 May 2008. This includes direct effects on vegetation resulting from disturbance at construction access roads and staging areas. The primary pedestrian fence will cut across or abut portions of Los Negros Creek (Section O-1), Rio San Juan, Los Velas, and Los Velas West tracts (Section O–2), Los Ebanos (Section O-3), Peñitas, Abrams West, Abrams, Peñitas WMA, and Chihuahua Woods (TNC) (Section O-4), Pate Bend and Hidalgo Bend (Section O-6), Monterrey Banco (Section O-7), Champion WMA and La Coma (Section O-8), Llano Grande Banco (Section O–9), Rosario Banco (Section O–10), Anacua WMA (Section O-11), Culebron Banco tract (Section O-13), Vaqueteria Banco (Section O-15), Palo Banco and Phillips Banco (Section O-18) Jeronimo Banco (Section O-20), and Boscaje del la Palma and Southmost ranch (Section O-21), but the fence will avoid the Arroyo Ramirez tract (Section O-1) and the Tahuachal Banco tract (Section O–16) of the LRGVNWR (see **Table 4-1** for the total area impacted in national wildlife refuges). Note that WMAs are owned by TPWD and managed by LRGVNWR.

Complete lists of the vegetative alliances and other land uses within each component of the project footprint are presented in **Appendix B**. **Appendix B, Table 1** presents the vegetation alliances within the 60-foot impact corridor north of Sections O-1 through O-3 and O-11 through O-21. **Appendix B, Table 2** presents the vegetative alliances within the 40-foot impact corridor south of Sections O-4 through O-10. **Appendix B, Table 3** presents the vegetative alliances impacted within the staging areas. **Appendix B, Table 4** presents the vegetative alliances impacted by the construction access roads. A summary of the direct impacts on grasslands, shrublands, woodlands, open waters, and other land uses is presented in **Table 1-3**. A summary of impacts on wetlands in the project footprint is presented in **Table 4-2**. The Project will impact approximately 2.77 acres of delineated wetlands and other waters of the United States.

4.1 OCELOT AND GULF COAST JAGUARUNDI

Implementation of the Project may affect and is likely to adversely affect ocelots and jaguarundis in each section (Sections O-1 through O-21). Implementing general and species-specific BMPs will help to avoid impacts on these species (see **Section 1.3**). Additionally, mitigation measures will compensate for impacts on these species and their habitat (see **Section 1.3.3**). The Project is located fully within Picachos Corridor, a wildlife corridor that is being developed with Mexico under a binational Memorandum of Understanding (MOU) (see **Figure 4–1**), and therefore it is assumed that ocelot and jaguarundi habitat occurs in each section (see **Table 4-2**). Currently, 11 agencies (3 from the United States and 8 from Mexico) are developing the MOU to establish wildlife corridors on both sides of the Rio Grande (north and south of the Texas/Mexico border from

Table 4-1. Impacts on Wildlife Refuges

Fence Section	Name of Refuge	Length Intersected (miles)	Impact Area (acreage)
O-1	Los Negros Creek, LRGVNWR	0.331	2.41
O-2	Rio San Juan, LRGVNWR	0.158	0.63
O-2	Los Velas West, LRGVNWR	1.126	7.44
O-2	Los Velas, LRGVNWR	0	5.30
O-3	Los Ebanos, LRGVNWR	0.538	4.04
O-3	Los Ebanos, LRGVNWR	0.139	0.79
O-4	Peñitas, LRGVNWR	0.213	0.41
O-4	Chihuahua Woods, TNC	0	0.11
O-6	Hidalgo Bend, LRGVNWR	0.375	0.30
O-6	Pharr Settling Basin, LRGVNWR	0	1.59
O-6	Pate Bend, LRGVNWR	0.110	2.93
O-7	Monterrey Banco, LRGVNWR	0.880	4.24
O-8	La Coma, LRGVNWR	0.185	0.90
O-10	Rosario Banco, LRGVNWR	0.342	1.70
O-13	Culebron Banco, LRGVNWR	0.099	0.06
O-16	Tahuachal Banco, LRGVNWR	0	0.03
O-18	Palo Banco, LRGVNWR	1.169	2.23
O-18	Phillip Banco, LRGVNWR	0	7.74
O-21	Jeronimo Banco, LRGVNWR	0.289	2.10
O-21	Boscaje de la Palma, LRGVNWR	0.313	2.28
Total Impacts		**6.28**	**47.23**

Falcon Dam to Laguna Madre). To date, all U.S. government agencies and nongovernmental organizations (including USFWS, TPWD, and The Nature Conservancy) have signed the MOU. Mexican agencies are expected to sign in 2008. The wildlife corridors will begin to reconnect fragmented habitat for the ocelot/jaguarundi, birds, bats, and other mammals. The MOU will work to connect LRGVNWR tracts along the Rio Grande with areas in the states of Tamaulipas and Nuevo Leon, Mexico, and natural protected areas in Mexico. Laguna Atascosa NWR and Laguna Madre Natural Protected Area in Tamaulipas, Mexico are working together to establish a sister park relationship and also to reconnect wildlife corridors along the coast for ocelot, jaguarundi, and other wildlife species. They are also working on a Binational Management Plan with the establishment of wildlife corridors to recover these endangered cats as a top priority.

Table 4-2. Impacts on Wetlands by Section

Wetland ID	Wetland Type	Tactical Infrastructure Section	Size (acres)	Impacts (acres)
WL1	PEM/PSS	O-10	0.42	0.02
WL2	PEM	O-9	2.62	0.24
WL4	PEM/ditch	O-8	0.11	0.03
WL6	PEM/POW	O-5	0.38	0
WL8	Stream	O-1	0.36	0.14
WL11	Arroyo	O-1	0.08	0
WL12	Arroyo	O-1	2.85	0
WL14	PFO/PEM	O-1	0.37	0.16
WL15	Arroyo	O-1	0.12	0.05
WL16	PFO/PEM	O-2	0.36	0
WL18	PSS/PEM	O-20	0.02	0
WL19	PEM/POW	O-17	0.5	0
WL20	PSS/PEM	O-17	2.65	0.21
WL23	PFO along ditch	O-11	3.25	0.96
WL25	POW/PFO/PEM	O-12	1.08	0
WL26	PSS/POW/PEM	O-13	0.79	0
WL29	PFO/PEM	O-13	0.09	0
WL30	PFO/PSS	O-13	0.18	0
WL31	PSS/PEM	O-13	0.14	0
WL32	PEM	O-13	0.14	0
WL33	PEM	O-13	0.44	0.08
WL36	PFO	O-18	0.04	0
WL37	PEM/PSS	O-18	0.17	0
WL38	POW/PEM	O-18	0.68	0
WL46	PFO/PEM	O-21	0.27	0
WL47	POW/PEM	O-21	1.82	0
WL51	PEM	O-2	1.6	0
WL52	PFO	O-2	0.25	0.09
WL53	PFO	O-2	0.22	0.13
WL54	PFO	O-2	0.22	0.09
WL55	Stream	O-2	0.04	0.04
WL56	PFO	O-2	1.13	0.53
WL57	PFO	O-20	0.4	0
Total Impact				**2.77**

Notes: PEM=Palustrine Emergent; PSS=Palustrine Scrub-Shrub; POW=Palustrine Open Water; PFO= Palustrine Forested

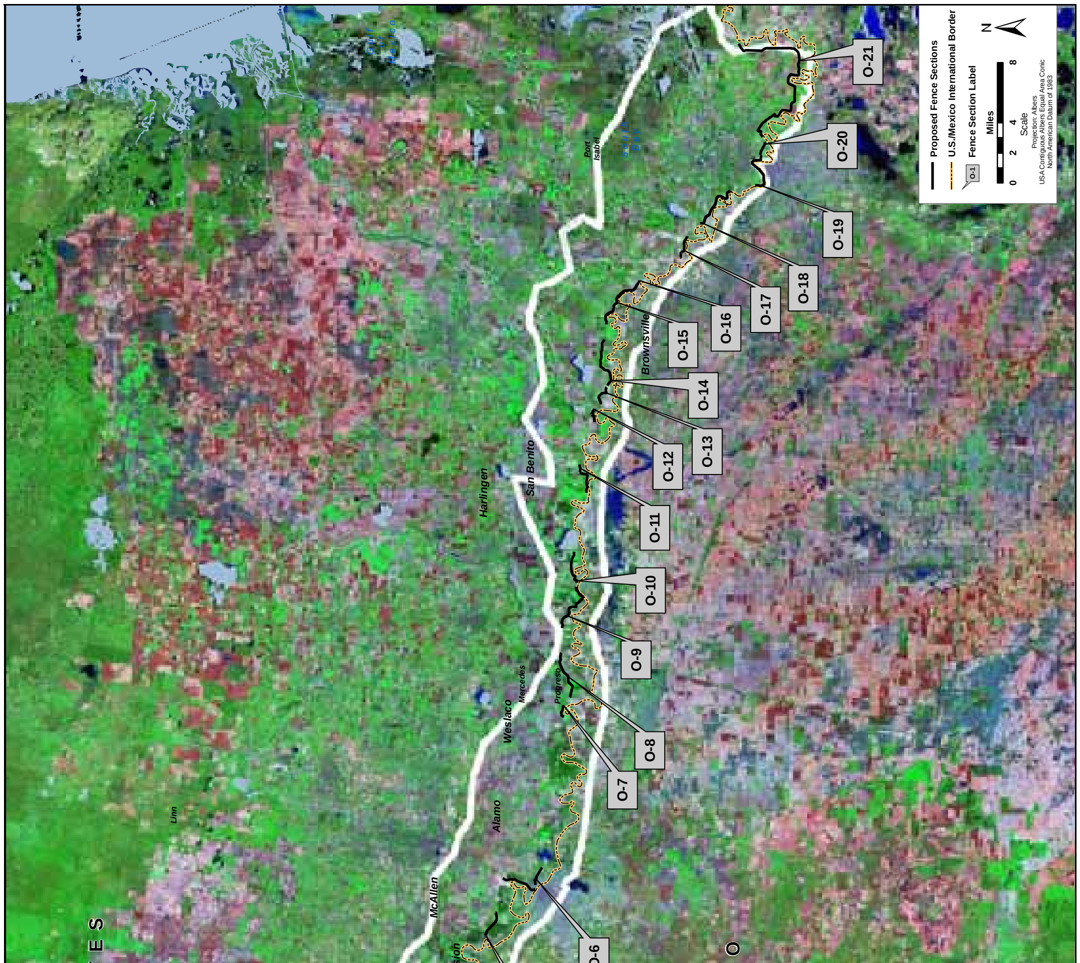

Figure 4-1. Project Footprint within Picachos Corridor

Direct Effects

Primary Pedestrian Fence. All grasslands, shrublands, woodlands, open water, and other wetlands within the Picachos Corridor are potentially ocelot and jaguarundi habitat. However, the most appropriate habitat expected to be affected includes thorn scrub shrubland and woodland habitat, predominantly honey mesquite and retama; disturbed floodplain shrubland, woodland, and forest habitat, predominantly honey mesquite and sugarberry; and to a lesser extent sabal palm.

Habitat fragmentation is the separation of a landscape into various land uses (development, agriculture, etc.), resulting in numerous small, disjunct habitat patches left for use by wildlife. Fragmentation eliminates habitat for species like the ocelot and jaguarundi that require large, unbroken blocks of habitat.

Additionally, the small habitat patches resulting from fragmentation often do not provide sufficient food and cover resources for many species that attempt to use them. This can result in an increased risk of death by predation, if the animal has to venture beyond the cover of the patch to find new food resources.

Many remnant brush tracts in the LRGV are small (less than 100 acres) and scattered (USFWS 1984 as cited by Jahrsdoerfer and Leslie 1988). Isolated native brush tracts in extensively cleared areas may serve as “islands” of wildlife habitat (as described by Blake and Karr 1984 as cited by Jahrsdoerfer and Leslie 1988). The size of natural areas, or the degree of fragmentation, and their proximity to each other influence recruitment and extinction relationships (Diamond 1975 as cited by Jahrsdoerfer and Leslie 1988). Larger areas, or smaller areas with close neighbors, provide increased diversity, dispersal potential, and lower extinction rates (Harris 1984 as cited by Jahrsdoerfer and Leslie 1988). There is evidence of isolation from contiguous gene pools in surrounding but fragmented natural habitat (Miller and Harris 1977 as cited by Jahrsdoerfer and Leslie 1988). Brushland tracts in the LRGV are isolated. Movement rates and distances moved between tracts by various species in the LRGV are unknown.

Reduction of habitat connectivity within portions of the wildlife corridor will likely impact ocelot and jaguarundi movement, access to traditional water sources, and potential for gene flow. Reduction of habitat connectivity is a particular concern in units of the LRGVNWR that will be bisected by the fence. These include Rosario Banco and Los Negros Creek in Section O-1, Rosario Banco in Section O-10, Anacua WMA in Section O-11, Boscaje de la Palma in Section O-21, and Southmost Ranch in Section O-21. Sufficient data are not available to determine the impacts of this on movements of these two species of cats, as their actual movement corridors or movement patterns in the area affected by the fence are not known. If their primary movement is perpendicular to the river, then the fence could substantially impact movements for some individuals. Such impacts to movement could correlate with reduced access to traditional water sources, and reduced gene flow between portions of the population for each species.

However, the fence is not a solid feature 70 miles long. There are areas of habitat between fence sections through which the cats, which are relatively mobile species, could move. In addition, wildlife openings—holes in the base of the fence through which ocelot and jaguarundi could pass—have been incorporated in the fence design; and the placement of the openings include the areas considered most likely to serve as movement corridors for these two species (see **Appendix A** for the location of cat holes). Consequently, impacts on these species relative to habitat connectivity are anticipated to be both short- and long-term, and range from minor to major depending upon the actual fence section. Movement of individuals parallel to the river is still impacted by the fence due to reduction in travel corridors, especially in areas where international bridges act as an east-west barrier.

Patrol Roads. Patrol roads that are being built or improved as part of the Project are located within the project footprint as described above (within the 60-foot corridor north of the fence for Sections O-1 through O-3 and O-11 through O-21, and within the 40-foot corridor south of the fence for Section O-4 through O-10). Therefore, direct impacts on vegetation and habitat are included in the totals in **Table 1-3**. Additionally, roads are assumed to fragment ocelot and jaguarundi home ranges and travel corridors. Fragmentation results from conversion and development of the most productive and/or most accessible sites, leaving the remaining smaller patches increasingly isolated.

Vehicular traffic associated with the fence construction, and with operation and maintenance activities, will remain on established roads. Rehabilitation of affected soils will include revegetation of the disturbed area to reduce erosion while allowing the area to return to native vegetation. Erosion control measures will be utilized to avoid siltation of aquatic habitats. Any excess soils not used during construction of the tactical infrastructure or subsequent rehabilitation will be hauled from the site and disposed of properly.

Vegetation Removal/Mowing. Maintenance activities on revegetated sites, (such as mowing, herbicide application, or noxious species control) will be targeted primarily for herbaceous species (grasses) and will occur within the project footprint as described above (within the 60-foot corridor north of the fence for Sections O-1 through O-3 and O-11 through O-21, and within the 40-foot corridor south of the fence for Section O-4 through O-10). Therefore, direct impacts on vegetation and habitat are included in the totals in **Table 1-3** and in the discussion of impacts on ocelot and jaguarundi habitat (above). Additionally, herbicide applications could have long-term effects on federally listed species and their habitat within the project footprint. The implementation of BMPs will reduce impacts on federally listed species and their habitats. CBP will coordinate with USIBWC to adhere to the 1993 Biological Opinion regarding USIBWC mowing operations and the terms and conditions of the 2003 Biological Opinion issued to the Immigration and Naturalization Service for Operation Rio Grande. These measures will reduce the effects on federally listed plant species.

Temporary Construction—Noise and Lights. Noise created during construction will have the potential to affect ocelot and jaguarundi individuals within the action area (see **Appendix A**). All project-related noise will be temporary and will only be heard within the action area. All project-related noise (with the exception of pile driving) is expected to attenuate to ambient noise levels of 55 to 80 dBA within 300 feet. Pile driving will attenuate to ambient noise levels of 55 to 80 dBA within 1,800 feet (see **Appendix A**).

The impacts of noise will include subtle, localized impacts from the overall elevation of ambient noise levels during construction. Noise levels after construction are anticipated to return to close to current ambient levels. Elevated noise levels during construction could result in reduced communication ranges, interference with predator/prey detection, or habitat avoidance in the action area. More intense impacts could include behavioral change, disorientation, or hearing loss. Predictors of wildlife response to noise include the noise type (continuous or intermittent), prior experience with noise, proximity to the noise source, stage in the breeding cycle, activity, and age. Prior experience with noise is the most important factor in the response of wildlife to noise, because wildlife can become accustomed (or habituate) to the noise. The Project runs along many areas that are developed, and it is likely that any ocelots or jaguarundis that inhabit the action area have prior experience with noise. The rate of habituation to short-term construction is not known, but it is anticipated that most ocelots and jaguarundis will only be permanently displaced from the areas where the habitat is cleared and the fence and associated tactical infrastructure constructed, and will be temporarily dispersed from areas adjacent to the project areas, within and outside the project footprint, during construction periods.

Ocelots are primarily nocturnal, while jaguarundis are primarily diurnal with some nocturnal activity recorded. Therefore, the use of lights for nighttime construction will have the potential to adversely affect migration, dispersal, and foraging activities of individual ocelots and, to a lesser extent, jaguarundis within the action area. However, the dense habitat through which these cats tend to move resists substantial light penetration. Lights used for construction will be shielded to avoid unnecessary illumination of potential habitat for these two species. Finally, the Project runs along many areas that already experience above-normal illumination. Therefore, construction lights will not have more than temporary, minor to moderate adverse effects on any ocelots or jaguarundis inhabiting the action area.

Indirect Effects

Primary Pedestrian Fence. The height of the primary pedestrian fence will restrict the cat's movements. However, cats could continue to travel through a vegetated corridor to the ends of the primary pedestrian fence and through wildlife openings in Section O-1 through O-3 and O-11 through O-21, although the extent to which they will do so is unknown. This additional travel time will expend additional energy and increase the risk of encountering humans or vehicular strikes.

Removing vegetation and grading during construction could temporarily increase siltation in the river and wetlands and therefore have short-term minor adverse impacts on water quality of water sources for ocelots and jaguarundis. However, implementing standard BMPs, such as silt fences, should reduce this potential impact to negligible.

All ocelot and jaguarundi habitat between the fence and the Rio Grande could be indirectly, adversely affected by the presence of the primary pedestrian fence if it is not as accessible for management purposes or if it is disconnected from other suitable habitats. Units of the LRGVNWR that will be located completely south of the fence include Los Ebanos in Section O-3; Caballo Banco, Abrams West, Peñitas and La Pesquera, and Abrams in Section O-4; Gabrielson and Cottam in Section O-5; Pate Bend and Hidalgo Bend in Section O-6; Monterrey Banco in Section O-7; La Coma in Section O-8; Rosario Banco in O-10; Llano Grand Banco in Section O-11; Culebron Banco in Section O-13; Villitas Banco in Section O-11; Vaquerito Banco East in Section O-15; Las Palomas Banco in Section O-14; Vaqueteria Banco in Section O-15; Ranchito in Section O-16; South Palo Banco, Phillips Banco, and Champion Bend in Section O-18; and Jeronimo Banco, Boscaje De La Palma, and Southmost Ranch in Section O-21. National Land Cover Data (NLCD) indicate that the land between the primary pedestrian fence and U.S./Mexico international border consists of 10,558 acres of planted/cultivated land; 1,706 acres of developed land; 4,880 acres of undeveloped land; and 6,700 acres of WMAs and NWRs. Therefore, potentially 12,580 acres of ocelot and jaguarundi habitat (undeveloped, WMA, and NWR lands) will be indirectly impacted by the presence of the primary pedestrian fence.

Wildfires occur regularly along the river. With the addition of a fence or flood control wall, additional impacts from wildfires could occur to ocelots and jaguarundis and their habitat. The cats could be trapped between the river and the fence/wall during a wildfire. Firefighters might not risk personnel behind the fence/wall if their escape routes are limited to fight a wildfire safely. This type of situation could have negative impacts to ocelots and jaguarundis trying to escape a wildfire. Also, more habitat could be lost due to restrictions associated with fighting fires safely.

Indirect effects on ocelot and jaguarundi habitat will occur in units of the LRGVNWR that occur north of the fence. In these sections ocelots and jaguarundis could be separated from water sources. This impact will be greater in Section O-4 through O-10, where there will be no wildlife openings. Units that will occur north of the fence include Los Negros Creek in Section O-1; Los Velas West and Los Velas in Section O-2; Los Ebanos in Section O-3; Peñitas in Section O-4, Granjeno in Section O-5; La Coma in Section O-8; Rosario Banco in O-10; Villanueva in Section O-15; Phillips Banco, and Villanueva in Section O-18; Brownsville in Section O-20 ;and Boscaje De La Palma, and Southmost Ranch in Section O-21.

Beneficial indirect effects on ocelot and jaguarundi habitat could occur from the reduction of illegal cross-border traffic. Because some of this primary pedestrian fence borders agricultural and residential areas, it will likely decrease the number of dogs and humans gaining access to the area near the river in some sections of the fence. Areas disturbed by vehicular traffic, foot traffic, and litter alter the composition, structure, and function of wildlife habitats. Dogs could harass the ocelots; the fencing could potentially decrease such harassment adjacent to urban areas. Gaps in the fence occur near the wildlife refuges Arroyo Ramirez and Los Negros Creek in Section O-1; Rio San Juan in Section O-2; Los Ebanos in Section O-3; La Parada Banco in Section O-4; Madero in Section O-5; Pharr Settling Basin in Section O-6; La Gloria in Section O-11; Tahuachal Banco in Section O-16; and Phillips Banco in Section O-18. Construction and operation of tactical infrastructure will increase border security in the Rio Grande Valley Sector and might result in a change to illegal traffic patterns. Changes in cross–border violator traffic patterns result from a variety of factors in addition to border patrol operations; and therefore, are considered unpredictable and beyond the scope of this BRP.

4.2 THREATENED AND ENDANGERED PLANT SPECIES

The Project may affect and is likely to adversely affect the Zapata bladderpod and Zapata critical habitat in Section O-1. Implementing general and species-specific BMPs will help to avoid impacts on these species (see **Section 1.3**). The Project is not likely to adversely affect threatened and endangered plant species, including the star cactus, Texas ayenia, south Texas ambrosia, Walker's manioc, Johnston's frankenia, or their habitat in sections where suitable habitat for these species occur, or in sections where there are elements of occurrence (see **Table 4-3**). General and species-specific BMPs will help to avoid impacts on these species (see **Section 1.3**). No threatened or endangered plant species were observed during October and December 2007 or March and April 2008 surveys (e^2M 2008). Suitable habitat for some federally listed species was observed during the October and December 2007 surveys of the corridor. No suitable habitat for federally listed species was observed south of the levee in Sections O-4 through O-10 during the April and March 2008 surveys (see **Table 4-3**) (e^2M 2008). No effect on threatened or endangered plant species will occur if no suitable habitat exists in a section, or if there are no records of occurrence in the vicinity of a section (see below).

Direct Effects

Based on survey results and the implementation of BMPs, the Project is not likely to directly adversely affect individuals or populations of these federally listed plants, but may directly affect potential habitat for these species. Impacts on federally listed plant habitats are anticipated to be long-term, moderate, and adverse. The project corridor will also avoid several known locations of Zapata bladderpod and Walker's manioc.

Table 4-3. Effects of the Project on Threatened and Endangered Species, by Section

Section	Species	Status	Habitat	Elements of Occurrence*	Determination of Effect
O-1	Ocelot	E[1]	Yes	Multiple observations in vicinity	LAA[2]
O-1	Gulf Coast jaguarundi	E	Yes	—	LAA
O-1	Johnston's frankenia	E	Yes	Observed in vicinity 1968	NLAA[3]
O-1	Star cactus	E	Yes	—	NLAA
O-1	Walker's manioc	E	No	—	NE[4]
O-1	Zapata bladderpod	E	Yes	Observed in vicinity 2002 and 2003	LAA
O-1	Zapata bladderpod critical habitat	D[5]	Yes	—	LAA
O-2	Ocelot	E	Yes	—	LAA
O-2	Gulf Coast jaguarundi	E	Yes	—	LAA
O-2	Johnston's frankenia	E	No	—	NE
O-2	Star cactus	E	No	Observed on gravelly loam on northeast facing slope from 1959 to 2003	NLAA
O-2	Walker's manioc	E	No	Observed in vicinity 1993–1995; historic sighting in 1940	NLAA
O-2	Zapata bladderpod	E	No	—	NE
O-2	Zapata bladderpod critical habitat	D	No	—	NE
O-3	Ocelot	E	Yes	—	LAA
O-3	Gulf Coast jaguarundi	E	Yes	1 observation in vicinity 1987–1988	LAA
O-3	Star cactus	E	No	—	NE
O-3	Texas ayenia	E	No	—	NE
O-3	Walker's manioc	E	No	Occurrence in vicinity 1995–2002	NLAA
O-4	Ocelot	E	Yes	7 observations in vicinity 1991–1992	LAA
O-4	Gulf Coast jaguarundi	E	Yes	10 observations in vicinity 1988–1993	LAA

Section	Species	Status	Habitat	Elements of Occurrence*	Determination of Effect
O-4	Star cactus	E	No	—	NE
O-4	Texas ayenia	E	No	—	NE
O-4	Walker's manioc	E	No	Observed in vicinity 1990–1992, 1997–2002; historic observations 1940–1941	NLAA
O-5	Ocelot	E	Yes	Captured in vicinity 1992; observed in vicinity 1981	LAA
O-5	Gulf Coast jaguarundi	E	Yes	23 observations in vicinity 1987–1993	LAA
O-5	Texas ayenia	E	No	—	NE
O-5	Walker's manioc	E	No	Historic observation in vicinity 1940	NLAA
O-6	Ocelot	E	Yes	7 observations in vicinity 1989–1991	LAA
O-6	Gulf Coast jaguarundi	E	Yes	23 observations in vicinity 1987–1993	LAA
O-6	Texas ayenia	E	No	—	NE
O-6	Walker's manioc	E	No	—	NE
O-7	Ocelot	E	Yes	7 observations in vicinity 1989–1991	LAA
O-7	Gulf Coast jaguarundi	E	Yes	—	LAA
O-7	Texas ayenia	E	No	—	NE
O-7	Walker's manioc	E	No	—	NE
O-8	Ocelot	E	Yes	7 observations in vicinity 1989–1991	LAA
O-8	Gulf Coast jaguarundi	E	Yes	1 observation in vicinity 1988–1989	LAA
O-8	Texas ayenia	E	No	—	NE
O-8	Walker's manioc	E	No	—	NE
O-9	Ocelot	E	Yes	—	LAA
O-9	Gulf Coast jaguarundi	E	Yes	—	LAA
O-9	Texas ayenia	E	No	Observed 1977–1988	NLAA
O-9	Walker's manioc	E	No	—	NE
O-10	Ocelot	E	Yes	—	LAA

Section	Species	Status	Habitat	Elements of Occurrence*	Determination of Effect
O-10	Gulf Coast jaguarundi	E	Yes	—	LAA
O-10	Texas ayenia	E	No	—	NE
O-10	Walker's manioc	E	No	—	NE
O-11	Ocelot	E	Yes	—	LAA
O-11	Gulf Coast jaguarundi	E	Yes	—	LAA
O-11	South Texas ambrosia	E	No	—	NE
O-11	Texas ayenia	E	No	—	NE
O-12	Ocelot	E	Yes	—	LAA
O-12	Gulf Coast jaguarundi	E	Yes	3 observations in vicinity 1988–1989	LAA
O-12	South Texas ambrosia	E	No	—	NE
O-12	Texas ayenia	E	No	—	NE
O-13	Ocelot	E	Yes	—	LAA
O-13	Gulf Coast jaguarundi	E	Yes	—	LAA
O-13	South Texas ambrosia	E	No	—	NE
O-13	Texas ayenia	E	No	—	NE
O-14	Ocelot	E	Yes	—	LAA
O-14	Gulf Coast jaguarundi	E	Yes	—	LAA
O-14	South Texas ambrosia	E	No	—	NE
O-14	Texas ayenia	E	No	Observed in vicinity 2001 and 2002	NLAA
O-15	Ocelot	E	Yes	—	LAA
O-15	Gulf Coast jaguarundi	E	Yes	—	LAA
O-15	South Texas ambrosia	E	No	—	NE
O-15	Texas ayenia	E	No	Observed in vicinity 1932–1939	NLAA
O-16	Ocelot	E	Yes	—	LAA
O-16	Gulf Coast jaguarundi	E	Yes	—	LAA
O-16	South Texas ambrosia	E	No	Observed in vicinity 1932–1938	NLAA
O-16	Texas ayenia	E	No	—	NE
O-17	Ocelot	E	Yes	—	LAA

Section	Species	Status	Habitat	Elements of Occurrence*	Determination of Effect
O-17	Gulf Coast jaguarundi	E	Yes	4 observations in vicinity 1991–1992	LAA
O-17	South Texas ambrosia	E	No	—	NE
O-17	Texas ayenia	E	No	—	NE
O-18	Ocelot	E	Yes	—	LAA
O-18	Gulf Coast jaguarundi	E	Yes	3 observations in vicinity 1991–1992	LAA
O-18	South Texas ambrosia	E	No	—	NE
O-18	Texas ayenia	E	No	Observed under cultivation in vicinity 1945–1963	NLAA
O-19	Ocelot	E	Yes	—	LAA
O-19	Gulf Coast jaguarundi	E	Yes	—	LAA
O-19	South Texas ambrosia	E	No	—	NE
O-19	Texas ayenia	E	No	—	NE
O-20	Ocelot	E	Yes	1 observation in vicinity 1989–1991	LAA
O-20	Gulf Coast jaguarundi	E	Yes	—	LAA
O-20	South Texas ambrosia	E	No	—	NE
O-20	Texas ayenia	E	No	—	NE
O-21	Ocelot	E	Yes	2 individuals in vicinity 1988–1991, including 1 radio-collared male 1990–1991	LAA
O-21	Gulf Coast jaguarundi	E	Yes	36 observations in vicinity 1987–1993, including 1 incident of road mortality	LAA
O-21	South Texas ambrosia	E	Yes	—	NLAA
O-21	Texas ayenia	E	Yes	—	NLAA

Notes:

* Based on Natureserve and TPWD data

[1] Endangered

[2] Likely to adversely affect

[3] Not likely to adversely affect

[4] No effect

[5] Designated

***Vegetation Removal/Mowing*.** Herbicide application could have long-term effects on federally listed species and their habitat within the project footprint. The implementation of BMPs will reduce impacts on federally listed species and their habitats. CBP will coordinate with USIBWC to adhere to the 1993 Biological Opinion regarding USIBWC mowing operations and the terms and conditions of the 2003 Biological Opinion issued to Immigration and Naturalization Service for Operation Rio Grande. These measures will reduce the effect on federally listed plant species.

Indirect Effects

Long-term negligible to minor beneficial effects could result from reducing or preventing cross-border violator traffic through habitats for and populations of the star cactus, Johnston's frankenia, Zapata bladderpod, Texas ayenia, Walker's manioc, and South Texas ambrosia.

A known population of Zapata bladderpod occurs to the west of the western end of Section O-1, within identified Zapata bladderpod critical habitat in the Arroyo Ramirez tract of the LRGVNWR. Construction and operation of tactical infrastructure will increase border security in the Rio Grande Valley Sector and might result in a change to illegal traffic patterns. Changes in cross-border violator traffic patterns result from a variety of factors in addition to border patrol operations; and therefore, are considered unpredictable and beyond the scope of this BRP.

5. DETERMINATION OF EFFECT

There are 17 federally listed species that are known to occur or have the potential to occur within or adjacent to the project area (see **Tables 5-1**, **5-2**, and **5-3**). Additionally, two of the listed species have designated critical habitat in the project area.

Table 5-1. Federally Listed Species and Critical Habitats Within Starr County and the Determination of Effects Resulting from the Project

Species	Listing/Critical Habitat Designated	Determination of Effect
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Likely to adversely affect
Least tern, *Sterna antillarum*	Endangered	No effect
Piping plover, *Charadrius melodus*	Endangered	No effect
Piping plover, critical habitat	Designated	No effect
Ashy dogweed, Thymophylla tephroleuca	Endangered	No effect
Johnston's frankenia, *Frankenia johnstonii*	Endangered	Not likely to adversely affect
Star cactus, Astrophytum asterias	Endangered	Not likely to adversely affect
Walker's manioc, *Manihot walkerae*	Endangered	Not likely to adversely affect
Zapata bladderpod, *Lesquerella thamnophila*	Endangered	Likely to adversely affect
Zapata bladderpod, critical habitat	Designated	Likely to adversely affect

The species and habitats listed in **Table 5-1**, **5-2**, and **5-3** are known to occur within 25 miles of the border in Starr, Hidalgo, and Cameron counties. The Project may affect and is likely to adversely affect the ocelot, jaguarundi, Zapata bladderpod, and Zapata bladderpod critical habitat. The Project is not likely to adversely affect the star cactus, Texas ayenia, south Texas ambrosia, Walker's manioc, or Johnston's frankenia where suitable habitat for these species occur or in sections where there are elements of occurrence (see **Table 4-3**). Based upon the information provided regarding the tactical infrastructure sections, no effects are anticipated for the least tern, piping plover, piping plover critical

Table 5-2. Federally Listed Species and Critical Habitats Within Hidalgo County and the Determination of Effects Resulting from the Project

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Likely to adversely affect
Northern aplomado falcon*, Falco femoralis septentrionalis*	Endangered	No effect
Star cactus, *Astrophytum asterias*	Endangered	No effect
Piping plover, *Charadrius melodus*	Endangered	No effect
Piping plover, critical habitat	Designated	No effect
Texas ayenia, *Ayenia limitaris*	Endangered	Not likely to adversely affect
Walker's manioc, *Manihot walkerae*	Endangered	Not likely to adversely affect

Table 5-3. Federally Listed Species and Critical Habitats Within Cameron County and the Determination of Effects Resulting from the Project

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Likely to adversely affect
Brown pelican, *Pelecanus occidentalis*	Endangered	No effect
Northern aplomado falcon, *Falco femoralis septentrionalis*	Endangered	No effect
Hawksbill sea turtle, *Eretmochelys imbricata*	Endangered	No effect
Kemp's Ridley sea turtle, *Lepidochelys kempii*	Endangered	No effect
Leatherback sea turtle, *Dermochelys coriacea*	Endangered	No effect
South Texas ambrosia, *Ambrosia cheiranthifolia*	Endangered	Not likely to adversely affect
Texas ayenia, *Ayenia limitaris*	Endangered	Not likely to adversely affect
Piping plover, *Charadrius melodus*	Threatened	No effect
Piping plover critical habitat	Designated	No effect
Green sea turtle, *Chelonia mydas*	Threatened	No effect
Loggerhead sea turtle, *Caretta caretta*	Threatened	No effect

habitat, and ashy dogweed in Starr County; the star cactus, the Northern aplomado falcon, piping plover, and piping plover critical habitat in Hidalgo County; or the brown pelican, Northern aplomado falcon, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, piping plover, piping plover critical habitat, green sea turtle, and loggerhead sea turtle in Cameron County.

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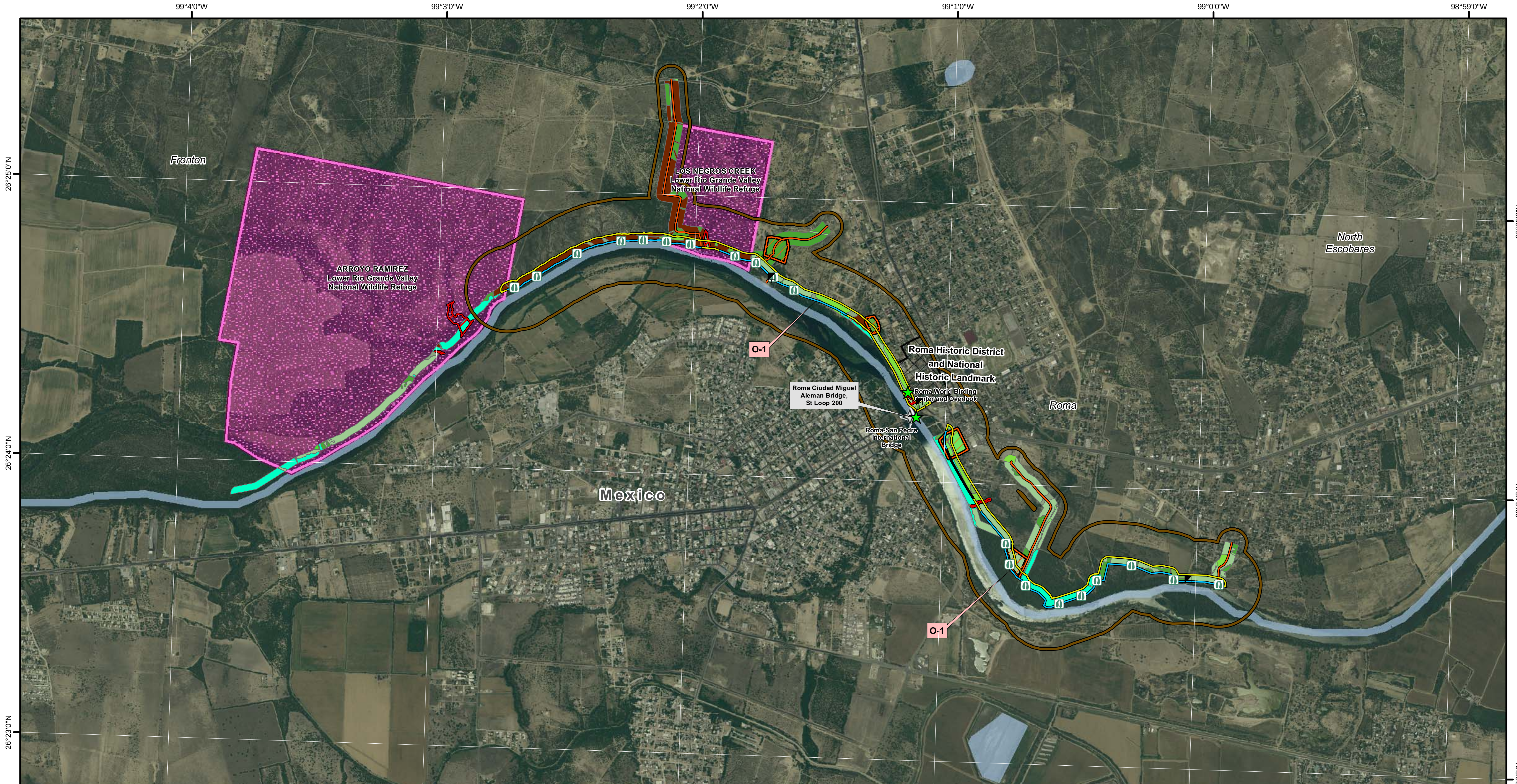
APPENDIX A

Detailed Area Action Maps



Bollard or Picket Fence
Concrete Retaining Wall
Floating Fence
150ft Corridor
Staging Areas
Access Roads
Action Area
Surface Water
NWI Wetlands Outside Assessment Area

USACE Approved Wetlands & OWOUS
Rio Grande
Parks and Refuges
Zapata Bladderpod Critical Habitat
Historic District
Historic Property
Ports of Entry
Wildlife Openings

Gate Points

Vegetation Habitats

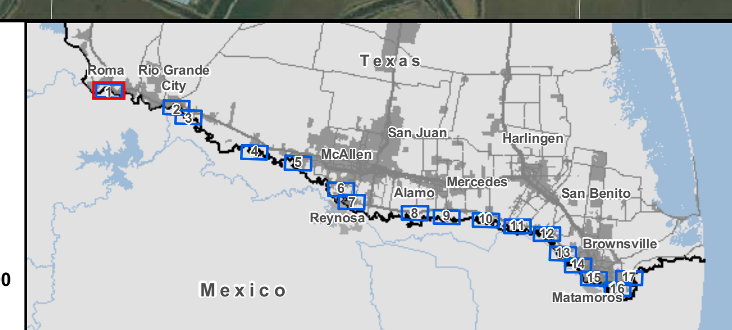
Agricultural Field/Fallow
Agriculture Cropped
Arroyo Shrubland
Bermuda Grass Herbaceous Vegetation
Buffelgrass Herbaceous Vegetation
Cenizo – Blackbrush Shrubland
Giant Reed Shrubland / Herbaceous Vegetation
Honey Mesquite Riparian Forest / Woodland
Other Land Use
Residential Development
Roads, Trails, Canal Banks and Berms
Sugarberry Riparian Forest / Woodland

N

Feet

0 500 1,000 2,000

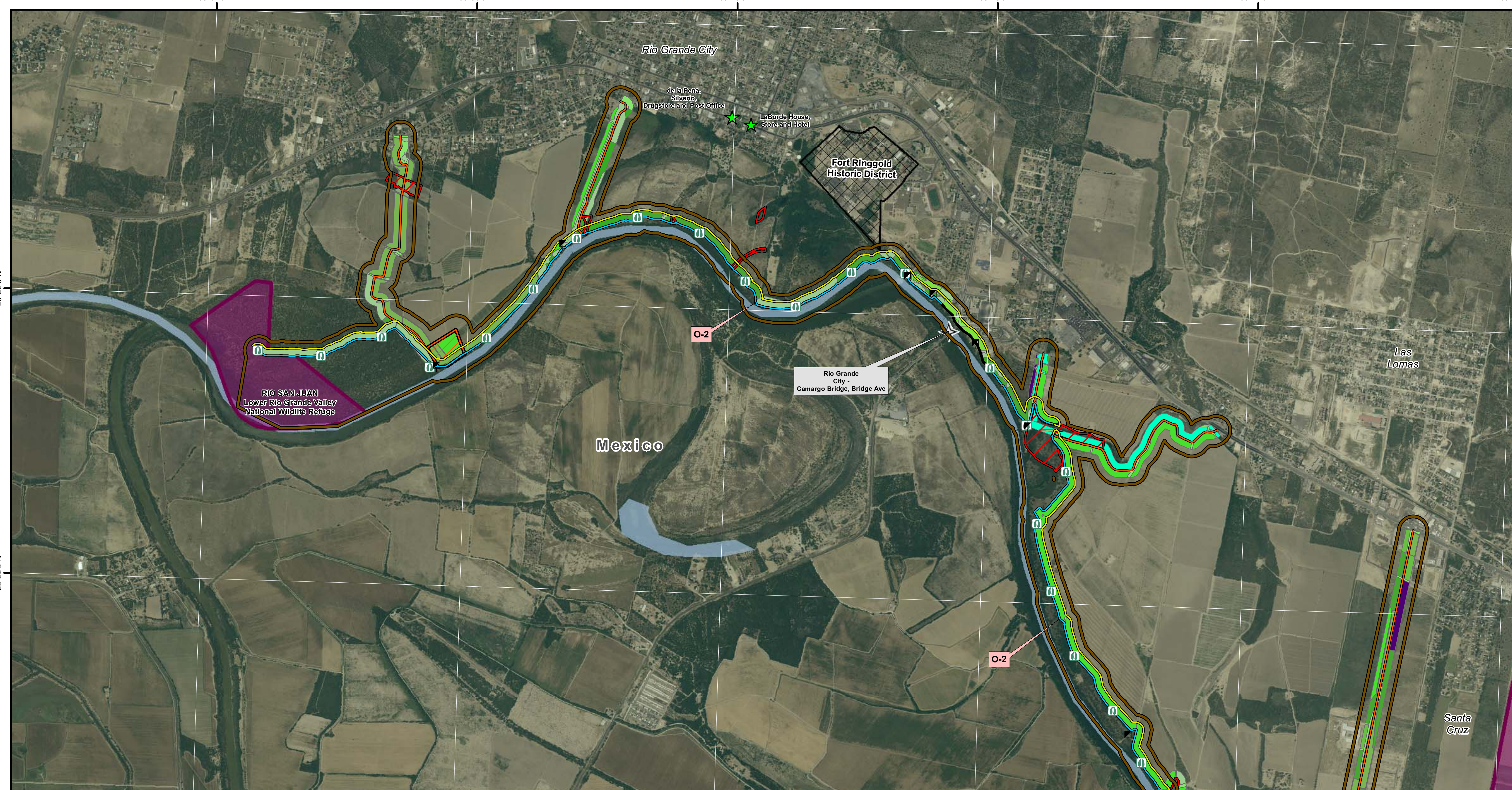
Scale



USBP
Biological Resources Plan
Rio Grande Valley Sector, Texas
Action Area Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008 | Scale 1" = 2000' | Map 1 of 17



- Bollard or Picket Fence
- Floating Fence
- 150ft Corridor
- Staging Areas
- Access Roads
- Action Area
- Surface Water
- NWI Wetlands Outside Assessment Area
- USACE Approved Wetlands & OWOUS
- Rio Grande
- Parks and Refuges
- Zapata Bladderpod Critical Habitat
- Historic District
- Historic Property
- Ports of Entry
- Wildlife Openings
- Gate Points

Vegetation Habitats

- Agricultural Field/Fallow
- Agriculture Cropped
- Arroyo Shrubland
- Buffelgrass Herbaceous Vegetation
- Honey Mesquite Riparian Forest / Woodland
- Honey Mesquite Woodland / Shrubland
- Lovegrass – Mixed Forb Annual Herbaceous Vegetation
- Open Water River / Ditch / Canal
- Other Land Use
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Sugarberry Riparian Forest / Woodland
- Urban Development

N

Feet

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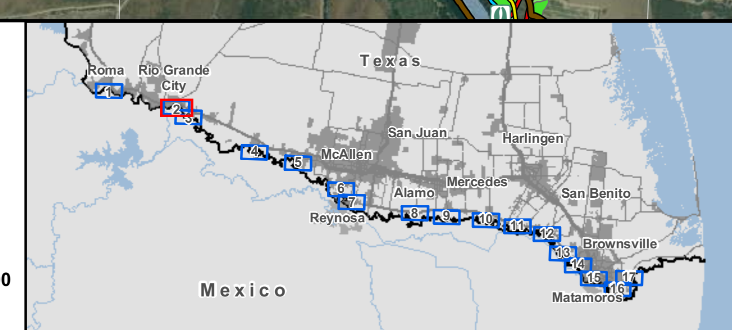

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Rio Grande Valley Sector, Texas
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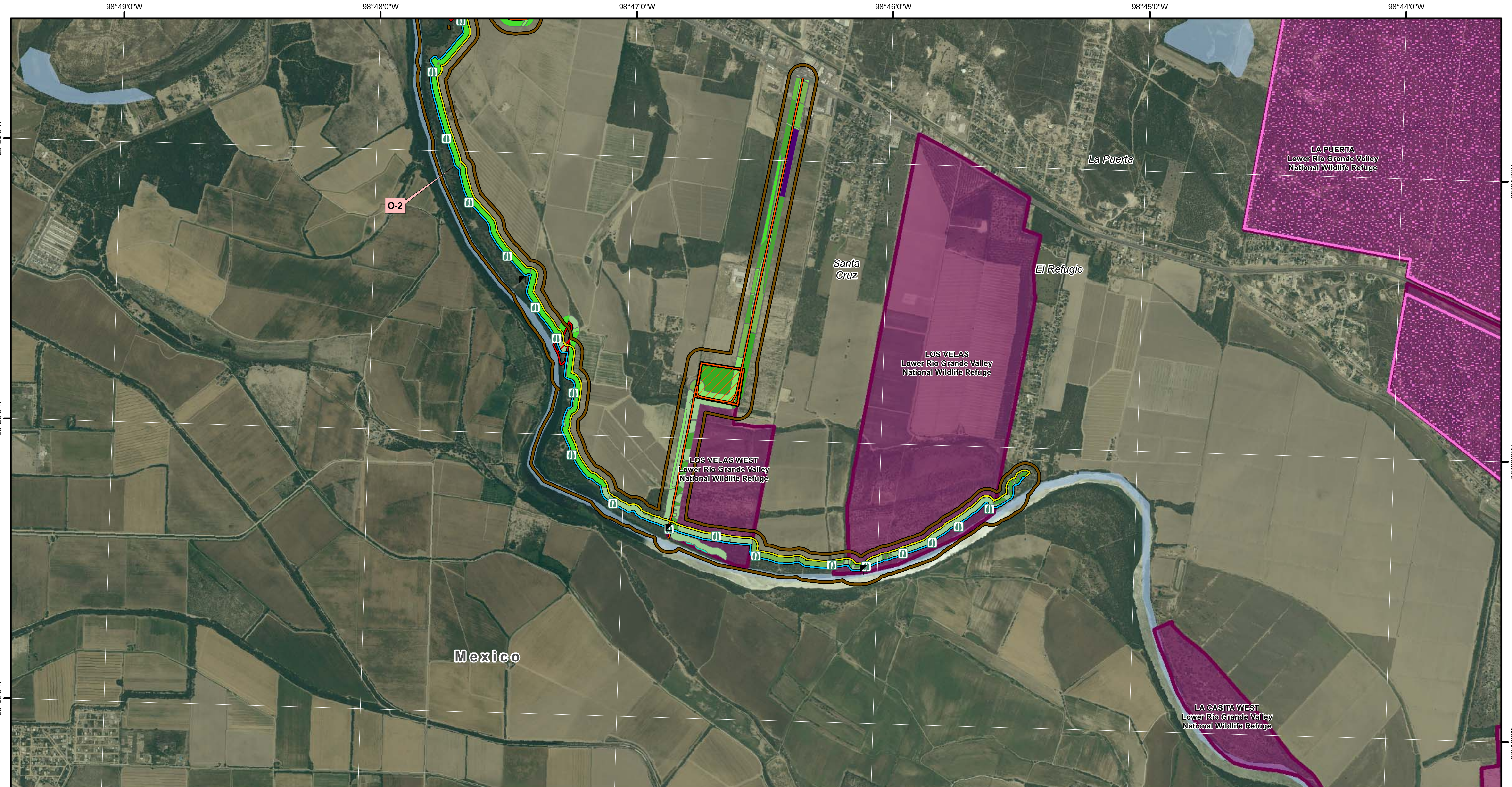
May 6, 2008	Scale 1" = 2000'	Map 2 of 17



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150ft Corridor
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Access Roads
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Surface Water
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Rio Grande
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Zapata Bladderpod Critical Habitat
Historic District
Historic Property
Ports of Entry
Wildlife Openings

Gate Points

Vegetation Habitats
- Agricultural Field/Fallow
- Agriculture Cropped
- Buffelgrass Herbaceous Vegetation
- Honey Mesquite Riparian Forest / Woodland
- Honey Mesquite Woodland / Shrubland
- Lovegrass – Mixed Forb Annual Herbaceous Vegetation
- Other Land Use
- Roads, Trails, Canal Banks and Berms
- Sugarberry Riparian Forest / Woodland
- Urban Development

N

Feet
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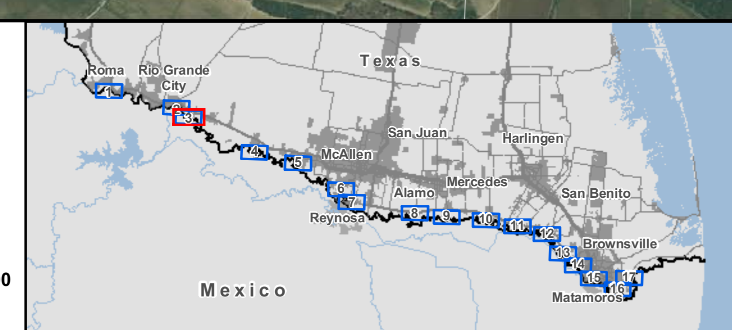
Scale



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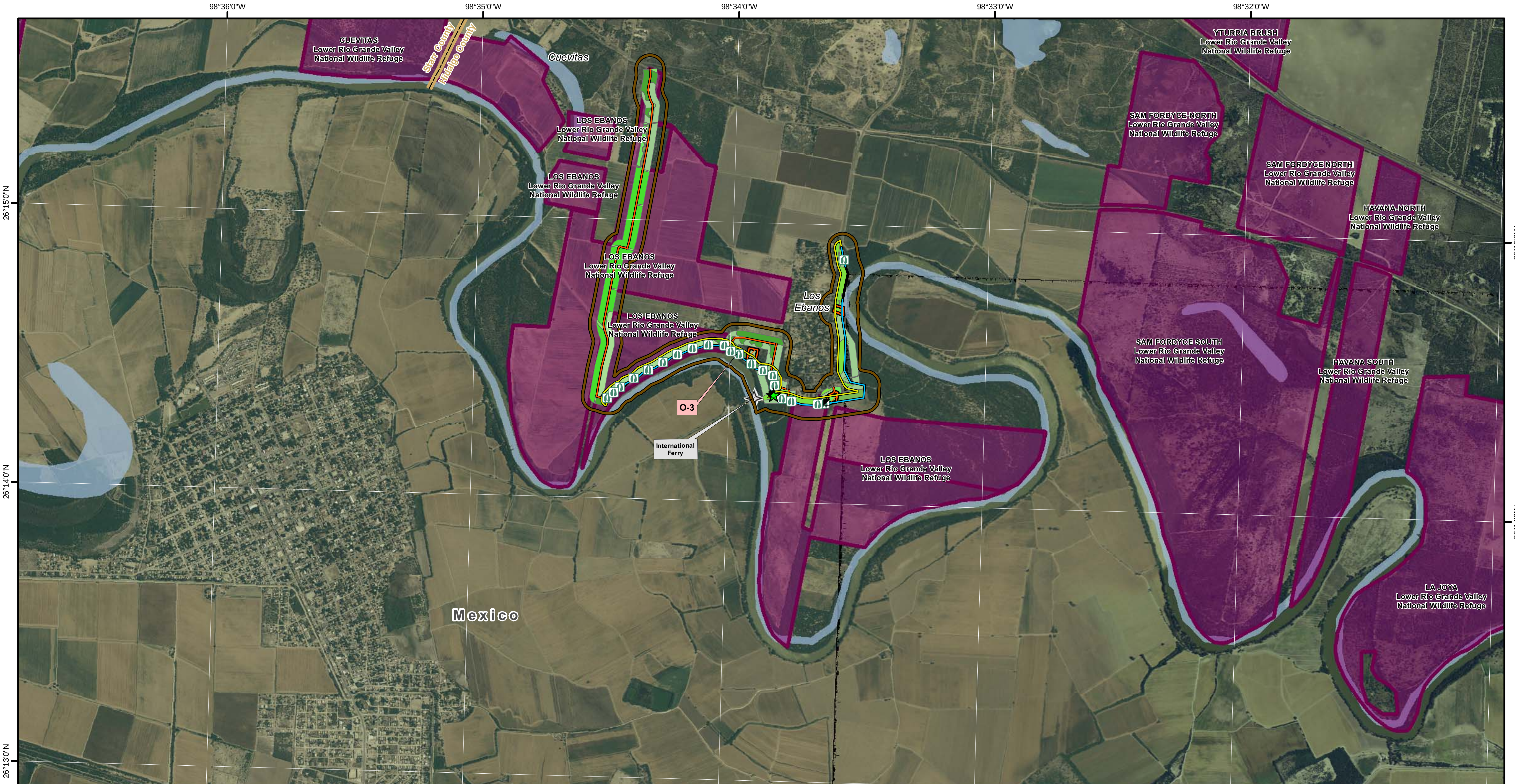
Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 3 of 17



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- Gate Points

Vegetation Habitats

- Agricultural Field/Fallow
- Agriculture Cropped
- Bermuda Grass Herbaceous Vegetation
- Buffelgrass Herbaceous Vegetation
- Honey Mesquite Riparian Forest / Woodland
- Mule's Fat Shrubland
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Switchgrass Herbaceous Vegetation

N

Feet

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Scale

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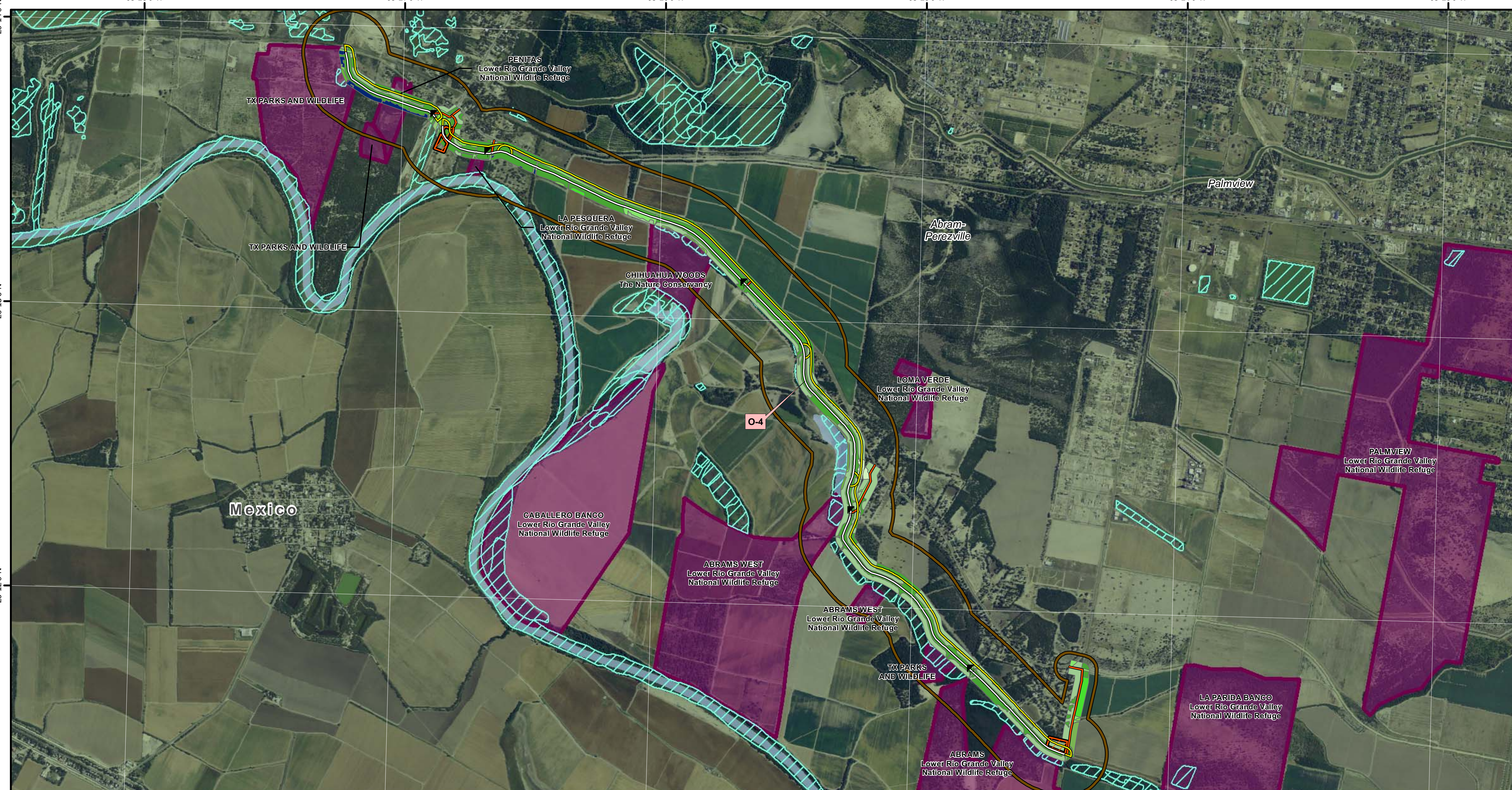
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 4 of 17



Concrete Flood Protection Structure/Concrete Fence
150ft Corridor
Staging Areas
Access Roads
Action Area
Surface Water
NWI Wetlands Outside Assessment Area
USACE Approved Wetlands & OWOUS
Rio Grande
Parks and Refuges
Zapata Bladderpod Critical Habitat
Historic District
Historic Property
Ports of Entry
Wildlife Openings
Gate Points

Vegetation Habitats
Agricultural Field/Fallow
Agriculture Cropped
Alkali Sacaton Herbaceous Vegetation
Buffelgrass Herbaceous Vegetation
Granjeno Woodland / Shrubland
Honey Mesquite Riparian Forest / Woodland
Honey Mesquite Woodland / Shrubland
Narrowleaf Cattail Herbaceous Vegetation
Open Water Pond / Lake
Open Water River / Ditch / Canal
Quelite Cenizo – Buffelgrass Herbaceous Vegetation
Residential Development
Roads, Trails, Canal Banks and Berms
Urban Development

N

Feet

0 500 1,000 2,000

Scale

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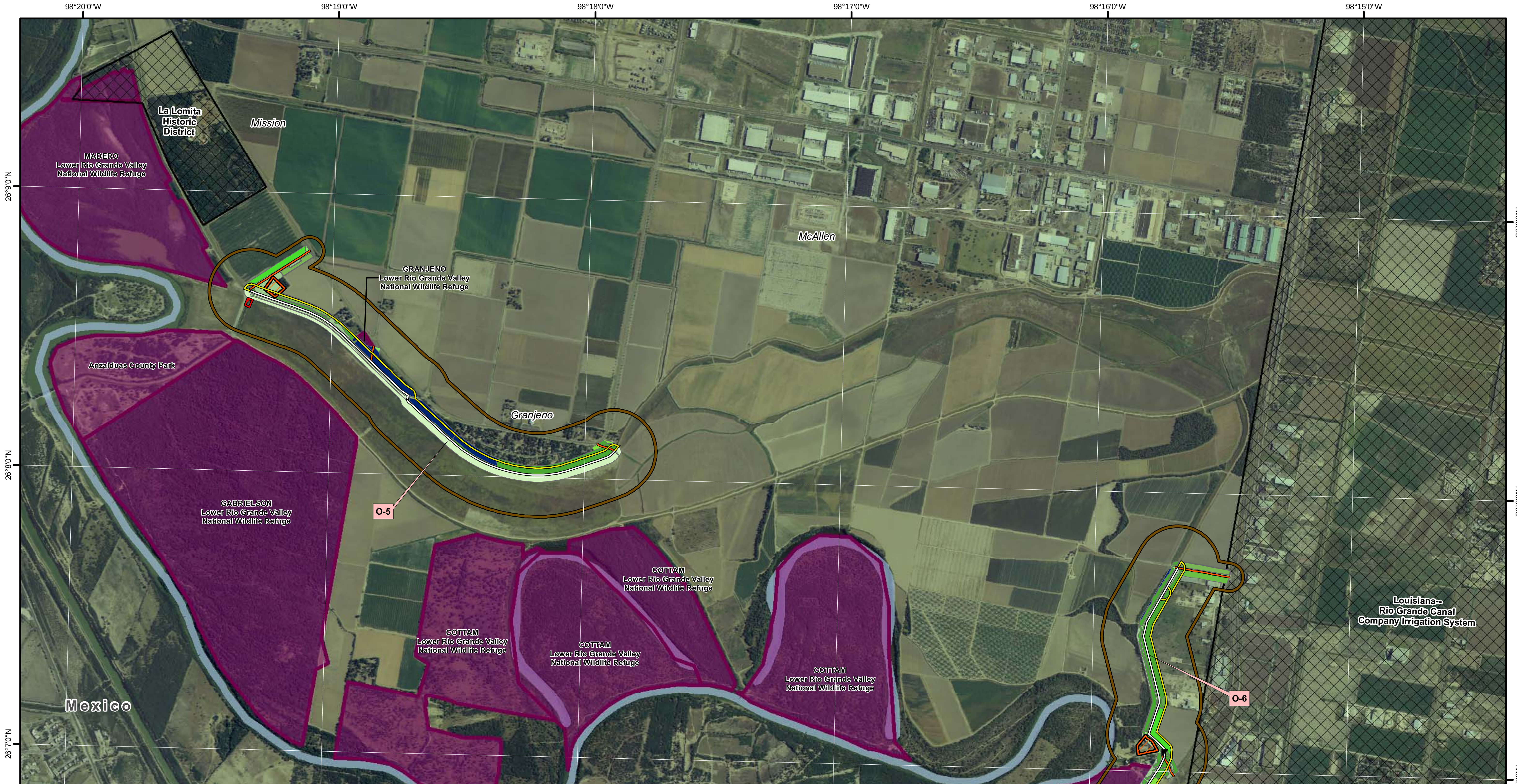

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Agriculture Cropped
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Bermuda Grass Herbaceous Vegetation
Buffelgrass Herbaceous Vegetation
Granjeno Woodland / Shrubland
Honey Mesquite Riparian Forest / Woodland
Open Water River / Ditch / Canal
Other Land Use
Residential Development
Roads, Trails, Canal Banks and Berms
Silver Bluestem Herbaceous Vegetation
Urban Development

N

Feet
0 500 1,000 2,000
Scale

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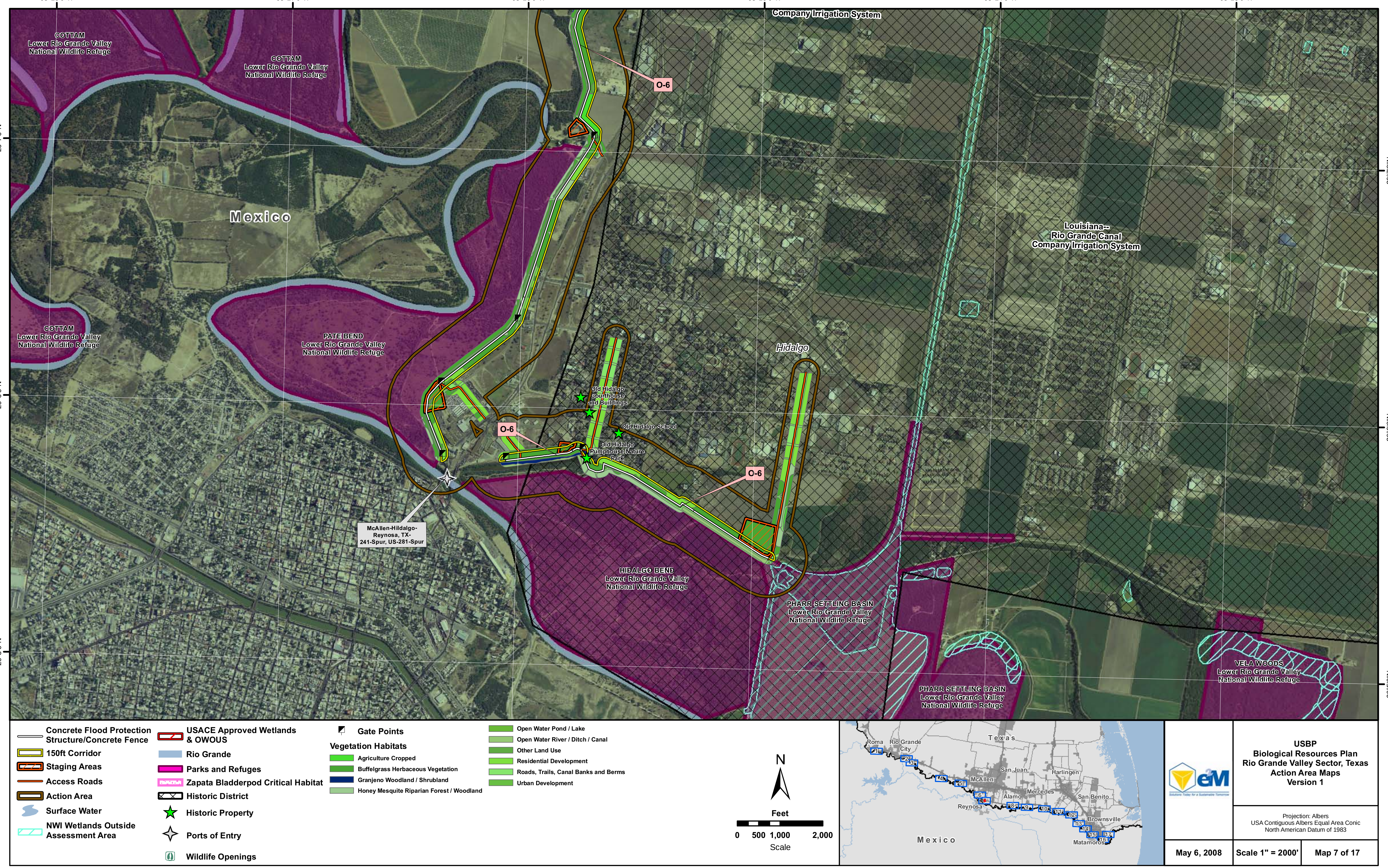
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98°17'0"W
98°16'0"W
98°15'0"W
98°14'0"W
98°13'0"W
26°7'0"N
26°6'0"N
26°5'0"N
COTTAM
Lower Rio Grande Valley
National Wildlife Refuge
PATE BEND
Lower Rio Grande Valley
National Wildlife Refuge
HIDALGO BEND
Lower Rio Grande Valley
National Wildlife Refuge
PHARR SETTLING BASIN
Lower Rio Grande Valley
National Wildlife Refuge
VELA WOODS
Lower Rio Grande Valley
National Wildlife Refuge
Mexico
Hidalgo
Louisiana--
Rio Grande Canal
Company Irrigation System
O-6
Old Hidalgo Courthouse and Buildings
Old Hidalgo School
Old Hidalgo Pumphouse Nature Park
McAllen-Hidalgo-Reynosa, TX-241-Spur, US-281-Spur
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Agriculture Cropped
Buffelgrass Herbaceous Vegetation
Granjeno Woodland / Shrubland
Honey Mesquite Riparian Forest / Woodland
Open Water Pond / Lake
Open Water River / Ditch / Canal
Other Land Use
Residential Development
Roads, Trails, Canal Banks and Berms
Urban Development
N
Feet
0 500 1,000 2,000
Scale
Texas
Mexico
Roma
Rio Grande City
McAllen
Reynosa
San Juan
Alamo
Mercedes
Harlingen
San Benito
Brownsville
Matamoros
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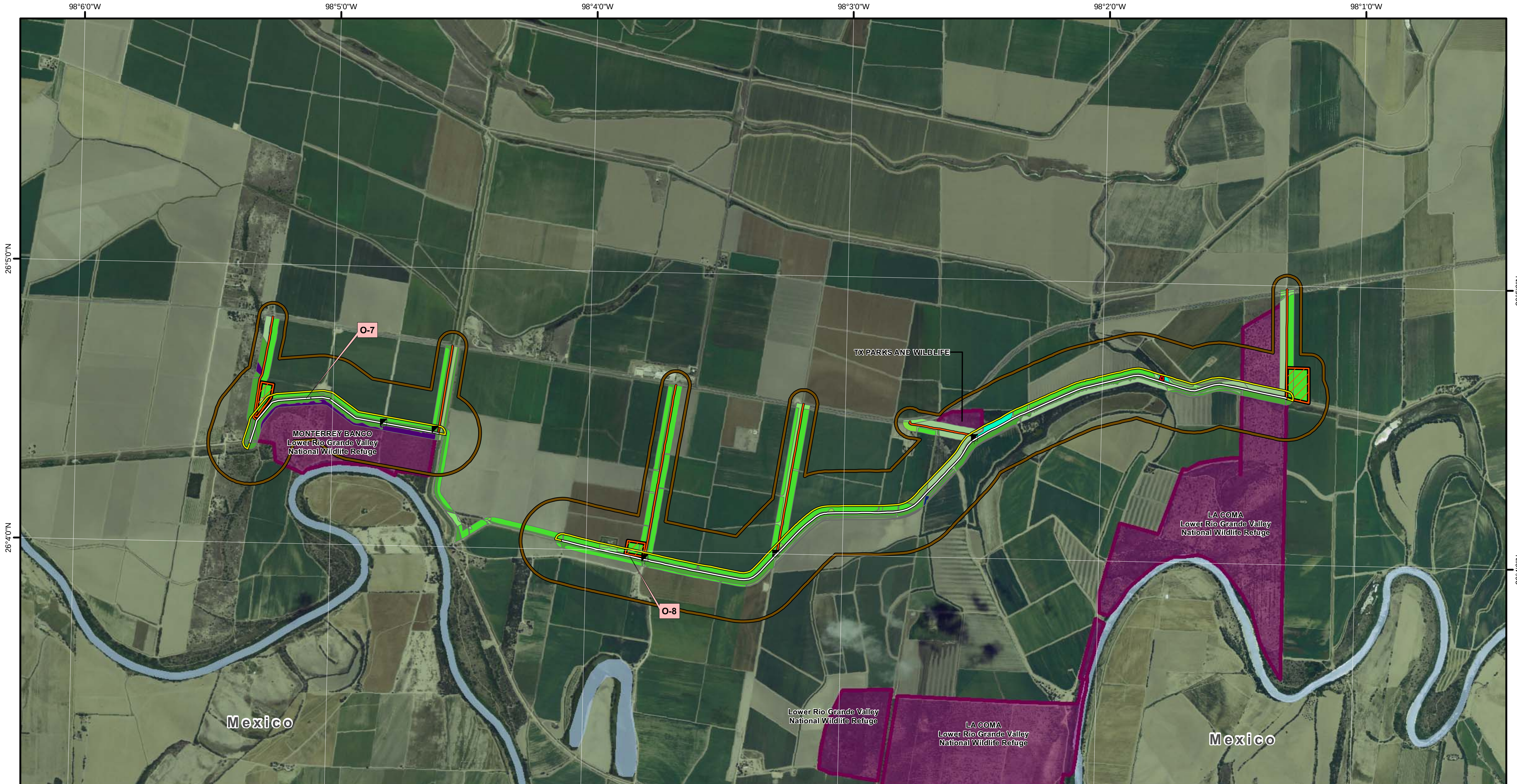

Concrete Flood Protection Structure/Concrete Fence
150ft Corridor
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Vegetation Habitats

- Agricultural Field/Fallow
- Agriculture Cropped
- Bermuda Grass Herbaceous Vegetation
- Black Willow Woodland / Shrubland
- Buffelgrass Herbaceous Vegetation
- Granjeno Woodland / Shrubland
- Honey Mesquite Riparian Forest / Woodland
- Honey Mesquite Woodland / Shrubland
- Johnsongrass Herbaceous Vegetation
- Narrowleaf Cattail Herbaceous Vegetation
- Open Water River / Ditch / Canal
- Other Land Use
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Sugarberry Riparian Forest / Woodland

N

Feet
0 500 1,000 2,000
Scale

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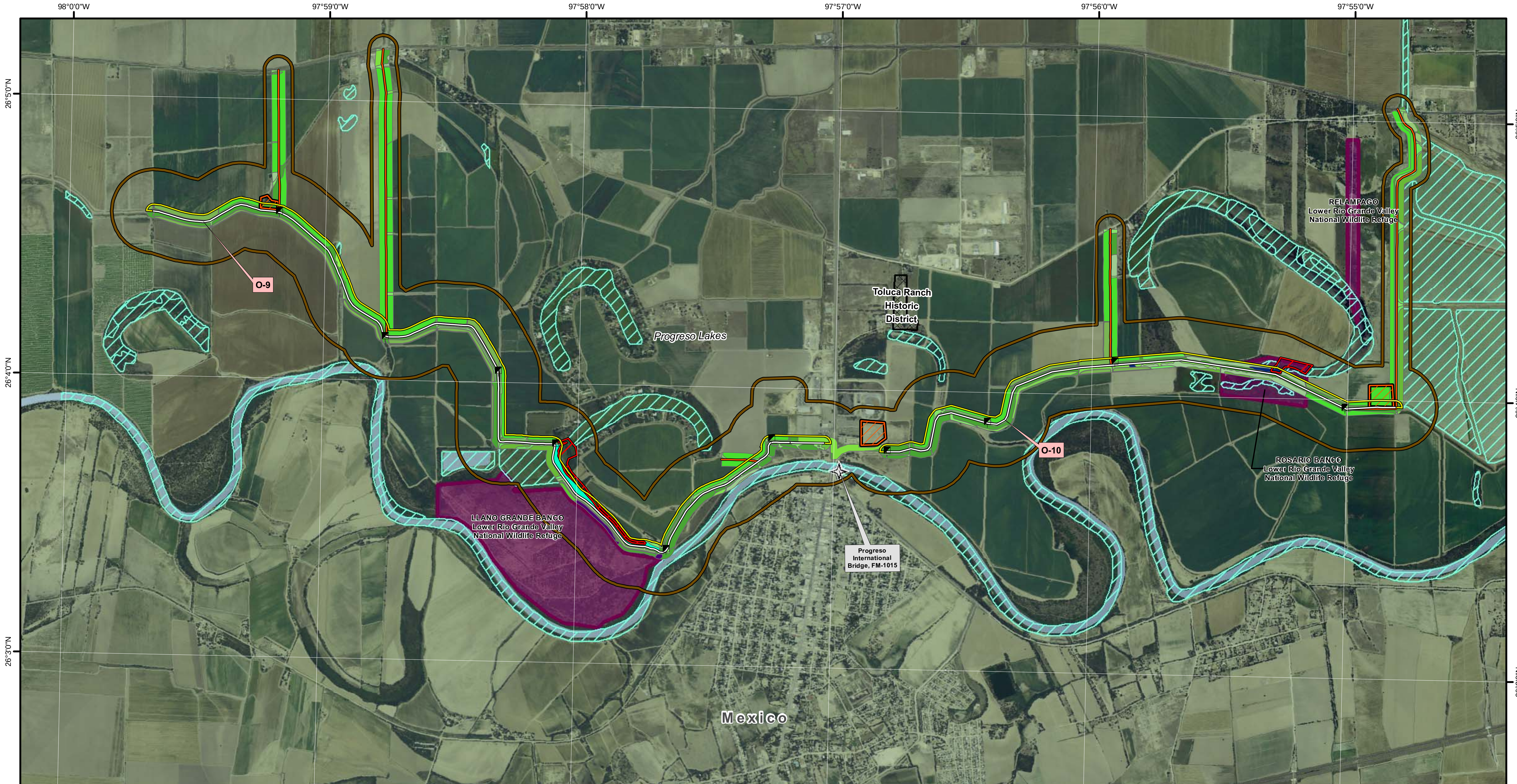

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Historic Property
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Gate Points

Vegetation Habitats

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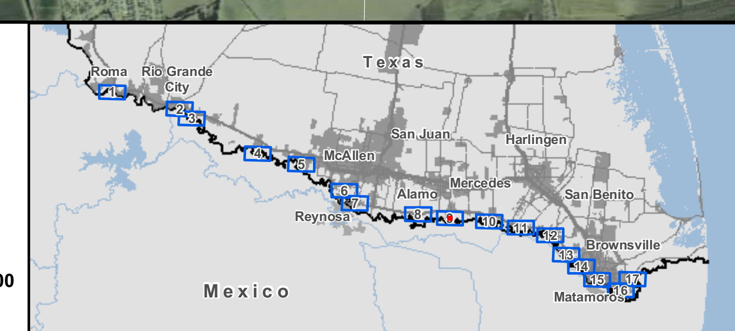
- Agriculture Cropped
- Bermuda Grass Herbaceous Vegetation
- Buffelgrass Herbaceous Vegetation
- Castor Bean / Buffelgrass Shrubland
- Giant Reed Shrubland / Herbaceous Vegetation
- Granjeno Woodland / Shrubland
- Honey Mesquite Riparian Forest / Woodland
- Honey Mesquite Woodland / Shrubland
- Johnsongrass Herbaceous Vegetation
- Mule's Fat Shrubland
- Narrowleaf Cattail Herbaceous Vegetation
- Open Water Pond / Lake
- Open Water River / Ditch / Canal
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Sugarberry Riparian Forest / Woodland
- Urban Development

N

Feet

0 500 1,000 2,000

Scale



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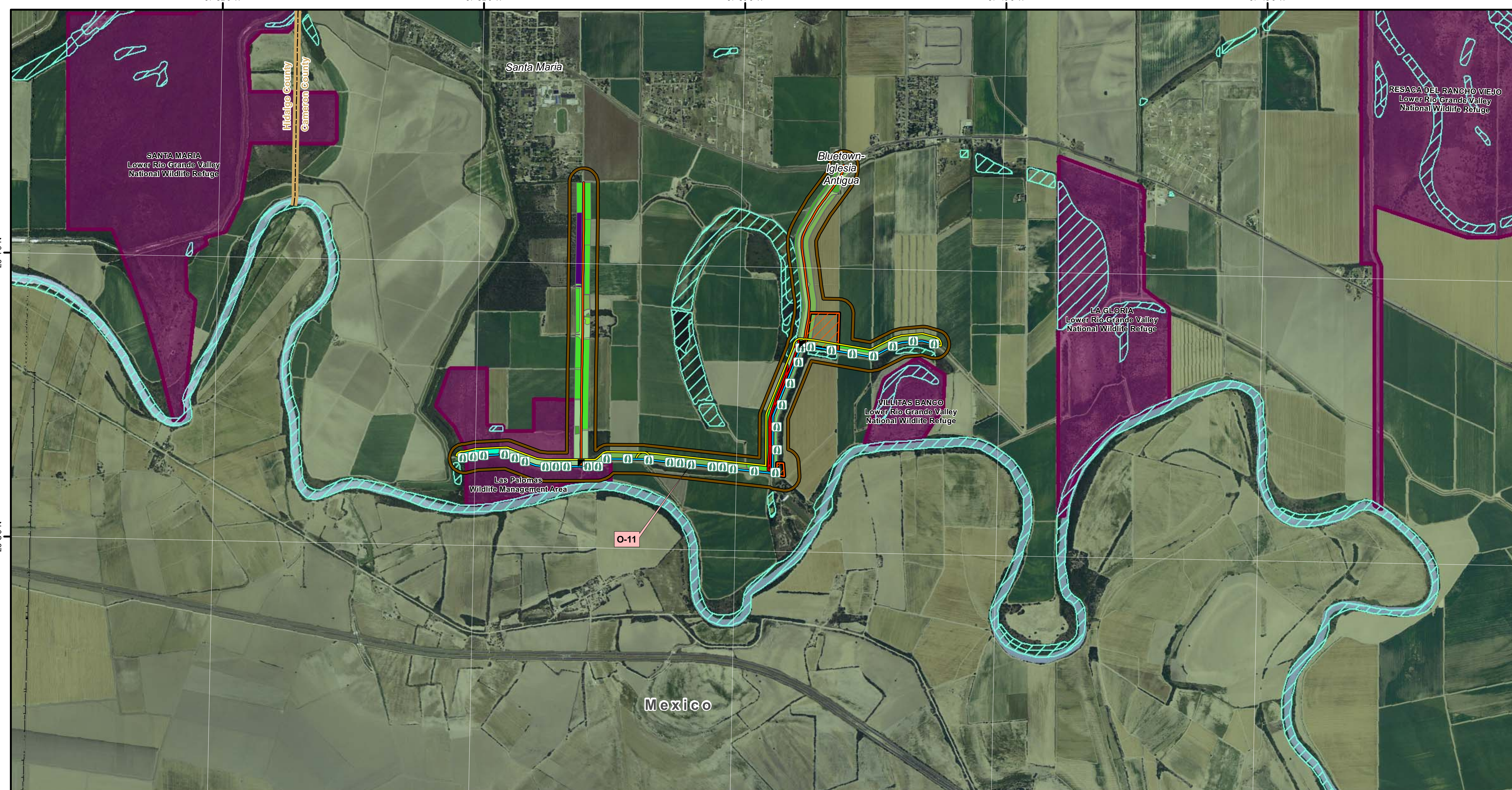

Bollard or Picket Fence
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Agriculture Cropped
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Honey Mesquite Woodland / Shrubland
Johnsongrass Herbaceous Vegetation
Open Water River / Ditch / Canal
Residential Development
Roads, Trails, Canal Banks and Berms
Sugarberry Riparian Forest / Woodland
Switchgrass Herbaceous Vegetation

N

Feet
0 500 1,000 2,000
Scale

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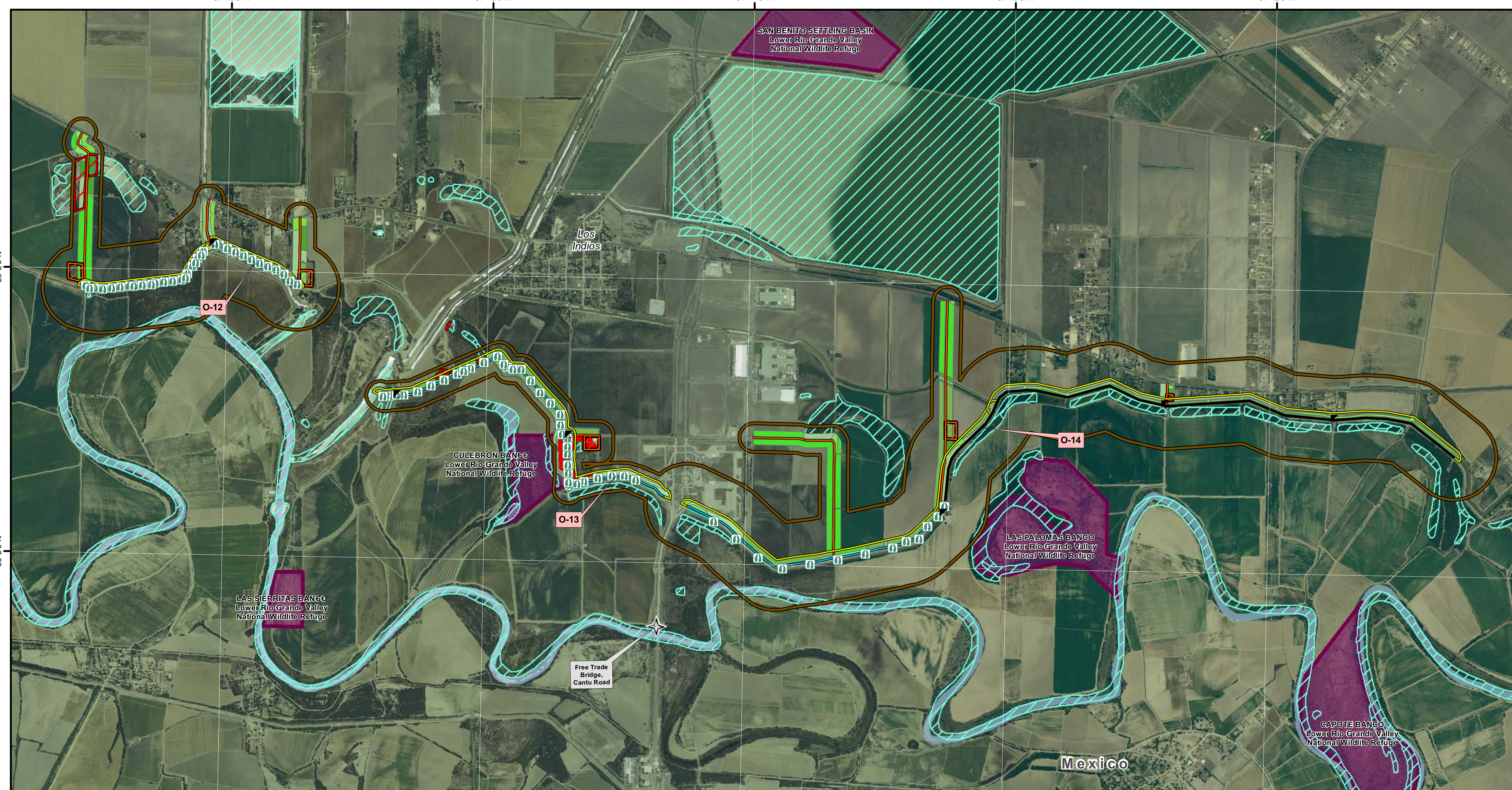

Bollard or Picket Fence
Floating Fence
150ft Corridor
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Gate Points

Vegetation Habitats
- Agricultural Field/Fallow
- Agriculture Cropped
- Black Willow Woodland / Shrubland
- Buffelgrass Herbaceous Vegetation
- Giant Reed Shrubland / Herbaceous Vegetation
- Honey Mesquite Riparian Forest / Woodland
- Johnsongrass Herbaceous Vegetation
- Lovegrass – Mixed Forb Annual Herbaceous Vegetation
- Mule's Fat Shrubland
- Narrowleaf Cattail Herbaceous Vegetation
- Open Water River / Ditch / Canal
- Ratama Shrubland
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Smartweed Herbaceous Vegetation
- Sugarberry Riparian Forest / Woodland
- Switchgrass Herbaceous Vegetation
- Windmill Grass Herbaceous Vegetation

N

Feet
0 500 1,000 2,000
Scale

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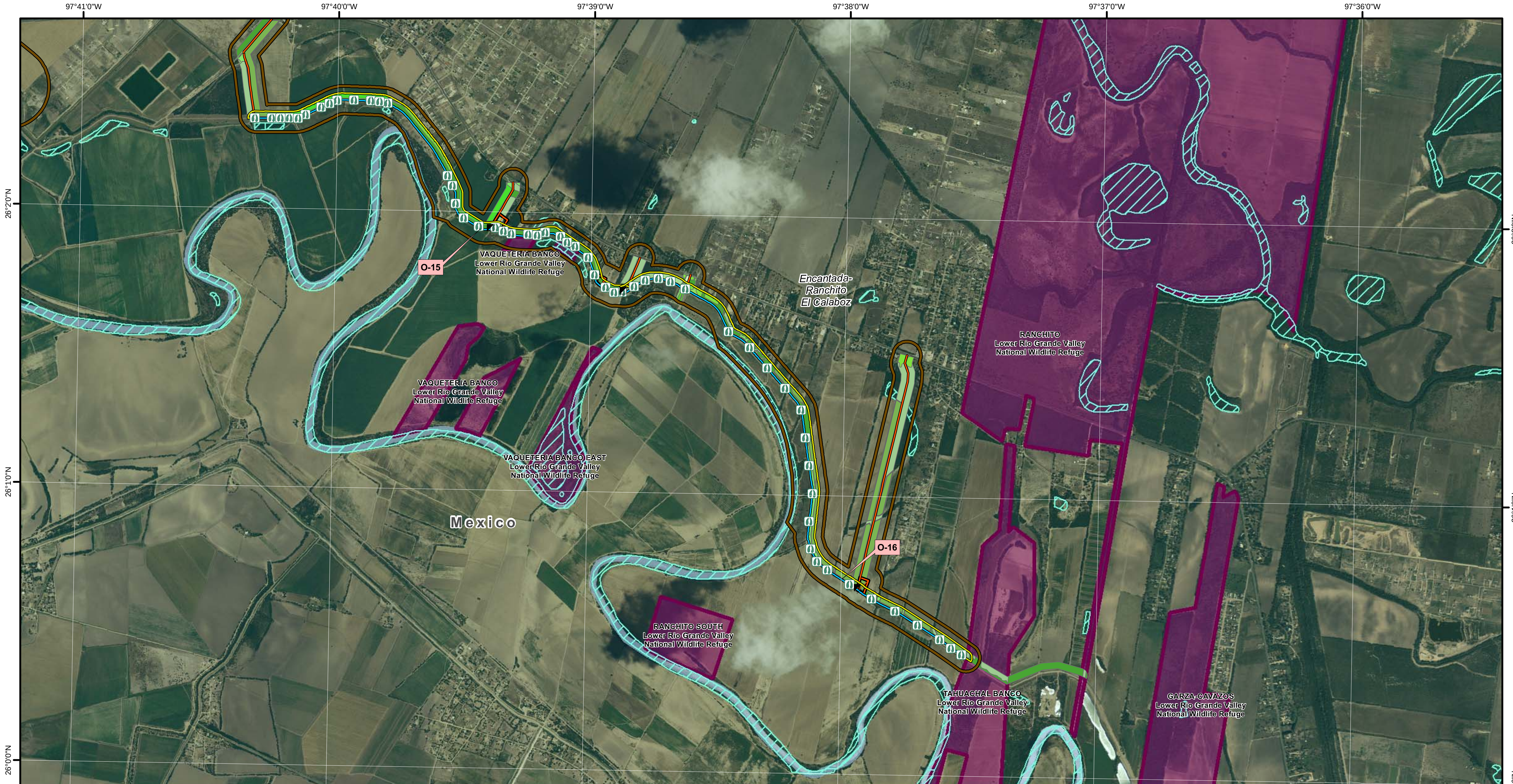

Bollard or Picket Fence
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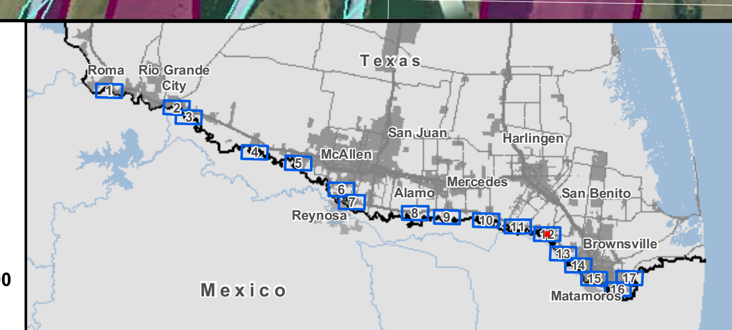
Buffelgrass Herbaceous Vegetation
Chinaberry Woodland
Giant Reed Shrubland / Herbaceous Vegetation
Honey Mesquite Riparian Forest / Woodland
Open Water River / Ditch / Canal
Residential Development
Roads, Trails, Canal Banks and Berms
Switchgrass Herbaceous Vegetation

N

Feet
0 500 1,000 2,000
Scale



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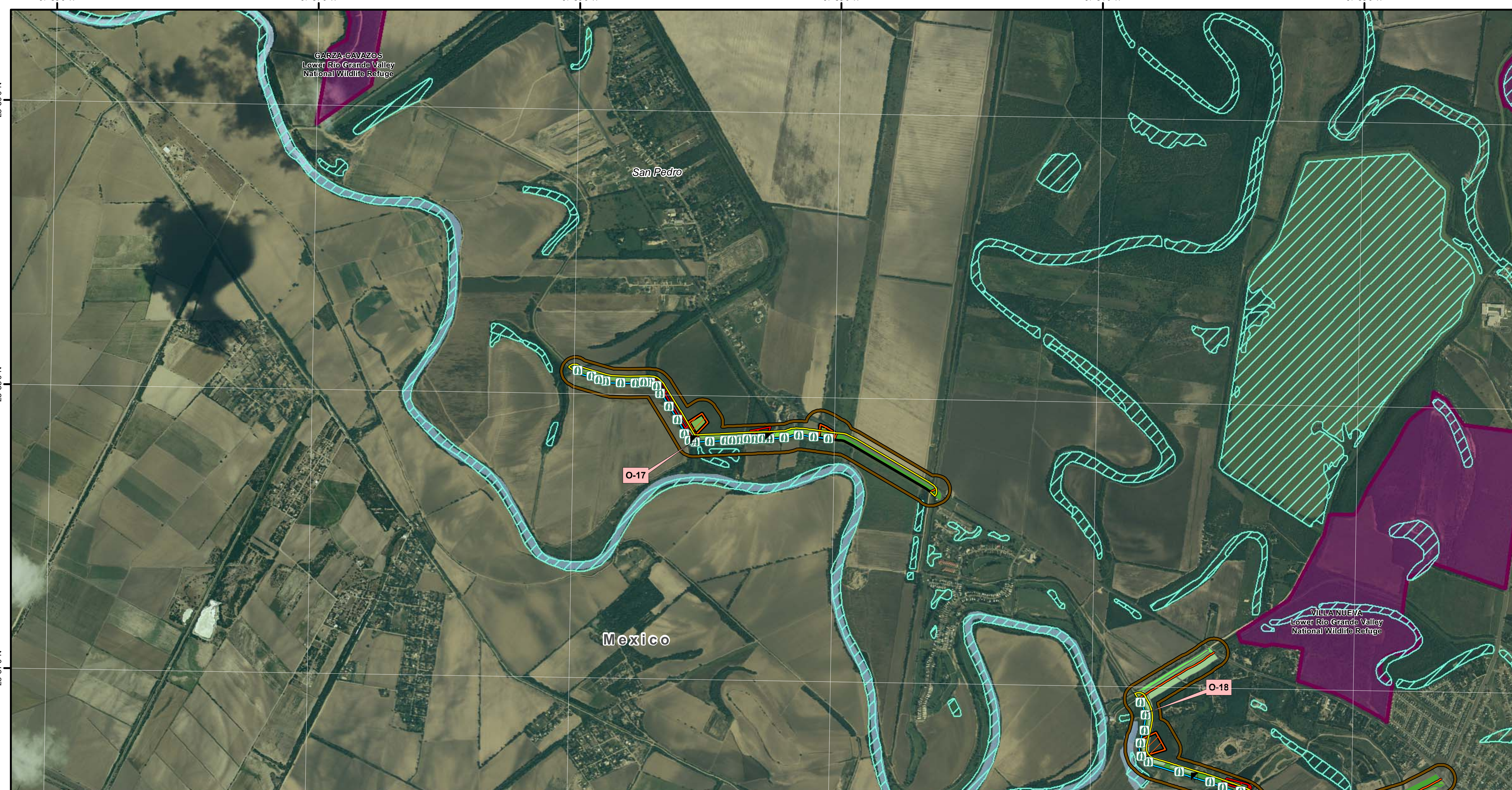

- Bollard or Picket Fence
- Floating Fence
- 150ft Corridor
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- Open Water River / Ditch / Canal
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N

Feet

0 500 1,000 2,000

Scale

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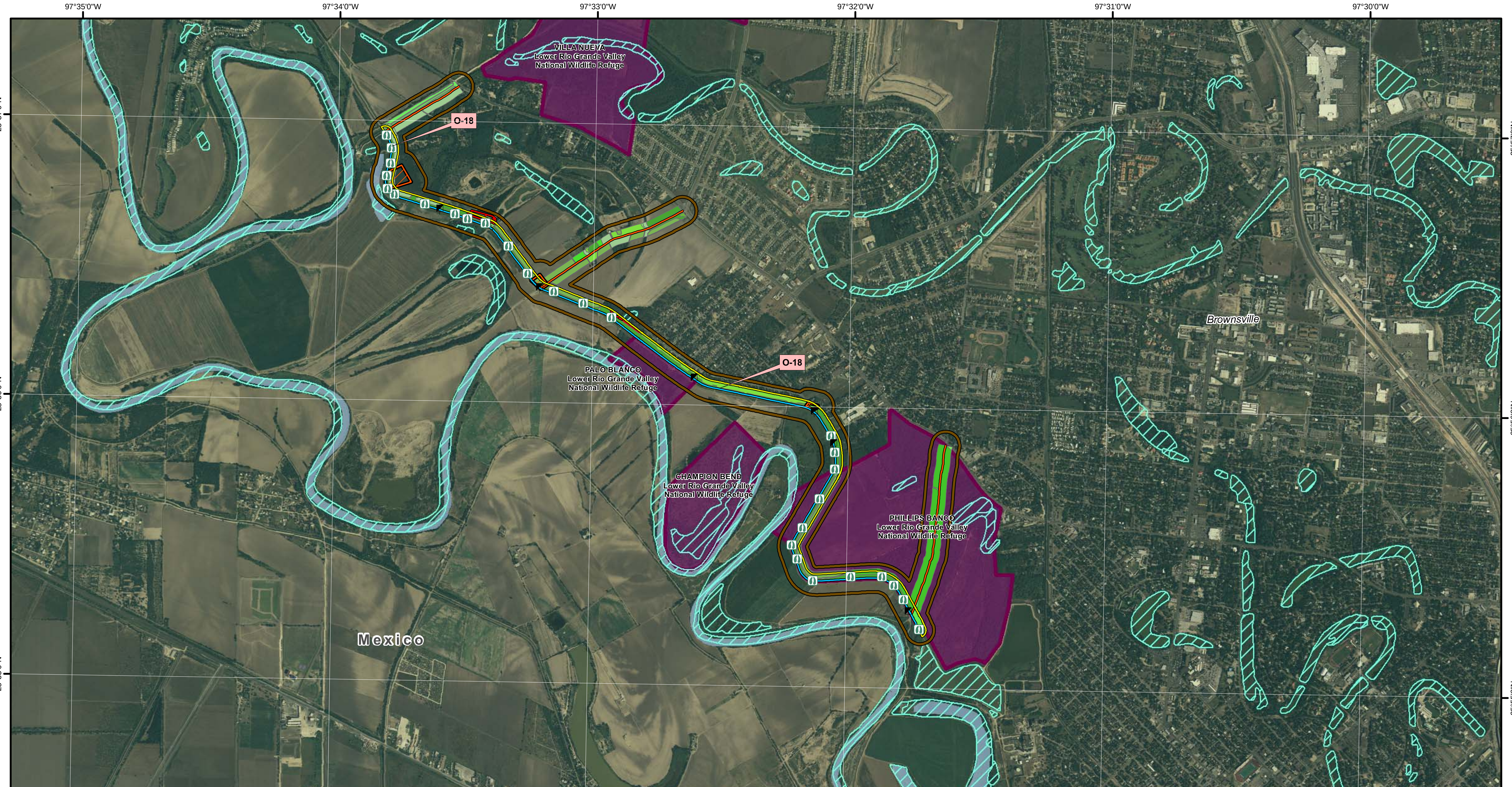

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- Agricultural Field/Fallow
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- Buffelgrass Herbaceous Vegetation
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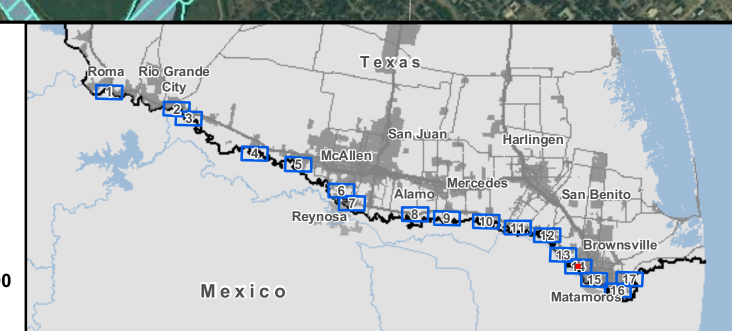
- Mule's Fat Shrubland
- Narrowleaf Cattail Herbaceous Vegetation
- Open Water Pond / Lake
- Open Water River / Ditch / Canal
- Ratama Shrubland
- Residential Development
- Roads, Trails, Canal Banks and Berms
- Tepeguahe Woodland

N

Feet
0 500 1,000 2,000
Scale



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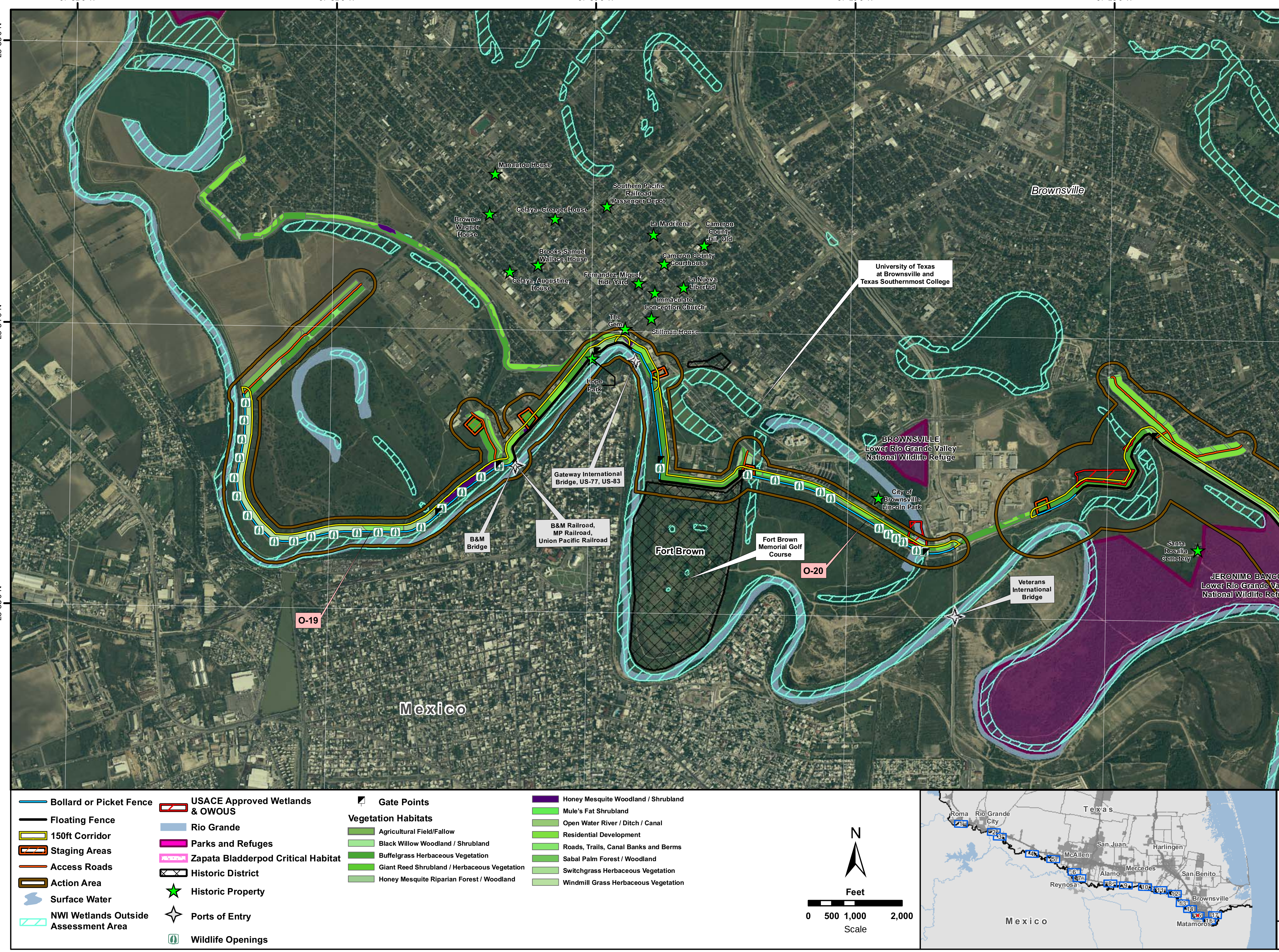

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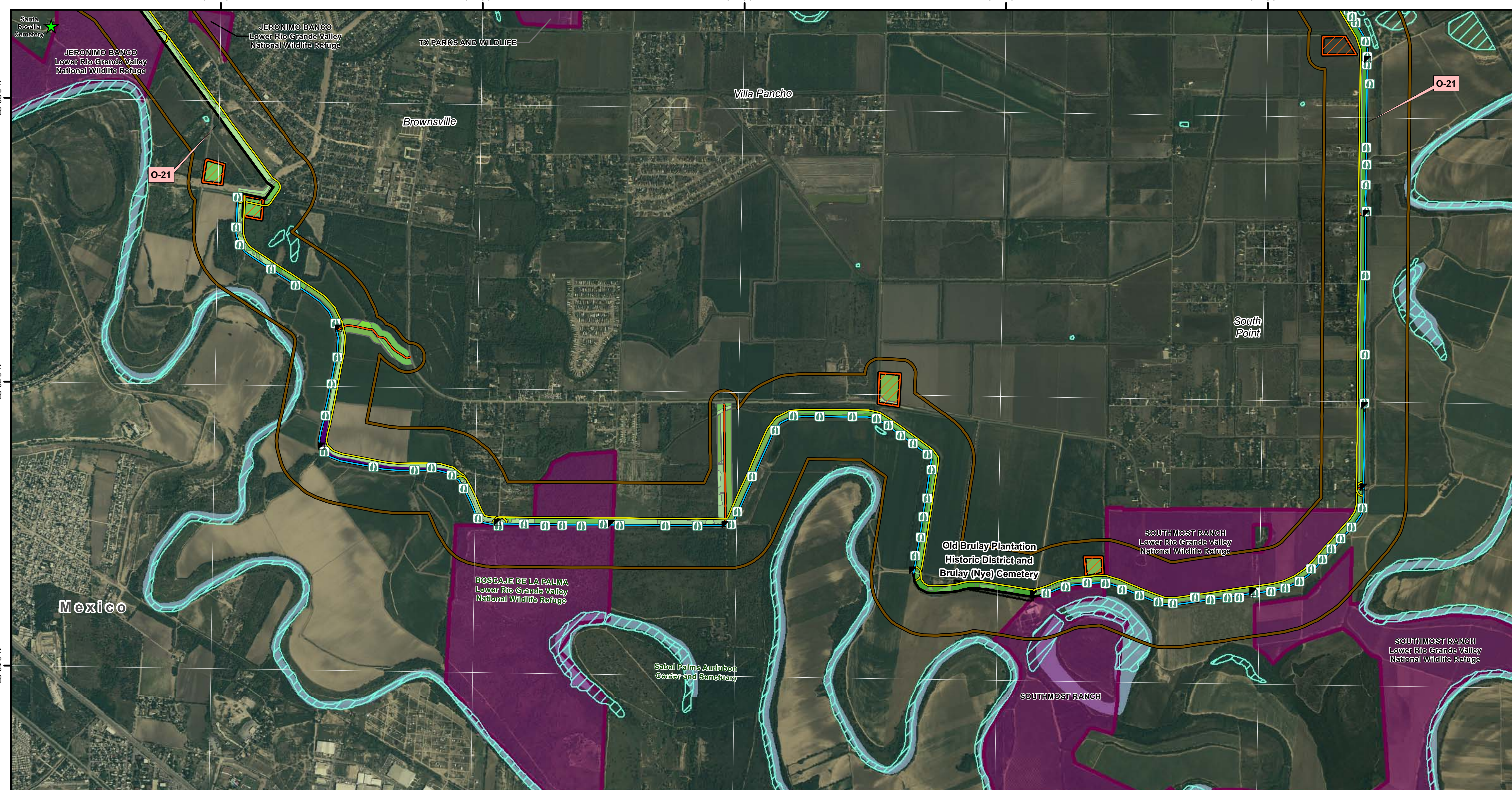

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Honey Mesquite Woodland / Shrubland
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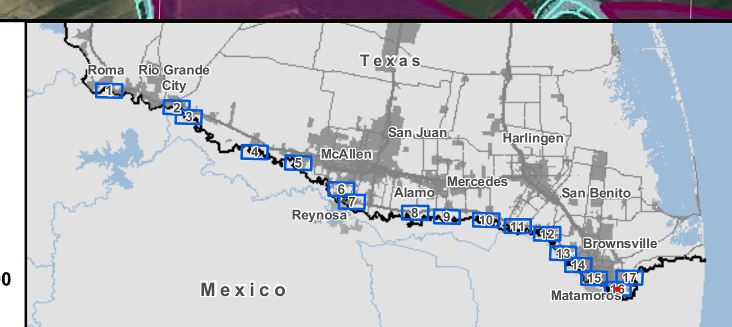
Residential Development
Roads, Trails, Canal Banks and Berms
Sabal Palm Forest / Woodland
Switchgrass Herbaceous Vegetation

N

Feet
0 500 1,000 2,000
Scale



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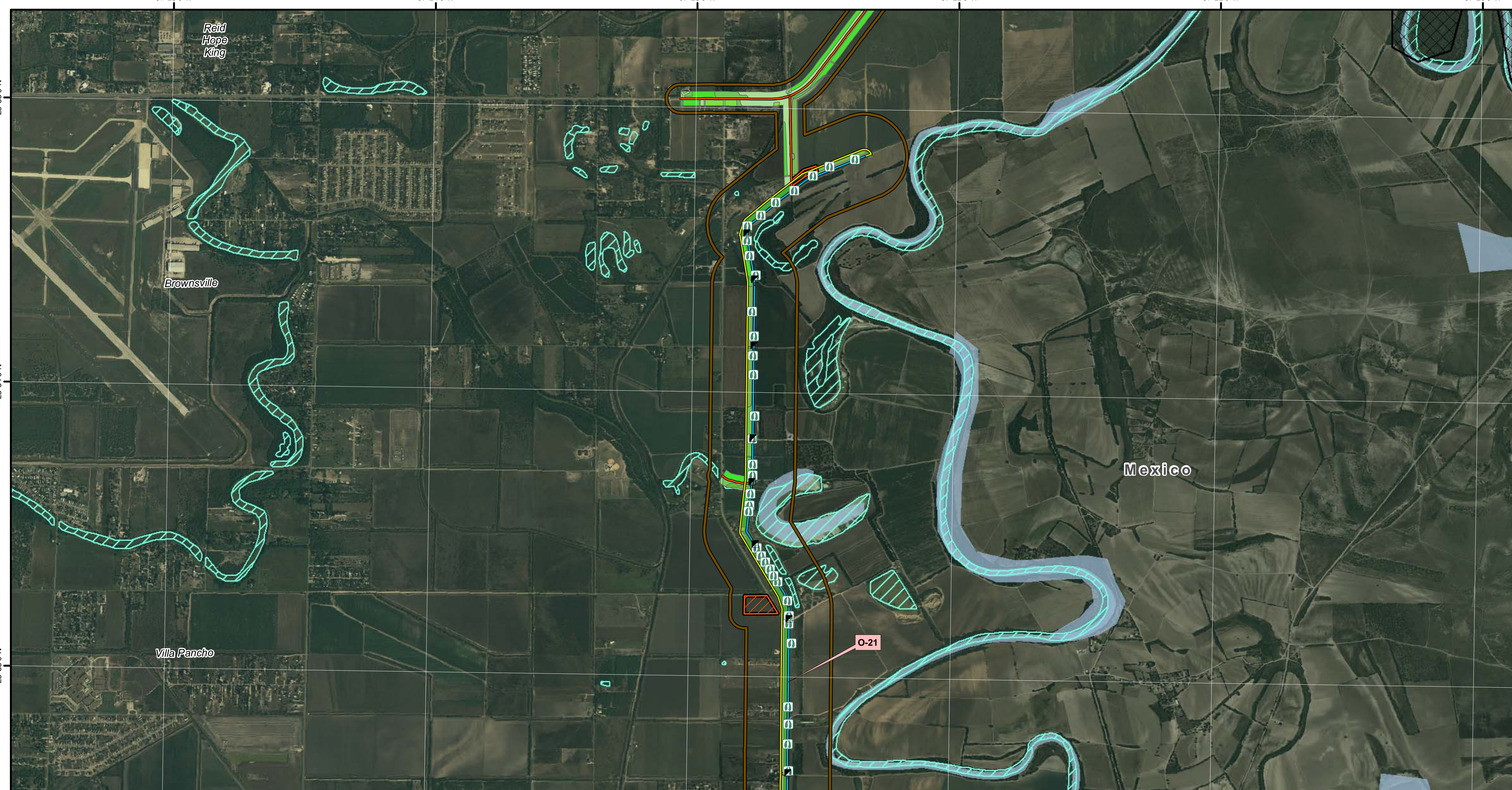

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N

Feet

0 500 1,000 2,000

Scale

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APPENDIX B

Detail of Vegetative Alliances and Other Land Uses with the Project Area

Table 1. Direct Effects by Vegetative Alliance within the 60 Foot Corridor for Fence Sections O-1 through O-3 and O-11 through O-21

60-foot corridor	O-1	O-2	O-3	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	Total
Grassland															
Bermuda Grass Herbaceous Vegetation	0.848	0.000	0.298	2.285	0.000	0.000	0.000	2.663	0.000	0.000	0.012	0.000	0.000	0.000	6.106
Buffelgrass Herbaceous Vegetation	2.400	10.476	1.294	0.000	0.000	0.000	8.362	8.511	6.308	6.949	20.587	9.598	5.889	46.438	126.812
Johnsongrass Herbaceous Vegetation	0.000	0.000	0.000	0.001	0.000	0.407	0.589	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.996
Switchgrass Herbaceous Vegetation	0.000	0.000	3.610	6.405	2.371	4.493	4.560	0.000	0.343	0.000	0.000	0.000	0.000	20.267	42.049
Silver Bluestem Herbaceous Vegetation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Windmill Grass Herbaceous Vegetation	0.000	0.000	0.000	0.000	1.342	0.257	0.000	0.000	0.000	0.000	0.000	4.797	0.000	0.000	6.396
Quelite Cenizo - Buffelgrass Herbaceous Vegetation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Narrowleaf Cattail Herbaceous Vegetation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.009
Alkali Sacaton Herbaceous Vegetation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Smartweed Herbaceous Vegetation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lovegrass - Mixed Forb Annual Herbaceous Vegetation	0.000	1.466	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.466
Grassland Total	**3.248**	**11.943**	**5.202**	**8.691**	**3.713**	**5.157**	**13.511**	**11.174**	**6.651**	**6.949**	**20.608**	**14.395**	**5.889**	**66.705**	**183.834**
Shrubland															
Castor Bean/Buffelgrass Shrubland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Honey Mesquite Woodland / Shrubland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.947	0.000	4.691	5.638
Cenizo - Blackbrush Shrubland	7.923	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7.923
Ratama Shrubland	0.000	0.000	0.000	0.000	0.000	0.892	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.892
Mule's Fat Shrubland	0.000	0.000	0.180	0.000	0.000	0.725	0.000	0.000	0.000	0.000	0.492	0.000	0.219	0.000	1.616
Giant Reed Shrubland / Herbaceous Vegetation	0.031	0.000	0.000	0.000	0.000	0.124	0.000	0.000	0.114	0.000	0.000	0.000	0.000	0.001	0.270
Arroyo Shrubland	0.915	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.915
Shrubland Total	**8.869**	**0.000**	**0.180**	**0.000**	**0.000**	**1.741**	**0.000**	**0.000**	**0.114**	**0.000**	**0.492**	**0.947**	**0.219**	**4.691**	**17.255**
Woodland and Forest															
Chinaberry Woodland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.319	0.000	0.000	0.000	0.000	0.000	0.319
Tepeguahe Woodland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001
Granjeno Woodland / Shrubland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.330	0.000	0.000	0.000	0.000	2.330
Honey Mesquite Riparian Forest / Woodland	8.530	22.855	3.171	2.748	0.592	0.000	3.235	0.000	1.260	0.000	0.161	1.929	0.082	1.312	45.877
Sugarberry Riparian Forest / Woodland	3.990	0.175	0.000	0.442	1.779	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.387
Sabal Palm Forest / Woodland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.335	8.335
Woodland Total	**12.521**	**23.030**	**3.171**	**3.190**	**2.371**	**0.000**	**3.236**	**0.000**	**1.579**	**2.330**	**0.163**	**1.929**	**0.082**	**9.647**	**63.249**
Open Water															
Open Water River / Ditch / Canal	0.000	0.000	0.000	0.032	0.000	0.046	0.496	0.000	0.019	0.000	0.023	0.000	0.000	0.042	0.658
Open Water Pond / Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.047
Open Water Total	**0.000**	**0.000**	**0.000**	**0.032**	**0.000**	**0.046**	**0.496**	**0.000**	**0.019**	**0.000**	**0.023**	**0.000**	**0.000**	**0.089**	**0.705**
Other Land Use															
Agriculture Cropped	0.000	14.991	0.000	0.219	0.000	0.000	0.012	0.938	0.000	0.000	0.000	0.000	0.000	0.918	17.078
Agricultural Field / Fallow	0.252	6.286	1.362	4.344	0.000	3.935	2.648	0.467	2.168	1.410	0.833	0.001	0.000	8.299	32.005
Residential Development	1.987	1.656	3.275	0.000	0.000	0.000	0.126	0.004	0.240	0.399	0.979	2.327	0.186	0.294	11.473
Roads, Trails, Canal Banks and Berms	0.454	5.551	0.893	0.669	0.874	0.773	6.310	1.143	6.692	0.799	3.140	5.012	0.411	3.816	36.538
Other Land Use	0.122	0.081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.203
Other Land Use Total	**2.816**	**28.566**	**5.530**	**5.232**	**0.874**	**4.708**	**9.096**	**2.552**	**9.100**	**2.607**	**4.952**	**7.340**	**0.597**	**13.327**	**97.298**
Grand Total	**27.454**	**63.539**	**14.083**	**17.145**	**6.958**	**11.652**	**26.338**	**13.726**	**17.464**	**11.885**	**26.237**	**24.610**	**6.788**	**94.460**	**362.339**

Table 2. Direct Effects by Vegetative Alliance within the 40 Foot Corridor for Fence Sections O-4 through O-10

40-foot Corridor	O-4	O-5	O-6	O-7	O-8	O-9	O-10	Total Acreage
Herbaceous								
Bermuda Grass Herbaceous Vegetation						0.543		**0.543**
Buffelgrass Herbaceous Vegetation	17.392		14.882	3.162	4.812	6.622	4.607	**51.477**
Johnsongrass Herbaceous Vegetation								**0.000**
Total	17.392		14.882	3.162	4.812	7.164	4.607	**52.020**
Mixed Woodland / Wooded Herbaceous Vegetation								
Granjeno Woodland / Shrubland	0.038		0.002		0.003		0.050	**0.093**
Honey Mesquite Woodland / Shrubland				0.054		0.001		**0.055**
Huisache Woodland / Shrubland						0.037		**0.037**
Total	0.038		0.002	0.054	0.003	0.038	0.050	**0.185**
Mixed Riparian Forest / Woodland								
Honey Mesquite Riparian Forest / Woodland	0.150		0.732				0.058	**0.941**
Total	0.150		0.732				0.058	**0.941**
Wetland/Riparian								
Alkali Sacaton Herbaceous Vegetation		4.463						**4.463**
Common Reed Herbaceous Vegetation								**0.000**
Giant Reed Shrubland / Herbaceous Vegetation								**0.000**
Narrowleaf Cattail Herbaceous Vegetation							1.184	**1.184**
Total		4.463					1.184	**5.646**
Land Use								
Agricultural Field/Fallow								**0.000**
Agriculture Cropped							0.001	**0.001**
Open Water Pond / Lake						0.210		**0.210**
Open Water River / Ditch / Canal		2.253		0.002		0.596		**2.851**
Other Land Use								**0.000**
Roads, Trails, Canal Banks, and Berms	3.655	1.856	2.894	0.756	11.106	10.784	5.508	**36.559**
Urban Development			0.185			0.040		**0.224**
Total	3.655	4.109	3.079	0.757	11.106	11.630	5.510	**39.846**
Grand Total	**21.235**	**8.571**	**18.696**	**3.973**	**15.920**	**18.833**	**11.409**	**98.638**

Table 3. Direct Effects on Vegetation Resulting from Disturbance in Construction Staging Areas

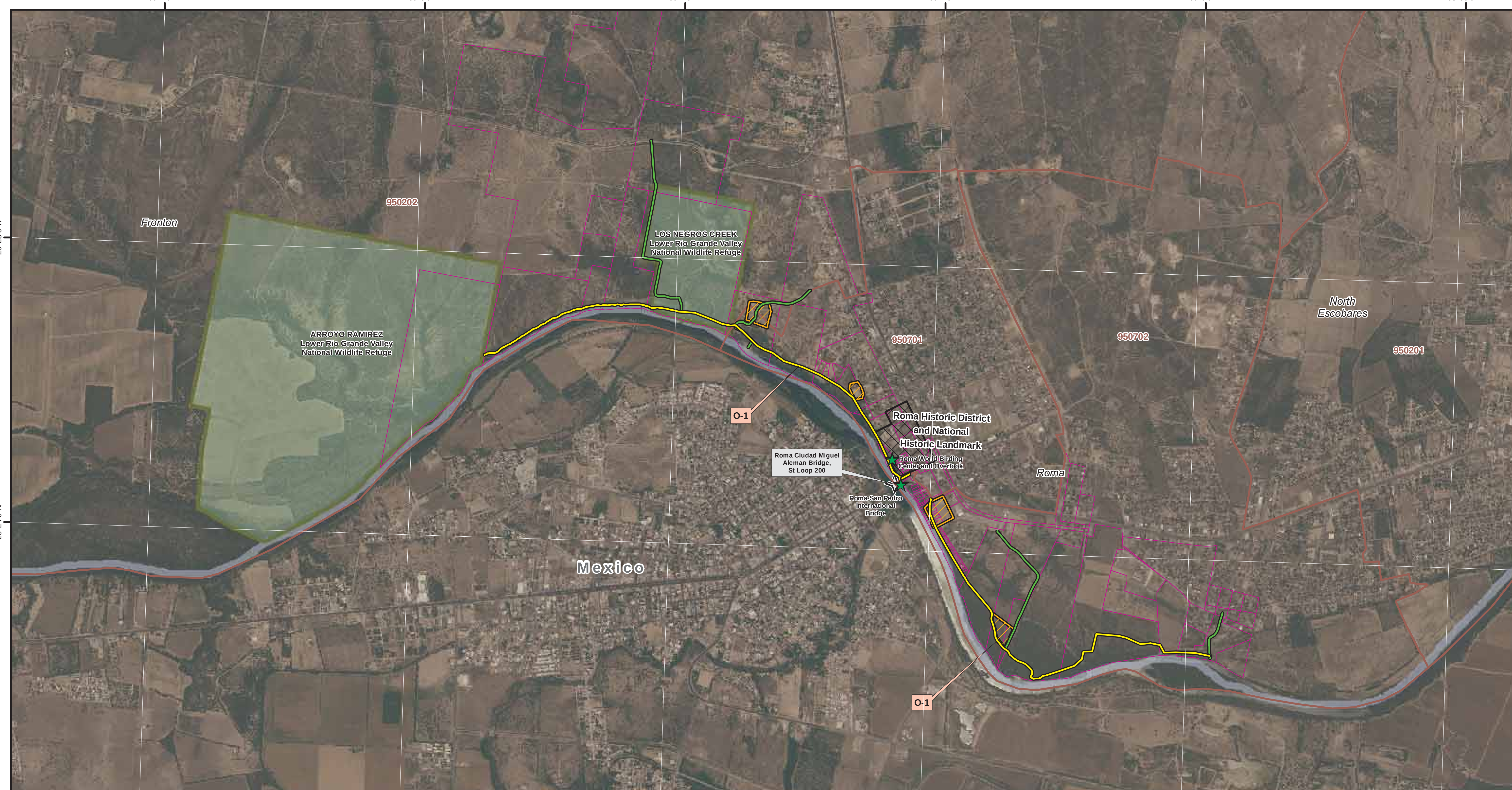
Staging Areas	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	
Herbaceous Vegetation																						
Bermuda Grass Herbaceous Vegetation	4.206		0.623																			4.829
Buffelgrass Herbaceous Vegetation	4.649		0.006	1.999		17.724		0.091	1.836	6.003				0.252	0.652	0.029		0.434	4.191	0.631	0.536	39.036
Switchgrass Herbaceous Vegetation											0.050	0.251	0.001								1.470	1.772
Windmill Grass Herbaceous Vegetation													0.518									0.518
Narrowleaf Cattail Herbaceous Vegetation												1.252										1.252
Lovegrass - Mixed Forb Annual Herbaceous Vegetation		9.665																				9.665
Total	8.855	9.665	0.630	1.999		17.724		0.091	1.836	6.003	0.050	1.503	0.519	0.252	0.652	0.029		0.434	4.191	0.631	2.006	57.072
Shrubland																						
Cenizo - Blackbrush Shrubland	0.012																					0.012
Ratama Shrubland													1.482									1.482
Mule's Fat Shrubland																				0.499		0.499
Total	0.012												1.482							0.499		1.993
Woodland and Forest																						
Granjeno Woodland / Shrubland																	0.037					0.037
Honey Mesquite Riparian Forest / Woodland	2.940	0.171	1.081	1.973	2.108	1.029					0.876			0.072	0.978			3.486		0.105		14.817
Sugarberry Riparian Forest / Woodland	0.064																					0.064
Sabal Palm Forest / Woodland																					6.669	6.669
Total	3.004	0.171	1.081	1.973	2.108	1.029					0.876			0.072	0.978		0.037	3.486		0.105	6.669	21.586
Land Use																						
Agriculture Cropped		3.481		0.118			2.958	10.005		5.027		2.310									5.208	29.107
Agricultural Field / Fallow		3.758	0.000								10.341	0.360		1.865		0.883	3.130	0.769			10.153	31.259
Residential Development	0.029		0.338			0.181									0.004			0.001	0.636			1.189
Roads, Trails, Canal Banks and Berms	0.603	5.926	0.051	0.176		0.387	0.476	0.000	0.042			0.076		0.003	0.019			0.036	0.003		1.112	8.910
Other Land Use	1.695																					1.695
Total	2.326	13.165	0.389	0.294		0.568	3.434	10.005	0.042	5.027	10.341	2.746		1.868	0.023	0.883	3.130	0.807	0.639		16.473	72.159
Grand Total	**14.197**	**23.001**	**2.099**	**4.266**	**2.108**	**19.321**	**3.434**	**10.096**	**1.878**	**11.031**	**11.266**	**4.249**	**2.001**	**2.192**	**1.653**	**0.912**	**3.167**	**4.727**	**4.830**	**1.235**	**25.148**	**152.810**

Table 4. Direct Effects on Vegetation Resulting from Disturbance in Construction Access Roads

Access Roads	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	O-9	O-10	O-11	O-12	O-13	O-14	O-15	O-16	O-17	O-18	O-19	O-20	O-21	
Herbaceous Vegetation																						
Bermuda Grass Herbaceous Vegetation			0.372							4.203	0.164				0.000			2.087				6.826
Buffelgrass Herbaceous Vegetation	7.630	6.292	4.438	3.823	1.398	5.721	6.875	4.622	2.389	5.831	0.883	1.809		1.193	1.659	0.408	0.453	2.292	6.033	0.454	0.515	64.716
Switchgrass Herbaceous Vegetation			2.517								0.000	0.773	0.916	0.211							11.766	16.183
Windmill Grass Herbaceous Vegetation													0.813									0.813
Narrowleaf Cattail Herbaceous Vegetation				0.159					0.077	0.061		0.226										0.524
Alkali Sacaton Herbaceous Vegetation				0.209	0.198											0.219						0.626
Smartweed Herbaceous Vegetation														0.066								0.066
Lovegrass - Mixed Forb Annual Herbaceous Vegetation		3.920										0.556										4.476
Total	7.630	10.212	7.326	4.191	1.596	5.721	6.875	4.622	2.466	10.095	1.047	3.365	1.729	1.470	1.659	0.627	0.453	4.379	6.033	0.454	12.281	94.229
Shrubland																						
Honey Mesquite Woodland / Shrubland		1.796					0.220				1.615								0.066			3.697
Cenizo - Blackbrush Shrubland	9.582																					9.582
Ratama Shrubland													1.333									1.333
Mule's Fat Shrubland																		0.569		0.011		0.581
Giant Reed Shrubland / Herbaceous Vegetation																0.251						0.251
Arroyo Shrubland	0.277	0.453																				0.729
Total	9.858	2.248					0.220				1.615		1.333			0.251		0.569	0.066	0.011		16.173
Woodland and Forest																						
Chinaberry Woodland																0.000						0.000
Tepeguahe Woodland																		10.564				10.564
Granjeno Woodland / Shrubland					0.950	0.329																1.280
Honey Mesquite Riparian Forest / Woodland	8.575	16.022	6.895	5.808	1.200	3.655	0.729	5.950	0.218	0.738	3.367	3.644		1.958	2.305	7.929		3.598	0.790	0.349	2.095	75.824
Sugarberry Riparian Forest / Woodland	0.225	9.224						0.093				0.026										9.567
Sabal Palm Forest / Woodland																					4.687	4.687
Total	8.799	25.245	6.895	5.808	2.150	3.985	0.729	6.043	0.218	0.738	3.367	3.670		1.958	2.305	7.929		14.161	0.790	0.349	6.782	101.922
Open Water																						
Open Water River / Ditch / Canal		0.028			0.063	0.080	1.728	0.010		0.622	7.685	1.208	0.151	0.134		0.051		0.787			0.086	12.633
Open Water Pond / Lake						0.011				3.812								0.080			0.198	4.101
Total		0.028			0.063	0.091	1.728	0.010		4.434	7.685	1.208	0.151	0.134		0.051		0.867			0.285	16.734
Land Use																						
Agriculture Cropped		6.471	11.710	1.240	1.394		2.947	14.827	24.212	9.304	8.043	4.015		13.176	0.957			0.557			4.506	103.358
Agricultural Field / Fallow		18.908	0.919	0.732	0.690	1.003				1.448	2.997	0.273	0.890	4.948	4.718	7.454	0.041	3.550	4.096		4.899	57.567
Residential Development	0.887		0.394	0.391	0.187	12.612		0.389	0.458		0.108	1.104		0.074		0.849		1.403	0.066		10.175	29.097
Roads, Trails, Canal Banks and Berms	5.856	20.321	7.389	4.516	2.026	14.858	1.518	11.054	7.223	9.839	8.101	4.885		7.755	2.117	3.801	0.176	4.993	5.010	0.392	16.104	137.935
Urban Development		1.268				1.747																3.016
Other Land Use						0.034																0.034
Total	6.744	46.969	20.412	6.878	4.297	30.256	4.465	26.270	31.892	20.592	19.249	10.277	0.890	25.952	7.793	12.104	0.217	10.504	9.171	0.392	35.684	331.008
Grand Total	33.031	84.701	34.633	16.877	8.107	40.052	14.017	36.945	34.576	35.859	32.963	18.521	4.103	29.515	11.757	20.962	0.669	30.480	16.060	1.207	55.031	560.065

APPENDIX F

Detailed Maps of Fence Sections



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

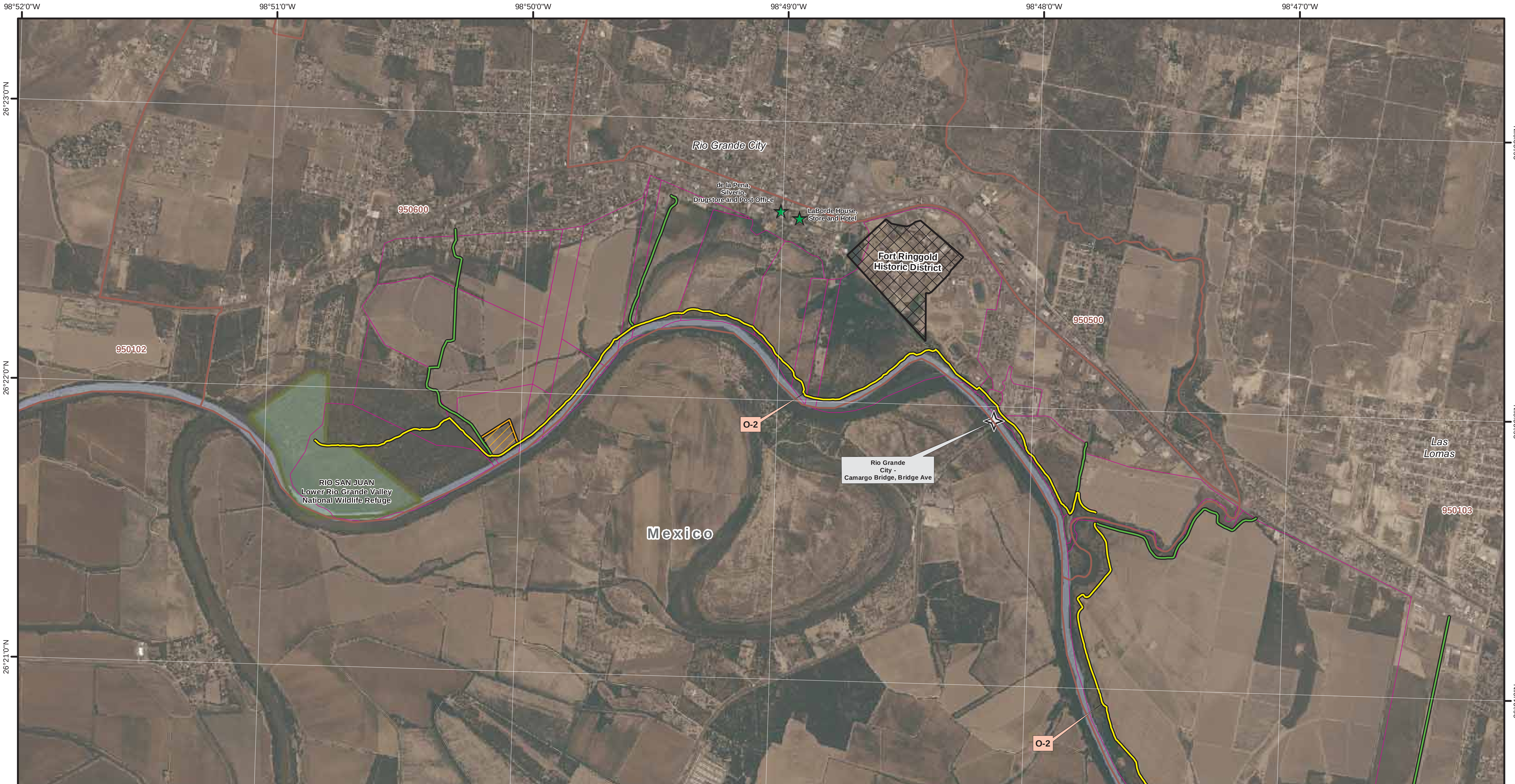
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 1 of 17



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Ports of Entry
Approved Development

Feet

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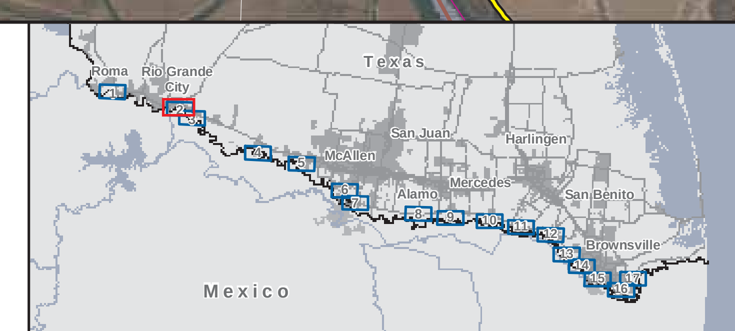

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USA Contiguous Albers Equal Area Conic
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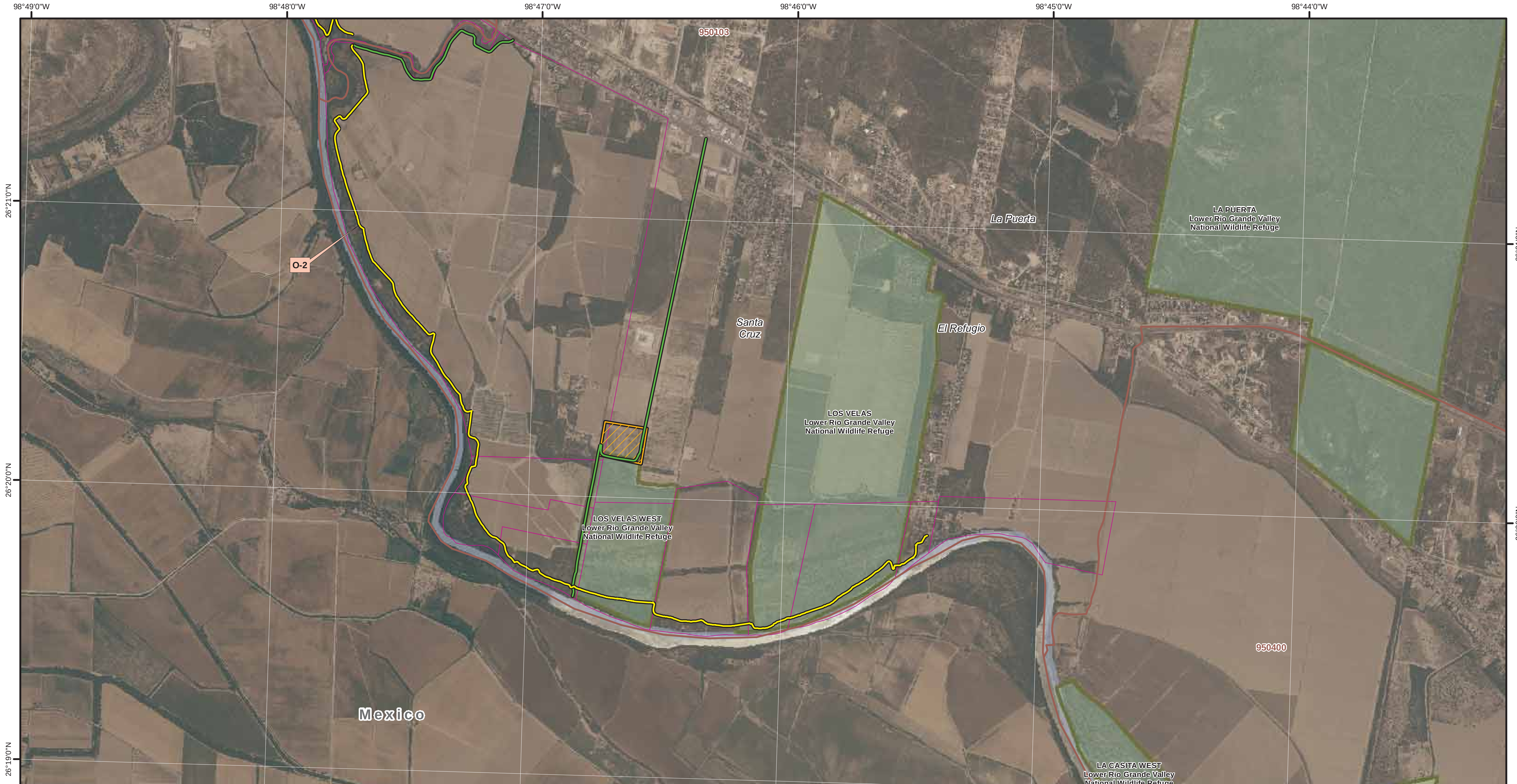
May 6, 2008	Scale 1" = 2000'	Map 2 of 17



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Scale

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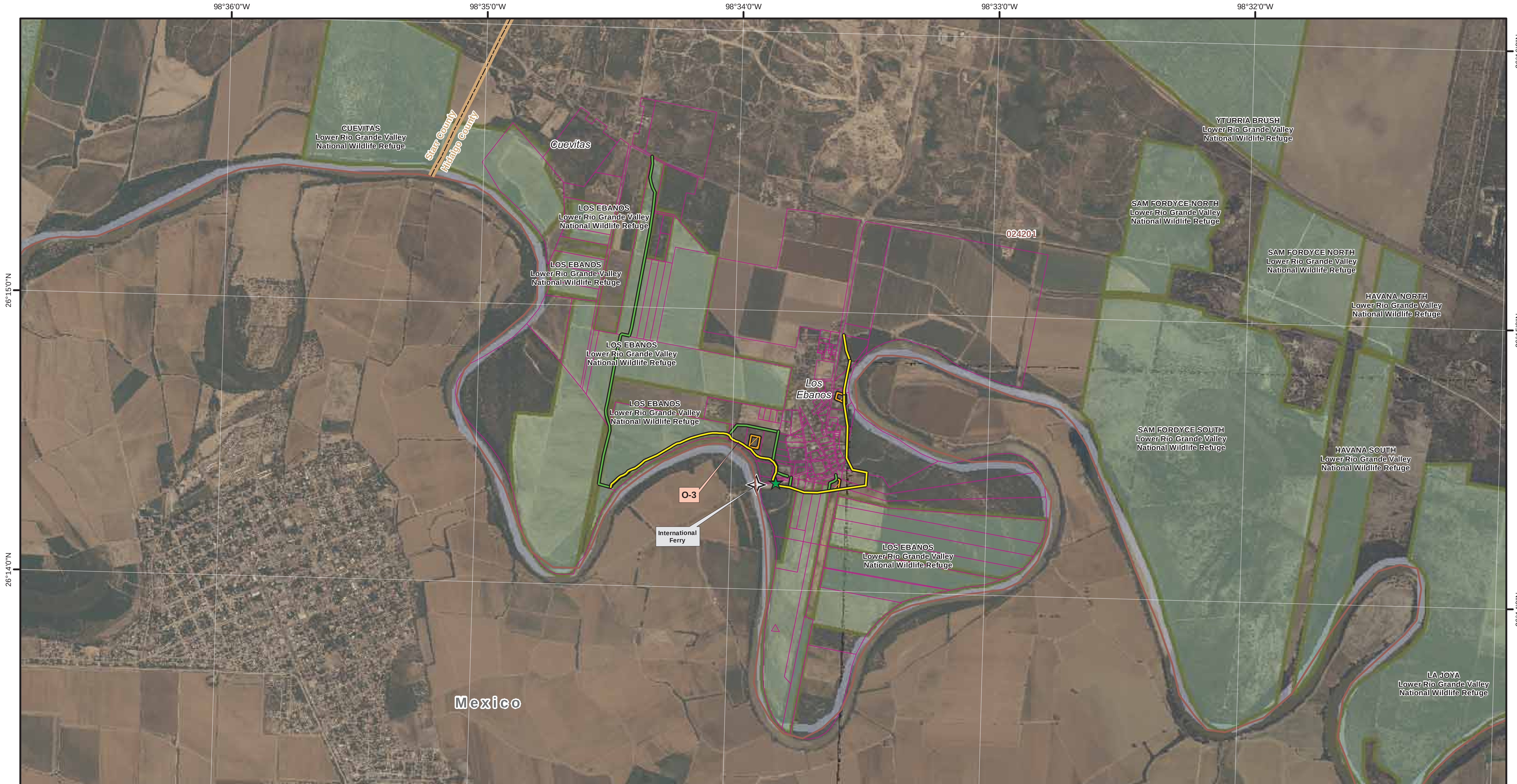
May 6, 2008	Scale 1" = 2000'	Map 3 of 17



Fence Sections | Parks and Refuges | Approved Development
Access Roads | Land Parcels
Staging Areas | Census Tracts
Rio Grande | Historic District
NWI Wetlands | Historic Property
Ports of Entry

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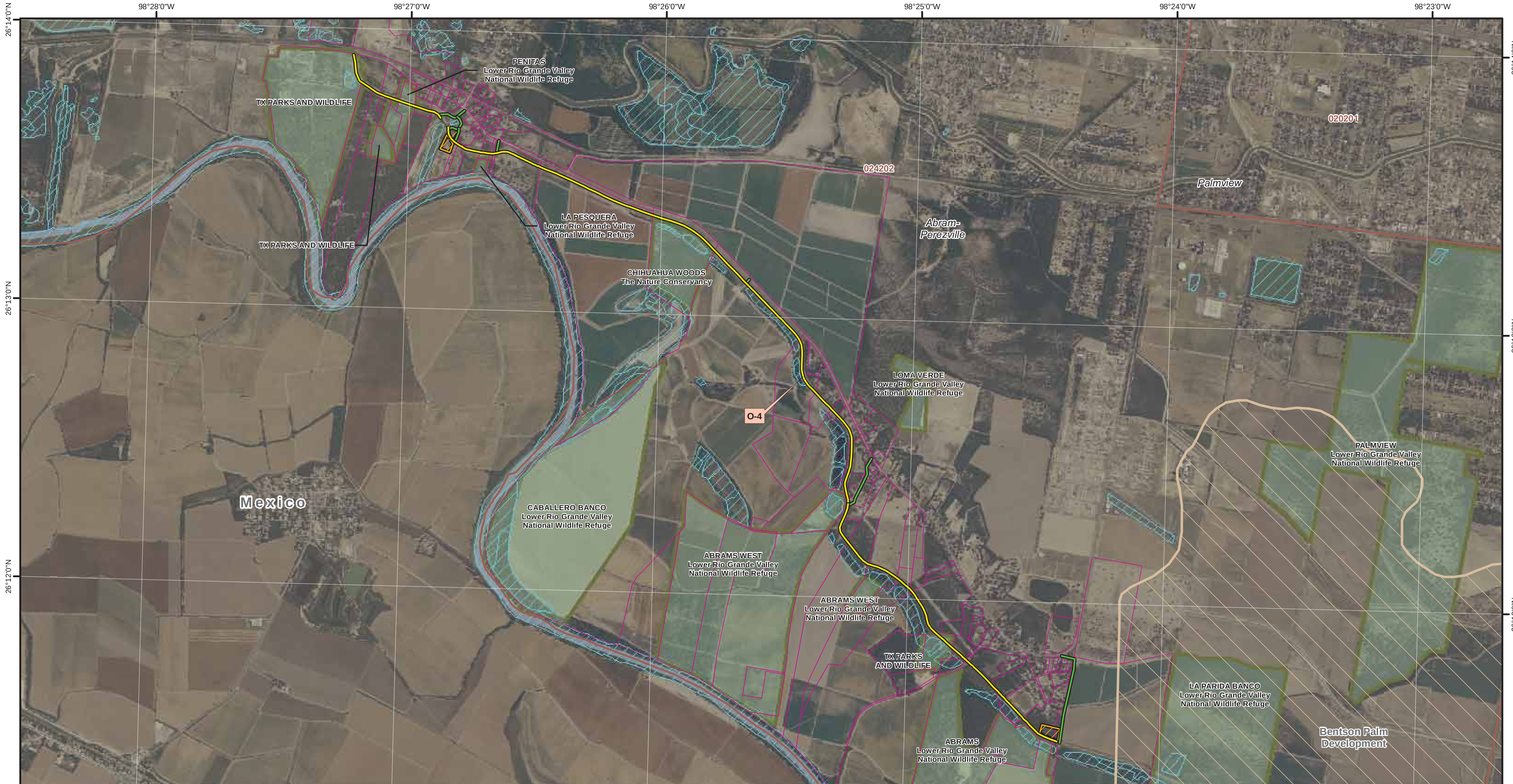
May 6, 2008 | Scale 1" = 2000' | Map 4 of 17



Fence Sections
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Historic Property
Ports of Entry
Approved Development

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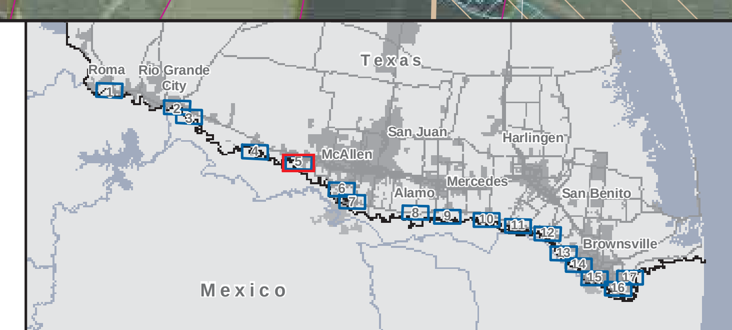

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Projection: Albers
USA Contiguous Albers Equal Area Conic
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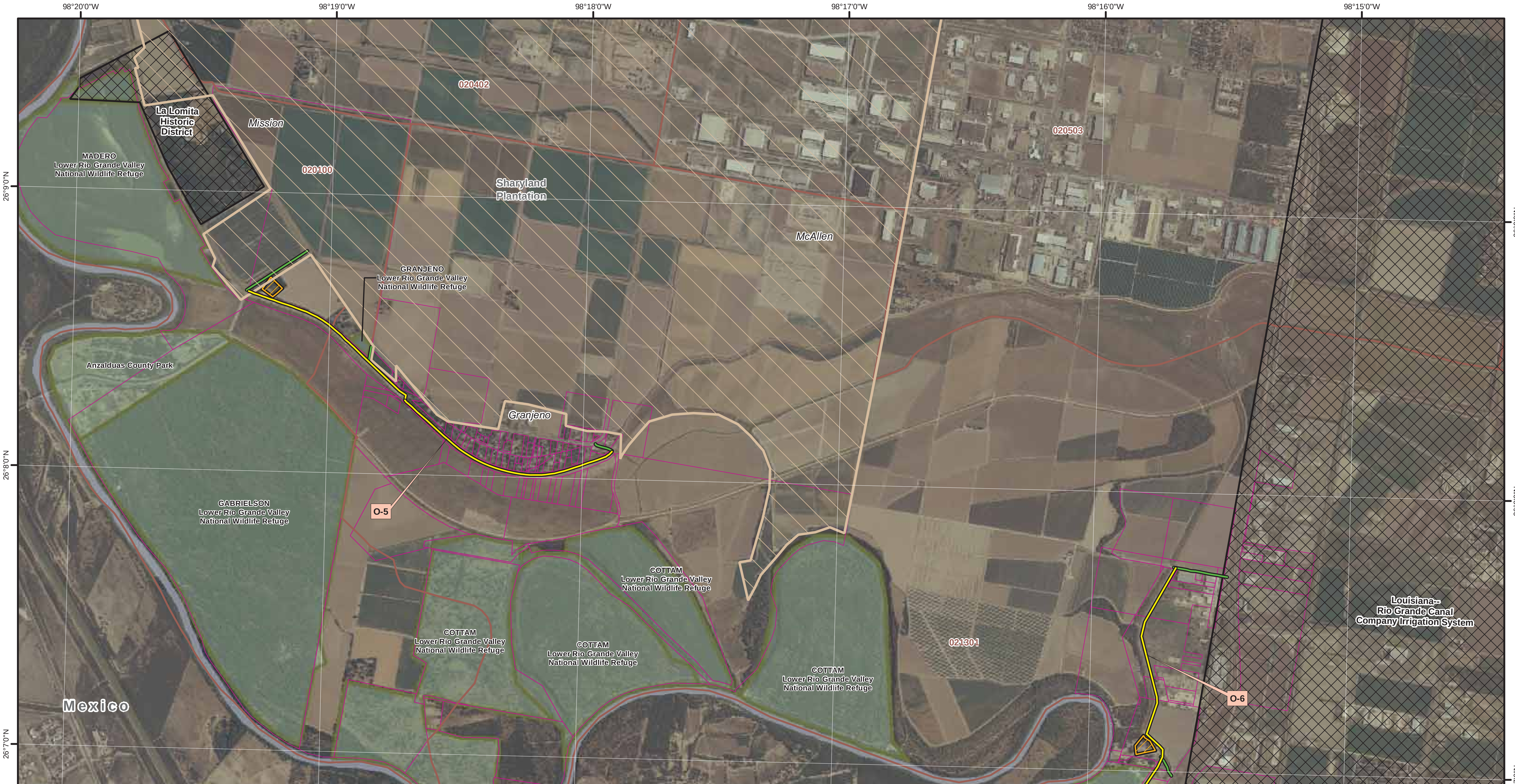
May 6, 2008	Scale 1" = 2000'	Map 5 of 17



Fence Sections
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Land Parcels
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Approved Development

Feet
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Scale

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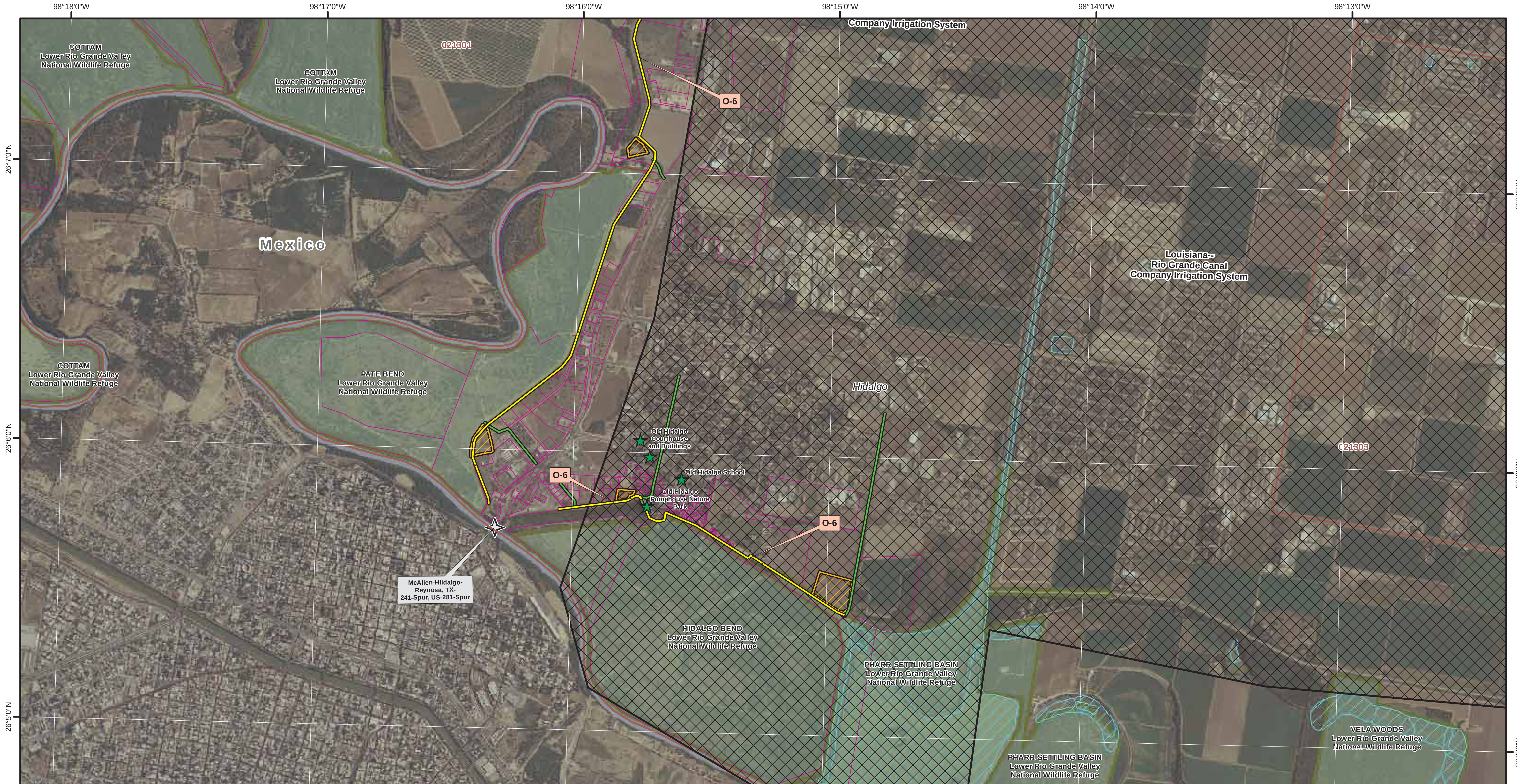
Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 6 of 17



Fence Sections
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0 500 1,000 2,000
Scale

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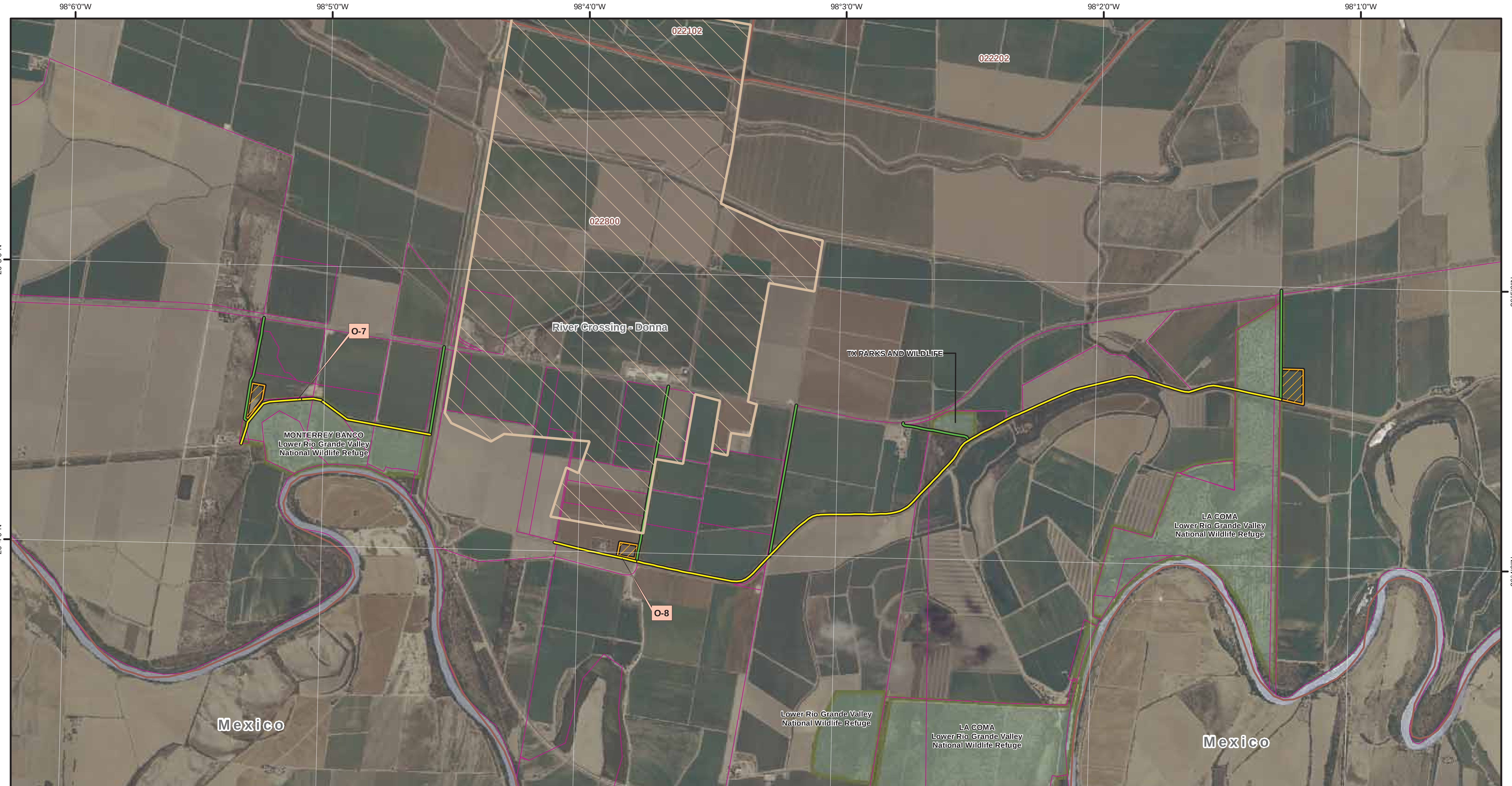
Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 7 of 17



Fence Sections
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Ports of Entry
Approved Development

Feet

0 500 1,000 2,000

Scale

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Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure
U.S. Border Patrol
Rio Grande Valley Sector, Texas
Detailed Fence Section Maps
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Projection: Albers
USA Contiguous Albers Equal Area Conic
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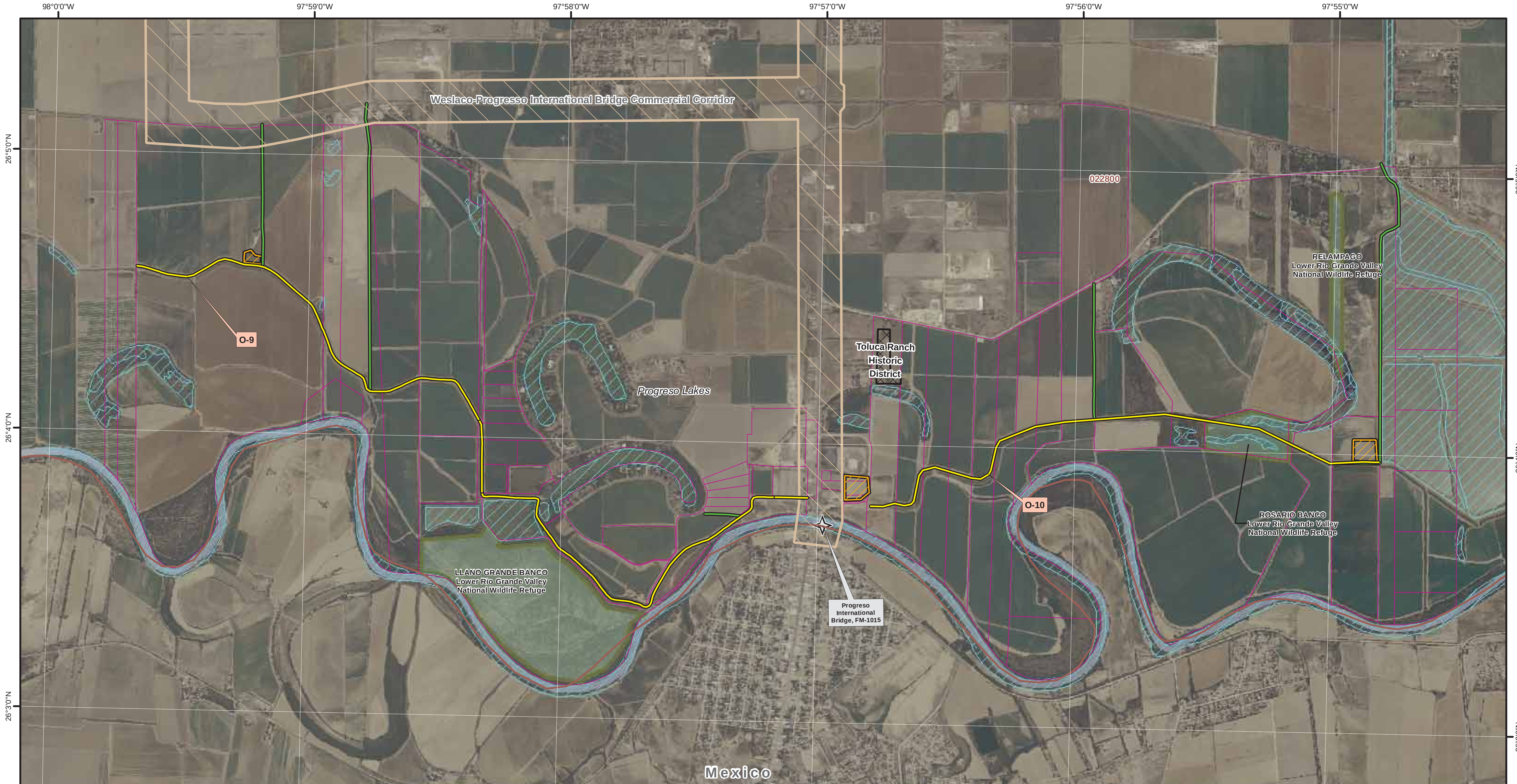
May 6, 2008	Scale 1" = 2000'	Map 8 of 17



- Fence Sections
- Access Roads
- Staging Areas
- Rio Grande
- NWI Wetlands
- Parks and Refuges
- Land Parcels
- Census Tracts
- Historic District
- Historic Property
- Ports of Entry
- Approved Development

Feet

0 500 1,000 2,000

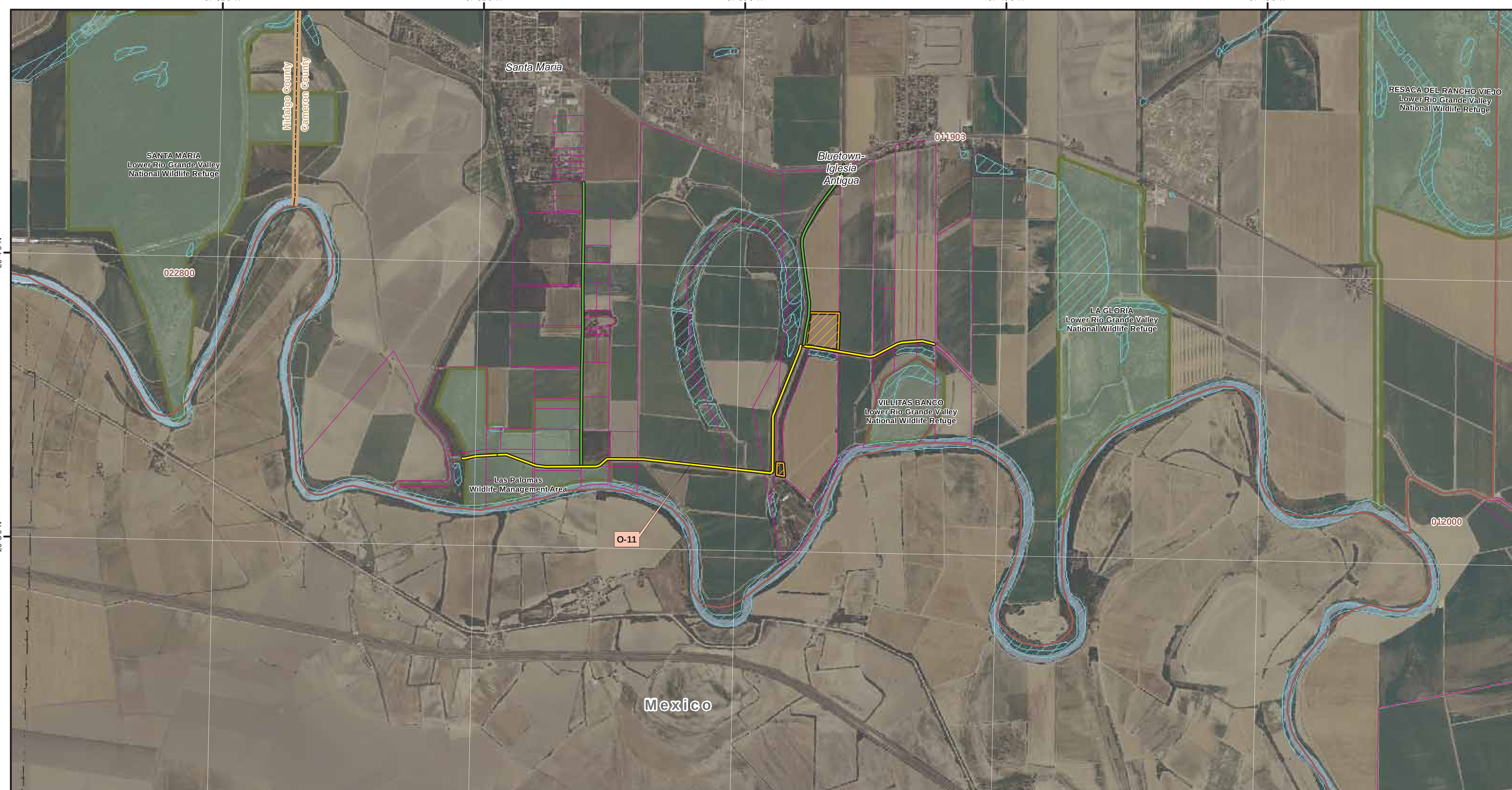
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 9 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
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Census Tracts
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Historic Property
Ports of Entry
Approved Development

Feet
0 500 1,000 2,000
Scale

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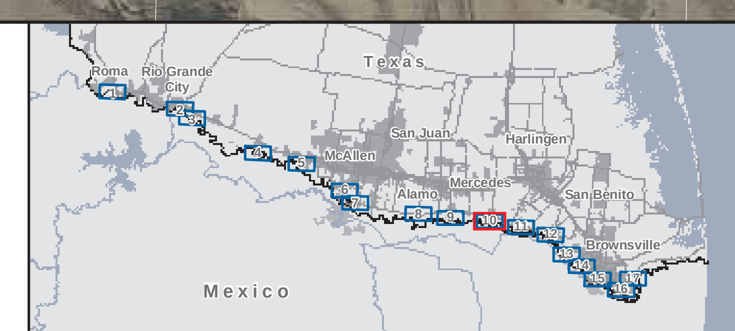
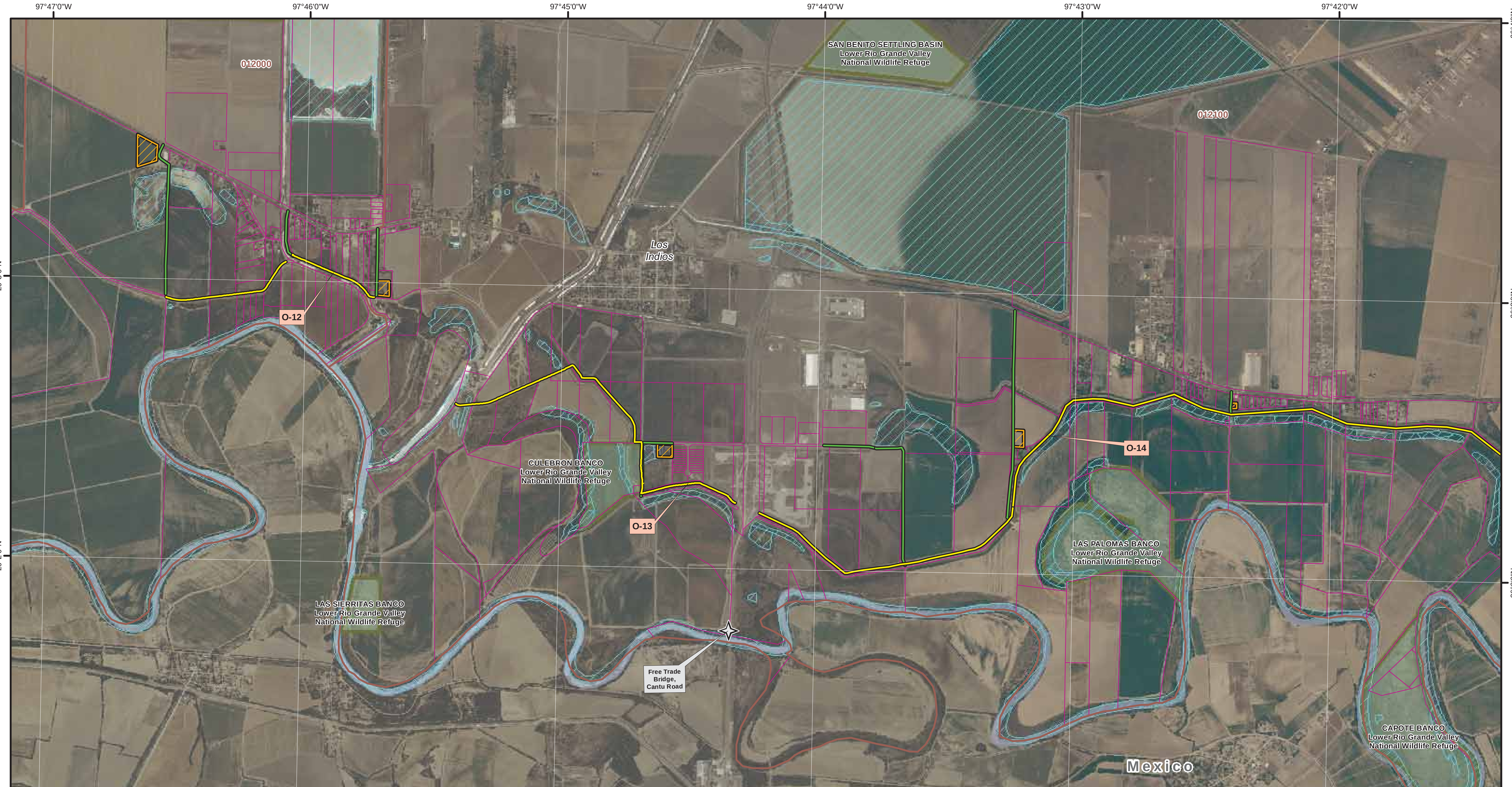


Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 10 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

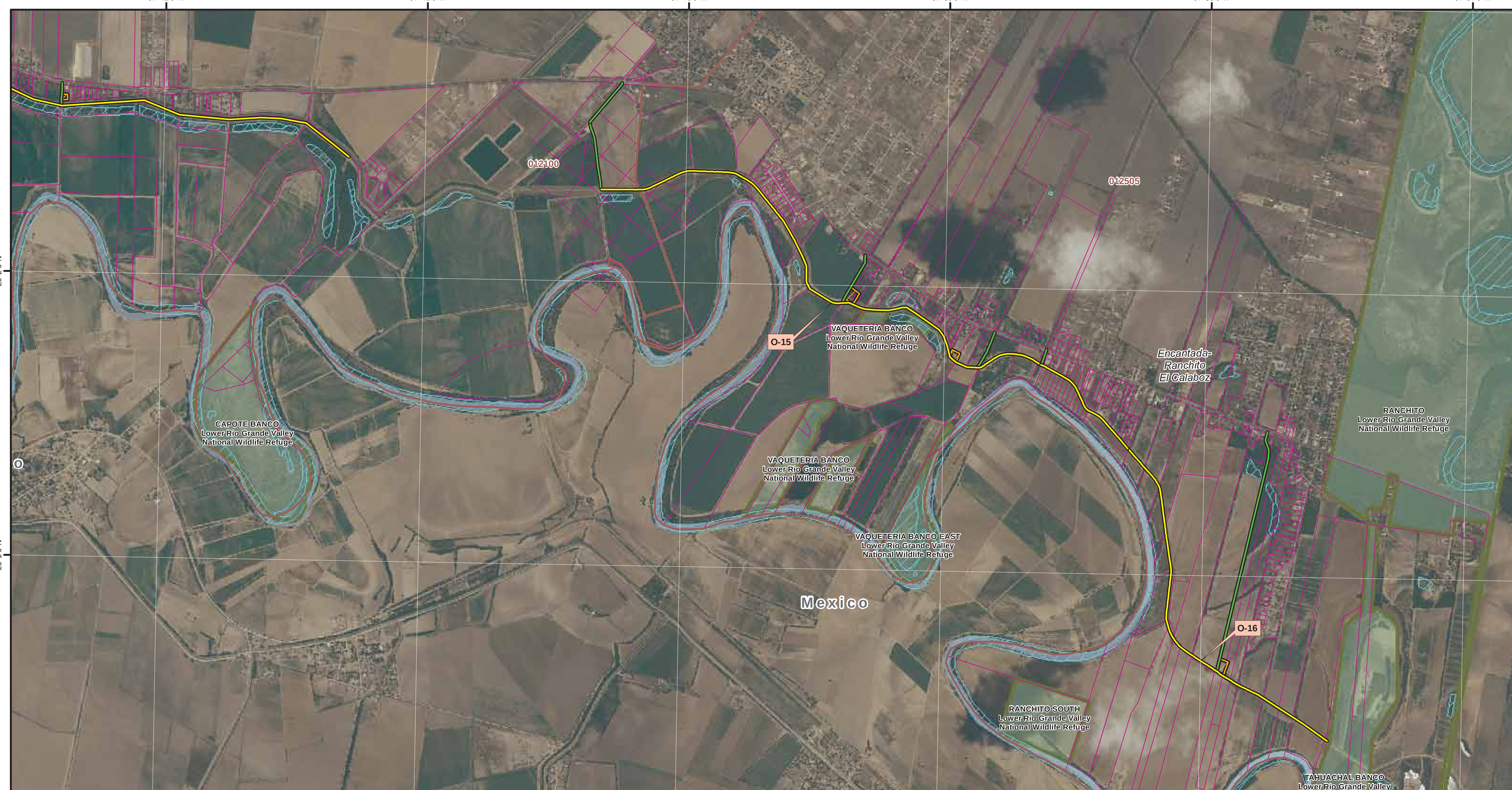
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure
U.S. Border Patrol
Rio Grande Valley Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 11 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

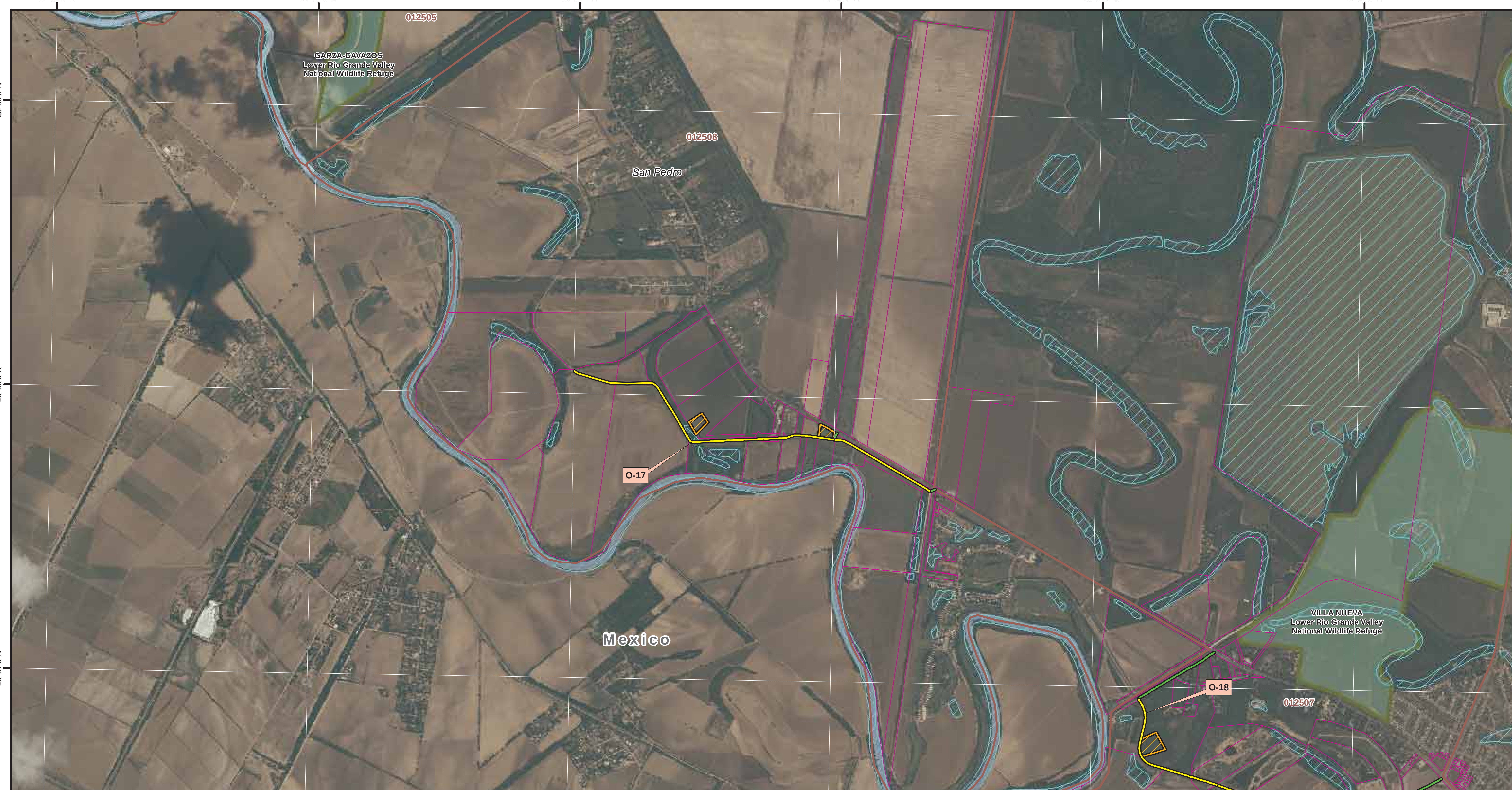
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 12 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

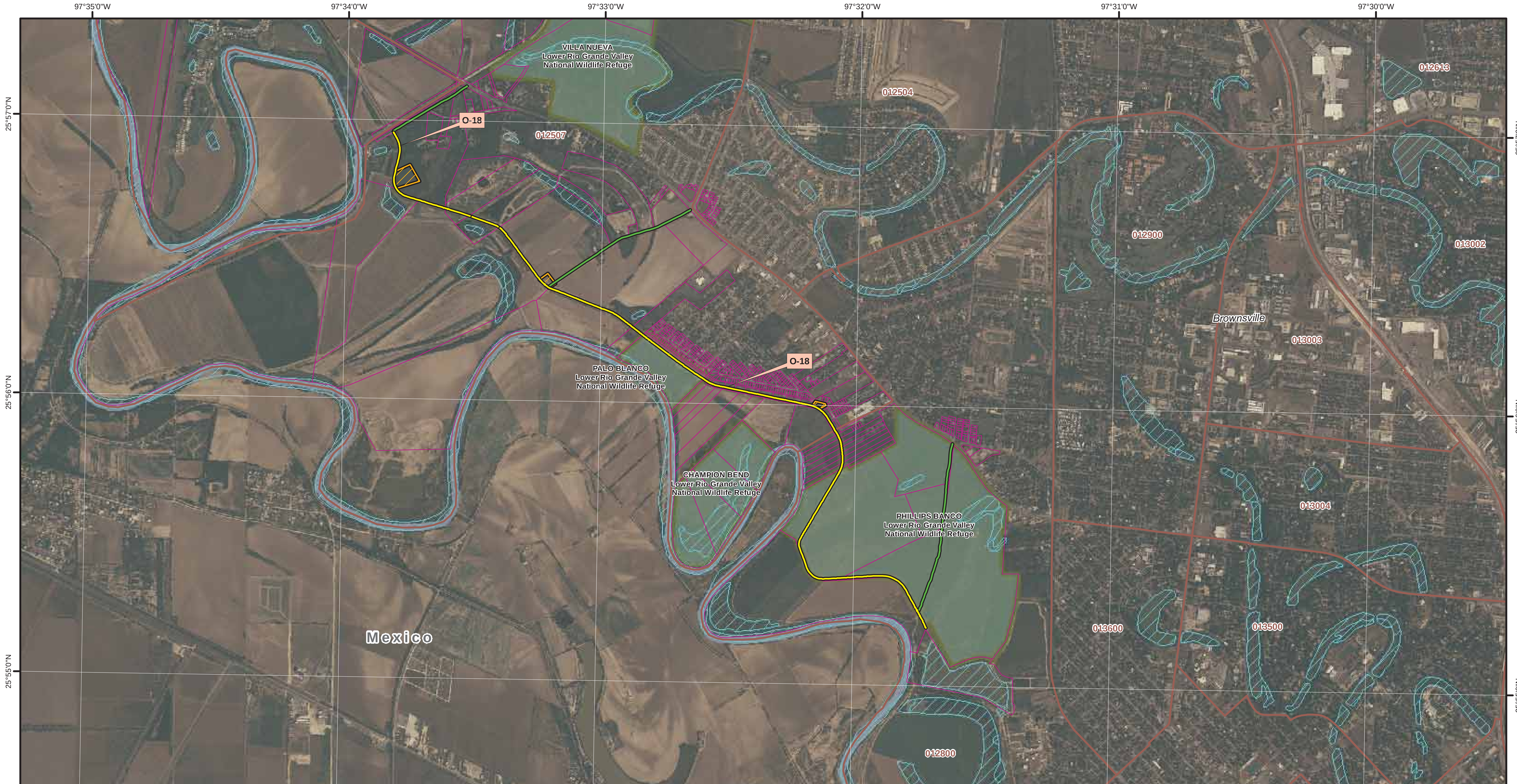
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 13 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

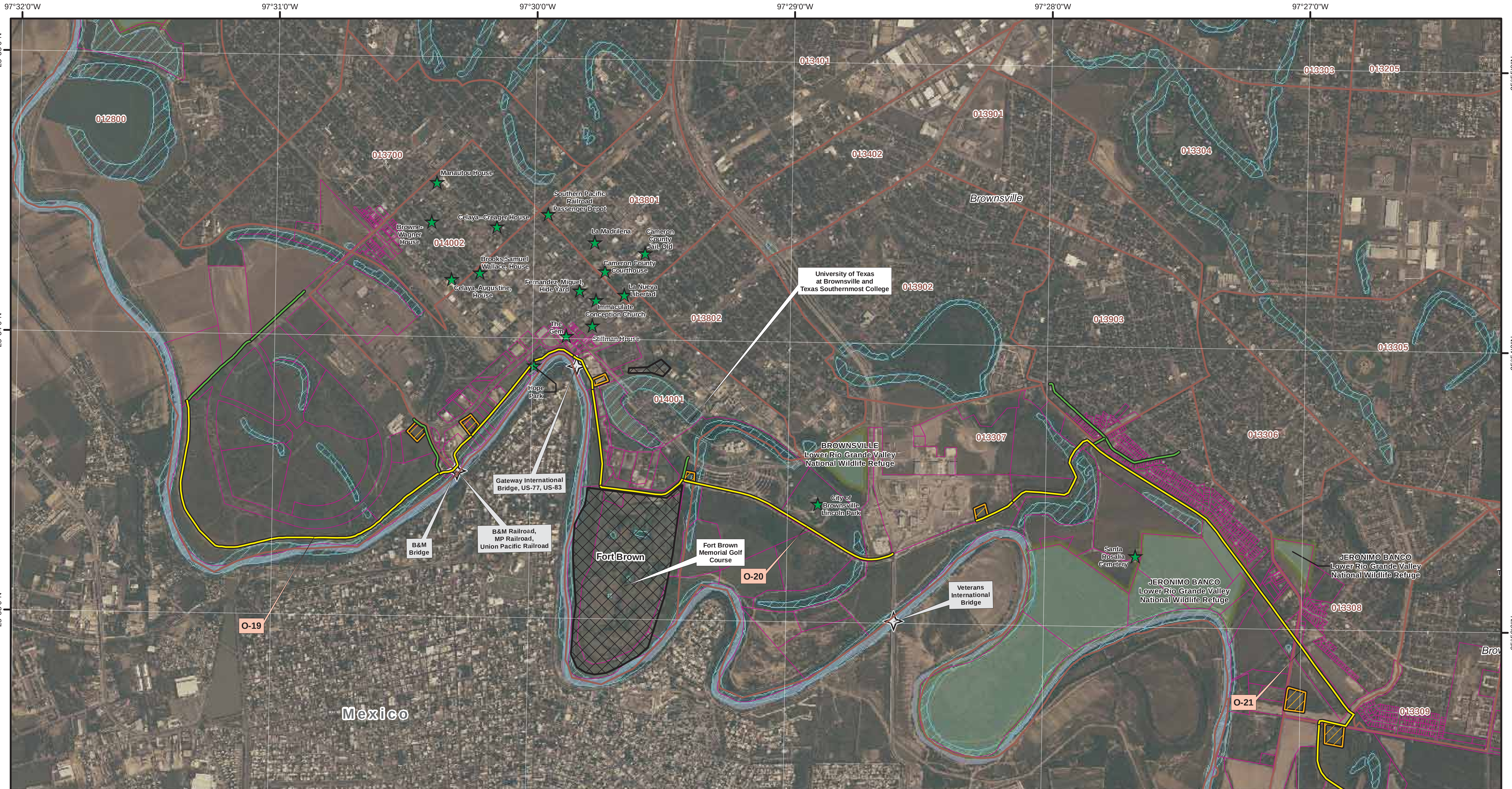
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 14 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

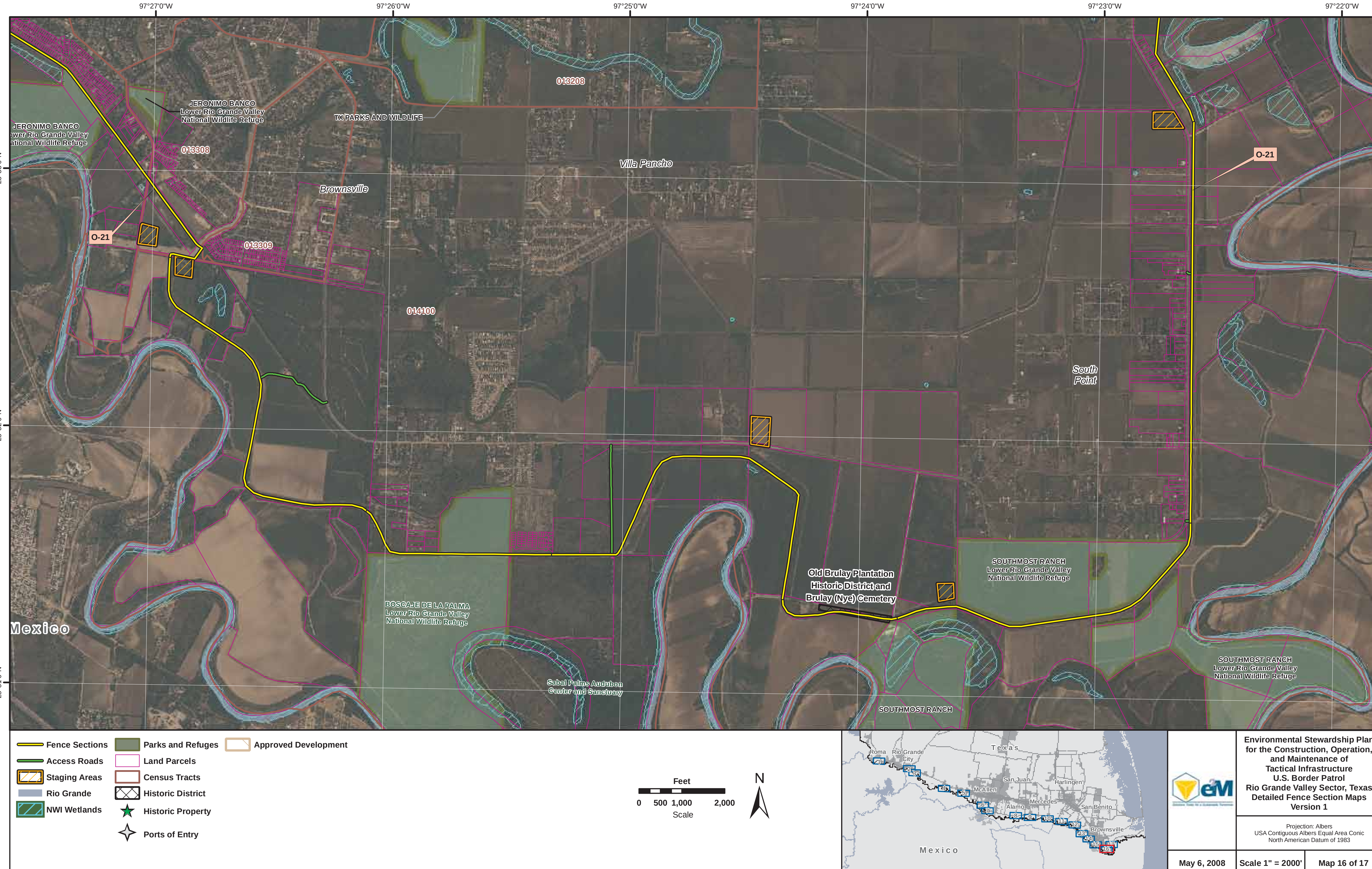
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

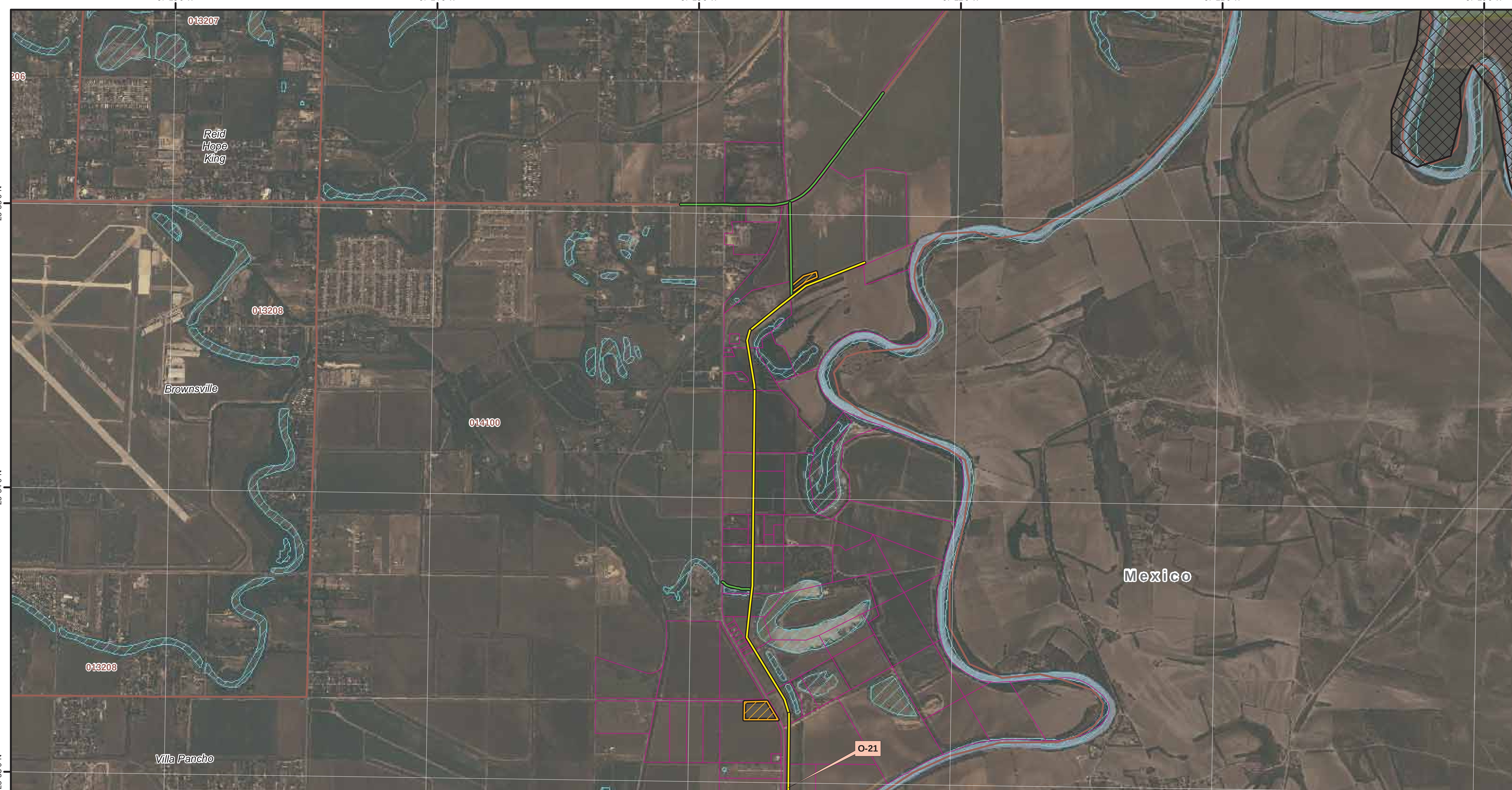
May 6, 2008	Scale 1" = 2000'	Map 15 of 17



Environmental Stewardship Plan
for the Construction, Operation,
and Maintenance of
Tactical Infrastructure
U.S. Border Patrol
Rio Grande Valley Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 16 of 17



Fence Sections
Access Roads
Staging Areas
Rio Grande
NWI Wetlands
Parks and Refuges
Land Parcels
Census Tracts
Historic District
Historic Property
Ports of Entry
Approved Development

Feet
0 500 1,000 2,000
Scale
N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 17 of 17

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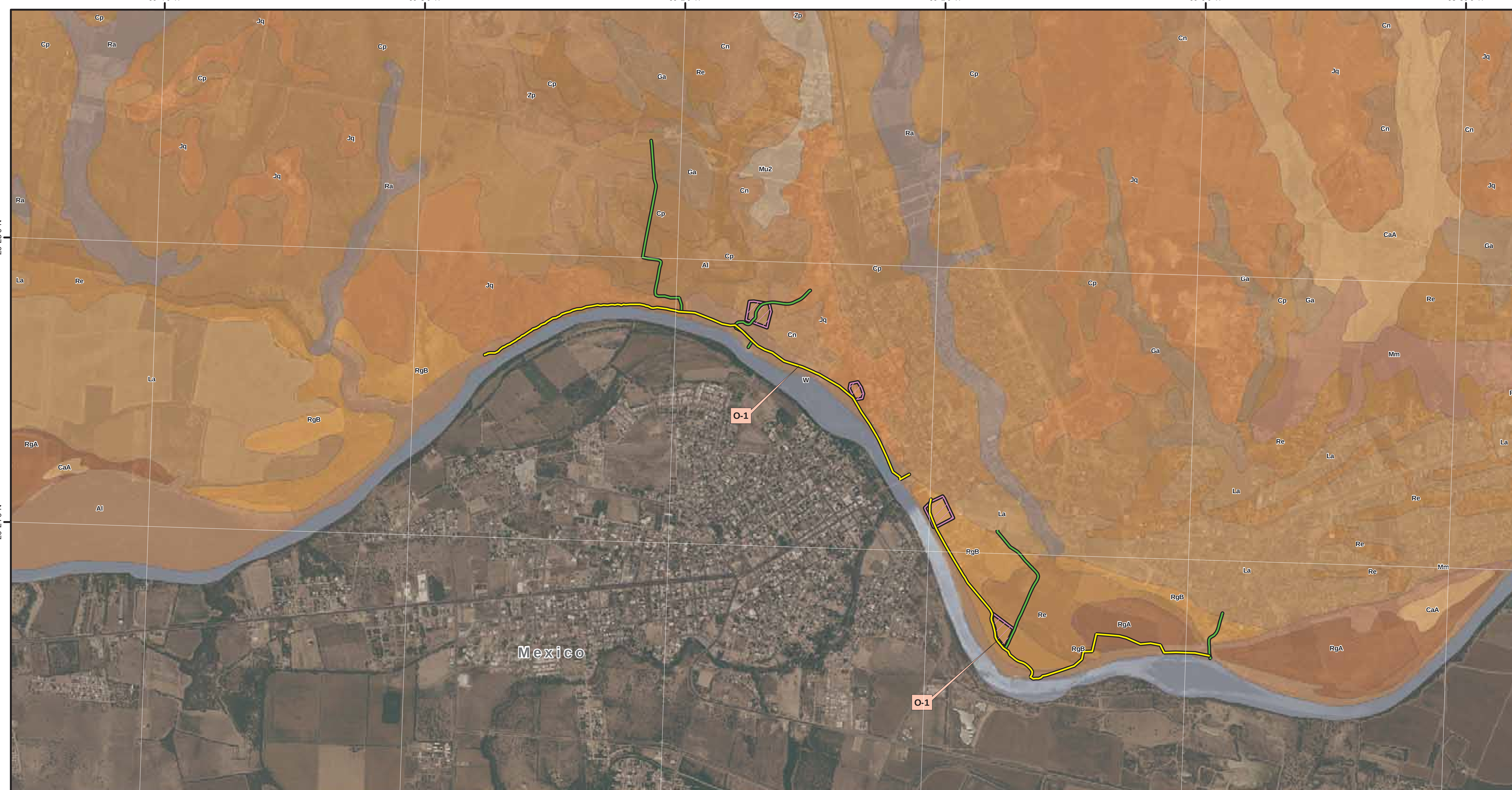
APPENDIX G

Detailed Maps of Fence Sections Showing Soils



Fence Sections
Access Roads
Staging Areas

Soil Types

- Al, Alluvial land
- CaA, Camargo silty clay loam, 0 to 1 percent slopes
- Cn, Catarina soils
- Cp, Copita fine sandy loam
- Ga, Garceno clay loam
- Jq, Jimenez-Quemado association
- La, Lagloria silt loam
- Mm, Matamoros silty clay
- Mu2, Maverick soils, eroded
- Ra, Ramadero loam
- Re, Reynosa silty clay loam
- RgA, Rio Grande silt loam, 0 to 1 percent slopes
- RgB, Rio Grande silt loam, 1 to 3 percent slopes
- W, Water
- Zp, Zapata soils

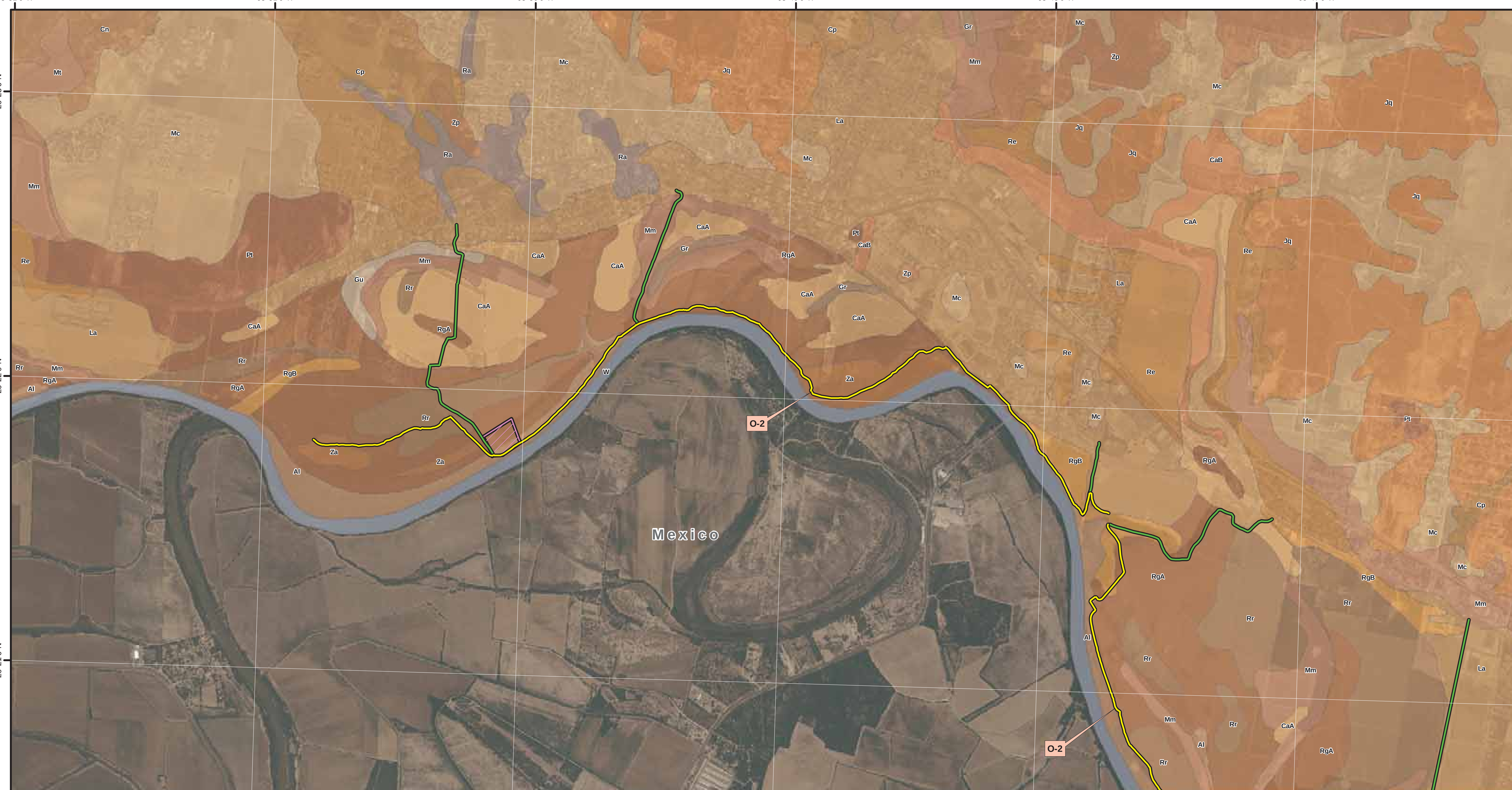
Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 1 of 17



- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- Al, Alluvial land
- CaA, Camargo silty clay loam, 0 to 1 percent slopes
- CaB, Camargo silty clay loam, 1 to 3 percent slopes
- Cn, Catarina soils
- Cp, Copita fine sandy loam
- Gr, Grulla clay
- Gu, Grulla clay, depressional
- Jq, Jimenez-Quemado association
- La, Lagloria silt loam
- Mc, McAllen fine sandy loam
- Mm, Matamoros silty clay
- Mt, Montell clay, saline
- Pt, Pits
- Ra, Ramadero loam
- Re, Reynosa silty clay loam
- RgA, Rio Grande silt loam, 0 to 1 percent slopes
- RgB, Rio Grande silt loam, 1 to 3 percent slopes
- Rr, Rio Grande silty clay loam
- Tr, Tiocano-Rio complex
- W, Water
- Za, Zalla loamy fine sand
- Zp, Zapata soils

Feet

0 500 1,000 2,000

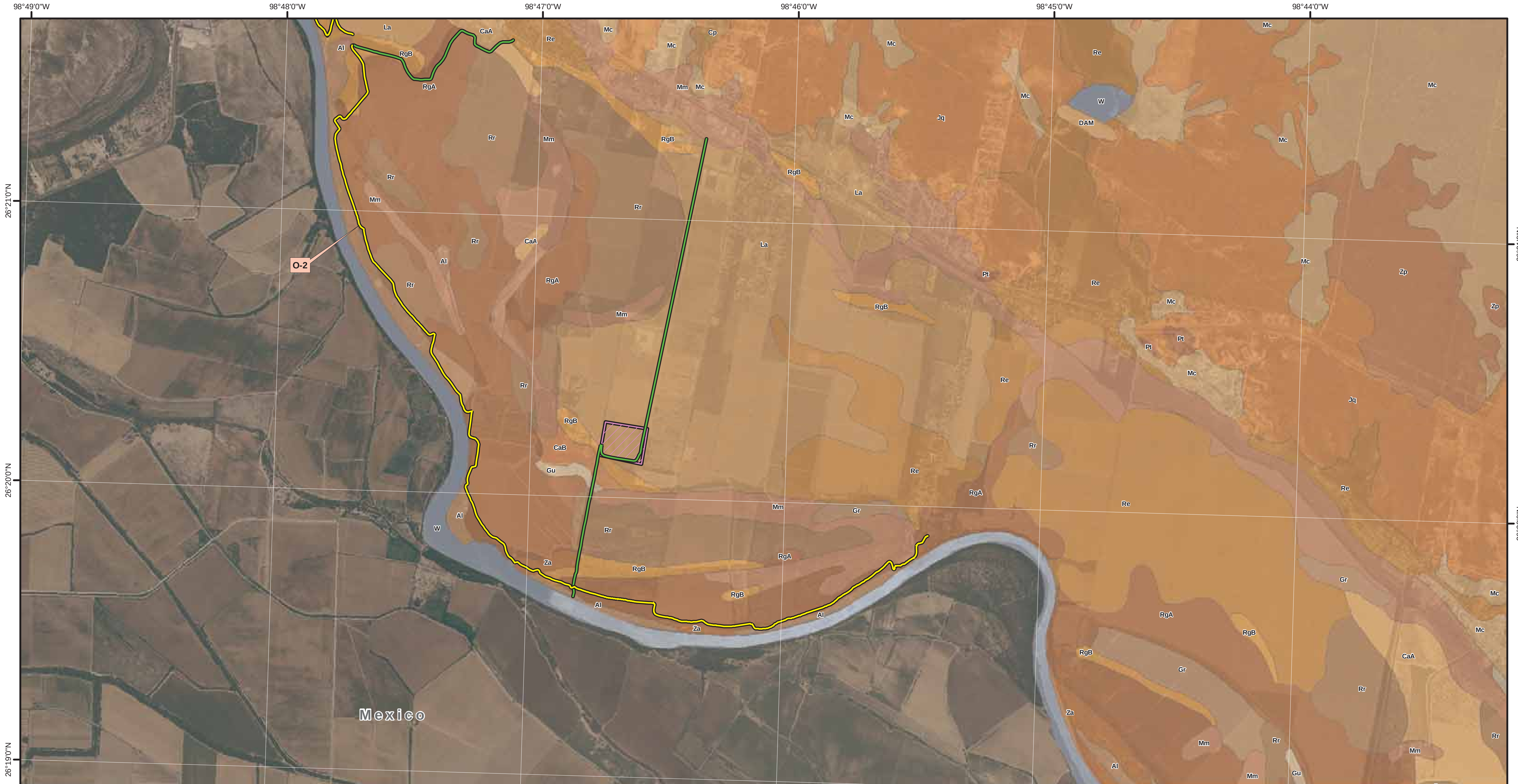
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 2 of 17



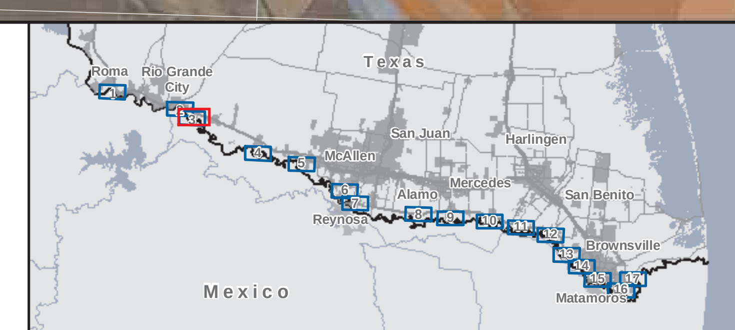
Fence Sections
Access Roads
Staging Areas

Soil Types

- Al, Alluvial land
- CaA, Camargo silty clay loam, 0 to 1 percent slopes
- CaB, Camargo silty clay loam, 1 to 3 percent slopes
- Cp, Copita fine sandy loam
- DAM, Dams
- Gr, Grulla clay
- Gu, Grulla clay, depressional
- Jq, Jimenez-Quemado association
- La, Lagloria silt loam
- Mc, McAllen fine sandy loam
- Mm, Matamoros silty clay
- Pt, Pits
- Re, Reynosa silty clay loam
- RgA, Rio Grande silt loam, 0 to 1 percent slopes
- RgB, Rio Grande silt loam, 1 to 3 percent slopes
- Rr, Rio Grande silty clay loam
- Tr, Tiocano-Rio complex
- W, Water
- Za, Zalla loamy fine sand
- Zp, Zapata soils

Feet
0 500 1,000 2,000
Scale

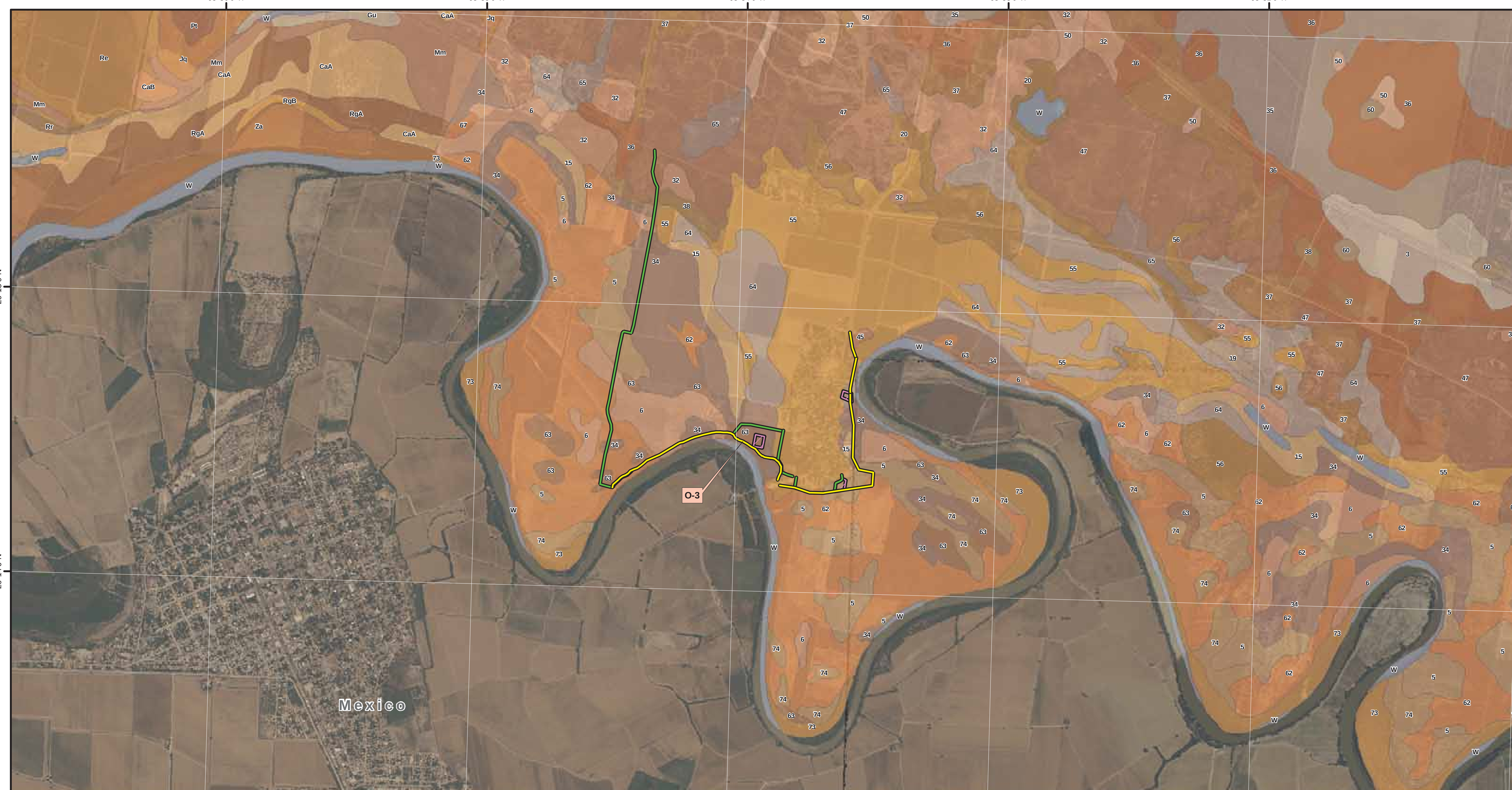
N



Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 3 of 17



- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- 15, Grulla clay
- 19, Harlingen clay
- 20, Harlingen clay, saline
- 3, Brennan fine sandy loam, 0 to 1 percent slopes
- 32, Jimenez-Quemado complex, 1 to 8 percent slopes
- 34, Matamoros silty clay
- 35, McAllen fine sandy loam, 0 to 1 percent slopes
- 36, McAllen fine sandy loam, 1 to 3 percent slopes
- 37, McAllen fine sandy loam, 3 t 5 percent slopes
- 38, McAllen sandy clay loam, 0 to 1 percent slopes
- 45, Pits, borrow
- 47, Pits, gravel
- 5, Camargo silt loam
- 50, Ramadero sandy clay loam
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 56, Reynosa silty clay loam, saline, 0 to 1 percent sl
- 6, Camargo silty clay loam
- 60, Rio clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 65, Runn silty clay, saline
- 67, Tiocano clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- CaA, Camargo silty clay loam, 0 to 1 percent slopes
- CaB, Camargo silty clay loam, 1 to 3 percent slopes
- Gu, Grulla clay, depressional
- Jq, Jimenez-Quemado association
- Mc, McAllen fine sandy loam
- Mm, Matamoros silty clay
- Pt, Pits
- Re, Reynosa silty clay loam
- RgA, Rio Grande silt loam, 0 to 1 percent slopes
- RgB, Rio Grande silt loam, 1 to 3 percent slopes
- Rr, Rio Grande silty clay loam
- W, Water
- Za, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

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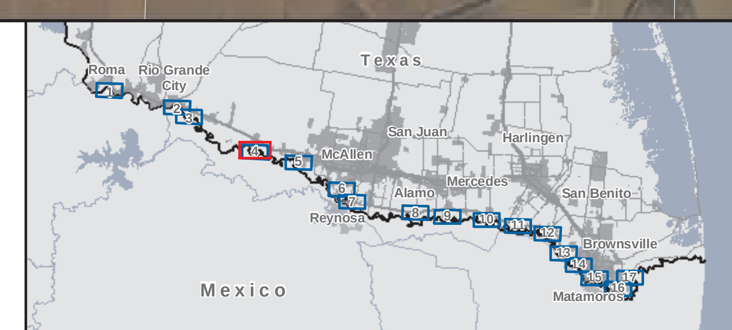
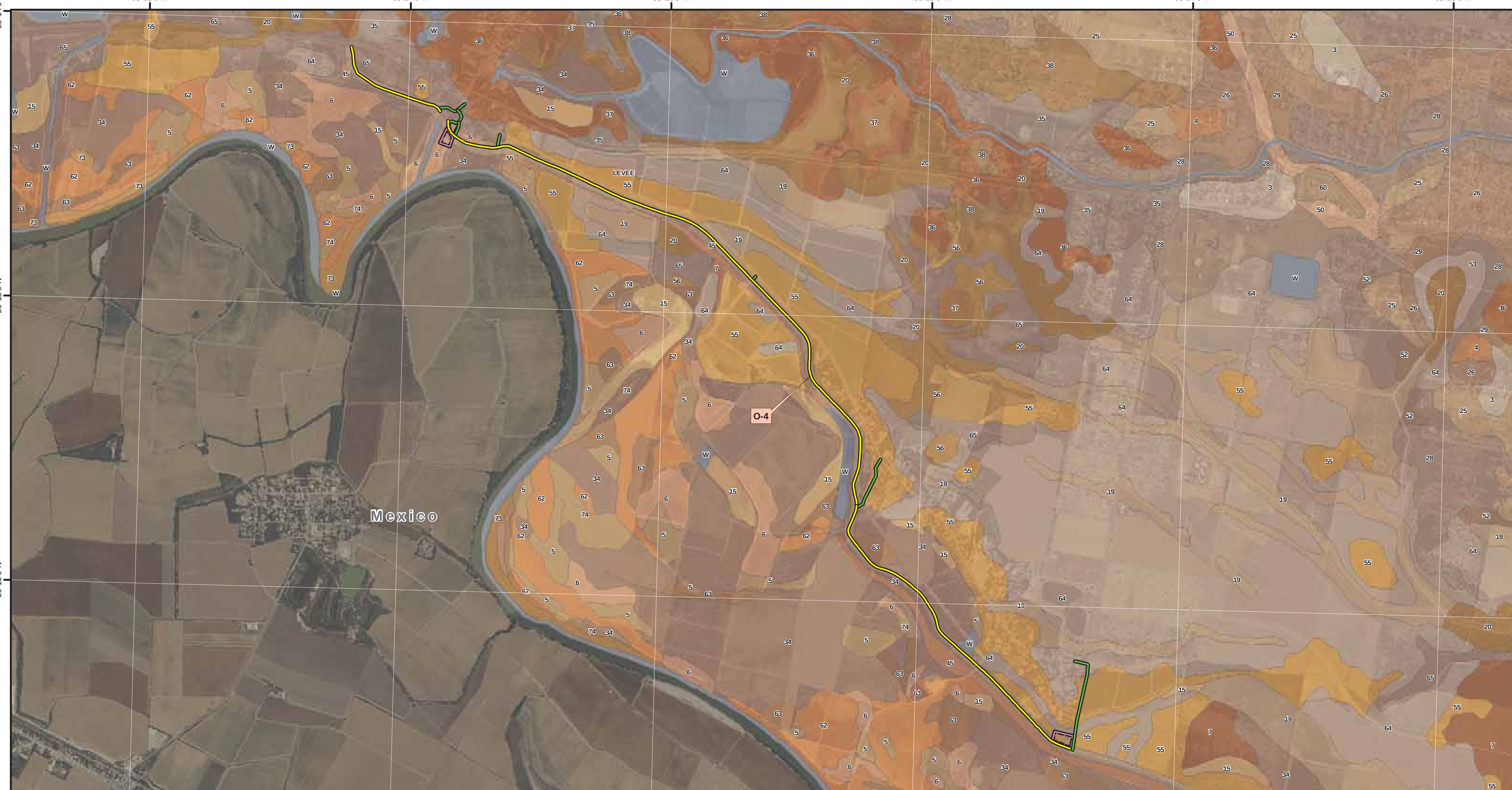


Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 4 of 17



Fence Sections
Access Roads
Staging Areas

Soil Types

- 15, Grulla clay
- 19, Harlingen clay
- 20, Harlingen clay, saline
- 25, Hidalgo fine sandy loam, 0 to 1 percent slopes
- 26, Hidalgo fine sandy loam, 1 to 3 percent slopes
- 28, Hidalgo sandy clay loam, 0 to 1 percent slopes
- 29, Hidalgo sandy clay loam, 1 to 3 percent slopes
- 3, Brennan fine sandy loam, 0 to 1 percent slopes
- 32, Jimenez-Quemado complex, 1 to 8 percent slopes
- 34, Matamoros silty clay
- 35, McAllen fine sandy loam, 0 to 1 percent slopes
- 36, McAllen fine sandy loam, 1 to 3 percent slopes
- 37, McAllen fine sandy loam, 3 t 5 percent slopes
- 38, McAllen sandy clay loam, 0 to 1 percent slopes
- 4, Brennan fine sandy loam, 1 to 3 percent slopes
- 45, Pits, borrow
- 5, Camargo silt loam
- 50, Ramadero sandy clay loam
- 52, Raymondville clay loam, 0 to 1 percent slopes
- 53, Raymondville clay loam, saline, 0 to 1 percent slo
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 56, Reynosa silty clay loam, saline, 0 to 1 percent sl
- 6, Camargo silty clay loam
- 60, Rio clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 65, Runn silty clay, saline
- 7, Cameron silty clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- LEVEE, Levee
- W, Water

Feet

0 500 1,000 2,000

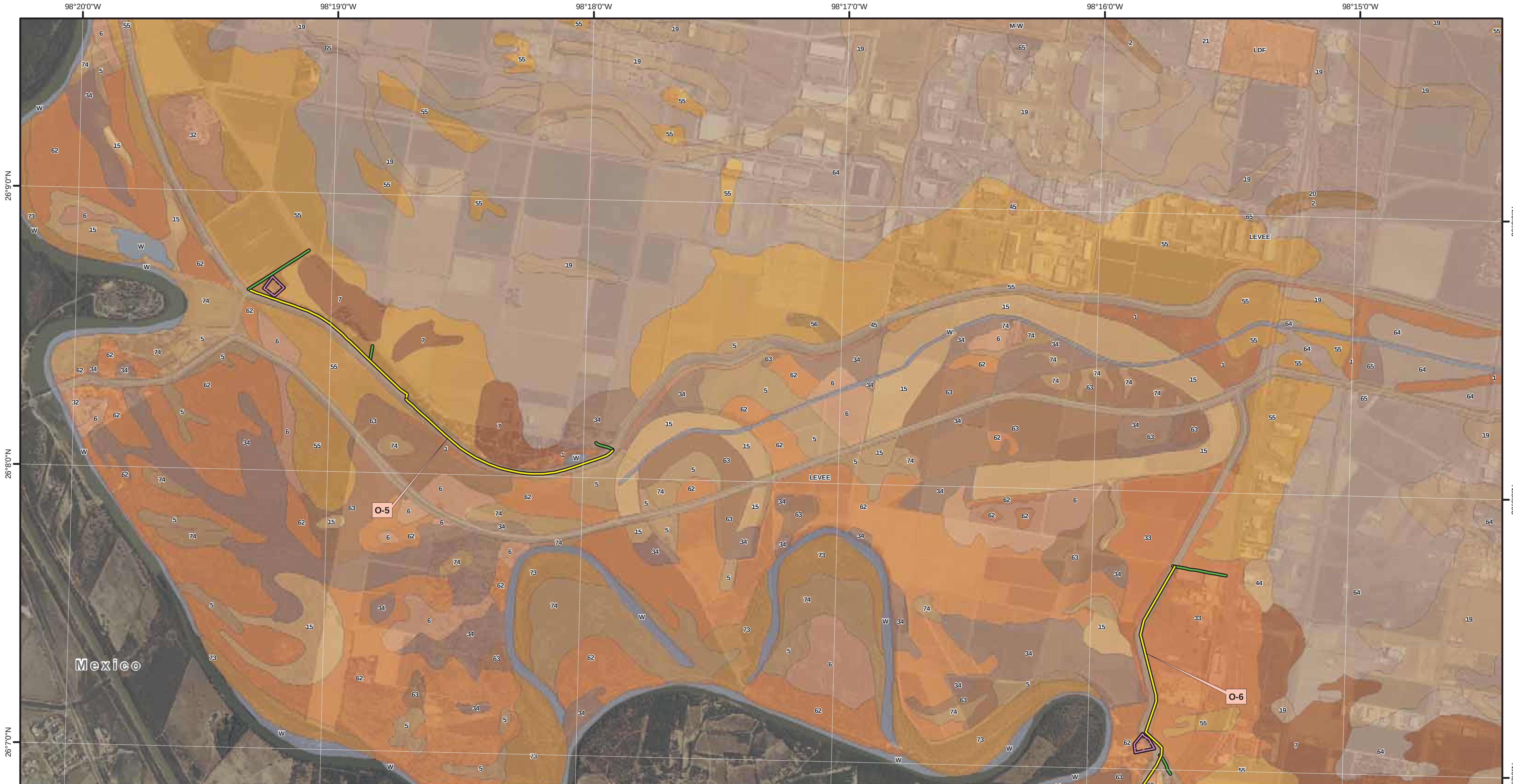
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 5 of 17



Fence Sections
Access Roads
Staging Areas

Soil Types

- 1, Arents, loamy
- 15, Grulla clay
- 19, Harlingen clay
- 2, Benito clay
- 20, Harlingen clay, saline
- 21, Harlingen-Urban land complex
- 32, Jimenez-Quemado complex, 1 to 8 percent slopes
- 33, Laredo silty clay loam
- 34, Matamoros silty clay
- 44, Olmito silty clay
- 45, Pits, borrow
- 5, Camargo silt loam
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 56, Reynosa silty clay loam, saline, 0 to 1 percent sl
- 57, Reynosa-Urban land complex, 0 to 1 percent slopes
- 6, Camargo silty clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 65, Runn silty clay, saline
- 7, Cameron silty clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- LDF, Landfill
- LEVEE, Levee
- M-W, Miscellaneous water
- W, Water

Feet
0 500 1,000 2,000
Scale

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Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
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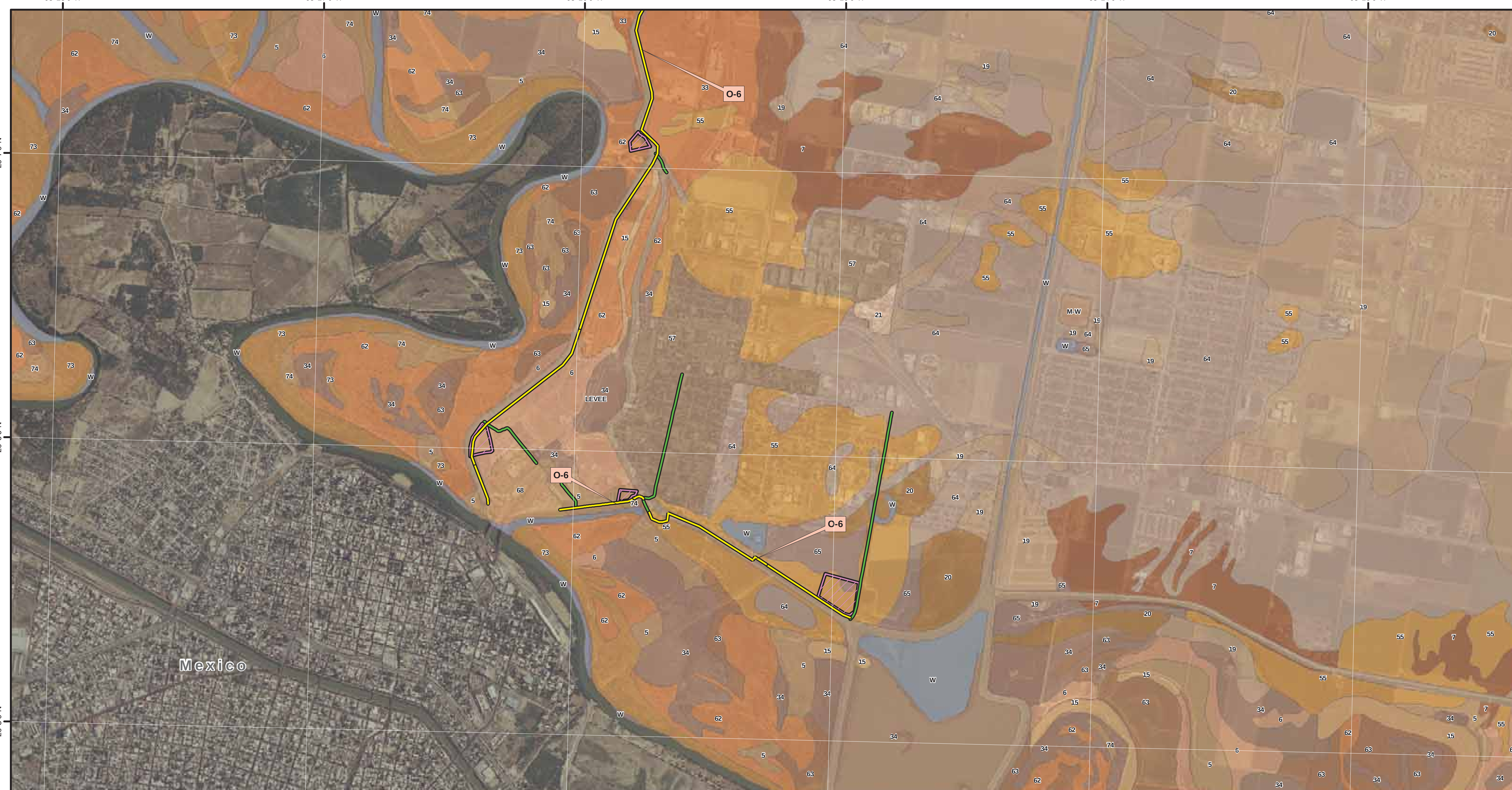

- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- 15, Grulla clay
- 19, Harlingen clay
- 20, Harlingen clay, saline
- 21, Harlingen-Urban land complex
- 33, Laredo silty clay loam
- 34, Matamoros silty clay
- 44, Olmito silty clay
- 5, Camargo silt loam
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 57, Reynosa-Urban land complex, 0 to 1 percent slopes
- 6, Camargo silty clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 65, Runn silty clay, saline
- 68, Urban land
- 7, Cameron silty clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- LEVEE, Levee
- M-W, Miscellaneous water
- W, Water

Feet

0 500 1,000 2,000

Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 6, 2008	Scale 1" = 2000'	Map 7 of 17

- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- 15, Grulla clay
- 19, Harlingen clay
- 2, Benito clay
- 20, Harlingen clay, saline
- 31, Hidalgo-Urban land complex, 0 to 3 percent slopes
- 33, Laredo silty clay loam
- 34, Matamoros silty clay
- 41, Mercedes clay, 1 to 5 percent slopes, gullied
- 45, Pits, borrow
- 5, Camargo silt loam
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 6, Camargo silty clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 7, Cameron silty clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- LEVEE, Levee
- W, Water

Feet
0 500 1,000 2,000
Scale

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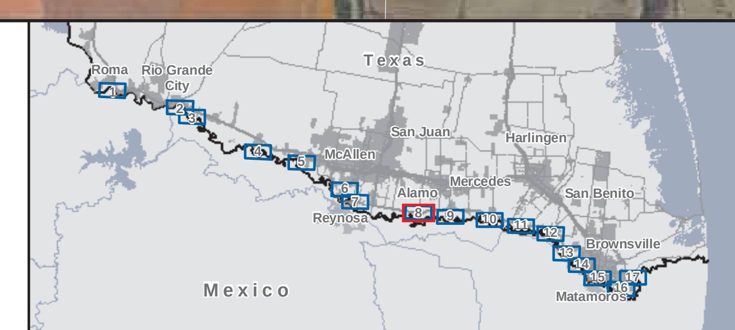

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
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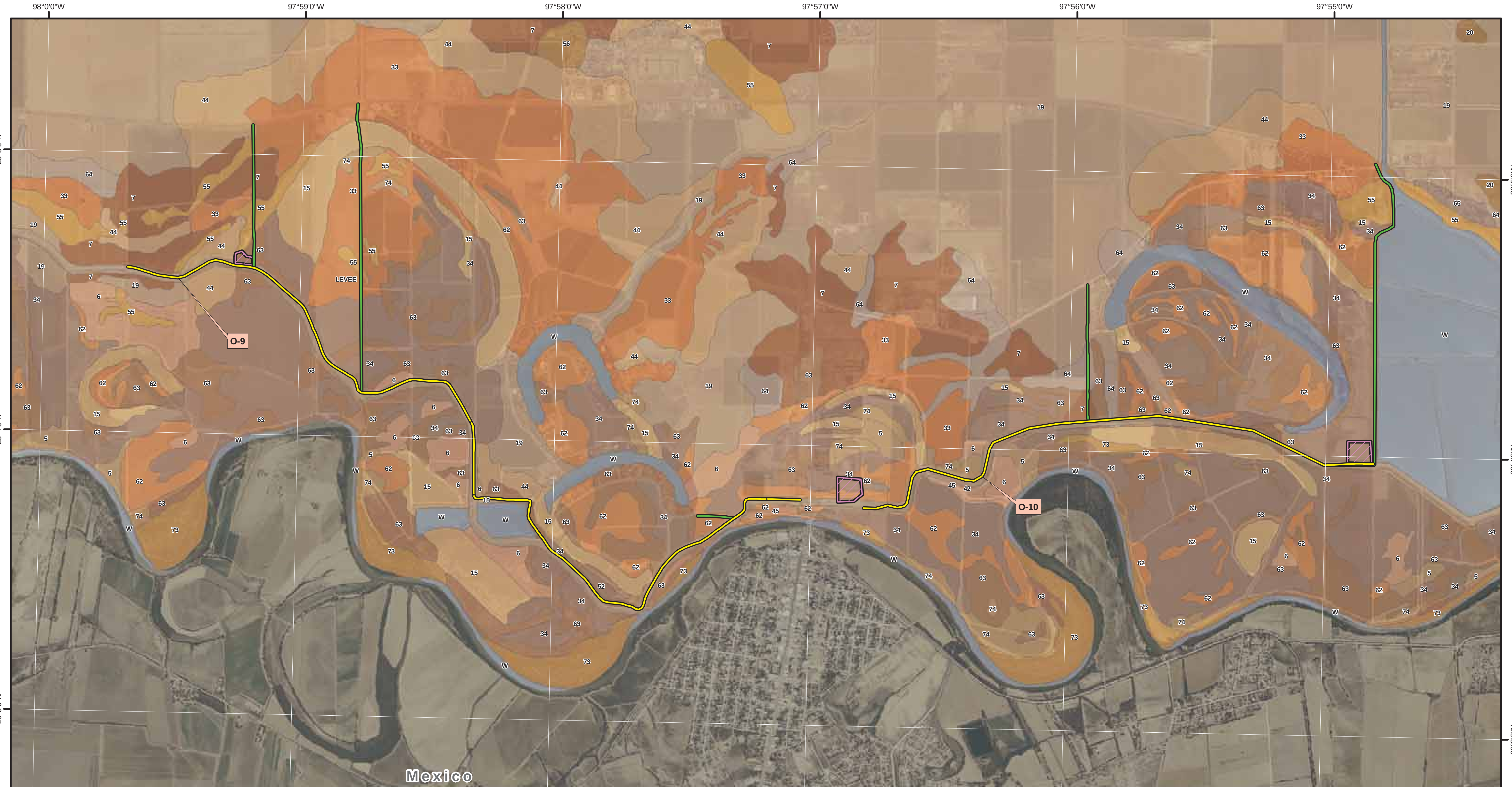

Fence Sections
Access Roads
Staging Areas

Soil Types

- 15, Grulla clay
- 19, Harlingen clay
- 20, Harlingen clay, saline
- 33, Laredo silty clay loam
- 34, Matamoros silty clay
- 38, McAllen sandy clay loam, 0 to 1 percent slopes
- 42, Nueces fine sand, 0 to 3 percent slopes
- 44, Olmito silty clay
- 45, Pits, borrow
- 5, Camargo silt loam
- 52, Raymondville clay loam, 0 to 1 percent slopes
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 56, Reynosa silty clay loam, saline, 0 to 1 percent sl
- 6, Camargo silty clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 65, Runn silty clay, saline
- 7, Cameron silty clay
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- LEVEE, Levee
- W, Water

Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

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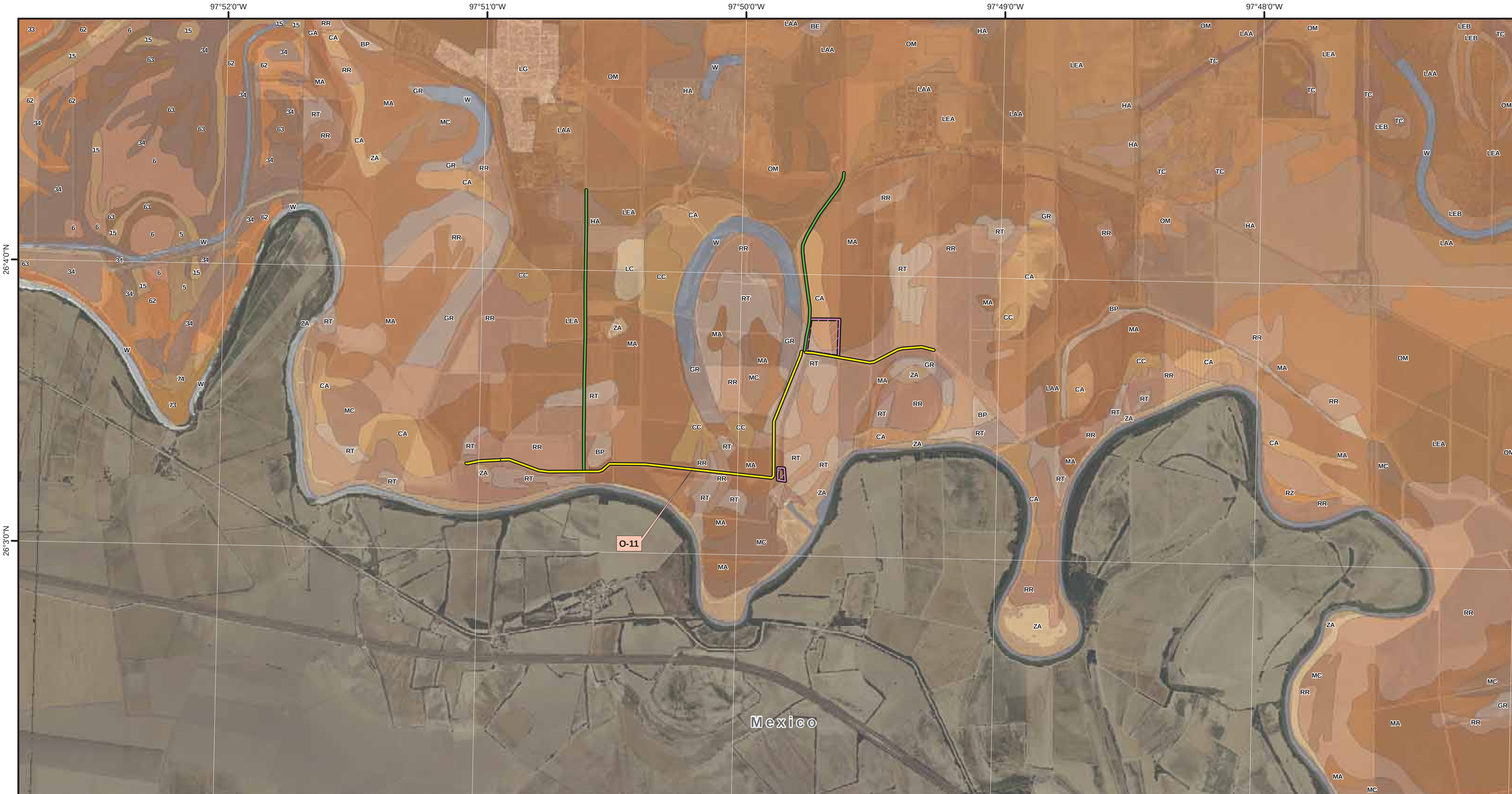

Fence Sections
Access Roads
Staging Areas

Soil Types

- 15, Grulla clay
- 33, Laredo silty clay loam
- 34, Matamoros silty clay
- 45, Pits, borrow
- 5, Camargo silt loam
- 55, Reynosa silty clay loam, 0 to 1 percent slopes
- 6, Camargo silty clay loam
- 62, Rio Grande silt loam
- 63, Rio Grande silty clay loam
- 64, Runn silty clay
- 66, Sarita fine sand, 0 to 3 percent slopes
- 73, Zalla loamy fine sand, undulating
- 74, Zalla silt loam
- BE, Benito clay
- BP, Borrow pits
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- GA, Galveston fine sand, hummocky
- GR, Grulla clay
- HA, Harlingen clay
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LC, Laredo silty clay loam, saline
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LEB, Laredo-Reynosa complex 1 to 3 percent slopes
- LEVEE, Levee
- LG, Laredo-Urban land complex
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- ON, Olmito-Urban land complex
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RZ, Rio Grande-Zalla complex
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet
0 500 1,000 2,000
Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

Projection: Albers
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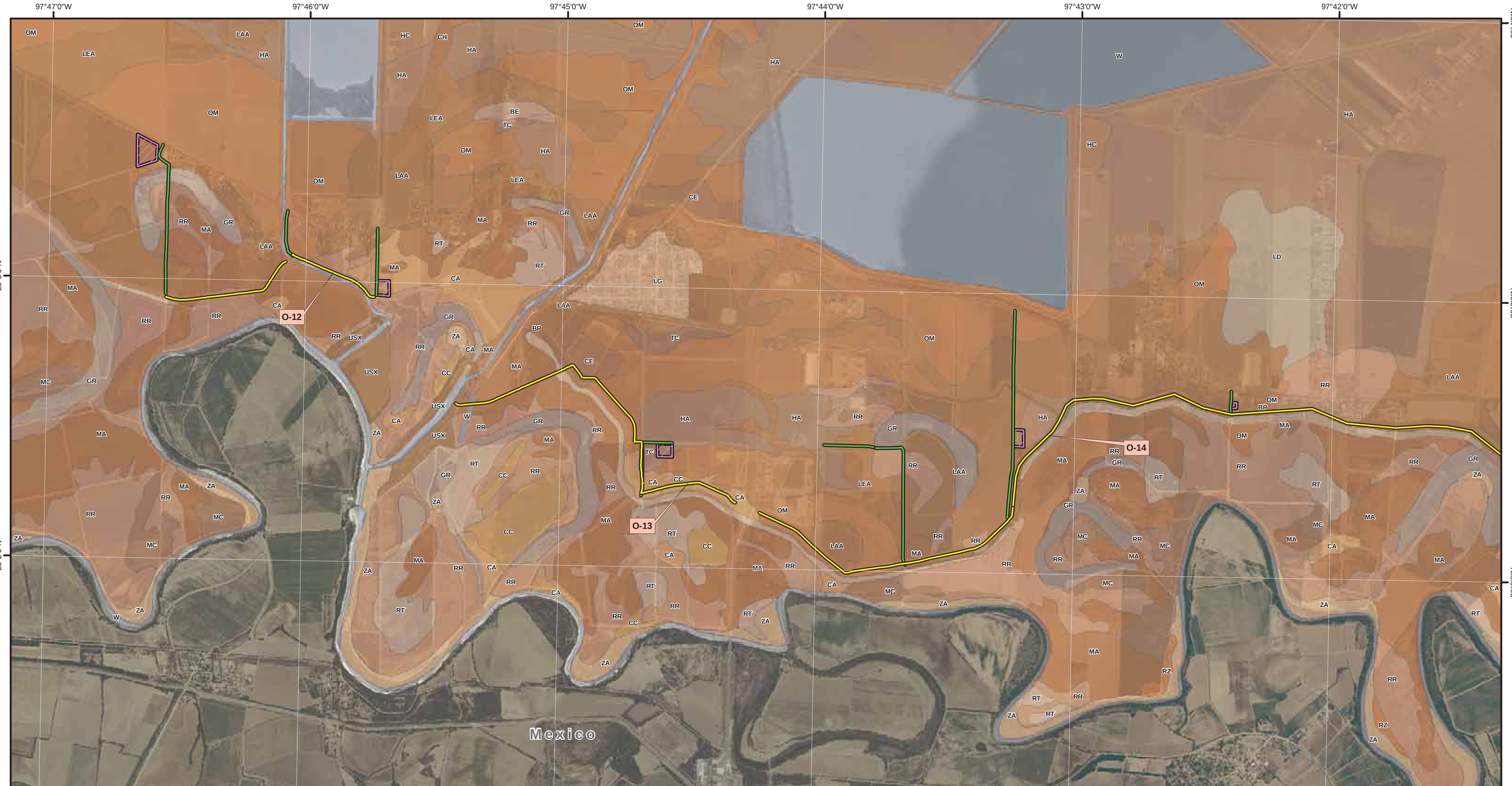


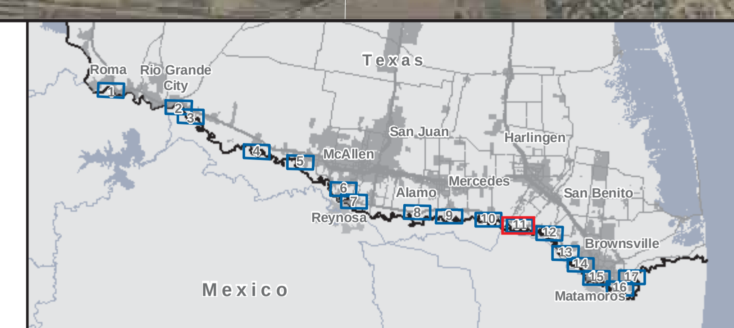
Fence Sections
Access Roads
Staging Areas

Soil Types

- BE, Benito clay
- BP, Borrow pits
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- HC, Harlingen clay, saline
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LG, Laredo-Urban land complex
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RZ, Rio Grande-Zalla complex
- TC, Tiocano clay
- USX, Ustifluvents, clayey
- W, Water
- ZA, Zalla loamy fine sand

Feet
0 500 1,000 2,000
Scale

N



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North American Datum of 1983

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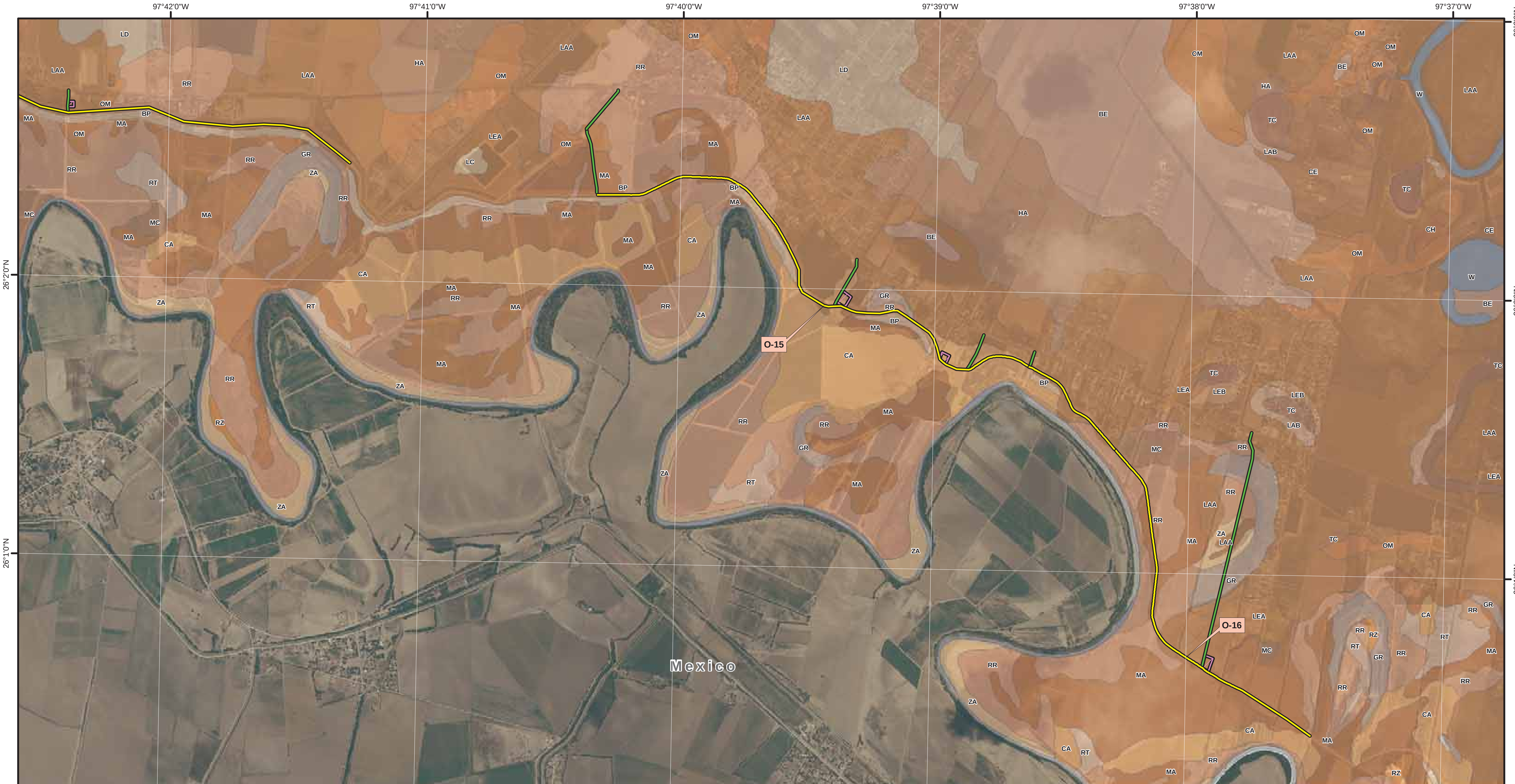

- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- BE, Benito clay
- BP, Borrow pits
- CA, Camargo silt loam
- CE, Cameron silty clay
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LEB, Laredo-Reynosa complex 1 to 3 percent slopes
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RZ, Rio Grande-Zalla complex
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

N

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Projection: Albers
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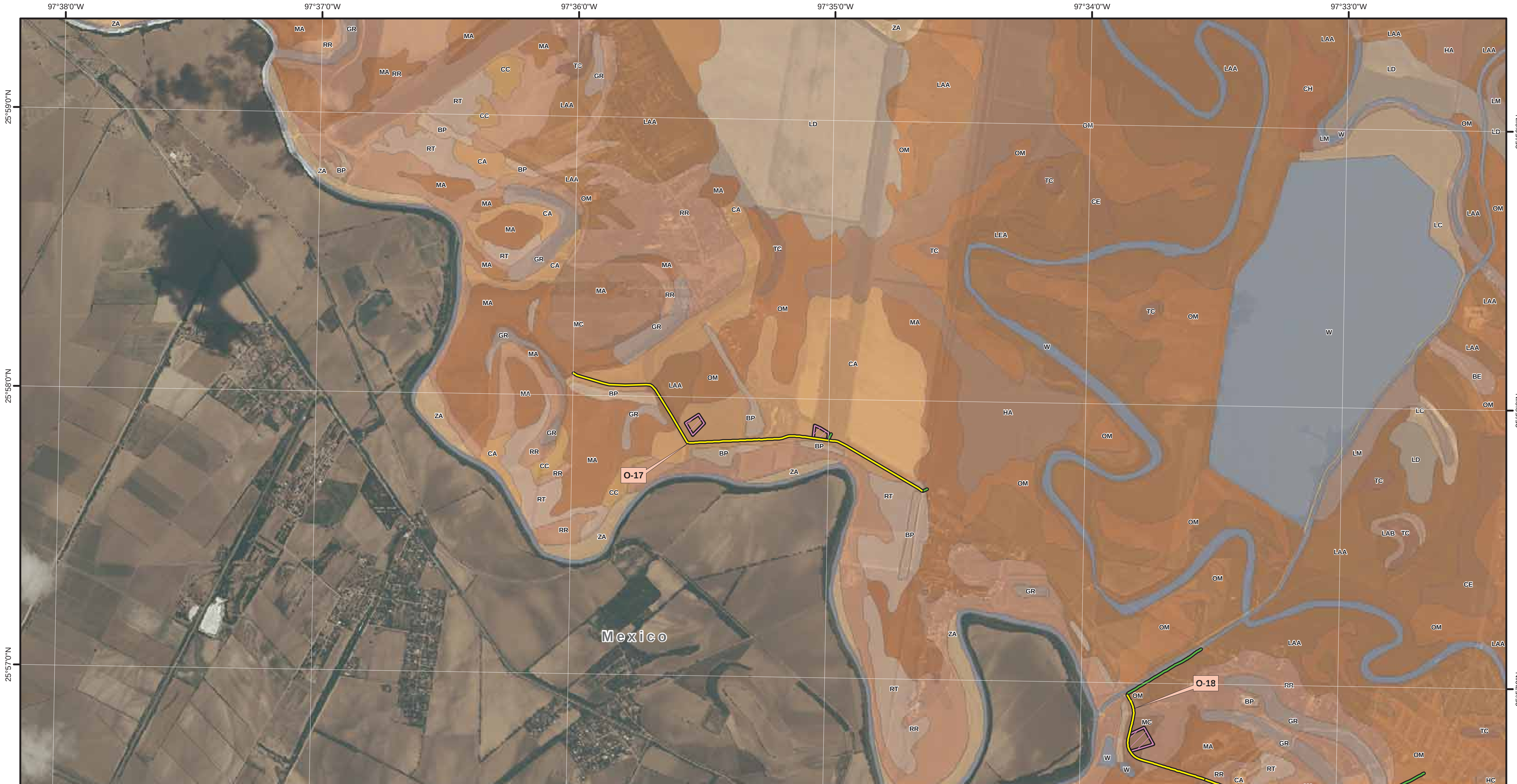

Fence Sections	
Access Roads	
Staging Areas	

Soil Types

- BE, Benito clay
- BP, Borrow pits
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- HC, Harlingen clay, saline
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LM, Lomalta clay
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

N

Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Rio Grande Valley Sector, Texas Soil Maps Version 1

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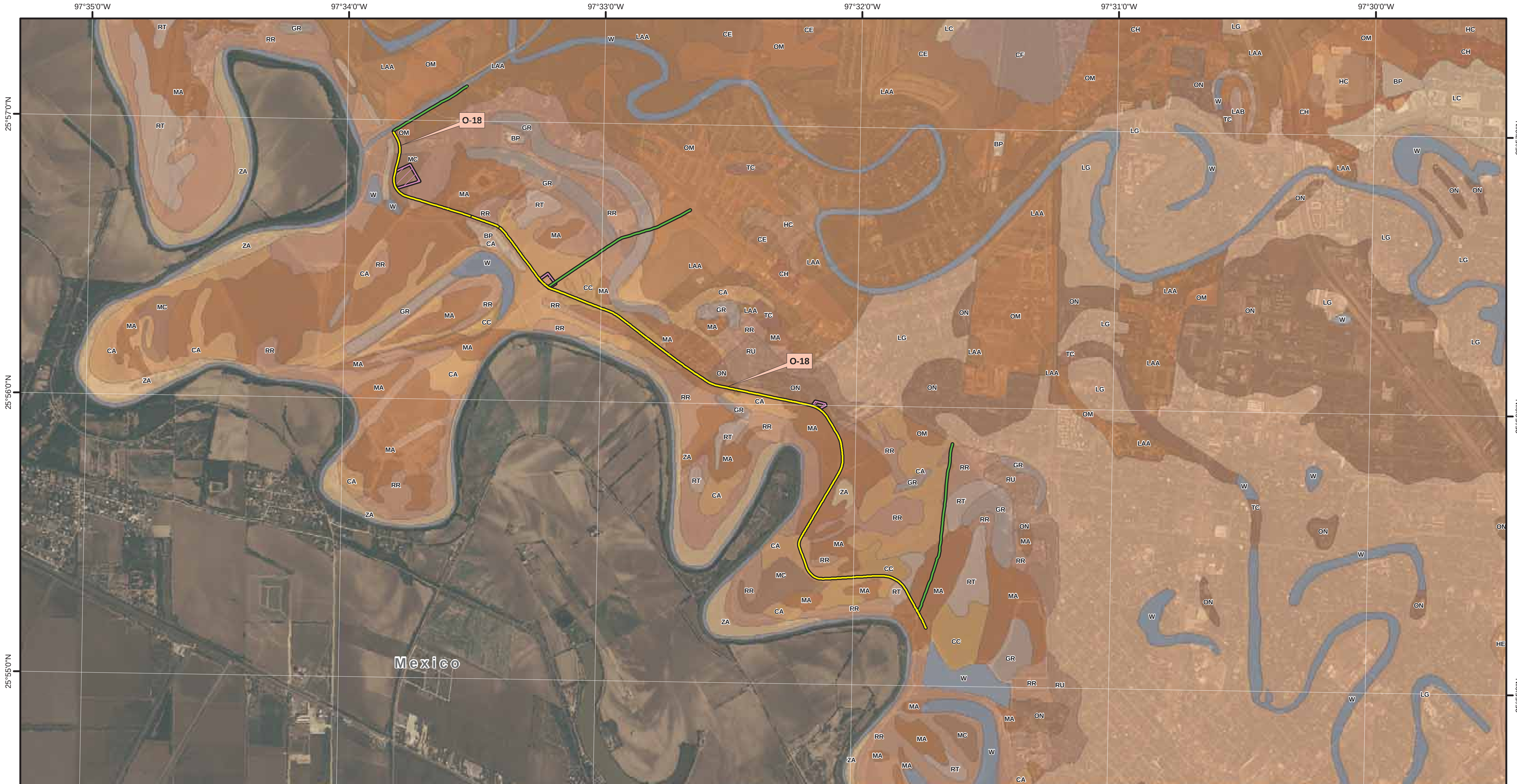


- Fence Sections
- Access Roads
- Staging Areas

Soil Types

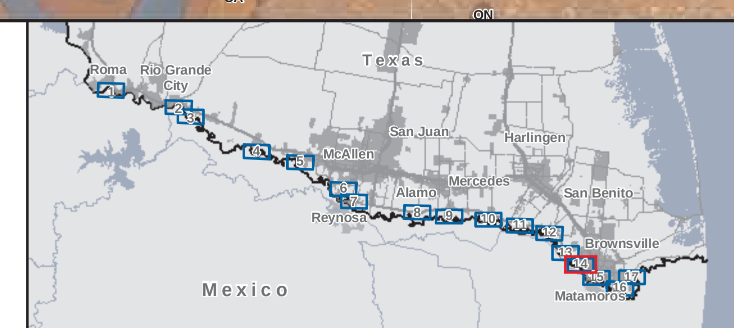
- BP, Borrow pits
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CF, Cameron silty clay, saline
- CH, Chargo silty clay
- GR, Grulla clay
- HC, Harlingen clay, saline
- HE, Harlingen-Urban land complex
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LG, Laredo-Urban land complex
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- ON, Olmito-Urban land complex
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RU, Rio Grande-Urban land complex
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

N



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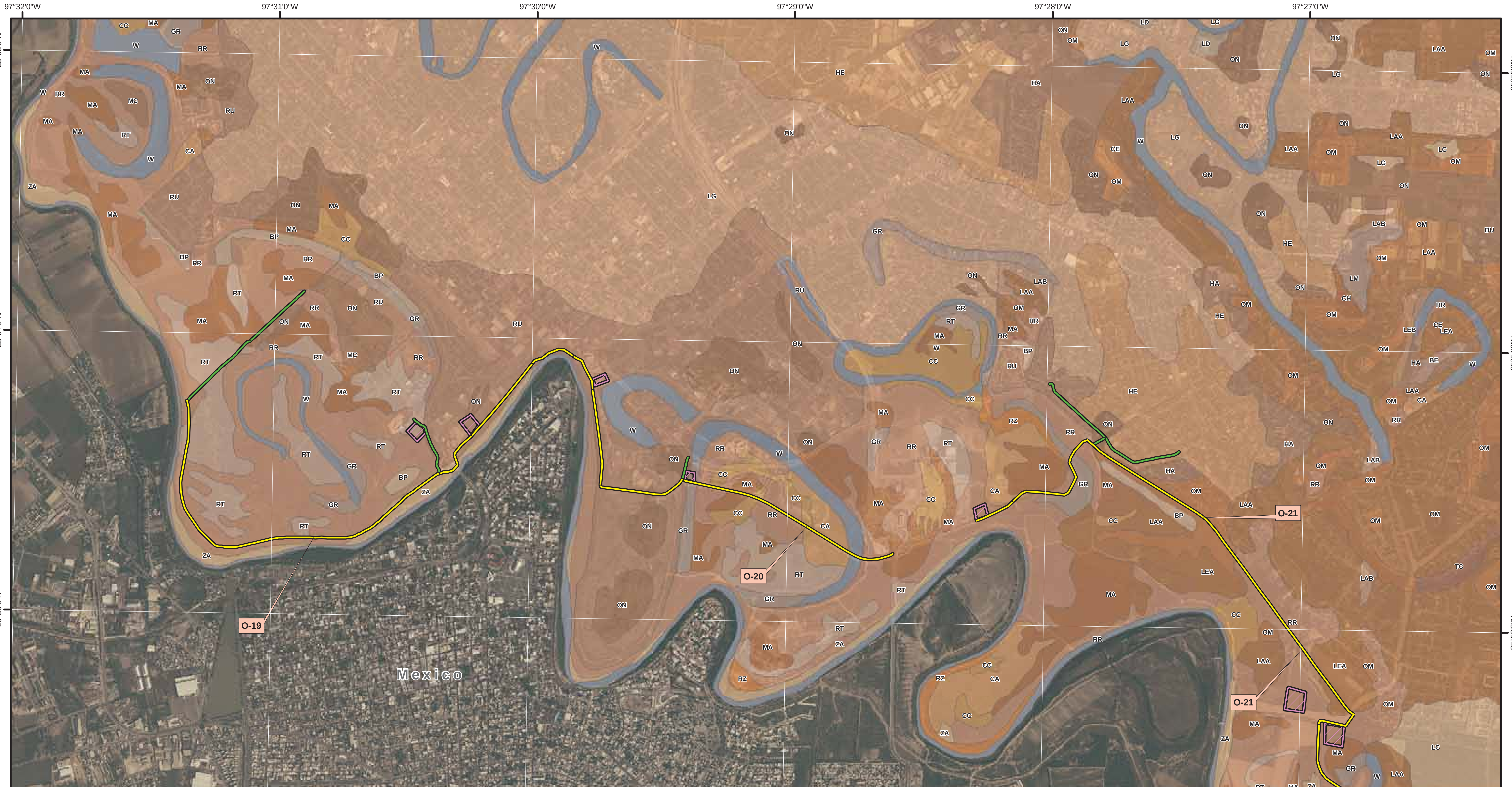


- Fence Sections
- Access Roads
- Staging Areas

Soil Types

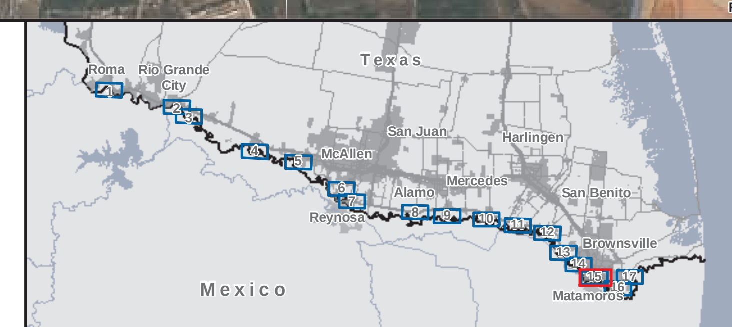
- BE, Benito clay
- BP, Borrow pits
- BU, Benito-Urban land complex
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- HE, Harlingen-Urban land complex
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LEB, Laredo-Reynosa complex 1 to 3 percent slopes
- LG, Laredo-Urban land complex
- LM, Lomalta clay
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- ON, Olmito-Urban land complex
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RU, Rio Grande-Urban land complex
- RZ, Rio Grande-Zalla complex
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

N



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Projection: Albers
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- Fence Sections
- Access Roads
- Staging Areas

Soil Types

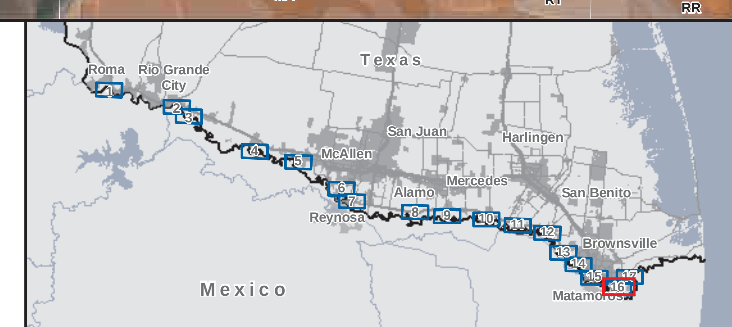
- BE, Benito clay
- BP, Borrow pits
- CA, Camargo silt loam
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CF, Cameron silty clay, saline
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- HC, Harlingen clay, saline
- HE, Harlingen-Urban land complex
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LM, Lomalta clay
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RZ, Rio Grande-Zalla complex
- TC, Tiocano clay
- W, Water
- ZA, Zalla loamy fine sand

Feet

0 500 1,000 2,000

Scale

N



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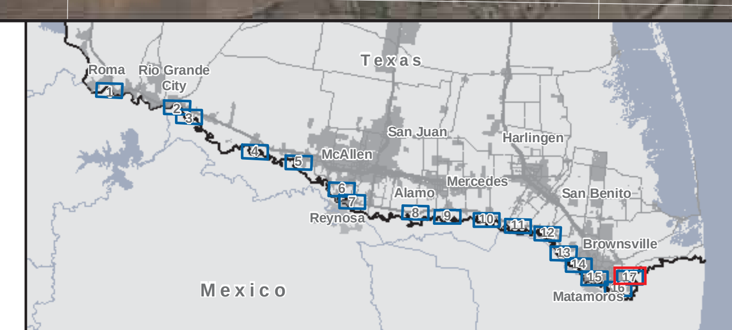
- Fence Sections
- Access Roads
- Staging Areas

Soil Types

- BE, Benito clay
- BP, Borrow pits
- BU, Benito-Urban land complex
- CC, Camargo silty clay loam
- CE, Cameron silty clay
- CF, Cameron silty clay, saline
- CH, Chargo silty clay
- GR, Grulla clay
- HA, Harlingen clay
- LAA, Laredo silty clay loam, 0 to 1 percent slopes
- LAB, Laredo silty clay loam, 1 to 3 percent slopes
- LC, Laredo silty clay loam, saline
- LD, Laredo-Olmito complex
- LEA, Laredo-Reynosa complex, 0 to 1 percent slopes
- LEB, Laredo-Reynosa complex 1 to 3 percent slopes
- LG, Laredo-Urban land complex
- LM, Lomalta clay
- LO, Lomalta-Urban land complex
- MA, Matamoros silty clay
- MC, Matamoros-Rio Grande complex
- OM, Olmito silty clay
- ON, Olmito-Urban land complex
- RR, Rio Grande silt loam
- RT, Rio Grande silty clay loam
- RZ, Rio Grande-Zalla complex
- SE, Sejita silty clay loam
- W, Water
- ZA, Zalla loamy fine sand

Feet
0 500 1,000 2,000
Scale

N



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